RFID

SMART RFID SENSOR

YHY522 RFID SENSOR

Contactless Reader/Writer Module

Product data sheet

VER 2.1
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CONTENT

1. Introduction

This document describes the functionality of the contactless reader/writer YHY522. It includes the functional and electrical specifications.

2. General description

The YHY522 is a highly integrated reader/writer for contactless communication at 13.56MHz.The YHY522 reader supports ISO14443A/ MIFARE® mode.

The YHY522 has built-in transceiver antenna to communicate with ISO/IEC 14443A/ MIFARE® cards without additional circuitry. The module provides a robust and efficient implementation of a demodulation and decoding circuitry for signals from ISO/IEC 14443A/ MIFARE® compatible cards and transponders. The digital part handles the complete ISO/IEC 14443A framing and error detection(Parity & CRC).

In the master mode, YHY522 will seek the card or data itself and output to host automatically.

Another useful function is that the module can use for counting, such as value decrement or increment. The YHY522 can dec/inc a number every time from the card which goes into the RF field.

In the slave mode, the module just needs only one command to finish one action, such as read or write data from card's block. The user does not need input three steps : request, anticollision and selection. The module will do this function for you automatically. What you need is just send one command to the module. Then it will send back what you want. Anything is just so simple and so easy. Also, if there is any card goes into the rf field, the red led on the module will light and the IRQ pin will change from "1" to "0" to indicate the event.

The red led will flash during communication.

Host interface :

Serial UART(similar to RS232 with voltage levels according pad voltage supply)

3. Features

- ▲ RFID Read/Write module Base on RC522 and with built-in transceiver antenna
- ▲ Auto checks for presence of tags and output interrupt information
- ▲ Auto read/write data from RFID tag
- ▲ Auto increment/decrement value from RFID tag
- ▲ Easy LOCK/UNLOCK function to protect RFID information
- ▲ Encrypted EEPROM to store configured data and up to 40 groups of keys

- ▲ Contactless operating frequency 13.56 MHz
- ▲ Supports ISO14443A /MIFARE® ,Mifare® Classic1K,Mifare® Classic 4K
- ▲ RS232 Interface, baud rate up to 230400bps
- ▲ Fast data transfer Contactless communication up to 106KHz
- ▲ Secure Encrypted contactless communication
- ▲ Typical Operating Distance: 0 – 60 mm
- ▲ Operating Voltage ： DC 2.7-3.6V
- ▲ Watchdog timer
- ▲ 1 LED indicator, 3 programmable I/O pins
- ▲ Size: 58mm × 35mm × 6mm
- ▲ Weight:10g

4. Application information

YHY522 can be use on vending machine, secure access, parking, payment, ticketing, leisure, member ship, time & attendance, biometrics, IT-access, Identify, loyalty, Counter, data storage and fast data collection systems.

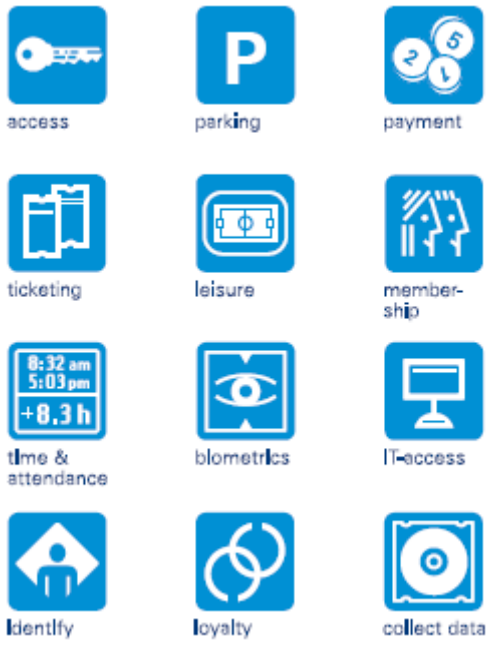


Figure 1. YHY522 Applications

5. Quick reference data

Table 1: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	Supply voltage	GND=0V	2.7	3.3	3.6	V
I_{HPD}	Hard Power-down Current		-	-	10	uA
I_{ASD}	Antenna Soft-down	V_{CC} =3.3V		15	20	mA
I_{VCC}	Supply Current	V_{CC} =3.3V		43	65	mA
D_{RW}	Read/Write card Distance	V_{CC} =3.3V	0		60	mm
T_{amb}	Operating ambient temperature		-25		+85	℃

6. Ordering Information

Table 2: Ordering Information

Type Number	Package	
	Name	Description
YHY522	YPHDR9-4	See Package Outline in Figure 8

7. Block diagram

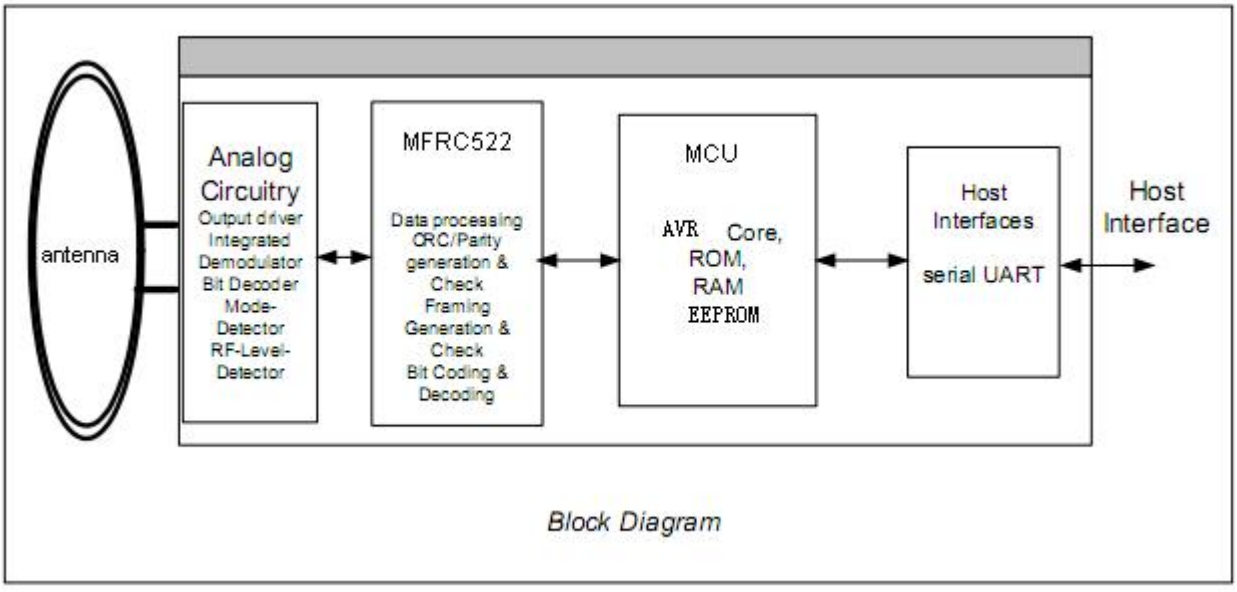


Figure 2. Simplified YHY522 Block diagram

The Analog circuitry and MFRC522 handle the modulation and demodulation RFID signal.

The MCU handles the protocol requirements for the communication schemes including the RF base protocols as well as the protocols for host communication.

