RDM Tag Module **RDM880**

13.56MHz RFID Reader/Writer

ISO\IEC 14443A

ISO\IEC 14443B

ISO\IEC 15693

PRODUCT REFERENCE GUIDE

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Contents

Product Overview

RDM880 Module Introduction

Connecting the RDM880 Module

RDM880 DEMO Software

Product Overview

1. General Description

The RDM880L module is a Mifare® ISO14443 A read/write device with a typical operating distance of 30-80mm. The reading range of the module is depending on the antenna and TAG.

The RDM880L combines all basic functions to access the ISO14443A Card. Including Mifare® Smart Card, Mifare PRO etc. Its versatility allows a flexible and efficient application in different configurations and system devices. Because of the small size the module can be integrated easily into existing data collection applications such as portable terminals, ticketing, machines vending or access control.

The 13.56MHz RDM880L OEM read/write module is a very compact device designed for fast integration into portable or stationary readers.

The OEM reader module was designed for simple integration. The serial TTL-interface can be directly connected to microprocessors and easily converted to the RS232/RS485/RS422 serial interface device. The protocol can be tested using any terminal.

RDM880 Module Introduction

1. RDM880 Mechanical Specification

Size: 39*19*9 mm

Antenna: External

Signal:2Led& 1Beep(TTL)

Figure 1 Top View Of RDM880

Dimensions in mm

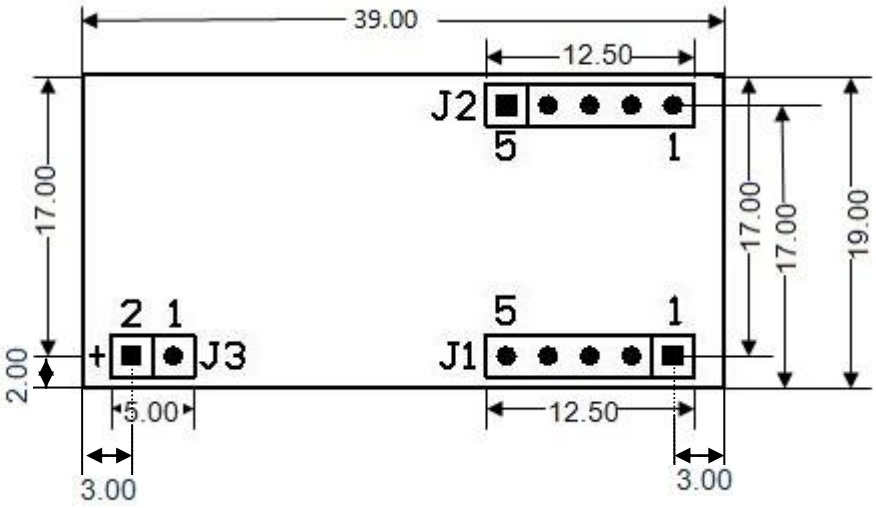
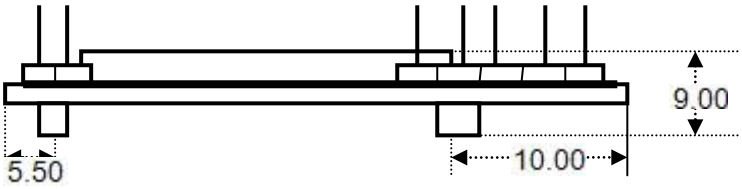


Figure 2 Side View Of RDM880



2. Naming Rules

RDM880 module's naming rules are made up of four parts.

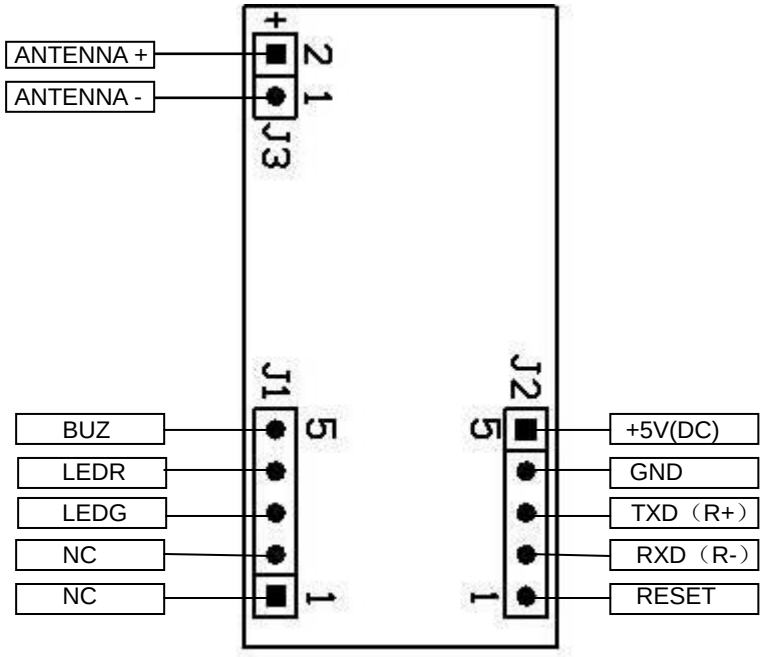
Figure 3 RDM880 Module's naming rules

Part 1	Part 2	-	Part 3			-	Part 4	
Company Name	Code	-	Interface Type			-	Type Of Smart Card	
			Symbol	Signification	Description		Symbol	Type of smart card
RDM	880	-	T	TTL	Read & Write/Read Only	-	A	S50、S70
			S	RS232	Read & Write/Read Only		B	ISO14443B
			R	RS485	Read & Write/Read Only		C	TI、I Code2
			I	SPI	Read & Write		D	Desfire
			W	WG26	Read Only		E	S50、S70、TI、I Code2、ISO14443B
			G	WG34	Read Only			
			A	ABA	Read Only			
			ST	RS232	Read Only (Configurable)		F	S50、S70、ISO14443B
			RT	RS485	Read Only (Configurable)			
			WT	WG	Read Only (Configurable)		U	Ultralight
			AT	ABA	Read Only (Configurable)			

3. RDM880 Interface Instruction

3.1 RS232/TTL Interface Instruction

Figure 4 RS232/TTL interface instruction



Pin Descriptions (Read & Write)

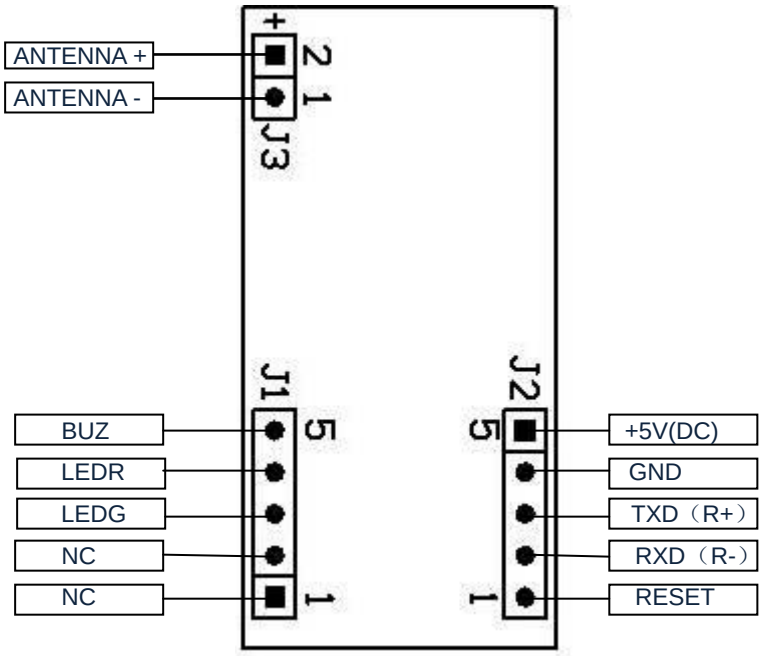
Pin	Name	Description
J1-1	NC	Obligate
J1-2	NC	Obligate
J1-3	LEDG	It is usually low level, this pin can control the LED when the low level is connected to GND.
J1-4	LEDR	It is usually high level which can control the LED when the low level is connected to GND.
J1-5	BUZ	It is usually low level, this pin can control the buzzer when the high level is connected to GND.
J2-1	RESET	Reset
J2-2	RXD	Connects with R1OUT(a 232PWL drive chip)
J2-3	TXD	Connects with T1IN a 232PWL drive chip)
J2-4	GND	Connects with the cathode of the power supply
J2-5	+5V(DC)	Connects with the anode of the power supply
J3-1	ANTENNA -	Connects with the antenna
J3-2	ANTENNA +	Connects with the antenna

Pin Descriptions(Read Only)

