USER MANUAL

ZCS-IC 01/02
RFID Reader

Revision 1.0 03/18/2013

Revision History

Revision	Date	Description	By
1.0	03/18/2013	Initial Release	zhengw

Table of Contents

1. Introduction

ZCS-IC is a contactless smart card reader/writer base on the 13.56M Hz contactless (RFID) Technology. It supports Mifare and ISO 1443A standard.It is a plug-and-play USB device allowing interoperability with different devices and applications. The proximity operating distance is up to 10 cm, depending on the type of contactless tag in use.

This advanced Reader/Writer is widely used in applications including Access Control, Parking Systems, Prepaid Parking, Ticketing, Time and Attendance, Admission Control and POS.Here will be briefly introduced how to use ‘rfid card reader ’and ‘membership card’ two applications.

2. Features and Benefits

- The genuine USB HID MIFARE1 card reader,plug and play
- Stable performance, fast speed, low consumption, without external power supply,use stable computer USB power ,a lower failure rate.
- Support MIFARE ONE card,sensing distance from 50-100mm.
- Light, beautiful, trendy.
- The circuit board has a programmable control buzzer,can be set sound.
- Have a power indicator light and operating status of the USB communication signals
- Built-in one continuous change all 16 district or any district password,perform a change of 16 area password takes less than 200 milliseconds.
- Any call operation, return to information, all kinds of accidents are clear at a glance
- Provide a full range of dynamic library functions, provide a comprehensive description of the development, points, example, and source code.(includes c#2003,c++builder,Adelphi,Powerbuilder,VB.net2003,VB6.0,java)

3. Terms and Abbreviations

HID	Human Interface Device
ISO	International Organization for Standardization
RFID	Radio Frequency IDentification

4. Operation

Insert the device into the USB port, the red LED will light,you can swipe a proximity card when the green LED flash end.If it reads good,the beeper will sound .

5.Specification

Power Consumption

- USB interface – from host interface. No external power adaptor needed.

Sensing Distance

- 50~100mm

Indicators

- Two-color LED
  - Red indicates power indicator
  - Green indicates read good
- Beeper
  - A beep sound indicates good read

Communication Interface

- USB
  - Complies with USB 2.0 specification

Card Size

- Supports cards that meets the ISO14443-A, Mifare standards

Dimension

- ZCS-01:120mm(length) by 100mm (width) and 30mm (height).
- ZCS-02:110mm(length) by 80mm (width) and 30mm (height).