8. Pinning information

8.1 Pining

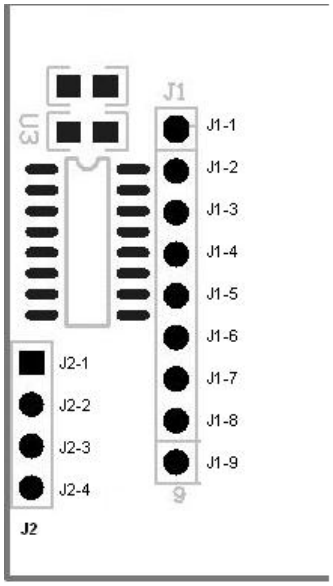


Figure 3 – Pinning configuration

8.2 Pin description

Table 3: J1 Pin description

Pin	Symbol	Type	Description
J1-1	RXD	I	Uart Receiver [1]
J1-2	TXD	O	Uart Transmitter [2]
J1-3	OUT1	O	Output 1
J1-4	OUT2	O	Output 2
J1-5	RST	I	Reset, active-low, floating for power-on reset by default
J1-6	BUZ	O	Buzzer output, high level drive
J1-7	IRQ	O	Interrupt output, LOW level indicates card in the field
J1-8	V_{CC}	PWR	Power supply
J1-9	GND	PWR	Power supply Ground

9. Functional description

YHY522 supports the Reader/Writer mode for ISO/IEC 14443A/MIFARE card.

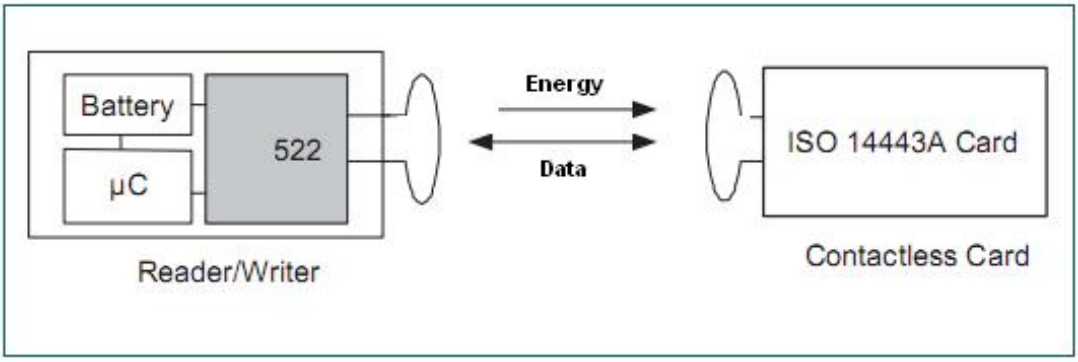


Figure 4 – YHY522 Reader/Writer mode

10. Digital interface

10.1 UART Interface

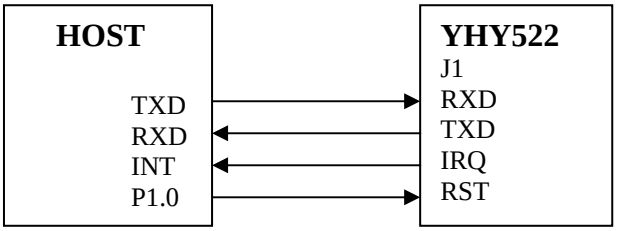


Figure 5 – YHY522 UART interface to host

The YHY522 supports direct interfacing serial UART interface type(J1). It is similar to RS232 with voltage levels according pad voltage supply.

10.2 RS232 Interface

RFU.

10.3 Slection of the transfer speeds

The default transfer speed is 19.2 kbit/s.

To change the transfer speed, the host controller has to write a value for the new transfer speed by the **CONFIG** command, after reset the module, the new speed will active.

Table 5: Selectable transfer speeds

Transfer Speed [kbit/s]	Configure Code
2.4	1
4.8	2
9.6	3
14.4	4
19.2	**5**
38.4	6

57.6	7
115.2	8
230.4	9

10.4 Transfer Protocol

The original setting for the host and YHY522 communicates at 19200bps, N, 8, 1.

In the slave mode, the host first sends the command and the module executes the operation and replies with a response to the command. The host can analyze the reply to check if the operation was successful or if any error occurred during the operation.

10.4.1 Host to YHY522 Transfer Protocol

Table 5. UART frame send by host

Header	Length	Command	Data	CSUM
2 Byte	1 Byte	1 Byte	N Bytes	1 Byte

1. Header: This header has 2 bytes that indicates the beginning of a frame. These 2 bytes should be always 0xAA 0xBB.

2. Length: This byte is used to indicate the length of the payload data. This includes the Length, Command and the Data bytes.

3. Command: This byte is used to instruct the module on what operation to perform.

4. Data: These are parameters for the module to execute the command. For example, for a Read command, the data will be the block number to be read and the authenticated key. For a Write command, this will be the block number and the authenticated key and 16 bytes data to write into the block. For other command, it maybe empty.

5. CSUM: This is the checksum byte. This byte is used on the host as well as the module to check the validity of the packet and to trap any data corruption. This is calculated by **XOR** all the bytes in the packet except the Header and the CSUM byte.

CSUM=Length ⊕ Command ⊕ Data[0] ⊕ Data[1]… ⊕ Data[n-1]

Note: If there is one byte "0xAA" in the packet data from Length to CSUM，please insert one byte "0x00" after "0xAA",but the Length need not change.

Code example:

```
//-------------------------------------------------
if (cSendBuffer[i] == 0xAA)
{
        TI = 0;
        SBUF = 0;
        while (!TI);
}
```

//----------

10.4.2 YHY522 to Host Transfer Protocol

Table 6. UART frame send by YHY522

Header	Length	Status	Data	CSUM
2 Byte	1 Byte	1 Byte	N Bytes	1 Byte

1. **Header:** This header has 2 bytes that indicates the beginning of a frame. These 2 bytes should be always 0xAA 0xBB.
2. **Length:** This byte is used to indicate the length of the payload data. This includes the Length, Command and the Data bytes
3. **Status:** This is the status for which the response is being sent back. If ok then the module return the command which host has sent, if failure it return the ones-complement code. For example, the command is 0x19, then the ones-complement code is 0xe6.
4. **Data**: This contains the result data if an operation was successful. It may be empty.
5. **CSUM:** This is the checksum byte. This byte is used on the host as well as the module to check the validity of the packet and to trap any data corruption. This is calculated by **XOR** all the bytes in the packet except the Header and CSUM byte.

CSUM=Length ⊕ Command ⊕ Response[0] ⊕ Response[1] ⊕ … ⊕ Response[n-1]

11. Interrupt Request System

The YHY522 indicates certain events by pin IRQ. If activated, the signal on pin IRQ maybe used to interrupt the host using its interrupt handling capabilities. This allows the implementation of efficient host software.

In the auto seek mode, if detect a card into the RF field, the IRQ pin will output “0”, else it will be “1”.

12. Power Reduction mode

12.1 Hard Power-down

A Hard Power-down is enabled with sending command **0x03** to the YHY522. This turns off all internal current sinks as well as the oscillator. All digital input buffers are separated from the input pads and clamped internally. The output pins are frozen at a certain value.

12.2 Transmitter Soft Power-down

The Transmitter Soft Power-down mode is entered immediately after send command **0x11** to the YHY522. The module will switch off the antenna power, but the mcu is still working.

13. Reset

The YHY522 is reset when a low level is present on the RST pin for longer than the minimum pulse length. During Reset, all I/O pins are set to their initial states, and the program starts execution from the Reset Vector.

Table 7: Reset Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Units
V_{POT}	Power-on Reset Threshold Voltage (rising)(1)			1.4	2.3	V
	Power-on Reset Threshold Voltage (falling)			1.3	2.3	V
V_{RST}	$\overline{RESET}$ Pin Threshold Voltage		0.2		0.9	V_{CC}
t_{RST}	Minimum pulse width on $\overline{RESET}$ Pin				1.5	µs

Notes: The Power-on Reset will not work unless the supply voltage has been below V_{POT} (falling).