Pin	Name	Description
J1-1	NC	Obligate
J1-2	NC	Obligate
J1-3	LEDG	It is usually low level, punching a card will discontinue the high level signal.
J1-4	LEDR	It is usually high level, punching a card will discontinue the low level signal.
J1-5	BUZ	It is usually low level, punching a card will expand the time of the 88US high level signal.
J2-1	RESET	Reset
J2-2	NC	Obligate
J2-3	TXD	Connects with T1IN a 232PWL drive chip)
J2-4	GND	Connects with the cathode of the power supply
J2-5	+5V(DC)	Connects with the anode of the power supply
J3-1	ANTENNA -	Connects with the antenna
J3-2	ANTENNA +	Connects with the antenna

3.2 RS232/RS485 Interface Instruction

Figure 5 RS232/RS485 interface instruction



Pin Descriptions (Read & Write)

Pin	Name	Description
J1-1	NC	Obligate
J1-2	NC	Obligate
J1-3	LEDG	It is usually low level, this pin can control the LED when the low level is connected to GND.
J1-4	LEDR	It is usually high level which can control the LED when the low level is connected to GND.
J1-5	BUZ	It is usually low level, this pin can control the buzzer when the high level is connected to GND
J2-1	RESET	Reset
J2-2	RXD	Receive Data（R+）
J2-3	TXD	Transmit Data（R-）
J2-4	GND	Connects with the cathode of the power supply
J2-5	+5V(DC)	Connects with the anode of the power supply
J3-1	ANTENNA -	Connects with the antenna
J3-2	ANTENNA +	Connects with the antenna

Pin Descriptions (Read Only)

Pin	Name	Description
J1-1	NC	Obligate
J1-2	NC	Obligate
J1-3	LEDG	It is usually low level, punching a card will expand the time of the 88US high level signal.
J1-4	LEDR	It is usually high level, punching a card will expand the time of the 88US low level signal.
J1-5	BUZ	It is usually low level, punching a card will expand the time of the 88US high level signal.
J2-1	RESET	Reset
J2-2	RXD	Receive Data（R+）
J2-3	TXD	Transmit Data（R-）
J2-4	GND	Connects with the cathode of the power supply
J2-5	+5V(DC)	Connects with the anode of the power supply
J3-1	ANTENNA -	Connects with the antenna
J3-2	ANTENNA +	Connects with the antenna

3.2.1 RS232 Format Interface

Figure 6 RS232 Format Interface

02	10 ASCII Data Characters	Checksum	03

a. 9600bps, N,8,1.

b. Checksum: The byte marked with Checksum go for XOR Parity check of the Card Number. Checksum = CR + LF.

EXAMPLE:

Card Number: 62 E3 08 6C ED (High bit ---- Low bit)

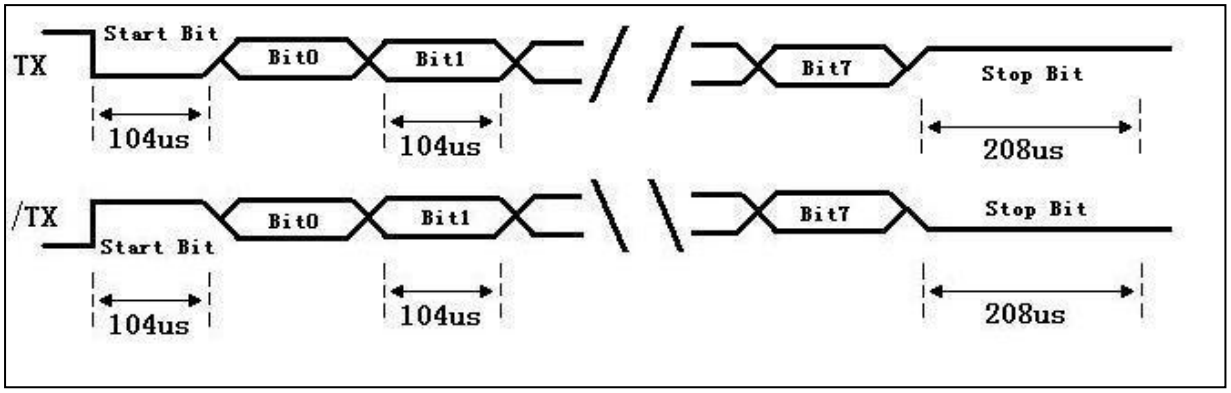
Output ASCII Code: 02H 36H 32H 45H 33H 30H 38 H 36H 43H 45H 44H 30H 28H 03H

Checksum: 62H xor E3H xor 08H xor 6CH xor EDH = 08H

SO: CR = 30h LF = 38H

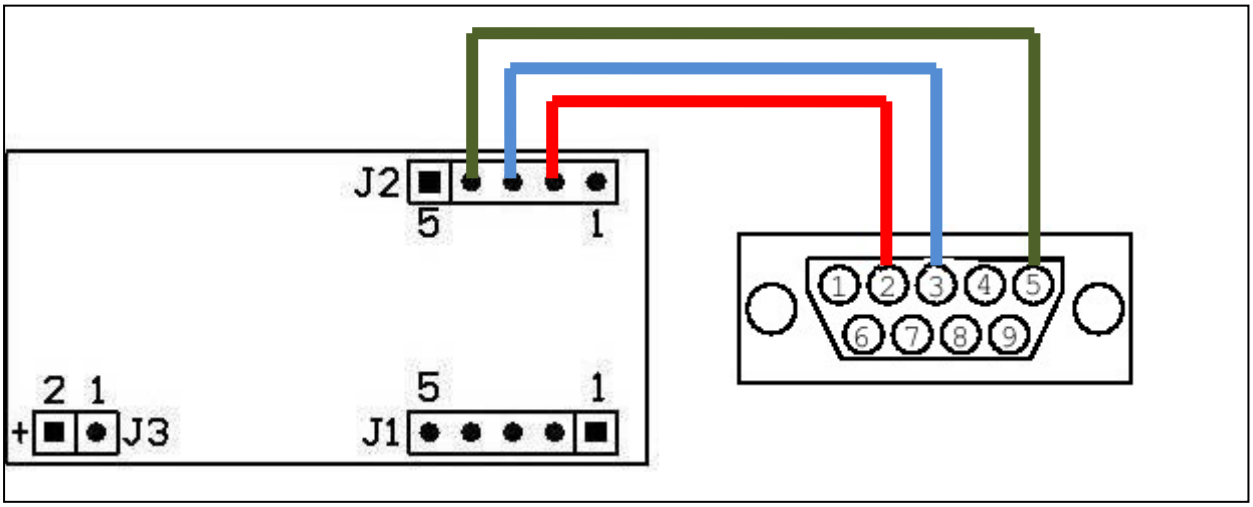
3.2.2 RS232 Format Timing

Figure 7 RS232 format timing



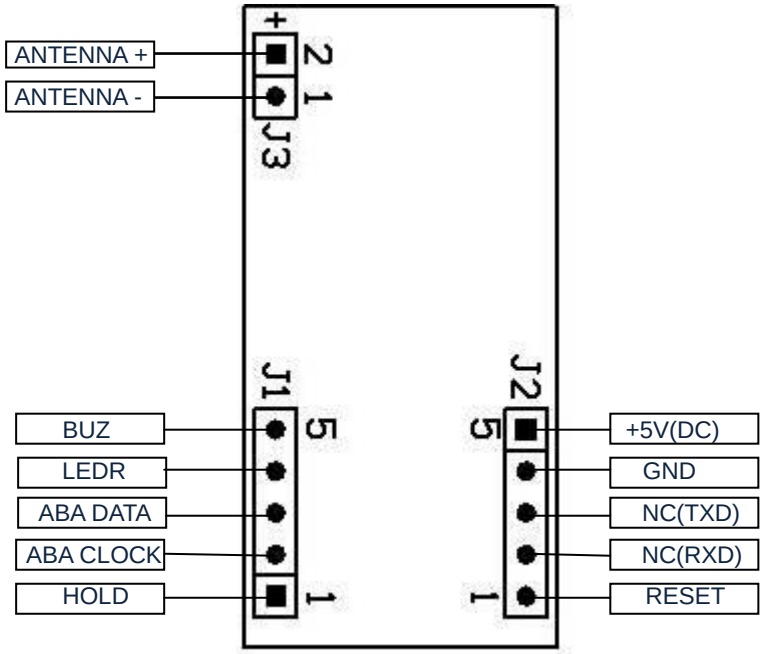
3.2.3 Connection Of RS232/RS485 Interface Module To PC