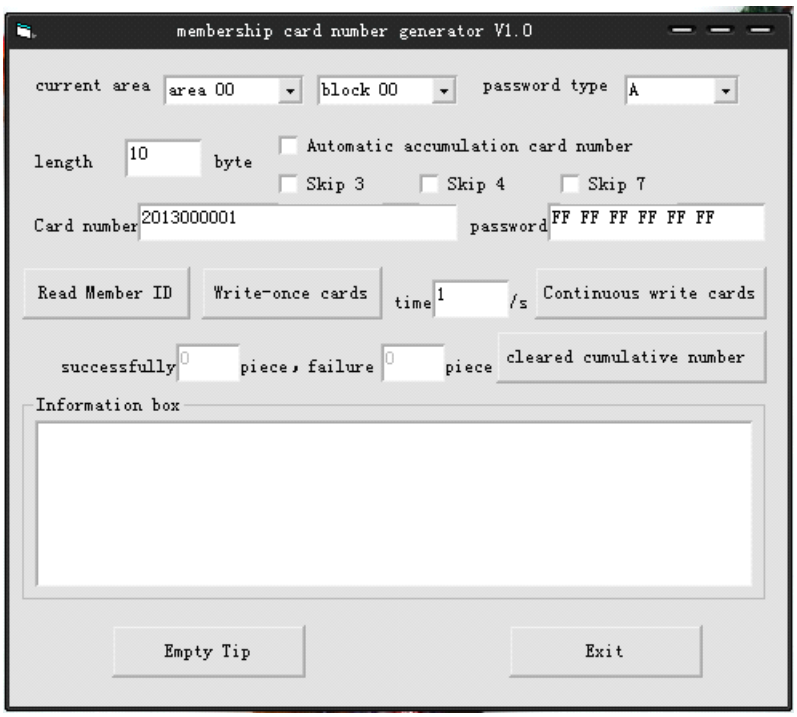
Model

- ZCS-IC 01:white
- ZCS-IC 02:black

6. Using the Demo Program

6.1Overview of membership Demo

Screenshot of msr100 tool Demo Software



6.1.1 install

Click 

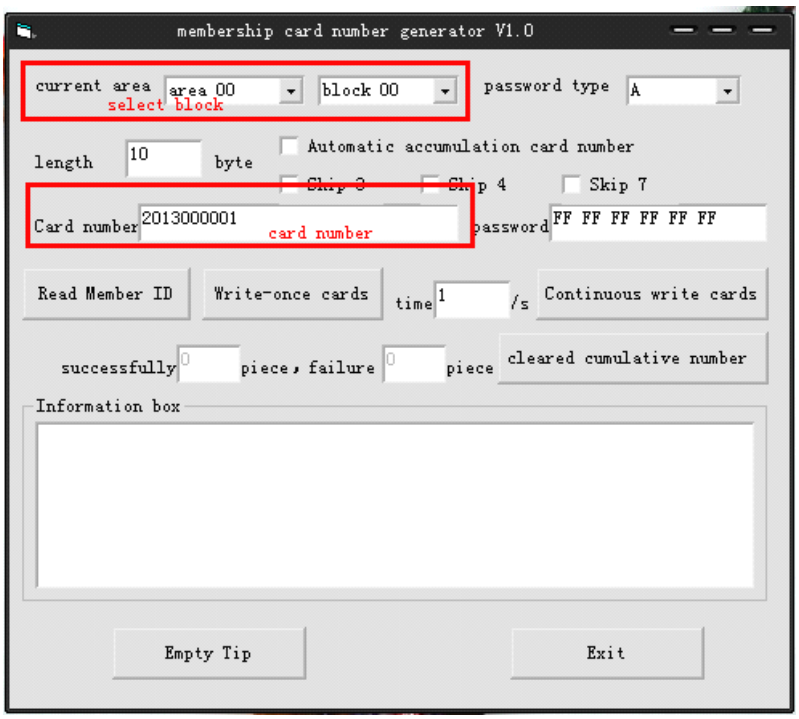
to install the software.

6.1.2 connection

Insert the device into the USB port, the red LED will light,you can swipe a proximity card when the green LED flash end