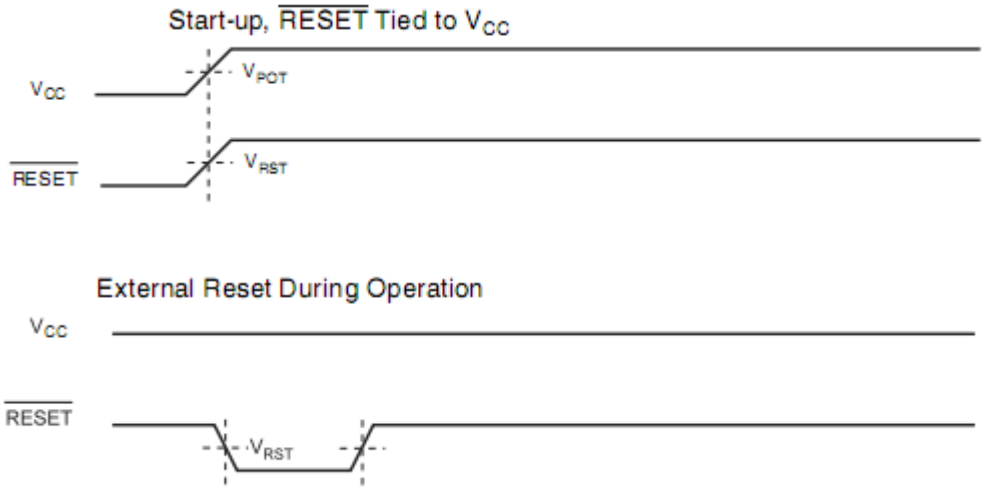


Figure 7– Reset timing

14. YHY522 Command Set

14.1 Commands overview

The commands for the YHY522 include system commands and RFID commands.

The system commands are use for controling the module settings and save parameters to the EEPROM.

The RFID commands are use to operating the RFID card, such as read or write block data.

Table 8: Command list

Code	Command	Description
SYSTEM COMMANDS		
0x00	Test_Com	Test Serial Communication
0x03	MSleep	Module Sleep(Hard Power Down)
0x04	MConfigure	Configure parameters to the module
0x05	Download_Keys	Download auth keys to the module
0x08	Download_Block_String	Download Block String to the module
0x09	Download_Value	Download Value to the module
0x11	Antenna_Control	Control Antenna on or off
0x13	Sense_Mode	Set Auto Sense Mode
0x14	Beep	Set Buzzer ON/OFF
0x15	Beep_time	Set buzzer beep delay time
0x16	Output1	Switch Output 1, default “1”
0x17	Output2	Switch Output 2, default “1”
RFID COMMANDS		
0x06	Change_Card_Keys	Change the Card’s Key
0x07	LOCK_Card	Lock/Unlock Card
0x12	Card_Sleep	Card Sleep(Halt)
0x19	Card_Type	Read Card Type
0x20	Card_ID	Read Card ID Number
0x21	Block_Read	Read Data From Card Block, 16 bytes
0x22	Block_Write	Write Data Into Card Block, 16 bytes
0x23	Value_Init	Initialize block data to Value format, 4 bytes
0x24	Value_Read	Read Value, 4 bytes
0x25	Value_Inc	Increase Value, 4 bytes, Low Byte First
0x26	Value_Dec	Decrease Value, 4 bytes, Low Byte First
0x27	Value_Backup	Backup Value to Another Block
0x2a	Sector_Read	Read One Sector
0x2b	Sector_Write	Write One Sector

14.2 Commands and Response

After power on or reset YHY522, the RED led will flash one time, It means that YHY522 is ready.

If a Mifare® tag detected by the module, pin IRQ will change from “1” to “0” and the red led on board will light till the tag moves out of rf field.

The RED led will flash during data stream exchanging between host and YHY522.

14.2.1 Test_Com

This command is use to test the RS232 communication. If succeess the module will send back the same string to the host.

Table 9. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	Len	0x00	N bytes	BCC

Table 10. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	Len	0x00	N bytes	BCC
Failure					

Table 11. Example

Send	**AA BB 09 00 *01 02 03 04 05 06 07 09***	
Description	AA BB	*Head*
	09	*Length*
	00	*COMMAND*
	01..07	*data*
	09	*BCC*
Receive(Success)	**AA BB 09 00 *01 02 03 04 05 06 07 09***	
Description	AA BB	*Head*
	09	*Length*
	00	*status*
	01..07	*data*
	09	*BCC*
Receive(Failure)		
Description		*No response or unknown data*

14.2.2 MSleep

After executing this Command the YHY522 will power down, waking up the module it needs to give the **RST** pin a low-level pulse or Re-power on the module.

Table 12. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x02	0x03		0x01

Table 13. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x03		0x01
Failure	0xAA 0xBB	0x02	0xFC		0xFE

Table 14. Example

Send	**AA BB 02 03 *01***	
Description	AA BB	*Head*
	02	*Length*
	03	*COMMAND*
	01	*BCC=02 ⊕03*
Receive(Success)	**AA BB 02 03 *01***	

Description	AA BB	*Head*
	02	*Length*
	03	*Status*
	01	*BCC*
Receive(Failure)	**AA BB 02 FC *FE***	
Description	AA BB	*Head*
	02	*Length*
	FC	*Error*
	FE	*BCC*

14.2.3 MConfigure

This command will configure parameters to the YHY522. After Reset YHY522 the configuration will active.

Table 15. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x12	0x04	Configure data: 16 bytes	BCC

Configure data: 16 bytes.

Table 16. Configure data

D[0]	D[1]	D[2..7]	D[8]	D[9]	D[10]	D[11]	D[12]	D[13]	D[14]	D[15]
Auto code	Key Type	Key String	Block R/W	Block Value	Value Backup	Start Sector	End Sector	Auth Mode	RFU	Baud Code

D[0]:Auto code -----

0—Auto function off ,the YHY522 will not auto seek card and the IRQ pin is not active.

1—Auto seek card, if there are cards in the RF field, the RED led will light and IRQ pin will output low level.

2—Same 1, and it will read the card id and upload to host, and then halt the card.

3—Same 1, and it will read the selected block and upload to host, and then halt the card.

4—Same 1, and it will write data into the selected block , and then halt the card.

5—Same 1, and it will decrement a value on the selected block and upload to host the value after decrement, and then halt the card.

6—Same 1, and it will increment a value on the selected block and upload to host the value after decrement, and then halt the card.

7—Same 1, and it will read from the **SSector**(start sector) to **ESector**(end sector) and upload to host, and then halt the card. This function can read out all the card blocks one time.

D[1]:Key Type -----

0x00 ---Key A

0x01 ---Key B

D[2..7]:Key string -----

Key(6 Bytes) to authenticate the mifare card

D[8]:Block R/W -----

Define one block of the card to be read or write.

D[9]:Block Value -----

Define one block of the card to increment or decrement

D[10]:Value Backup -----

Define one block of the card to backup the Value

D[11]:Start sector -----

Define the start sector to to be read .

D[12]:End sector -----

Define the end sector to to be read .

D[13]:Auth mode -----

Define the auth mode----

0—Auth directly from host, default mode

1—The YHY522 will use the downloaded keys for authentication card

D[14]:RFU -----

Reserved For future Used. Default 0x60.

D[15]:Baud code -----

See table 5 for the baud rate code.

Table 17. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x04		0x06
Failure	0xAA 0xBB	0x02	0xFB		0xF9

Table 18. Example 1 ---Auto read card id, Auto code=0x02

Send	**AA BB 12 04 02 00 FF FF FF FF FF FF 00 00 00 00 00 00 00 08 1C**	
Description	AA BB	*Head*
	12	*Length*
	04	*COMMAND*
	02	*Auto code—auto read id*
	00..00	*Any data*
	08	*Baud code---115200bps*
	1C	*BCC*
Receive(Success)	**AA BB 02 04 *06***	
Description	AA BB	*Head*
	02	*Length*
	04	*Status*
	06	*BCC*
Receive(Failure)	**AA BB 02 FB *F9***	
Description	AA BB	*Head*
	02	*Length*

	FC	Error
	FE	BCC

If success then reset the YHY522 to active this function. The reader will read the card id itself when there is a card into the RF field and then output the id to host, at the same time the buzzer would beep one time if it is connecting to a buzzer.