Figure 8 connection of RS232/RS485 interface RDM880 TO PC



3.3 ABA（AT） Interface Instruction

Figure 9 ABA interface instruction



Pin Descriptions

Pin	Name	Description
J1-1	HOLD	It is usually high level, the pin will keep the low level of 80ms.
J1-2	ABA CLOCK	ABA CLOCK
J1-3	ABA DATA	ABA DATA
J1-4	LEDR	It is usually high level, punching a card will expand the time of 300ms low level.
J1-5	BUZ	The BUZ interface connects with the cathode of the buzzer, the beep can be controlled by user port (which needs added drive), It is usually low level, punching a card will expand the time of 200ms high level.
J2-1	RESET	Reset

J2-2	NC（RXD）	Obligate
J2-3	NC（TXD）	Obligate
J2-4	GND	Connects with the cathode of the power supply
J2-5	+5V(DC)	Connects with the anode of the power supply
J3-1	ANTENNA -	Connects with the antenna
J3-2	ANTENNA +	Connects with the antenna

3.3.1 ABA TRACK2 Format Interface

Structure of ABA TRACK2 data message is :

0000000000	11010	1248P	1248P	1248P	1248P	1248P	1248P	1248P	1248P	1248P	1248P	11111	LRC	00000

- Leading Zero is 0 of 10 digits
- Start Char is HEX “B” (11010,Low bit first,1248P, P is Bit Odd Parity)
- Card Number is 0000000000~9999999999(10 digits) with most significant digit first
- End Char is HEX “F” (11111, Low bit first,1248P, P is Bit Odd Parity)
- Longitudinal Redundancy Check(LRC) is Even Parity check(excluding the parity bit)
- Trailing Zero is 0 of 5 digits
- Data transferred LSB first
- Example:

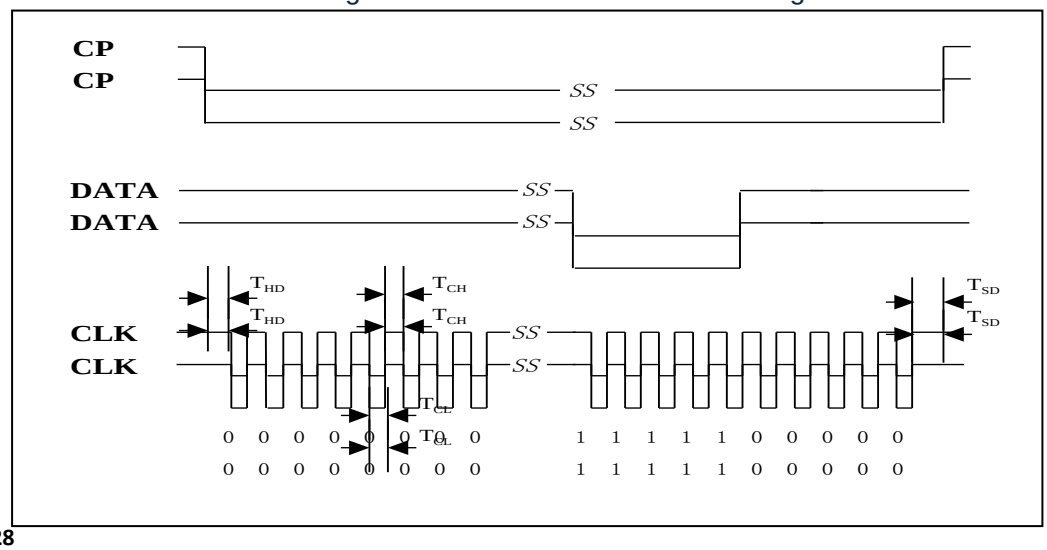
	B0	B1	B2	B3	P
Start Char..	1	1	0	1	0
Card Data	1	0	0	0	0
	0	1	0	0	0
	1	1	0	0	1
End Char.	1	1	1	1	1
LRC	0	0	1	0	0

LRC= START ⊕ DATA0 ⊕ …… ⊕ DATAN ⊕ END

Note: ⊕ is XOR

3.3.2 ABA TRACK2 Format Timing

Figure 10 ABA TRACK2 Format Timing



SYMBOL	DESCRIPTION	VALUE(Typ.)
T_{HD}	Start Delay	0.5ms
T_{SD}	Stop Delay	0.5ms
T_{CL}	CLK pulse low width	0.5ms
T_{CH}	CLK pulse high width	0.5ms

A card containing the hexadecimal data (0411115EA6) will be converted to denary and sent as denary 00017466220198 (14 digits).The calculation is performed as follows:
(6*160+10*161+14*162+5*163+1*164+1*165+1*166+1*167+4*168)=00017466220198

3.4 WG（WT） Interface Instruction

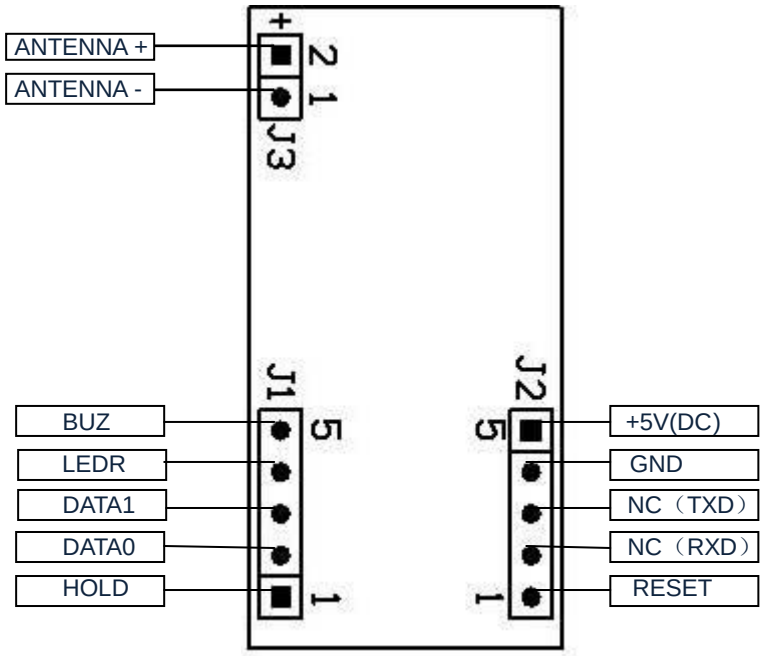


Figure 5 WG interface instruction

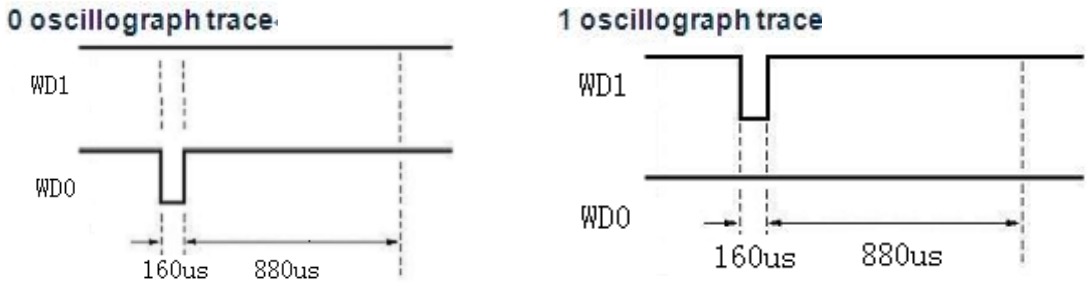
Pin Descriptions

Pin	Name	Description
J1-1	HOLD	It is usually high level, punching a card will keep the 45ms low level.
J1-2	DATA0	Connects with the anode of the power supply 1.6MS/120/80US
J1-3	DATA1	Connects with the cathode of the power supply
J1-4	LEDR	The LEDR interface connects with the cathode of the red led, which control the I/O interface. It is usually high level, this pin will keep the 88ms low level when it is reading a card.
J1-5	BUZ	It is usually low level, this pin will keep the 88ms low level when it is reading a card.
J2-1	RESET	Reset
J2-2	NC（RXD）	Receive Data
J2-3	NC（TXD）	Transmit Data

J2-4	GND	Connects with the cathode of the power supply
J2-5	+5V(DC)	Connects with the anode of the power supply
J3-1	ANTENNA -	Connects with the antenna
J3-2	ANTENNA +	Connects with the antenna

3.4.1 Wiegand Format 26bit Output Timing

SYMBOL	DESCRIPTION	VALUE(Typ.)
T_{HD}	Sending Start Delay	1.2ms
T_{SD}	Sending Stop Delay	1ms
T_{DW}	Data pulse width	160us
T_{IW}	Data pulse interval width	880us