6.1.3 swipe proximity card

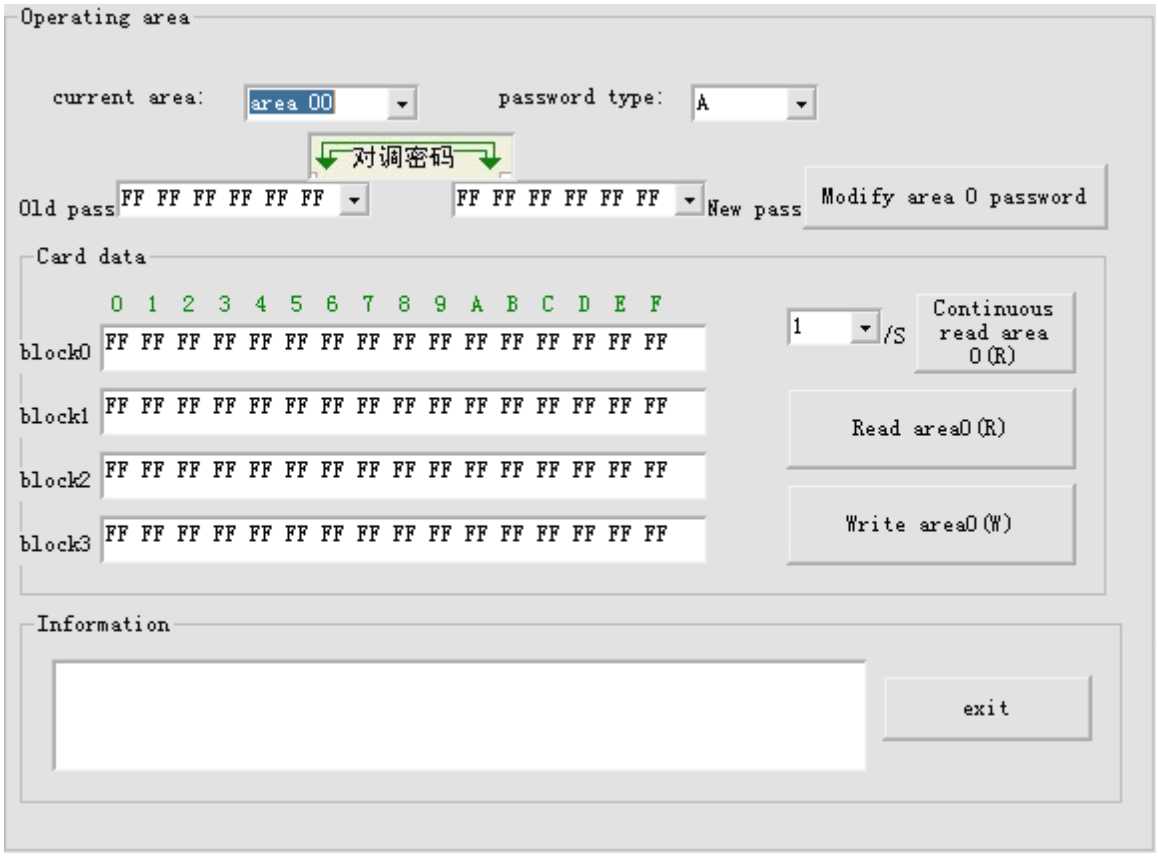
selected block, and input data



then you can write or read the data continuously.

6.2Overview of RFID card Demo

Screenshot of RFID card Demo Software



6.2.1 install

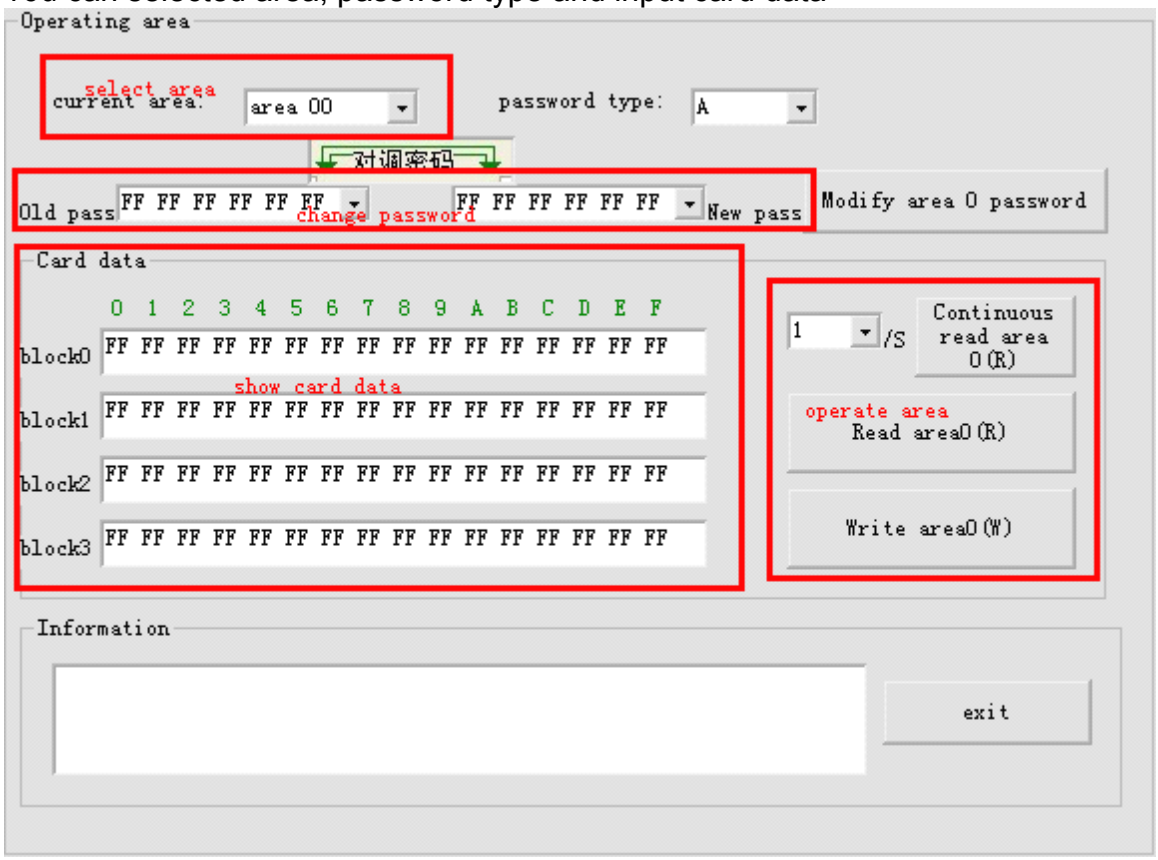
Installation as well as membership card application.