Example 2 *---Auto read card block, Auto code=0x03*

Configure command--: Host →YHY522

AA BB 12 04 03 00 FF FF FF FF FF FF 00 05 06 03 04 01 60 08 78

Description:

03: Auto code

00 FF FF FF FF FF FF: Auth key A and key string

00: Read block 0

01: Auth mode 1

08: Baud code,115200bps

If success then reset the YHY522 to active this function. The reader will read the card block itself when there is a card into the RF field and then output the block data to host, at the same time the buzzer would beep one time if it is connecting to a buzzer. Below is the output string example.

YHY522 → Host----

AA BB 12 **51 5E C0 E0 7A 04 88 04 00 47 51 35 56 61 10 28 08** EB

Description:

51: Status code

5E C0 E0 7A 04 88 04 00 47 51 35 56 61 10 28 08: Data in the block 0

Example 3 *---Auto write card block, Auto code=0x04*

Configure command--: Host →YHY522

AA BB 12 04 04 00 FF FF FF FF FF FF 02 05 06 03 04 01 60 08 7D

Description:

04: Auto code

00 FF FF FF FF FF FF: Auth key A and key string

02: Write block 2

01: Auth mode 1

08: Baud code,115200bps

Next you need to write command "**Download_Block_String**" to load the string to be written into the block.

For example:

AA BB 12 08 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 1A

Description:

01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01: 16 bytes data

If success then reset the YHY522 to active this function. The reader will write the card block itself when there is a card into the RF field and then output the status to host, at the same time the buzzer would beep one time if it is connecting to a buzzer. Below is the output string.

AA BB 02 52 50

Description:

52: Status code---writing is OK

Example 4 *---Auto decrement value, Auto code=0x05*

Configure command--:Host →YHY522

AA BB 12 04 05 00 FF FF FF FF FF FF 02 05 06 03 04 01 60 08 7C

Description:

05: Auto code

00 FF FF FF FF FF FF: Auth key A and key string

05 06: 05—decrement block, 06-backup block

01: Auth mode 1

08: Baud code,115200bps

Next you need to write command "**Download_Value**" to load the value.

For example:

AA BB 06 09 01 00 00 00 0E

Description:

01 00 00 00: 4 bytes value(1), low byte first

Note: Any block to be used as value format, it need to initialize in the first time.

If success then reset the YHY522 to active this function. The reader will decrease the card block value itself when there is a card into the RF field and then output the value after decrement to host, at the same time the buzzer would beep one time if it is connecting to a buzzer. Below is the output string.

AA BB 06 53 63 00 00 00 36

Description:

53: Status code, decrement is OK

63 00 00 00: block 02 value(99) after decrement

Example 5 *---Auto increment value, Auto code=0x06*

Configure command--: Host →YHY522

AA BB 12 04 06 00 FF FF FF FF FF FF 02 05 06 03 04 01 60 08 7F

Description:

06: Auto code

00 FF FF FF FF FF FF: Auth key A and key string

05 06: 05—increment block, 06-backup block

01: Auth mode 1

08: Baud code,115200bps

Next you need to write command "**Download_Value**" to load the value if you did not write it before.
For example:
AA BB 06 09 01 00 00 00 0E
Description:

01 00 00 00 : 4 bytes value(1), low byte first

Note: Any block to be use as value format, it need to initialize in the first time.

If success then reset the YHY522 to active this function. The reader will increment the card block itself when there is a card into the RF field and then output the value after increment to host, at the same time the buzzer would beep one time if it is connecting to a buzzer. Below is the output string.

AA BB 06 **54** **64 00 00 00** 36

Description:

54: Status code, increment is OK

64 00 00 00: block 02 value(100) after increment

Example 6 *---Auto read card sectors, Auto code=0x07*

Configure command--: Host →YHY522

AA BB 12 04 07 00 FF FF FF FF FF FF 00 05 06 03 04 01 60 08 7C
Description:

07: Auto code

00 FF FF FF FF FF FF: Auth key A and key string

03 04: 03—Start sector,04—End sector

01: Auth mode 1

08: Baud code,115200bps

This command would read out 2 sectors. The output format is:

AABB+ Len(1 byte)+Status(1byte,0x56)+Sector data(48/240 bytes)+BCC

Note: the reader will output n(sectors=SSector-ESector+1)frame to host.

If success then reset the YHY522 to active this function. The reader will read the card from SSector to ESector itself when there is a card into the RF field and then output the data to host, at the same time the buzzer would beep one time if it is connecting to a buzzer. Below is the output string.

YHY522 → Host----

Frame 1:

AA BB **33** **56** **03** 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 00 00 00 00 00 00 00 00 66

Description:

33 : Length

56 : Status code

03 : Sector 03

00..00: Data

Frame 2:

AA BB 33 56 04 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 00 00 00 00 00 00 00 61

Description:

33 : Length

56 : Status code

04 : Sector 04

00..00: Data

14. 2. 4 Download_Keys

This command can load up to 40 groups keys to the YHY522's EEPROM, all the data stored in the EEPROM is encrypted. When **auth mode** is **1**, the reader will use the EEPROM's key to auth the card. After reset this keys will active.

Table 19. Command--: Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x09	0x05	7 bytes Sector: 1 byte Keys: 6 bytes	BCC

Sector: 0—0x27 (mifare 4 k card has 40 sectors)

Keys: KeyA or KeyB, default FF FF FF FF FF FF.

Table 20. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x05		0x07
Failure	0xAA 0xBB	0x02	0xFA		0xF8

Table 21. Example

Send	**AA BB 09 05 01 FF FF FF FF FF FF 0D**	
Description	AA BB	*Head*
	09	*Length*
	05	*COMMAND*
	01	*Sector 01*
	FF FF FF FF FF FF	*Key*
	0D	*BCC*
Receive(Success)	**AA BB 02 03 *01***	

Description	AA BB	*Head*
	02	*Length*
	05	*Status*
	07	*BCC*
Receive(Failure)	**AA BB 02 FC *FE***	
Description	AA BB	*Head*
	02	*Length*
	FA	*Error*
	F8	*BCC*

14.2.5 Download_Block_String

This command will load one block string(16 bytes) to the YHY522's EEPROM for writing into the card, all the data store in the EEPROM is encrypted. When **auth mode** is **1**, auto **code** is **4**, this string will active.

Table 22. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x12	0x08	Block string :16 bytes	BCC

Table 23. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x08		0x 0A
Failure	0xAA 0xBB	0x02	0xF7		0x F5

Table 24. Example

Send	**AA BB 12 08 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 1A**	
Description	AA BB	*Head*
	12	*Length*
	08	*COMMAND*
	00..0F	*Data*
	1A	*BCC*
Receive(Success)	**AA BB 02 08 *0A***	
Description	AA BB	*Head*
	02	*Length*
	08	*Status*
	0A	*BCC*
Receive(Failure)	**AA BB 02 FC *FE***	
Description	AA BB	*Head*
	02	*Length*
	FA	*Error*
	F5	*BCC*

14.2.6 Download_Value

This command will load value(4 bytes, low byte first) to the YHY522's EEPROM for increment or decrement, all the data store in the EEPROM is encrypted. When **auth mode** is **1**, auto **code** is **5**, this value will active.

Table 25. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x06	0x09	Value:4 bytes	BCC

Value: Low byte first

Table 26. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x09		0x 0B
Failure	0xAA 0xBB	0x02	0xF6		0x F4

Table 27. Example

Send	**AA BB 06 09 01 00 00 00 0E**	
Description	AA BB	*Head*
	06	*Length*
	09	*COMMAND*
	01 00 00 00	*Value, low byte first*
	0E	*BCC*
Receive(Success)	**AA BB 02 08 *0A***	
Description	AA BB	*Head*
	02	*Length*
	09	*Status*
	0B	*BCC*
Receive(Failure)	**AA BB 02 FC *FE***	
Description	AA BB	*Head*
	02	*Length*
	F6	*Error*
	F4	*BCC*

14.2.7 Antenna_Control

This command set the antenna power on or off .