3.5 SPI Interface Instruction

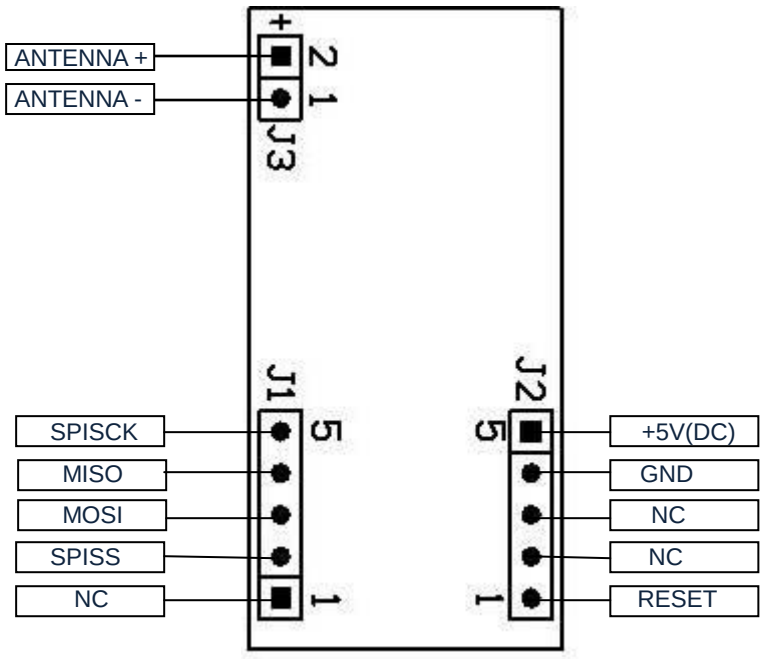


Figure 7 SPI interface instruction

Pin Descriptions

Pin	Name	Description
J1-1	NC	
J1-2	SPISS	SPISS of any CPU
J1-3	MOSI	MOSI of any CPU
J1-4	MISO	MISO of any CPU
J1-5	SPISCK	SPISCK of any CPU
J2-1	RESET	Reset
J2-2	RXD	Receive Data
J2-3	TXD	Transmit Data
J2-4	GND	Connects with the cathode of the power supply
J2-5	+5V(DC)	Connects with the anode of the power supply
J3-1	ANTENNA -	Connects with the antenna
J3-2	ANTENNA +	Connects with the antenna

4. RDM880 Interface Specification

Figure RDM880 Interface Specification

Model No.	RDM880
R/W chip	MFRC500，MFRC400，MFRC531，MFRC632
Standard	ISO/IEC14443-A;ISO/IEC14443-B; ISO/IEC 15693
Support Card	MifareOneS50; MifareOneUltralight; MifareOneS70; MifarePro; AT88RF020; 66CL160S; SR176; SRIX4K; I-code2; TI RFID Tag-it HF-I,EM4135,EM4034
Frequency	13.56MHz
Baud Rate	9600-115200bit/s（configurable, default9600）
Power supply	DC5V(5%)
Current	<70mA
Static working current	31mA
Working current	67mA
Power dissipation	0.3W
Operating range	30-100mm（reading range depend on antenna and card/tag）
interface	TTL electrical level/RS232,RS485,WG,ABA,SPI
Working temperature	-10 degree to 70 degree
Storage temperature	-20 degree to 80 degree
Size	39*19*9 mm（DIP28）
Optional antenna(customized)	20*40mm 49*55mm 40*71mm 65*90mm 155*166mm(special, required customized)
Relative Provide	Provide SDK free，DEMO program

5. RDM880 Typical Applications:

Many applications can be developed with the RDM RFID module such as PC logon, Internet/intranet access, e-commerce, point of sale, identity confirmation; Access control, Offline Ticketing, Customizing cards, Road pricing etc. in all everywhere a PC or Microprocessor needs to communicate with a contactless transponder.

6. RDM880 Operating Mode

- Master Slave Operation Mode, under this working style, the reader that is working under the control of the PC or other controllers, communicates with the controller through the port.
- Active Working Mode, the reader read the card which is in the card-read range, and then output the data from the interface.

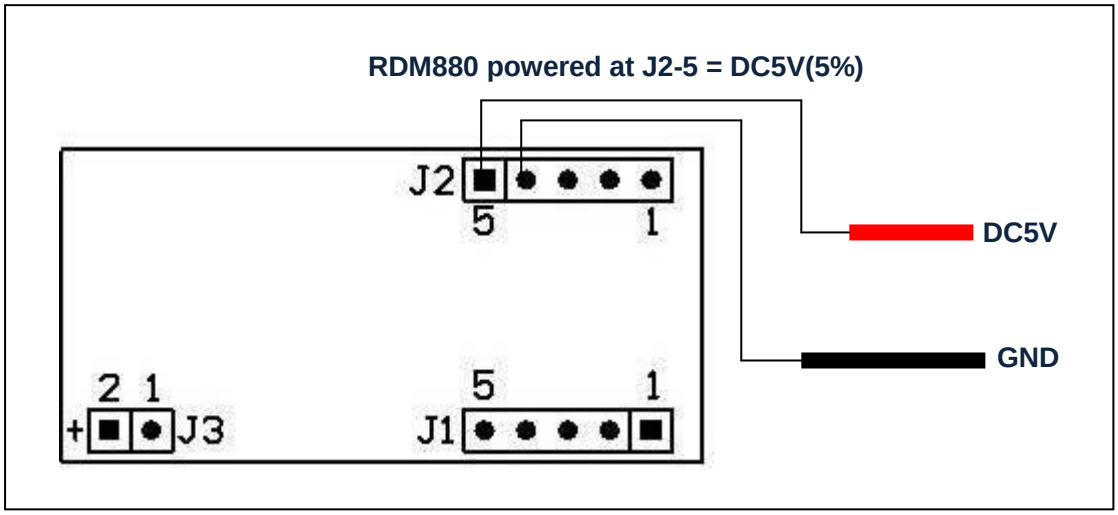
7. RDM880 Adjacent Module Identification

RDM880 Adjacent Module Identification, adjacent identification is designed for reducing the data redundancy, when using this function, when the reader reads the identical tag repeatedly, it only can upload a set of data(the cards in the card read range at the same time)

Connecting the RDM880 Module

1. Power Supply Options

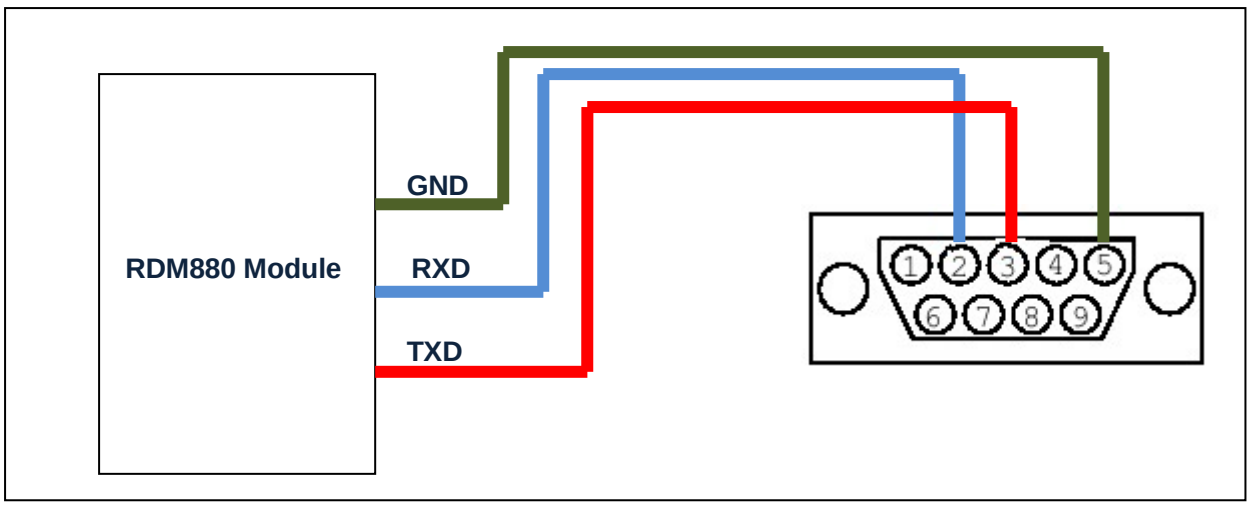
Figure 8



Note: In the configuration shown above, The Module requires a regulated input voltage in DC5V input to J2-5(an input in this configuration).