6.2.2 connection

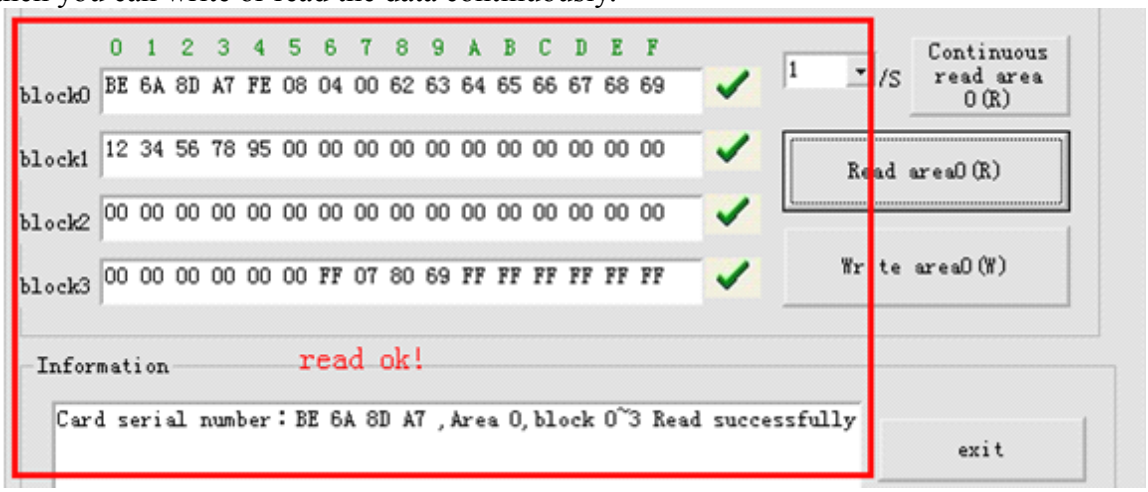
Insert the device into the USB port, the red LED will light,you can swipe a proximity card when the green LED flash end

6.1.3 swipe proximity card

You can selected area, password type and input card data



then you can write or read the data continuously.



7.SDK API

7.1 api detail

unsigned char __stdcall piccreadex(unsigned char ctrlword,unsigned char *serial, unsigned char area,unsigned char keyA1B0,unsigned char *picckey,unsigned char *piccdata0_2)	
Function	Read one sector information, include the block1, block2, block3 data, and return the card serial number.
Parameters	➢ Ctrlword:control word,is a byte,equivalent to eight bits,each bit only has 0 and 1 two states Suggest to set the ctrlowd: #define BLOCK0_EN0X01 #define BLOCK1_EN0X02 #define BLOCK2_EN0X04 #define NEEDSERIAL 0X08 #define EXTERNKEY 0X10 Eg: Read block0,block1,block2, only read the serial card, need assign the password Ctrlword = BLOCK0_EN + BLOCK1_EN + BLOCK2_EN + NEEDSERAL + EXTERNKEY Read block0,block1,block2, read any cards, need assign the password Ctrlword = BLOCK0_EN + BLOCK2_EN + EXTERNKEY Read block0, block2, read any cards, start the chip internal password Ctrlword = BLOCK0_EN + BLOCK2_EN ➢ Serial: point to the assigned array , at least 4 chars. If the Ctrlword not set NEEDSERIAL control word, the Serial do not need to assign a value, for the array only return value, if Ctrlword set NEEDSERIAL, it must set the value for the array. ➢ Area:the number of the sectors, 0~15 ➢ keyA1B0:0 means that use the B password to authentication, for non zero with A password to authenticate ➢ *picckey:point to the array for the password. ➢ *piccdata0_2:point to the array for the arrays, it should be more than 48 bytes, to save the three blocks data.