Table 28. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x03	0x11	Switch:1Byte	BCC

Switch----
0x00: antenna soft power-down
0x03: antenna soft power-on

Table 29. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x11		0x13
Failure	0xAA 0xBB	0x02	0xEE		0xEC

Table 30. Example

Send	**AA BB 03 11 00 12**	
Description	AA BB	*Head*
	03	*Length*
	11	*COMMAND*
	00	*antenna soft power-down*

	12	BCC
Receive(Success)	**AA BB 02 11 *13***	
Description	AA BB	*Head*
	02	*Length*
	11	*Status*
	13	*BCC*
Receive(Failure)	**AA BB 02 EE *EC***	
Description	AA BB	*Head*
	02	*Length*
	EE	*Error*
	EC	*BCC*

14.2.8 Sense_Mode

This command can change the auto sense mode any time during the YHY522 working, it needs no reset operation.

Table 31. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x03	0x13	Auto code:1Byte	BCC

Auto code -----

0—Auto function off ,the YHY522 will not auto seek card and the IRQ pin is not active.

1—Auto seek card, if there are cards the RED led will light and IRQ pin output low level.

2—Same 1, and it will read the card id and upload to host, and then halt the card.

3—Same 1, and it will read the selected block and upload to host, and then halt the card.

4—Same 1, and it will write data into the selected block , and then halt the card.

5—Same 1, and it will decrement a value on the selected block and upload to host the value after decrement, and then halt the card.

6—Same 1, and it will increment a value on the selected block and upload to host the value after decrement, and then halt the card.

7—Same 1, and it will read from the SSector(start sector) to ESector(end sector) and upload to host, and then halt the card. This function can read out all the card blocks one time.

Table 32. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x13		0x11
Failure	0xAA 0xBB	0x02	0xEC		0xEE

Table 33. Example

Send	**AA BB 03 13 00 *10***	
Description	AA BB	*Head*
	03	*Length*
	13	*COMMAND*
	00	*Auto off*
	10	*BCC*
Receive(Success)	**AA BB 02 13 *11***	

Description	AA BB	*Head*
	02	*Length*
	13	*Status*
	11	*BCC*
Receive(Failure)	**AA BB 02 EC *EE***	
Description	AA BB	*Head*
	02	*Length*
	EC	*Error*
	EE	*BCC*

14.2.9 Beep

This command sets the buzzer ON or OFF, and control the buzzer beep times. The condition is the pin BUZ connecting one buzzer.

Table 34. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x03	0x14	1Byte *'1y'*: Buzzer ON and sound *y* times *'0F'*: Buzzer OFF	BCC

Table 35. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x14		0x16
Failure	0xAA 0xBB	0x02	0xEB		0x E9

Table 36. Example

Send	**AA BB 03 14 13 *04***	
Description	AA BB	*Head*
	03	*Length*
	14	*COMMAND*
	13	*beep 3 times*
	04	*BCC*
Receive(Success)	**AA BB 02 14 *16***	
Description	AA BB	*Head*
	02	*Length*
	14	*Status*
	16	*BCC*
Receive(Failure)	**AA BB 02 EB *E9***	
Description	AA BB	*Head*
	02	*Length*
	EB	*Error*
	E9	*BCC*

14.2.10 Beep_time

This command Set buzzer beep delay time.

Table 37. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x03	0x15	Time: 1Byte	BCC

Time: n*10 ms

Table 38. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x15		0x17
Failure	0xAA 0xBB	0x02	0x EA		0x E8

Table 39. Example

Send	**AA BB 03 15 10 *06***	
Description	AA BB	*Head*
	03	*Length*
	15	*COMMAND*
	10	*Beep time Interval*
	06	*BCC*
Receive(Success)	**AA BB 02 15 *17***	
Description	AA BB	*Head*
	02	*Length*
	15	*Status*
	17	*BCC*
Receive(Failure)	**AA BB 02 EA *E8***	
Description	AA BB	*Head*
	02	*Length*
	EA	*Error*
	E8	*BCC*

14.2.11 Output1

This command sets the pin Output1 “1” or “0” level. Default is no pull-up, output low(sink).

Table 40. Command--: Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x03	0x16	State: 1Byte *‘00’*: Output *‘0’* *‘01’*: Output *‘1’*	BCC

Table 41 Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x16		0x14
Failure	0xAA 0xBB	0x02	0xE9		0x EB

Table 41. Example

Send	**AA BB 03 16 01 *04***	
Description	AA BB	*Head*
	03	*Length*
	16	*COMMAND*
	01	*Output “1”*

	04	*BCC*
Receive(Success)	**AA BB 02 16 *14***	
Description	AA BB	*Head*
	02	*Length*
	16	*Status*
	17	*BCC*
Receive(Failure)	**AA BB 02 E9 *EB***	
Description	AA BB	*Head*
	02	*Length*
	E9	*Error*
	EB	*BCC*

14. 2. 12 Output2

This command sets the pin Output2 “1” or “0” level. Default is no pull-up, output low(sink).

Table 42. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x03	0x17	State: 1Byte *‘00’*: Output *‘0’* *‘01’*: Output *‘1’*	BCC

Table 43. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x17		0x15
Failure	0xAA 0xBB	0x02	0xE8		0x EA

Table 44. Example

Send	**AA BB 03 17 01 *05***	
Description	AA BB	*Head*
	03	*Length*
	17	*COMMAND*
	01	*Output “1”*
	05	*BCC*
Receive(Success)	**AA BB 02 17 *15***	
Description	AA BB	*Head*
	02	*Length*
	17	*Status*
	15	*BCC*
Receive(Failure)	**AA BB 02 E8 *EA***	
Description	AA BB	*Head*
	02	*Length*
	E8	*Error*
	EA	*BCC*

14. 2. 13 Change_Card_Keys

This command will change the card’s authentication keys. The card

needs to be put on the field when performing this action.

Table 45. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x1A	0x06	Key Info: 24 bytes	BCC

Key Info: Key type +Sector number + Old Key + New Key + Key A+ Access bits + Key B

Key type: 1 byte, 0x00—Key A, 0x01—Key B.

Sector number: 1 byte, 0x00..0x27 (0..39)

Old Key: 6 bytes, default "FFFFFFFFFFFF" (*)

Key A: 6 bytes new key

Access bits: 4 bytes---' FF 07 80 69'

Key B: 6 bytes ----default 'FF FF FF FF FF FF'

(*)Note: If auth mode is "1", then this key is not active, it can be any 6 data bytes.

Table 46. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x06		0x04
Failure	0xAA 0xBB	0x02	0xF9		0xFB

Table 47. Example

Send	**AA BB 1A 06 00 08 FF FF FF FF FF FF 00 11 22 33 44 55 FF 07 80 69 FF FF FF FF FF FF 14 (*)**	
Description	AA BB	*Head*
	1A	*Length*
	06	*COMMAND*
	00	*Key type A*
	08	*Sector 08*
	FF FF FF FF FF FF	*Old Key*
	00 ..55	*New key*
	FF 07 80 69	*Access bytes*
	FF FF FF FF FF FF	*Key B*
	30	*BCC*
Receive(Success)	**AA BB 02 06 04**	
Description	AA BB	*Head*
	02	*Length*
	06	*Status*
	04	*BCC*
Receive(Failure)	**AA BB 02 F9 FB**	
Description	AA BB	*Head*
	02	*Length*
	F9	*Error*
	FB	*BCC*

14. 2. 14 LOCK_Card

This command will LOCK/UNLOCK the appointed sector. Once the

sector is **LOCK**, all the blocks can only read or decrement. The user need to use the **key A** to authenticate the card. The card needs to be put on the field when performing this action.

Table 48. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x0A	0x07	Lock Info: 8 bytes	BCC

Lock Info: Sector number + Key A + LOCK/UNLUCK

Sector number: 1 byte, 0x00..0x27 (0..39)

Key A: 6 bytes, default "FFFFFFFFFFFF" (*)

LOCK/UNLUCK: 0x00---LOCK; 0x01---UNLOCK

(*)Note: If auth mode is "1", then this key is not active, it can be any 6 data bytes.

