



IEI Technology Corp.



MODEL:  
**IRFD-410**

**HF 13.56 MHz Industrial RFID Reader  
PN532 Support, USB/RS-232 Interface  
RoHS Compliant**

# User Manual

Rev. 1.00 – 2 July, 2009



# Revision

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Date	Version	Changes
2 July, 2009	1.00	Initial release

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Chapter

1

# Introduction

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## 1.1 IRFD-410 RFID Reader Overview



**Figure 1-1: IRFD-410 RFID Reader**

The IRFD-410 is a RFID reader for 13.56 MHz High Frequency (HF) RFID systems and is compliant with ISO 14443A and ISO 14443B industrial standards. The IRFD-410 also comes with a utility and a software development kit (SDK) for configuring reader module and writing/reading tags.

### 1.1.1 IRFD-410 Features

The IRFD-410 has the following features

- 13.56 MHz radio frequency industrial RFID reading module
- Supports standard protocol ISO 14443A and ISO 14443B for reading MIFARE tags
- Reader to reader anti-collision
- Reads and writes tags with up to 2Kb
- Single power supply and low power consumption
- Keyboard data entry
- Various interfaces to main system
  - 115.2 Kbps maximum serial communication speeds
  - USB

## 1.2 Technical Specifications

The specifications for the Intel based embedded systems are listed below.

	<b>IRFD-410</b>
<b>Support Protocol</b>	ISO 14443A (MIFARE) Read/Write ISO 14443B (MIFARE) Read/Write Felica (R) ISO 18092 (R)
<b>RF Frequency</b>	13.56 MHz
<b>Interface</b>	RS-232 serial port or USB
<b>UART</b>	RS-232 with 3.3 V or 5 V logic levels
<b>USB</b>	USB 2.0 full speed with 3.3 V or 5 V logic levels
<b>RFID ASIC</b>	PN532
<b>Processor</b>	PN532 and AT90USB162
<b>Operating Distance</b>	Passive mode: 50 mm Active mode: 100 mm
<b>Power Consumption</b>	5V @ 150 mA
<b>Storage Temperature</b>	-10°C ~ 70°C
<b>Operating Temperature</b>	0°C ~ 50°C
<b>Operating Humidity</b>	10% ~ 85% RH
<b>Driver Support</b>	Windows XP Windows XPE

**Table 1-1: Technical Specifications**



Chapter

2

# System Components

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## IRFD-410 RFID Reader

### 2.1 IRFD-410 Mechanical Overview

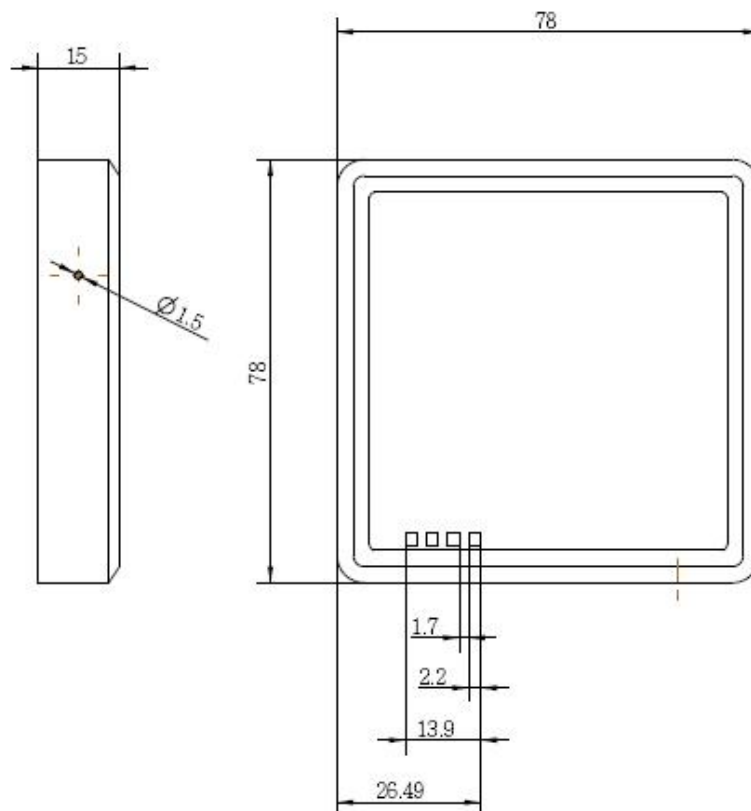
The IRFD-410 RoHS compliant RFID reader combines an IRFD-410 RFID reader module and an IPEX type antenna module in a plastic enclosure. Featuring one USB port and one RS-232 serial communication ports, the IRFD-410 offers system integrators and developers the best selection of RFID applications.

### 2.2 Dimensions

#### 2.2.1 IRFD-410 Physical Dimensions

The dimensions of the IRFD-410 are listed below and shown in **Figure 2-1**.

- **Height:** 15.00 mm
- **Width:** 78.00 mm
- **Length:** 78.00 mm



**Figure 2-1: IRFD-410 Dimensions (mm)**

## 2.3 External Overview

The IRFD-410 front panel contains access to antenna and two LEDs:

- Active
- Power

The IRFD-410 also contains a RS-232 and USB Y cable.

An external overview of the IRFD-410 is shown in **Figure 2-2** below.