2. Connect ion Of RDM880 To PC

Figure 9 connection: RDM880 TO PC

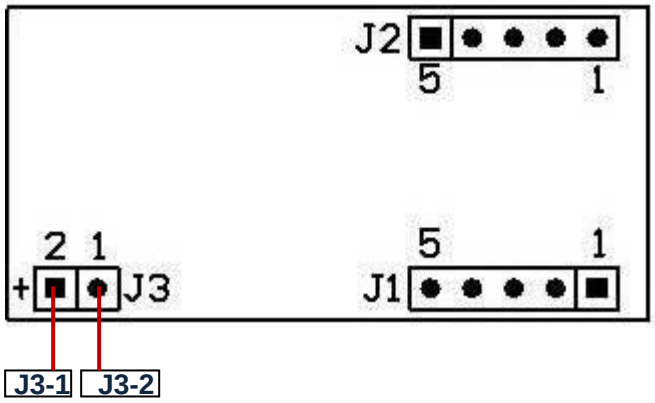


Note: In addition to the signals connections, the host must supply input voltage. See Figure 8. If the module's interface is RS232, it's output format needs to be converted by a chip when the module is connected to pc.

3. Antenna Connections

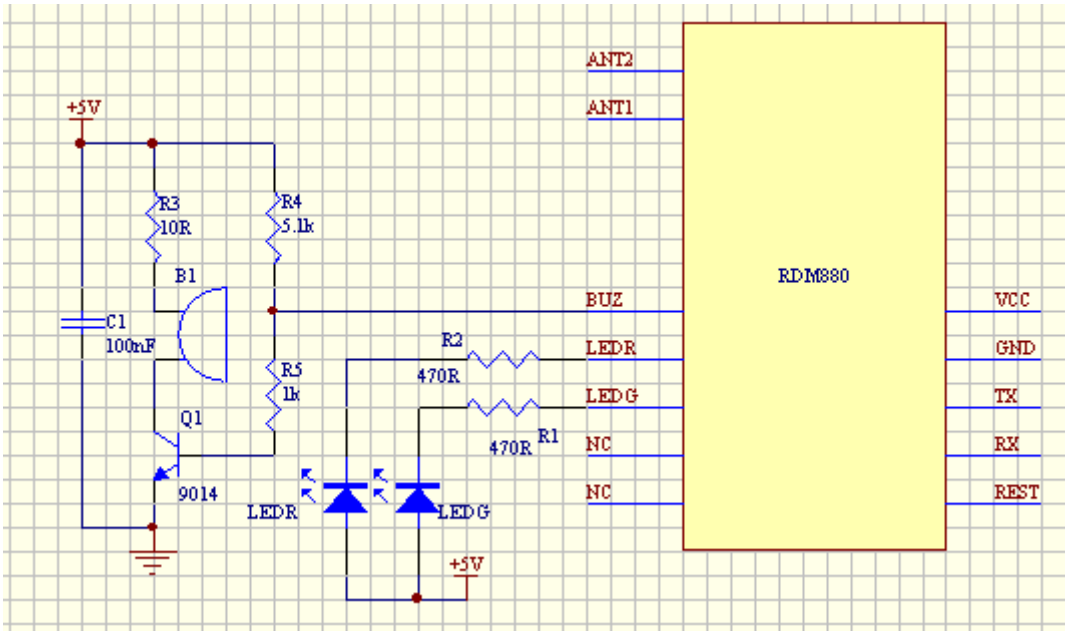
All Models of the RDM880 have two internal antennas that can be enabled by connecting J3-1 and J3-2 .

Figure10 Connecting the Antenna



4. LED and Buzzer Connections

Figure11 LED and Buzzer Connections



Note: For any interface of RDM880 modules, the LEDR pin is connected to the red LED, and the LEDG pin is connected to a green LED, the BUZ pin is connected to the buzzer.

RDM880 Module DEMO Software

The use surroundings are different for the RDM880 different interfaces, but the principal for the operation of the demo software is same, following take RS 232 as the samples to explain its operation method.

1. DEMO Software

The DEMO software is a low-level tool to show the software developer exactly how a REQUEST is sent to the RDM880 module by a host and the exact RESPONSE from the RDM880 module is provided to the host.

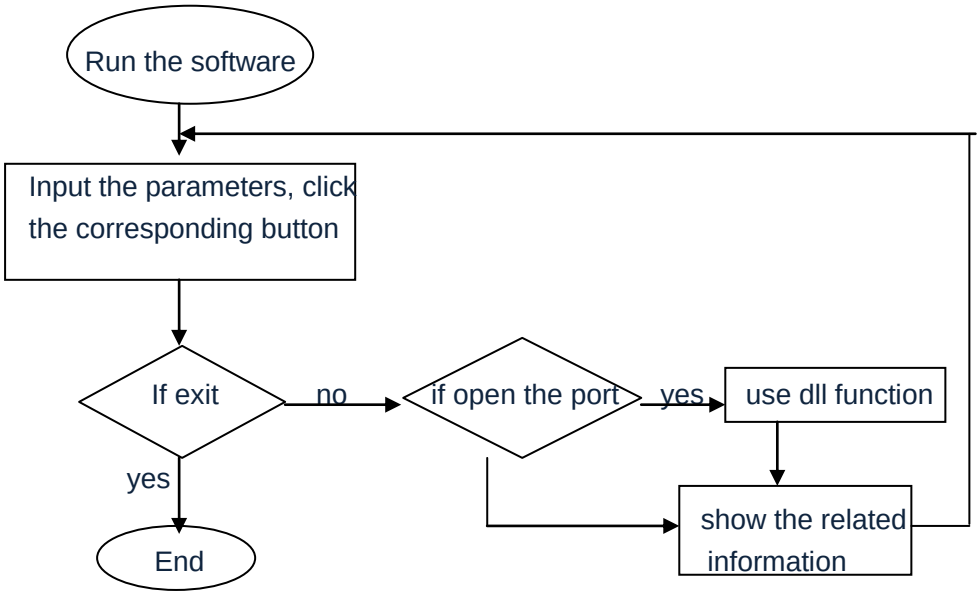
Hardware requirement: 1. at least 32M EMS memory