Table 49. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x07		0x05
Failure	0xAA 0xBB	0x02	0xF8		0xFA

Table 50. Example

Send	**AA BB 0A 07 08 FF FF FF FF FF FF 00 05**	
Description	AA BB	*Head*
	0A	*Length*
	07	*COMMAND*
	08	*Sector to be LOCK/UNLOCK*
	FF FF FF FF FF FF	*Key*
	00	*LOCK*
	05	*BCC*
Receive(Success)	**AA BB 02 07 05**	
Description	AA BB	*Head*
	02	*Length*
	07	*Status*
	05	*BCC*
Receive(Failure)	**AA BB 02 F8 FA**	
Description	AA BB	*Head*
	02	*Length*
	F8	*Error*
	FA	*BCC*

14.2.15 Card_Sleep

This command sets the Card into sleeping. After successfully operation the card will be halt. Reactivate the card need to remove the card from antenna area and put the card into antenna area again. Or reset the YHY522 to repower the card.

Table 51. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x02	0x12		0x10

Table 52. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x12		0x10
Failure	0xAA 0xBB	0x02	0x ED		0xEF

Table 53. Example

Send	**AA BB 02 12 *10***	
Description	AA BB	*Head*
	02	*Length*
	12	*COMMAND*
	10	*BCC*
Receive(Success)	**AA BB 02 12 *10***	
Description	AA BB	*Head*
	02	*Length*
	12	*Status*
	10	*BCC*
Receive(Failure)	**AA BB 02 ED *EF***	
Description	AA BB	*Head*
	02	*Length*
	ED	*Error*
	EF	*BCC*

14.2.16 Card_Type

This command reads card type.

Table 54. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x02	0x19		0x1B

Table 55. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x04	0x19	Card type: 2Bytes	BCC
Failure	0xAA 0xBB	0x02	0x E6		0xE4

Card type:
0x0400---Mifare 1k card(s50)
0x0200---Mifare 4k card(s70)

Table 56. Example

Send	**AA BB 02 19 *1B***	
Description	AA BB	*Head*
	02	*Length*
	19	*COMMAND*
	1B	*BCC*
Receive(Success)	**AA BB 04 19 04 00 *19***	

Description	AA BB	*Head*
	04	*Length*
	19	*Status*
	04 00	*Card TYPE 04 00: S50 Card; 02 00: S70 Card*
	19	*BCC*
Receive(Failure)	**AA BB 02 E6 *E4***	
Description	AA BB	*Head*
	02	*Length*
	E6	*Error*
	E4	*BCC*

14.2.17 Card_ID

This command read the mifare card serial number.

Table 57. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x02	0x20		0x22

Table 58. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x06	0x20	Card ID: 4Bytes	BCC
Failure	0xAA 0xBB	0x02	0x DF		0xDD

Table 59. Example

Send	**AA BB 02 20 *22***	
Description	AA BB	*Head*
	02	*Length*
	20	*COMMAND*
	22	*BCC*
Receive(Success)	**AA BB 06 20 *92 BF 72 59* *20***	
Description	AA BB	*Head*
	06	*Length*
	20	*Status*
	92 BF 72 59	*Card ID*
	20	*BCC*
Receive(Failure)	**AA BB 02 DF *DD***	
Description	AA BB	*Head*
	02	*Length*
	DF	*Error*
	DD	*BCC*

14.2.18 Block_Read

This command reads data from the appointed block. One block has 16 bytes.

Table 60. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum

	0xAA 0xBB	0x0A	0x21	Block Info: 8 bytes	BCC

Block Info: Key type +Block number + Key

Key type: 1 byte, 0x00—Key A, 0x01—Key B.

Block number: 1 byte, 0x00..0xff (0..255) (*)

Key: 6 bytes, default "FFFFFFFFFFFF"

(*)Note: If auth mode is "1", then this key is not active, it can be any 6 data bytes.

Table 61. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x12	0x21	Block data: 16Bytes	BCC
Failure	0xAA 0xBB	0x02	0x DE		0xDC

Table 62. Example

Send	**AA BB 0A 21 00 08 FF FF FF FF FF FF 23**	
Description	AA BB	*Head*
	0A	*Length*
	21	*COMMAND*
	00	*Authenticate with Key A*
	08	*Read Block 08(Sector 02,1st block)*
	FF FF FF FF FF FF	*Keys*
	23	*BCC*
Receive(Success)	**AA BB 12 21 00 11 22 33 44 55 66 77 88 99 AA 00 BB CC DD EE FF 23 (*)**	
Description	AA BB	*Head*
	12	*Length*
	21	*Status*
	00 .. FF	*16 Bytes Data of Block 08*
	23	*BCC*
Receive(Failure)	**AA BB 02 DE DC**	
Description	AA BB	*Head*
	02	*Length*
	DE	*Error*
	DC	*BCC*

**If receive one block data include 'AA',then the '00' will be added behind 'AA', but the length does not add 1.*

14. 2. 19 Block_Write

This command writes 16 bytes data to the appointed card's block.

Table 63. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x1A	0x22	Block Info: 24 bytes	BCC

Block Info: Key type +Block number + Key + BData

Key type: 1 byte, 0x00—Key A, 0x01—Key B.

Block number: 1 byte, 0x01..0xff (1..255)

Key: 6 bytes, default “FFFFFFFFFFFF” (*)

BData: 16 bytes data to be write into card

(*)Note: If auth mode is “1”, then this key is not active, it can be any 6 data bytes.

Table 64. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x22		0x20
Failure	0xAA 0xBB	0x02	0xDD		0xDF

Table 65. Example

Send	**AA BB 1A 22 00 08 FF FF FF FF FF FF 00 11 22 33 44 55 66 77 88 99 AA 00 BB CC DD EE FF 30 (*)**	
Description	AA BB	*Head*
	1A	*Length*
	22	*COMMAND*
	00	*Key type A*
	08	*Write Block 08(Sector 02,1st block)*
	FF FF FF FF FF FF	*Authenticate with Key A*
	00 ..FF	*16 bytes data*
	30	*BCC*
Receive(Success)	**AA BB 02 22 20**	
Description	AA BB	*Head*
	02	*Length*
	22	*Status*
	20	*BCC*
Receive(Failure)	**AA BB 02 DD DF**	
Description	AA BB	*Head*
	02	*Length*
	DD	*Error*
	DF	*BCC*

**If write one block data include ‘AA’, then the ‘00’ will be added behind ‘AA’, but the length does not add 1.*

14. 2. 20 Value_Init

This command initializes block as value format. It needs to perform this command before any block to be use as value format.
Below is the description of value block.

DATA BLOCKS

All sectors contain 3 blocks of 16 bytes for storing data (Sector 0 contains only two data blocks and the read-only manufacturer block).

The data blocks can be configured by the access bits as

- read/write blocks for e.g. contactless access control or
- value blocks for e.g. electronic purse applications, where additional commands like increment and decrement for direct control of the stored value are provided.

An authentication command has to be carried out before any memory operation in order to allow further commands.

Value Blocks

The value blocks allow to perform electronic purse functions (valid commands: *read, write, increment, decrement, restore, transfer*).
The value blocks have a fixed data format which permits error detection and correction and a backup management.
A value block can only be generated through a *write* operation in the value block format:

- Value: Signifies a signed 4-byte value. The lowest significant byte of a value is stored in the lowest address byte. Negative values are stored in standard 2´s complement format. For reasons of data integrity and security, a value is stored three times, twice non-inverted and once inverted.
- Adr: Signifies a 1-byte address, which can be used to save the storage address of a block, when implementing a powerful backup management. The address byte is stored four times, twice inverted and non-inverted. During *increment, decrement, restore* and *transfer* operations the address remains unchanged. It can only be altered via a *write* command.