	Array0~array15 keep the block1 data, array16~31 keep the block2 data, array32~array47 keep the block2 data	
Return	Return a unsigned char value,and point the current value to the *piccdata	
	0	Operation is successful, the data read out is valid
	1	0 ~ 2 block haven't read out, may swipe card too fast,but the card serial number has been read
	2	0 block have been read, but 1 ~ 2 block read failure,card serial number has been read.
	3	0 and 1 block have been read, but 2 block read failure,card serial number has been read.
	8	Look for a card error, there is no card in the induction area
	9	Multiple cards in the sensing area
	10	The card may have been dormant
	11	Password loading failure
	12	Password authentication failed
	21	Dynamic library ICUSB. DLL is not in the current directory
	22	Dynamic library or driver error
	24	The operation timed out
	other	An unknown error

unsigned char __stdcall piccwriteex(unsigned char ctrlword,unsigned char *serial, unsigned char area, unsigned char keyA1B0,unsigned char *picckey,unsigned char *piccdata0_2)		
Function	Write one sector, include the block0, block1, block2	
Parameters	➢ Ctrlword:control word,is a byte,equivalent to eight bits,each bit only has 0 and 1 two states ➢ Serial: simply point to a space allocated for at least four of the char array can be written unsigned char * pointer,the subscript start from 0 ➢ Area:the area code,range from 0 to 15 ➢ keyA1B0:0 means that use the B password to authentication, for non zero with A password to authenticate ➢ *picckey:Password array, ➢ *piccdata0_2:Buffer used to store data.	
Return	Return unsigned char values	
	0	Operation is successful, write card data is valid
	1	0 ~ 2 block didn`t write in, may swipe card too fast.
	2	0 block have been write in, but 1 ~ 2 block write failure
	3	0 and 1 block have been write in, but 2 block write failure
	8	Look for a card error, there is no card in the induction area
	9	Multiple cards in the sensing area
	10	The card may have been dormant

	11	Password loading failure
	12	Password authentication failed
	21	Dynamic library ICUSB. DLL is not in the current directory
	22	Dynamic library or driver error
	24	The operation timed out
	other	An unknown error

Note:The above function is in the case of known card password,if you need to change the card password,you can call piccchangesinglekey function

unsigned char __stdcall pcdbeep(unsigned long xms)		
Function	Let the reader audible	
Parameters	➢ xms:The length of sound time,unit is millisecond	
Return	Return unsigned char values	
	0	Operation is successful
	21	Dynamic library ICUSB. DLL is not in the current directory
	24	The operation timed out
	other	An unknown error

unsigned char __stdcall pcdgetdevicenumber(unsigned char *devicenumber)		
Function	Return unique serial number of the read/write device	
Parameters	➢ devicenumber: simply point to a space allocated for at least four of the char array can be written unsigned char * pointer,the subscript start from 0	
Return	Return unsigned char values	
	0	Operation is successful, write card data is valid
	12	Failed to read the device serial number
	21	Dynamic library ICUSB. DLL is not in the current directory
	22	Dynamic library or driver error
	24	The operation timed out
	other	An unknown error

unsigned char __stdcall piccrequest(unsigned char *serial)		
Function	Look for the card and return the serial number of the card	
Parameters	➢ *serial: simply point to a space allocated for at least four of the char array can be written unsigned char * pointer,the subscript start from 0	
Return	Return unsigned char values	
	0	Operation is successful, write card data is valid
	8	Look for a card error, there is no card in the induction area

	9	Multiple cards in the sensing area
	10	The card may have been dormant
	12	Failed to read the device serial number
	21	Dynamic library ICUSB. DLL is not in the current directory
	22	Dynamic library or driver error
	24	The operation timed out
	other	An unknown error

unsigned char __stdcall piccrequestex (unsigned char *serial)		
Function	Find IC card and select the specified serial number IC card,must specified serial number	
Parameters	➢ *serial: simply point to a space allocated for at least four of the char array can be written unsigned char * pointer,the subscript start from 0	
Return	Return unsigned char values	
	0	Operation is successful, write card data is valid
	8	Look for a card error, there is no card in the induction area
	9	Multiple cards in the sensing area
	10	The card may have been dormant
	12	Failed to read the device serial number
	21	Dynamic library ICUSB. DLL is not in the current directory
	22	Dynamic library or driver error
	24	The operation timed out
	other	An unknown error

unsigned char __stdcall piccauthkey1(unsigned char *serial,unsigned char area,unsigned char keyA1B0,unsigned char *picckey)		
Function	Password authentication way 1,use to external password authentication, must specified external password .This function must be run after the execution of piccrequest, or piccrequestex function,can not call other functions in the middle	
Parameters	➢ *serial: Card serial number ➢ Area:the area code,range from 0 to 15 ➢ keyA1B0:0 means that use the B password to authentication, for non zero with A password to authenticate ➢ *picckey:Password array	
Return	Return unsigned char values	
	0	Operation is successful, password has been certified
	11	Password loading failure
	12	Password authentication failed
	21	Dynamic library ICUSB. DLL is not in the current directory