2. at least 2M graphic memory

Software requirement: 1. Microsoft Windows 2000/XP/2003 operate system

2. adjusted the desktop resolution ratio to 1024*768 or higher

2. DEMO Software Flow Chart



3. Operate Instruction

3.1 Set System

Figure 3.1 Set System Frame

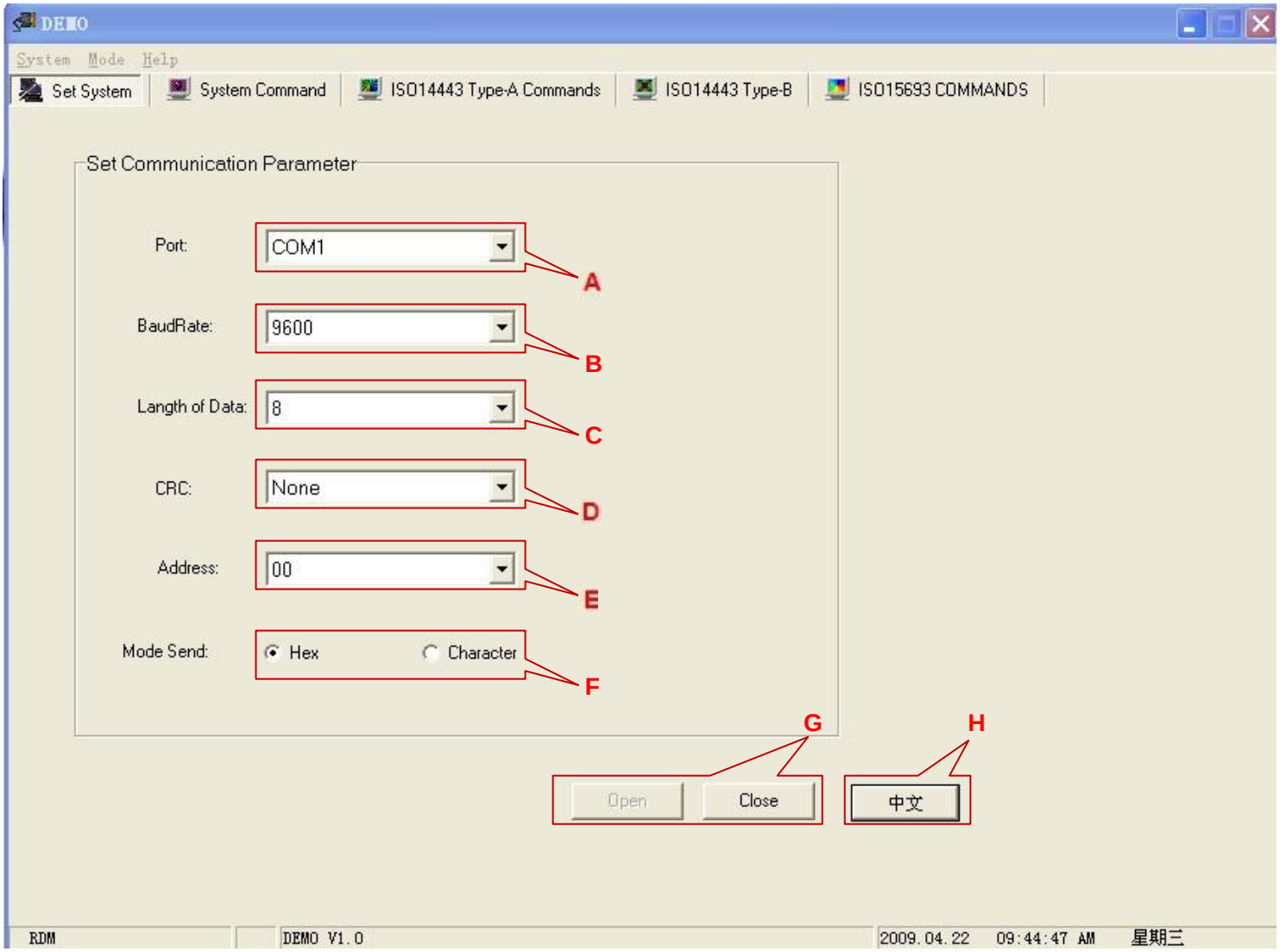


Figure 3.1.1 Set System Frame Parameter Declaration

Lable	Parameter name	Parameter Declaration
A	Port	Changeable, controlled by Label G.
B	Baud Rate	Changeable and Select in 9600,19200,38400,57600,115200,Deault 9600bps.
C	Length of Data	Fixed, Default 8bit.
D	CRC	Changeable, and select in Odd, Even and None, Default None。
E	Address	The address of equipment, Fixed, Default 00H.
F	Mode Send	Selectable.
G	COM Switch	Open or Close the selected COM Port.
H	Language Switch	Change into Chinese.

3.2 System Commands

Figure 3.2 System Command Frame

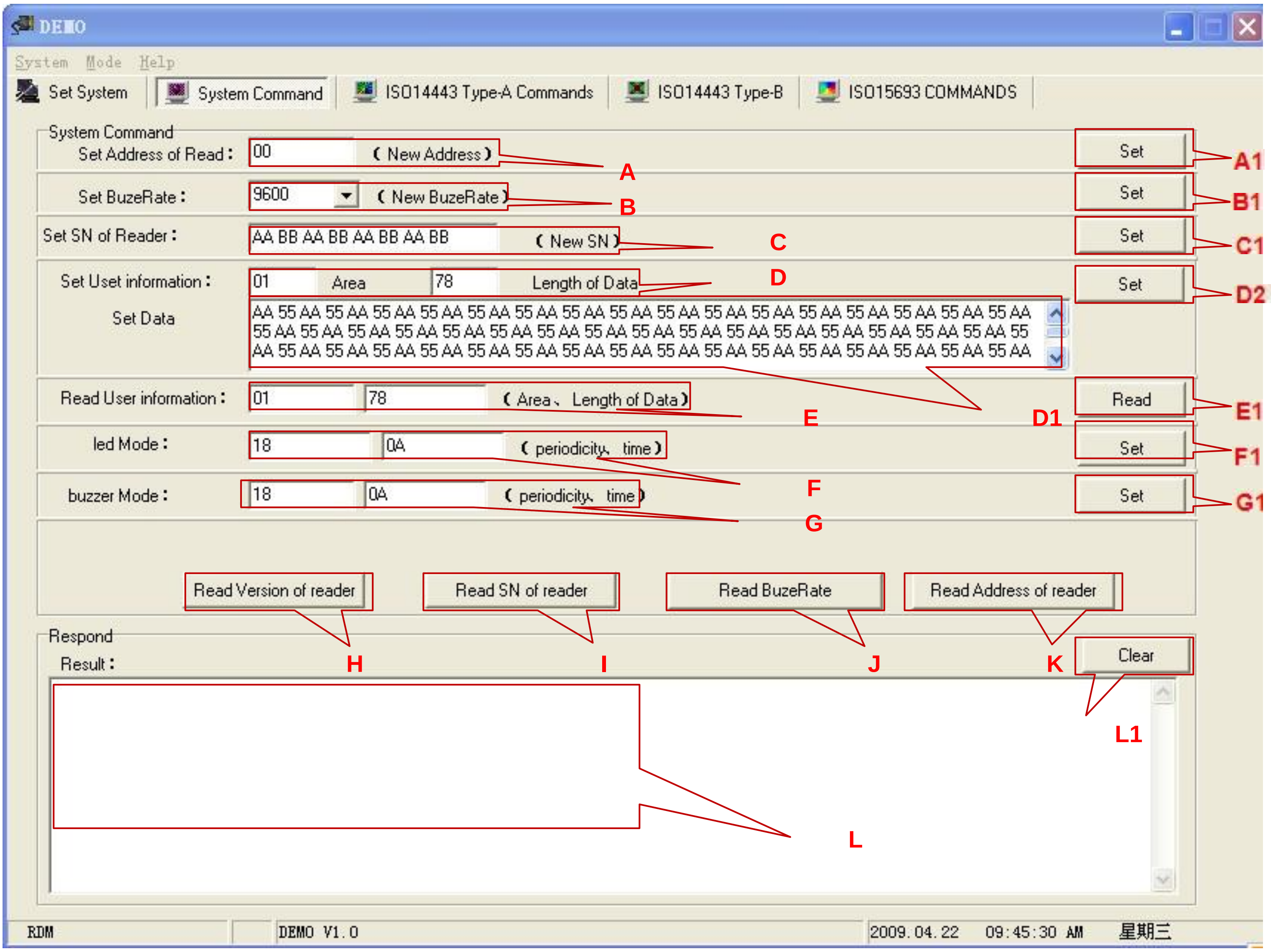


Figure 3.2.1 System Command Frame Parameter Declaration

Label	Parameter	Parameter Declaration
A	Set Address of Reader	Input the new address of Reader in Label A, and click Label A1 to set the new address, the return message will be shown in Label L.
B	Set Baud rate	Select a new baud rate in Label B, and click Label B1 to set the new baud rate, the return message will be shown in Label L.
C	Set SN of Reader	Input the new SN of Reader in Label C, and click Label C1 to set the new SN of Reader, the return message will be shown in Label L.
D	Set User Information	Input the new User information in Label D and D1, and click Label D2 to set the new SN of Reader, the return message will be shown in Label L.
E	Read User Information	Input the area and the length of data of user information you wanted, click

		Label E1 and the objective user information will be shown in Label L.
F	Led Mode	Input the periodicity and the time of the Led in Label F, click F1 to set the new periodicity and time of the Led, the return message will be shown in Label L.
G	Buzzer Mode	Input the periodicity and the time of buzzer in Label G, click G1 to set the new periodicity and time of the buzzer, the return message will be shown in Label L.
H	Read Version of Reader	Click here and the current version of reader will be shown in Label L.
I	Read SN of Reader	Click here and the current SN of reader will be shown in Label L.
J	Read Baud Rate	Click here and the current baud rate of reader will be shown in Label L.
K	Read Address of Reader	Click here and the current address of reader will be shown in Label L.
L	Result	Show the corresponding return messages of every parameter, click L1 will be clear all the messages.

Note: For A, Only select the correct address of the reader or the all-purpose address 00H, the module can work.

For B, The software maybe run error after a new baud rate set, return Set System Frame to select the same baud rate will be work.

For D, The longest of data which wrote in one area is 78H bit.

For F, The periodicity is the standing time when the led's first light, the unit is 20ms, 1000ms is the limited time, the led is blacking out all the remaining time. So the max of periodicity is 32H, if the value more than 32H, the led will be shining all the time. Periodicity is the standing time of the led's shining one time, default value is 18H, every time the led is shining for 24*20ms, and blacking out for 26*20ms. The Time is the times of led's shining and blacking out. The default periodicity value is 18H, and the default time value is 0A,that means the led shine for 24*20ms and black out for 10 times.