Byte Number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Description	Value				Value				Value				Adr	$\overline{\text{Adr}}$	Adr	$\overline{\text{Adr}}$

Table 66. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x0E	0x23	Value Info: 12 bytes	BCC

Value Info: Key type +Block number + Key + Value

Key type: 1 byte, 0x00—Key A, 0x01—Key B.

Block number: 1 byte, 0x01..0xfe (1..254)

Key: 6 bytes, default “FFFFFFFFFFFF” (*)

Value: 4 bytes value to be write into card, low byte first

(*)Note: If auth mode is “1”, then this key is not active, it can be any 6 data bytes.

Table 67. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x23		0x21
Failure	0xAA 0xBB	0x02	0xDC		0xDE

Table 68. Example

Send	**AA BB 0E 23 00 09 FF FF FF FF FF FF 01 00 00 00 25**	
Description	AA BB	*Head*
	0E	*Length*
	23	*COMMAND*

	00	*Key type A*
	09	*Init Block 09(Sector 02,2nd block)*
	FF FF FF FF FF FF	*Authenticate with Key A*
	01 00 00 00	*4 bytes value*
	25	*BCC*
Receive(Success)	**AA BB 02 23 21**	
Description	AA BB	*Head*
	02	*Length*
	23	*Status*
	21	*BCC*
Receive(Failure)	**AA BB 02 DC DE**	
Description	AA BB	*Head*
	02	*Length*
	DC	*Error*
	DE	*BCC*

14. 2. 21 Value_Read

This command reads value from the appointed block.

Table 69. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x0A	0x21	Value Info: 8 bytes	BCC

Value Info: Key type +Block number + Key

Key type: 1 byte, 0x00—Key A, 0x01—Key B.

Block number: 1 byte, 0x01..0xfe (1..254) (*)

Key: 6 bytes, default “FFFFFFFFFFFF”

(*)Note: If auth mode is “1”, then this key is not active, it can be any 6 data bytes.

Table 70. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x06	0x24	Value: 4Bytes	BCC
Failure	0xAA 0xBB	0x02	0x DB		0xD9

Table 39. Example

Send	**AA BB 0A 24 00 09 *FF FF FF FF FF FF* 27**	
Description	AA BB	*Head*
	0A	*Length*
	24	*COMMAND*
	00	*Authenticate with Key A*
	09	*Read Block 09(Sector 02,2nd block)*
	FF FF FF FF FF FF	*Keys*
	27	*BCC*
Receive(Success)	**AA BB 06 24 *01 00 00 00* 23**	
Description	AA BB	*Head*
	06	*Length*
	24	*Status*
	01 00 00 00	*4 Bytes value*
	23	*BCC*

Receive(Failure)	**AA BB 02 DB *D9***	
Description	AA BB	*Head*
	02	*Length*
	DB	*Error*
	D9	*BCC*

14. 2. 22 Value_Inc

This command perform value increment.

Table 71. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x0E	0x25	Value Info: 12 bytes	BCC

Value Info: Key type +Block number + Key + Value

Key type: 1 byte, 0x00—Key A, 0x01—Key B

Block number: 1 byte, 0x01..0xfe (1..254)

Key: 6 bytes, default "FFFFFFFFFFFF" (*)

Value: 4 bytes value to increment, low byte first

(*)Note: If auth mode is "1", then this key is not active, it can be any 6 data bytes.

Table 72. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x25		0x27
Failure	0xAA 0xBB	0x02	0xDA		0xD8

Table 73. Example

Send	**AA BB 0E 25 00 09 *FF FF FF FF FF FF* *01 00 00 00* 23**	
Description	AA BB	*Head*
	0E	*Length*
	23	*COMMAND*
	00	*Key type A*
	09	*Block 09(Sector 02,2nd block)*
	FF FF FF FF FF FF	*Authenticate with Key A*
	01 00 00 00	*4 bytes value*
	23	*BCC*
Receive(Success)	**AA BB 02 25 *27***	
Description	AA BB	*Head*
	02	*Length*
	25	*Status*
	27	*BCC*
Receive(Failure)	**AA BB 02 DA *D8***	
Description	AA BB	*Head*
	02	*Length*
	DA	*Error*
	D8	*BCC*

14. 2. 23 Value_Dec

This command perform value decrement.

Table 74. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x0E	0x26	Value Info: 12 bytes	BCC

Value Info: Key type +Block number + Key + Value

Key type: 1 byte, 0x00—Key A, 0x01—Key B

Block number: 1 byte, 0x01..0xfe (1..254)

Key: 6 bytes, default "FFFFFFFFFFFF" (*)

Value: 4 bytes value to decrement, low byte first

(*)Note: If auth mode is "1", then this key is not active, it can be any 6 data bytes.

Table 75. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x26		0x24
Failure	0xAA 0xBB	0x02	0xD9		0xDB

Table 76. Example

Send	**AA BB 0E 26 00 09 FF FF FF FF FF FF 01 00 00 00 20**	
Description	AA BB	*Head*
	0E	*Length*
	23	*COMMAND*
	00	*Key type A*
	09	*Block 09(Sector 02,2nd block)*
	FF FF FF FF FF FF	*Authenticate with Key A*
	01 00 00 00	*4 bytes value*
	20	*BCC*
Receive(Success)	**AA BB 02 26 24**	
Description	AA BB	*Head*
	02	*Length*
	26	*Status*
	24	*BCC*
Receive(Failure)	**AA BB 02 D9 DB**	
Description	AA BB	*Head*
	02	*Length*
	D9	*Error*
	DB	*BCC*

14. 2. 24 Value_Backup

This command will backup one block value to another block in the same Sector.

Table 77. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x0B	0x27	Backup Info: 9 bytes	BCC

Backup Info: Key type + Key + Source block + Target block

Key type: 1 byte, 0x00—Key A, 0x01—Key B

Key: 6 bytes, default "FFFFFFFFFFFF" (*)

Source block: 1 byte

Target block: 1 byte

(*)Note: If auth mode is "1", then this key is not active, it can be any 6 data bytes.

Table 78. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x27		0x25
Failure	0xAA 0xBB	0x02	0xD8		0xDA

Table 79. Example

Send	**AA BB 0B 27 00 FF FF FF FF FF FF 09 0A 2F**	
Description	AA BB	*Head*
	0B	*Length*
	27	*COMMAND*
	00	*Key type A*
	FF FF FF FF FF FF	*Authenticate with Key A*
	09	*Source Block 9(Sector 02,2nd block)*
	0A	*Target Block 10(Sector 02,3rd block)*
	2F	*BCC*
Receive(Success)	**AA BB 02 27 25**	
Description	AA BB	*Head*
	02	*Length*
	27	*Status*
	25	*BCC*
Receive(Failure)	**AA BB 02 D9 DB**	
Description	AA BB	*Head*
	02	*Length*
	D8	*Error*
	DA	*BCC*

14.2.25 Sector_Read

This command reads data from the appointed sector. One sector has 3 blocks(48 bytes, sector 0 to 31) or 15 blocks(240 bytes, sector 32 to 39) . This command would not read the tailor block.

Table 80. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	0x0A	0x2A	Sector Info: 8 bytes	BCC

Sector Info: Key type + Sector number + Key

Key type: 1 byte, 0x00—Key A, 0x01—Key B.

Sector number: 1 byte, 0x00..0x27 (0..39) (*)

Key: 6 bytes, default "FFFFFFFFFFFF"

(*)Note: If auth mode is "1", then this key is not active, it can be any 6 data bytes.