	22	Dynamic library or driver error
	24	The operation timed out
	other	An unknown error

unsigned char __stdcall piccauthkey2(unsigned char *serial,unsigned char area,unsigned char keyA1B0)		
Function	Password authentication way 2,use chip internal password to authentication.This function must be run after the execution of piccrequest, or piccrequestex function,can not call other functions in the middle	
Parameters	➢ *serial: Card serial number ➢ Area:the area code,range from 0 to 15 ➢ keyA1B0:0 means that use the B password to authentication, for non zero with A password to authenticate	
Return	Return unsigned char values	
	0	Operation is successful, password has been certified
	11	Password loading failure
	12	Password authentication failed
	21	Dynamic library ICUSB. DLL is not in the current directory
	22	Dynamic library or driver error
	24	The operation timed out
	other	An unknown error

unsigned char __stdcall piccread(unsigned char block,unsigned char *piccdata)		
Function	Read a block of data, which is 16 bytes.Must execute piccrequest or Piccrequestex function at first, and then execute piccauthkey1 or piccauthkey2 function.	
Parameters	➢ block:The absolute block number of the IC card ➢ *piccdata:point to the array subscript number greater than 16	
Return	Return unsigned char values	
	0	Operation is successful, the data read out is valid
	13	Reading current block failed,because of password authentication failed
	21	Dynamic library ICUSB. DLL is not in the current directory
	22	Dynamic library or driver error
	24	The operation timed out
	other	An unknown error

unsigned char __stdcall piccwrite(unsigned char block,unsigned char *piccdata)	
Function	Write a block of data, which is 16 bytes.Must execute piccrequest or Piccrequestex function at first, and then execute piccauthkey1

	or piccauthkey2 function.	
Parameters	➢ block:The absolute block number of the IC card ➢ *piccdata:point to the array subscript number greater than 16	
Return	Return unsigned char values	
	0	Operation is successful, write card data is valid
	14	Writing current block failed,because of password authentication failed
	21	Dynamic library ICUSB. DLL is not in the current directory
	22	Dynamic library or driver error
	24	The operation timed out
	other	An unknown error

unsigned char __stdcall picchalt()		
Function	Sleep card	
Return	Return unsigned char values	
	0	Operation is successful, write card data is valid
	21	Dynamic library ICUSB. DLL is not in the current directory
	22	Dynamic library or driver error
	24	The operation timed out
	other	An unknown error

unsigned char __stdcall piccchangesinglekey(unsigned char ctrlword,unsigned char *serial,unsigned char area , unsigned char keyA1B0,unsigned char *piccoldkey,unsigned char *piccnewkey)		
Function	Change single area password	
Parameters	➢ Ctrlword:control word,is a byte,equivalent to eight bits,each bit only has 0 and 1 two states ➢ Serial: simply point to a space allocated for at least four of the char array can be written unsigned char * pointer,the subscript start from 0 ➢ Area:the area code,range from 0 to 15 ➢ keyA1B0:0 means that use the B password to authentication, for non zero with A password to authenticate ➢ * piccoldkey:old Password array ➢ * piccnewkey:new Password array	
Return	Return unsigned char values	
	0	Operation is successful
	8	Look for a card error, there is no card in the induction area
	9	Multiple cards in the sensing area
	10	The card may have been dormant
	11	Password loading failure
	12	Password authentication failed

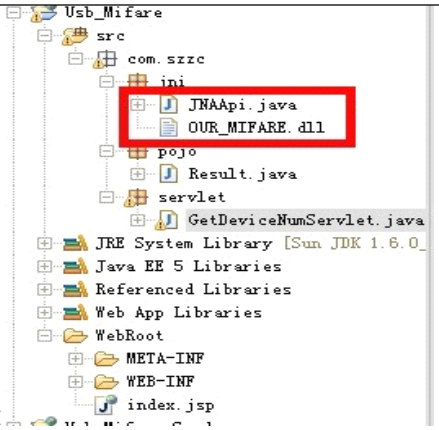
	21	Dynamic library ICUSB. DLL is not in the current directory
	22	Dynamic library or driver error
	24	The operation timed out
	other	An unknown error

7.2 sample code

Refer to the API,you can develop the application by yourself easily.