3.3 ISO14443 Type-A Commands

Figure 3.3 ISO 14443 Type-A Commands Frame

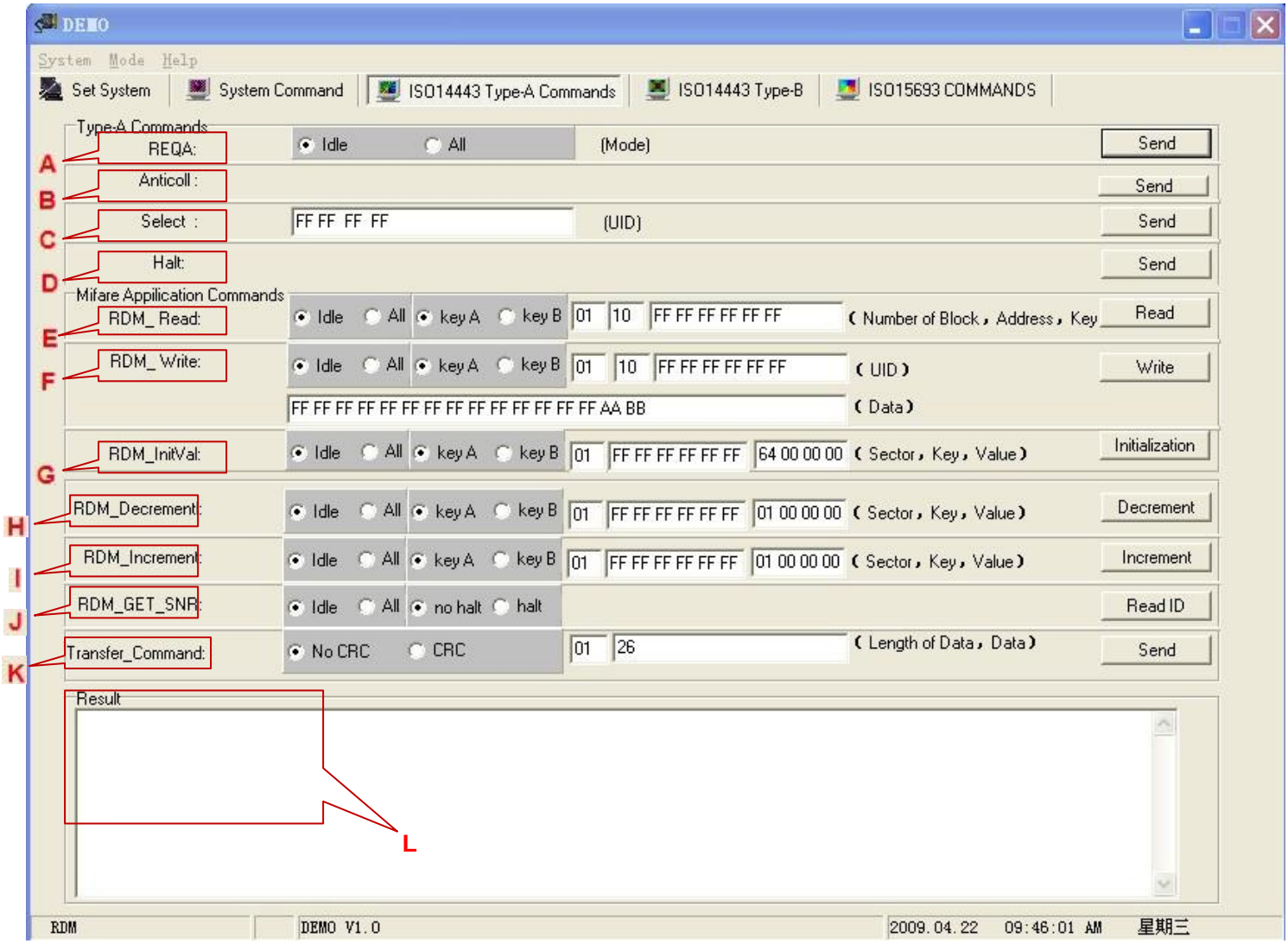


Figure 3.3.1 ISO 14443 Type-A Commands Frame Parameter Declaration

Label	Parameter	Parameter Declaration
A	REQA	Select the mode of ISO14443A Searching card, click the corresponding button send and the return message will be shown in Label L.
B	Anticall	Anti-collision, click the corresponding button send and the return message will be shown in Label L.
C	Select	Edit the number of the card, click the corresponding button send and the return message will be shown in Label L.
D	Halt	click the corresponding button send, the card will turn into the state of hart and the return message will be shown in Label L.
E	RDM_Read	Set the number of block, address, and key of the card, click the corresponding button read will search card, Anti-collision, select card and read the card, the return message will be shown in Label L.
F	RDM_Write	Set the number of block, address, and key of the card, and the user data. click the corresponding button write will search card, Anti-collision, select card and write the card, the return message will be shown in Label L.
G	RDM_InitVal	Set the area, key and the initialization value, click the corresponding button initialization will search card, Anti-collision, select card, confirm password and initialize value, the return message will be shown in Label L.
H	RDM_Decrement	Set the area, key and the decrement, click the corresponding button decrement will search card, Anti-collision, select card, confirm password and decrease the value of block, the return message will be shown in Label L.
I	RDM_Increment	Set the area, key and the increment, click the corresponding button increment will search card, Anti-collision, select card, confirm password and increase the value of block, the return message will be shown in Label L.
J	RDM_GET_SNR	click the corresponding button Read ID will search card, Anti-collision, select card and read the SN of the card, the return message will be shown in Label L.
K	Transfer_Commande	Set the length and value of the data which would be entered. It is a all-purpose command of ISO14443A, you can send any data to the card base on ISO14443A.
L	Result	Show the corresponding return messages of every parameter, click L1 will be clear all the messages.

Note: For more information about the commands of ISO14443 Type-A, please refer to the ISO14443 Type-A user guide.

3.4 ISO14443 Type-B Commands

Figure 3.4 ISO 14443 Type-B Commands Frame

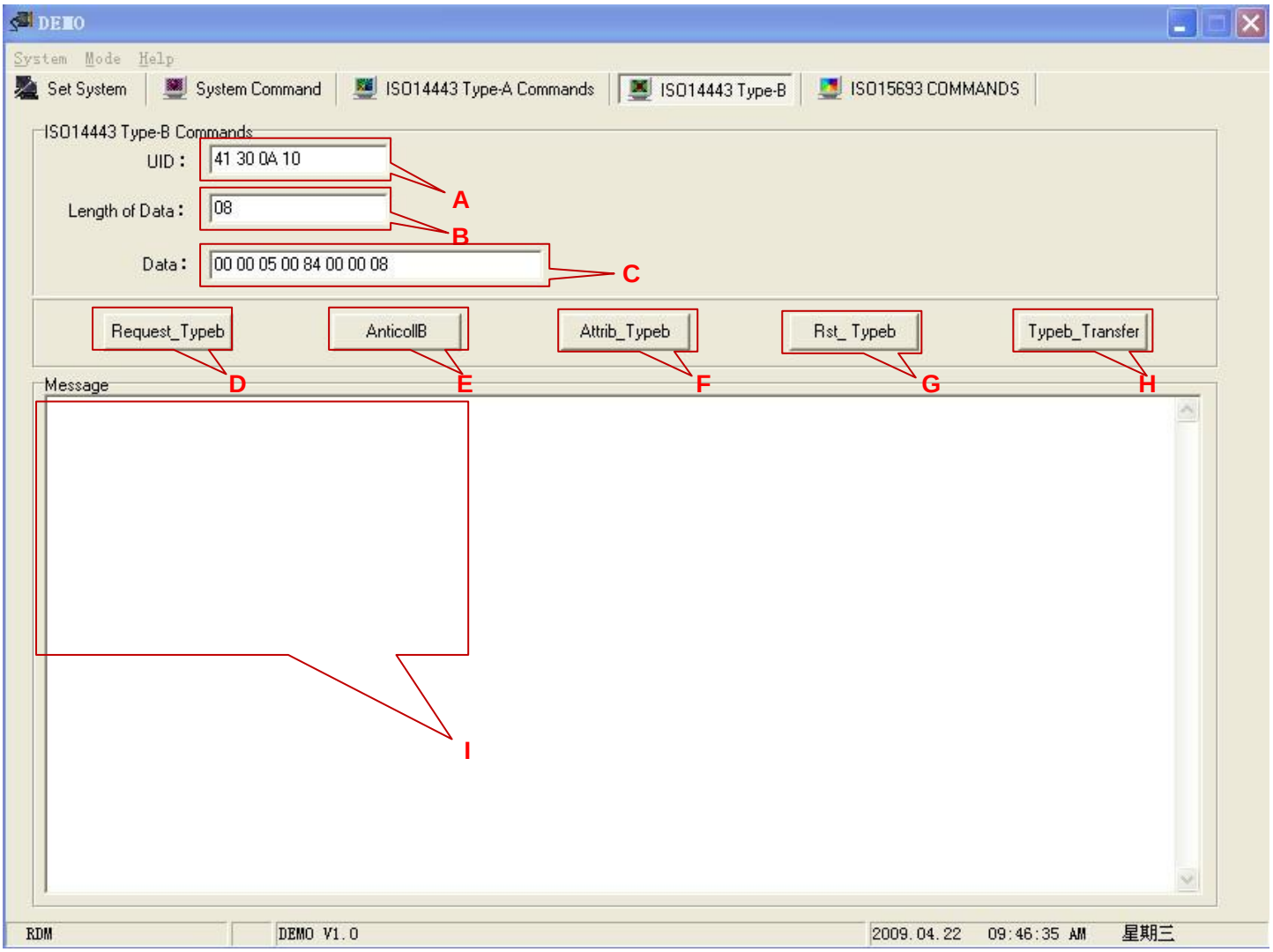


Figure 3.4.1 ISO 14443 Type-B Commands Frame Parameter Declaration

代号	参数	参数描述
A	UID	Input the SN of the card
B	Length of Data	Input the length of Data
C	Data	Input the value of Data
D	Request_Typeb	ISO14443 TypeB's searching card command, click here to complete the searching operation and the return message will be shown in Label I.
E	AnticollB	ISO14443 TypeB Ant-collision command, click here to complete the anti-collision operation and the return message will be shown in Label I.
F	Attrib_Typeb	ISO14443 TypeB Attrib command, click here to complete the searching operation and the return message will be shown in Label I.
G	Rst_typeb	Click here to carry out searching card and Attrib command, it will reset the card, the return message will be shown in Label I.
H	Typeb_Transfer	ISO14443 TypeB movement command, click here to transfer any effective commands to the card, the return message will be shown in Label I,
I	Message	Show the corresponding return messages of every parameter, click L1 will be clear all the messages.