Table 81. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	Len	0x2A	Sector data: 49/241 Bytes	BCC
Failure	0xAA 0xBB	0x02	0xD5		0xD7

Len:-----

0x33 (51)—if sector is 0-31

0xF3 (243)—if sector is 32-39

Sector data: Sector number(1 byte) + Blocks data(48/240 Bytes)

Table 82. Example

Send	AA BB 0A 2A 00 01 FF FF FF FF FF FF 21	
Description	AA BB	*Head*
	0A	*Length*
	2A	*COMMAND*
	00	*Authenticate with Key A*
	01	*Read Sector 01*
	FF FF FF FF FF FF	*Keys*
	21	*BCC*
Receive(Success)	AA BB 33 2A 01 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 00 00 00 00 00 00 00 00 18	
Description	AA BB	*Head*
	33	*Length*
	2A	*Status*
	01	*Sector 01*
	00 .. 00	*48 Bytes Data of Sector 01*
	18	*BCC*
Receive(Failure)	AA BB 02 D5 D7	
Description	AA BB	*Head*
	02	*Length*
	D5	*Error*
	D7	*BCC*

14. 2. 26 Sector_Write

This command writes 48/240 bytes data to the appointed sector.
One sector has 3 blocks(48 bytes, sector 0 to 31) or 15 blocks(240 bytes, sector 32 to 39) . This command can not write the tailor block and sector 0, sector 0 include block 0 which is read only.

Table 83. Command--:Host →YHY522

Send	Header	Length	Command	Data	XOR Checksum
	0xAA 0xBB	Len	0x2B	Write Info: 48/240 bytes	BCC

Len:-----

0x3A (58)—if sector is 0-31
0xFA (250)—if sector is 32-39

Write Info: Key type +Sector number + Key + SData

Key type: 1 byte, 0x00—Key A, 0x01—Key B.

Sector number: 1 byte, 0x01..0x27 (1..39)

Key: 6 bytes, default "FFFFFFFFFFFF" (*)

SData: 48/240 Bytes data to be write into card

(*)Note: If auth mode is "1", then this key is not active, it can be any 6 data bytes.

Table 84. Response--: YHY522→Host

Receive	Head	Length	Status	Data	XOR Checksum
Success	0xAA 0xBB	0x02	0x2B		0x29
Failure	0xAA 0xBB	0x02	0xD4		0xD6

Table 85. Example

Send	**AA BB 3A 2B 00 01 FF FF FF FF FF FF 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 22 22 22 22 22 22 22 22 22 22 22 22 22 22 22 22 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 10**	
Description	AA BB	*Head*
	3A	*Length*
	2B	*COMMAND*
	00	*Key type A*
	01	*Write Sector 01*
	FF FF FF FF FF FF	*Authenticate with Key A*
	11 ..33	*48 bytes data*
	10	*BCC*
Receive(Success)	**AA BB 02 22 20**	
Description	AA BB	*Head*
	02	*Length*
	2B	*Status*
	29	*BCC*
Receive(Failure)	**AA BB 02 DD DF**	
Description	AA BB	*Head*
	02	*Length*
	D4	*Error*
	D6	*BCC*

15. Electrical Characteristics

15.1 Operating Condition

Table 86: Operating Condition Range

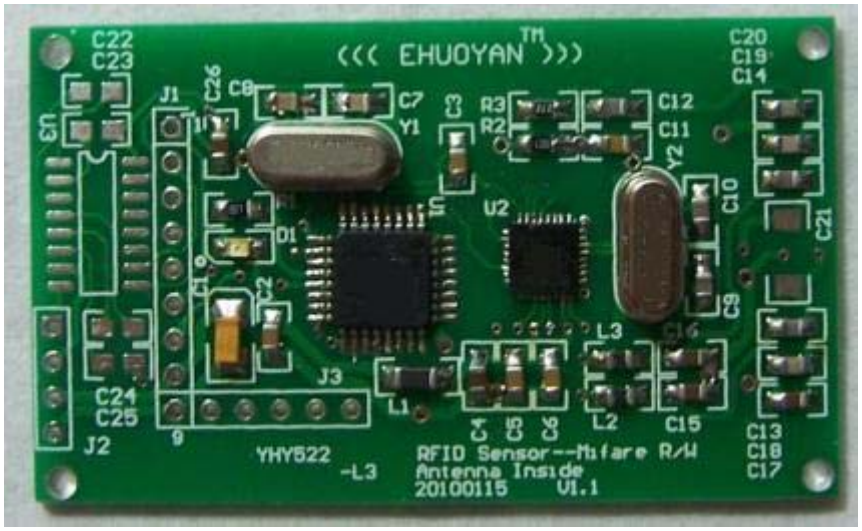
SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Tamb	Ambient Temperature	-	-25	+25	+85	°C
V_{CC}	DC Supply Voltages	GND = 0V	2.7	3.3	3.6	V
RD	Reading Distance	V_{CC} =3.3V	0	40	60	mm
WD	Writing Distance	V_{CC} =3.3V	0	40	50	mm

15.2 Current Consumption

Table 87: Current Consumption

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
I_{VCC}	Supply Current V_{CC}=2.7V-3.6V	Continuous read or write		43	65	mA
		Antenna Soft Power Down		15	20	mA
		Module Hard Power Down		-	10	μA

16. Package outline



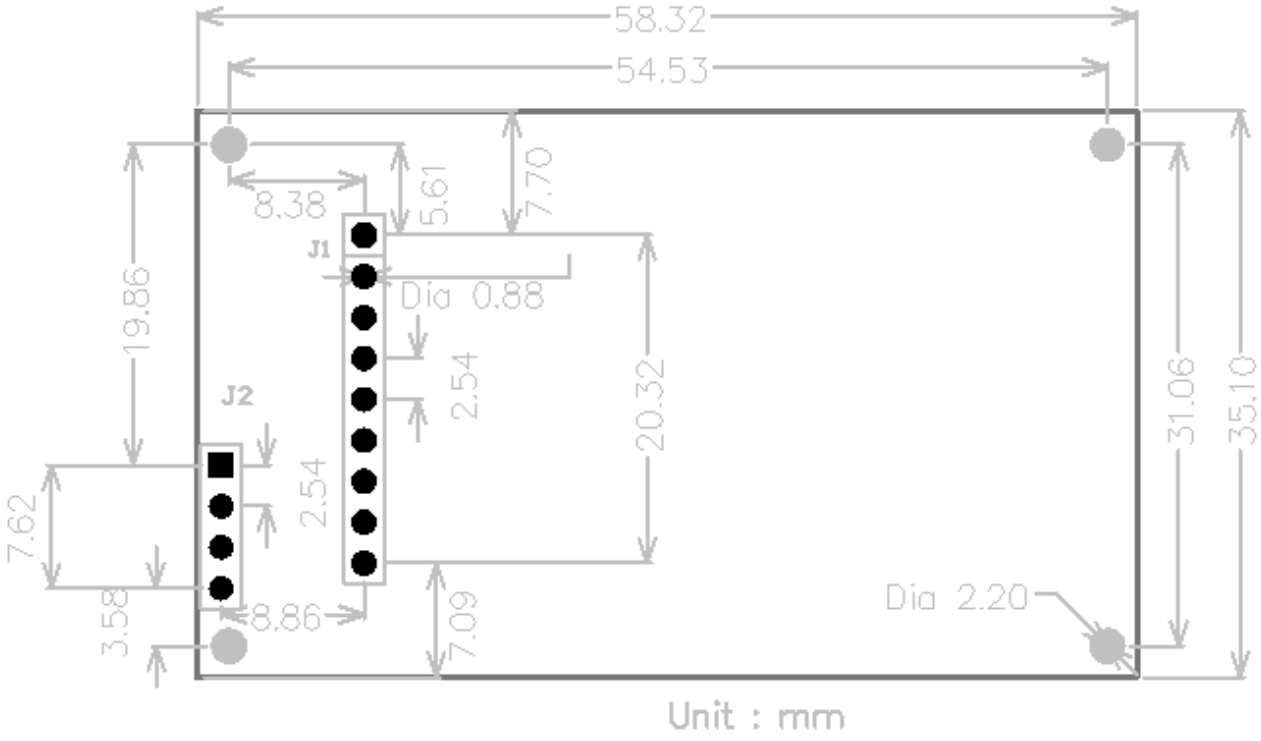


Figure 8– YHY522 Top view

Figure 9– YHY522 Side View

17. Contact information

To obtain information about EHUOYAN Tech sales and technical information, please reference the following information.

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