7.2.1 java code

engineering structure:




```
public interface CLibrary extends StdCallLibrary {
      CLibrary              INSTANCE              =              (CLibrary)
Native.loadLibrary("OUR_MIFARE",
                        CLibrary.class);
             /**
              * @return device serial number
              */
             public byte pcdgetdevicenumber(byte[] deviceNum);
             /**
              * @return card serial number
              */
             public byte piccrequest(byte[] serial);
             /**
              * @return read block 0~2
              */
      public byte piccreadex(byte ctrlword, byte[] serial, byte
area,
                        byte key, byte[] picckey, byte[] piccdata);
             /**
              * @return change password          */
      public byte piccchangesinglekey(byte ctrlword, byte[] serial,
                  byte area, byte key, byte[] oldPass, byte[]
newPass);
             /**
              * @return write
              */
      public byte piccwriteex(byte ctrlword, byte[] serial, byte
area,
```

```
                        byte key, byte[] picckey, byte[] piccdata);
            /**
             * @param buffer
             * @return switch byte[] to string
             */
            public String toHex(byte[] buffer);
      }
public Result getDeviceNum(byte[] deviceNum) {
            Result rs = new Result();
            byte status;
            status = CLibrary.INSTANCE.pcdgetdevicenumber(deviceNum);
            rs.setStatus(status);
            rs.setResult(deviceNum);
            rs.set_id(1);
            return rs;
      }
      public Result getCardData(byte ctrlword, byte[] serial, byte
area,
                  byte key, byte[] picckey, byte[] piccdata) {
            Result rs = new Result();
            byte status;
            byte[] serialNum = new byte[4];
            status = CLibrary.INSTANCE.piccrequest(serialNum);
            status      =      CLibrary.INSTANCE.piccreadex(ctrlword,
serialNum, area, key,picckey, piccdata);
            rs.set_id(2);
            rs.setCardSerial(serialNum);
            rs.setStatus(status);
            rs.setResult(piccdata);
            return rs;
      }
      public Result updatePass(byte ctrlword, byte[] serial, byte
area, byte key,
                  byte[] oldPass, byte[] newPass) {
            Result rs = new Result();
            byte status;
            byte[] serialNum = new byte[4];
            status = CLibrary.INSTANCE.piccrequest(serialNum);
            status  =  CLibrary.INSTANCE.piccchangesinglekey(ctrlword,
serialNum,area, key, oldPass, newPass);
            rs.set_id(3);
            rs.setStatus(status);
            return rs;
      }
      public Result writeData(byte ctrlword, byte[] serial, byte
area,
                  byte key, byte[] picckey, byte[] piccdata){
            Result rs = new Result();
            byte status;
            byte[] serialNum = new byte[4];
            status = CLibrary.INSTANCE.piccrequest(serialNum);
            status      =      CLibrary.INSTANCE.piccwriteex(ctrlword,
serialNum,
```

```
                        area, key, picckey, piccdata);
            rs.set_id(4);
            rs.setStatus(status);
            return rs;
      }
      public String toHex(byte[] buffer) {
            StringBuffer sb = new StringBuffer(buffer.length * 2);
            for (int i = 0; i < buffer.length; i++) {
            sb.append(Character.forDigit((buffer[i]  &  240)  >>  4,
16));
                  sb.append(Character.forDigit(buffer[i] & 15, 16));
            }
            return sb.toString();
      }
```