Note: For more information about the commands of ISO14443 Type-B, please refer to the ISO14443 Type-B user Guide.

3.5 ISO15693 Commands

Figure 3.5 ISO 15693 Commands Frame

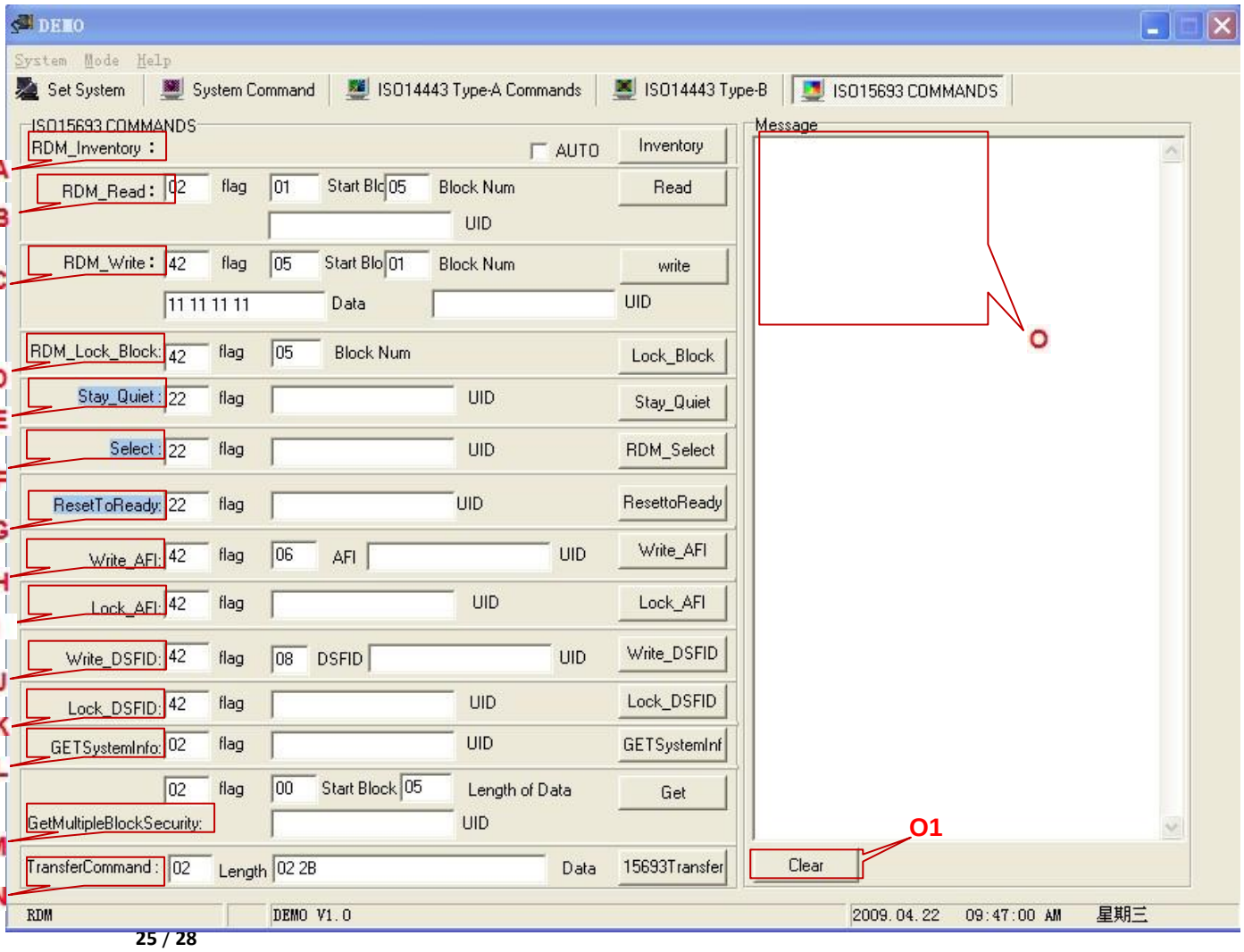


Figure 3.5.1 ISO 15693 Commands Frame Parameter Declaration

Label	Parameter	Parameter Declaration
A	RDM_Inverntory	Searching card and Anti-collision operations, if select auto the software will work automatically, the return message will be shown in Label O.
B	RDM_Read	Set objective block , click the corresponding button Read to read the card.
C	RDM_Write	Set objective block, click the corresponding button Write to write the card.
D	RDM_Lock_Block	Select the objective block and lock it.
E	Stay_Quiet	Set objective block, and set the card in the state of quiet.
F	Select	Select card.
G	ResetToReady	Set the cart into the state of ready.
H	Write_AFI	Write AFI.
I	Lock_AFI	Lock AFI.
J	Write_DSFID	Write DSFID
K	Lock_DSFID	Lock DSFID
L	Get SystemInfo	Get the system information
M	GetMultipleBlockSecurity	Get the security information
N	TransferCommand	Send all the effective commands or data to the card.
O	Message	Show the corresponding return messages of every parameter, click L1 will be clear all the messages.
O1	Clear	Clear all the messages in Label O

Note: For more information about the commands of ISO15693, please refer to the ISO15693 user guide.

CE&FCC 认证

Shenzhen Best Technology Co.,Ltd.
Room 702,Zhongguan Building,Liuxian Road,Nanshan District,
Shenzhen,Guangdong, China

EC-R&TTE Certificate

No.: BT0704090934

Submittor : **SHEN ZHEN RDM TAG MASTER CO.,LTD**
Fangda Building 207,Keji 12th Road south,High-Tech Industrial Park,NanShan ShenZhen
Manufacturer : **SHEN ZHEN RDM TAG MASTER CO.,LTD**
Fangda Building 207,Keji 12th Road south,High-Tech Industrial Park,NanShan ShenZhen
Product : **RFID Module**
M/N : **RDM880, RDM820,RDM830**

Essential requirement		Applied Specifications/Standards	Documentary Evidence	Result
Art.3.1(a)	Health	Not assessed		
Art.3.1(a)	Safety	EN60950	BTRL0704060302	Pass
Art.3.1(b)	EMC	ETSI EN301 489	BTRE0704060923	Pass
Art.3.2	Radio	ETSI EN300 220	BTRE0704060924	Pass

The EUT described above has been tested by us with the listed standards and found in compliance with the council RTTE directive 99/5/EC. It is possible to use CE marking to demonstrate the compliance with this Directive.
The scope of evaluation relates to the submitted documents only.

CE

Christina
Assistant Manager
Apr.05, 2007

TCB

GRANT OF EQUIPMENT AUTHORIZATION

TCB

Certification
Issued Under the Authority of the
Federal Communications Commission
By:

Timco Engineering, Inc.
849 NW State Road 45
P.O. Box 370,
Newberry, FL 32669

Date of Grant: 04/20/2007

Application Dated: 04/20/2007

SHEN ZHEN RDM TAG MASTER CO., LTD.
Fangda Building 207, Keji 12th Road South
High-Tech Industrial Park
NanShan, ShenZhen, 518000
China

Attention: Guangtao Niu , General Manager

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: U7NRDM880
Name of Grantee: SHEN ZHEN RDM TAG MASTER CO., LTD.
Equipment Class: Part 15 Low Power Communication Device Transmitter
Notes: RFID MODULE

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
	15C	13.56 - 13.58			

Modular Approval. Approval is limited to OEM installation only. This transmitter is restricted for use with the specific antenna(s) tested in this application for Certification and must not be co-located or operating in conjunction with any other antenna or transmitter.The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility. This grant is valid only when the device is sold to OEM integrators and the OEM integrators are instructed to ensure that the end user has no manual instructions to remove or install the device.