7.2.2 vb code

```
Private Declare Function piccreadex Lib "OUR_MIFARE.dll" (ByVal ctrlword As Byte,
ByVal serial As Long, ByVal area As Byte, ByVal key As Byte, ByVal picckey As Long,
ByVal piccdata As Long) As Byte

Private Sub Command2_Click()
  Dim status As Byte
    Dim myareano As Byte
    Dim authmode As Byte
    Dim myctrlword As Byte
    Dim mypicckey(0 To 5) As Byte
    Dim mypiccserial(0 To 3) As Byte
    Dim mypiccdata(0 To 63) As Byte
    Dim cardNumber As String
    Dim block1 As String
    Dim block2 As String
    Dim block3 As String
    Dim imageFlag As Boolean
    Dim str() As String
    Dim strLength As Integer
    Dim flag2 As Boolean
    myareano = CByte(Combo1.ListIndex)
  If (Combo2.ListIndex = 0) Then
    authmode = 1
    Else
    authmode = 0
  End If

  str = Split(Combo3.Text, " ")
  strLength = UBound(str) - LBound(str) + 1
  If (strLength = 6) Then
  For i = 0 To (strLength - 1)
```

```
        If (Len(str(i)) <> 2) Then
        Text5.Text = "Format error!"
        flag2 = True
        Exit For
       End If
  Next i
  Else
    flag2 = True
  Text5.Text = "error!"
  End If

If (flag2 = False) Then
For i = 0 To strLength - 1
  mypicckey(i) = "&H" & str(i)
Next
End If
   myctrlword = BLOCK0_EN + BLOCK1_EN + BLOCK2_EN + NEEDSERIAL +
EXTERNKEY
   status = piccrequest(VarPtr(mypiccserial(0)))
status = piccreadex(myctrlword, VarPtr(mypiccserial(0)), myareano, authmode,
VarPtr(mypicckey(0)), VarPtr(mypiccdata(0)))
For i = 0 To 3
mark = mark + IIf(Len(Hex(mypiccserial(i))) < 2, "0" + Hex(mypiccserial(i)),
Hex(mypiccserial(i))) + " "
Next i
Select Case status
Case 0:
For i = 0 To 47
     If (i < 15) Then
     block1 = block1 + IIf(Len(Hex(mypiccdata(i))) < 2, "0" + Hex(mypiccdata(i)),
Hex(mypiccdata(i))) + " "
     ElseIf (i = 15) Then
     block1 = block1 + IIf(Len(Hex(mypiccdata(i))) < 2, "0" + Hex(mypiccdata(i)),
Hex(mypiccdata(i)))
     ElseIf (15 < i And i < 31) Then
     block2 = block2 + IIf(Len(Hex(mypiccdata(i))) < 2, "0" + Hex(mypiccdata(i)),
Hex(mypiccdata(i))) + " "
     ElseIf (i = 31) Then
     block2 = block2 + IIf(Len(Hex(mypiccdata(i))) < 2, "0" + Hex(mypiccdata(i)),
Hex(mypiccdata(i)))
     ElseIf (31 < i And i < 47) Then
     block3 = block3 + IIf(Len(Hex(mypiccdata(i))) < 2, "0" + Hex(mypiccdata(i)),
Hex(mypiccdata(i))) + " "
     ElseIf (i = 47) Then
     block3 = block3 + IIf(Len(Hex(mypiccdata(i))) < 2, "0" + Hex(mypiccdata(i)),
```

```
Hex(mypiccdata(i)))
    End If
Next i
imageFlag = True
Text1.Text = block1
Text2.Text = block2
Text3.Text = block3

Dim piccdata(0 To 15) As Byte
Dim block As Byte
Dim block4 As String
block = myareano * 4 + 3
      status = piccrequest(VarPtr(mypiccserial(0)))
      status = piccauthkey1(VarPtr(mypiccserial(0)), block, authmode,
VarPtr(mypicckey(0)))
      status = piccread(block, VarPtr(piccdata(0)))
For i = 0 To 15
block4 = block4 + IIf(Len(Hex(piccdata(i))) < 2, "0" + Hex(piccdata(i)),
Hex(piccdata(i))) + " "
Next i
Text4.Text = block4

counts = counts + 1
Text5.Text = "Card S/N： " + mark + ", " + CStr(Combo1.ListIndex) + "area," + "
0~3block read successfully"
.....
End Select
...
End Sub
```

7.2.3 VC++ code

```
/*****************piccrequest*******************************/
  unsigned char myserial[4];
  unsigned char status;
  unsigned char (__stdcall *piccrequest)(unsigned char *serial);
  AnsiString FileName=ExtractFilePath(Application->ExeName);
  if(FileName.SubString(FileName.Length(),1) != "\\")
  {
        FileName += "\\";
  }

  FileName += "OUR_MIFARE.dll";
  if(!FileExists(FileName))
  {
```

```
                ShowMessageb("can not find dynamic library");
                return;
        }
        HINSTANCE hDll;
        hDll=LoadLibrary(FileName.c_str());
        piccrequest = (unsigned char (__stdcall *piccrequest)(unsigned char
*serial))GetProcAddress(hDll,"piccread");
        status = piccrequest(myserial);
        switch(status)
        {
                case 0:
                        //TO-DO
                        break;
                case 1:
                        break;
                //...
         }
```

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