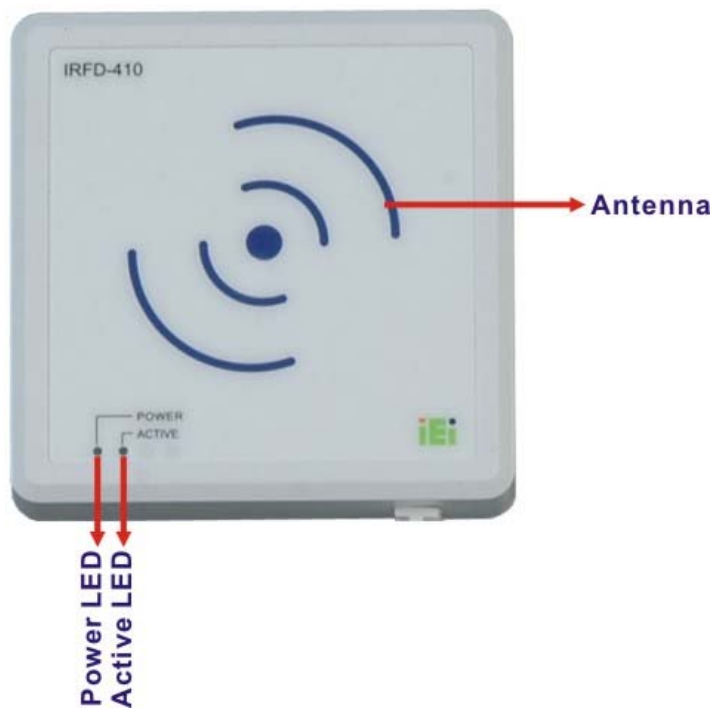


Figure 2-2: IRFD-410 External Overview

## IRFD-410 RFID Reader

### 2.4 Internal Overview

The IRFD-410 internal components are listed below:

- 1 x IRFD-410 RFID reader module
- 1 x Antenna
- 1 x Buzzer

All the components are accessed by removing the back cover.

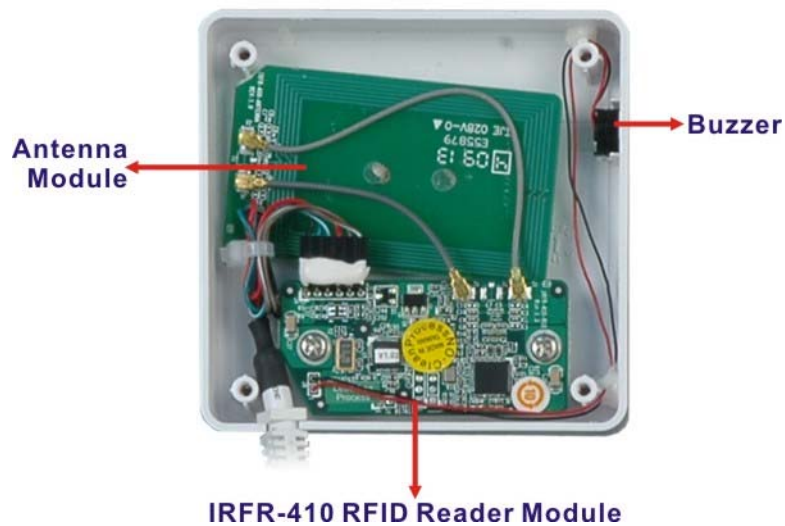


Figure 2-3: Internal Overview

## 2.5 IRFR-410 RFID Reader Module

The IRFD-410 device has an IRFR-410 RFID reader module installed in the system. The following sections describe the relevant components and jumpers on the RFID reader module.

### 2.5.1 IRFR-410 Layout

Figure 2-4 shows the on-board peripheral connectors and rear panel LEDs.



Figure 2-4: Connector and Jumper Locations

### 2.5.2 Peripheral Interface Connectors

Table 2-1 shows a list of the peripheral interface connectors on the IRFR-410. Detailed descriptions of these connectors can be found below.

Connector	Type	Label
Antenna connector	IPEX type connector	J1 and J3
Buzzer connector	2-pin	J8
RS-232 and USB connector	6-pin header	J4
Active LED (solder side)	LED	D1
Power LED (solder side)	LED	D2

Table 2-1: Peripheral Interface Connectors and Indicators

## 2.6 Internal Peripheral Connectors

Internal peripheral connectors are found on the IRFR-410 and are only accessible when the IRFR-410 is outside of the chassis. This section has complete descriptions of all the internal, peripheral connectors on the IRFR-410.

### 2.6.1 Antenna Connector

**CN Label:** J1, J3  
**CN Type:** IPEX  
**CN Location:** See **Figure 2-4**

The Antenna Connector connects to the 13.56 MHz antenna module.

### 2.6.2 Buzzer Connector

**CN Label:** J8  
**CN Type:** 2-pin  
**CN Location:** See **Figure 2-5**  
**CN Pinouts:** See **Table 2-2**

The 2-pin buzzer connector is connected to a buzzer.



**Figure 2-5: Buzzer Connector Location**

Pin No.	Description
1	MIC+
2	GND

**Table 2-2: Buzzer Connector Pinouts**

### 2.6.3 RS-232 and USB Connector

- CN Label:** J4
- CN Type:** 6-pin header
- CN Location:** See **Figure 2-6**
- CN Pinouts:** See **Table 2-3**

The 6-pin RS-232 and USB connector is connected to a RS-232 and USB Y cable.



**Figure 2-6: RS-232 and USB Connector Locations**

Pin No.	Description
1	GND
2	USBDM
3	USBDP
4	+5V
5	RXD
6	TXD

**Table 2-3: RS-232 and USB Connector Pinouts**

### 2.6.4 LED Indicators

**CN Label:** D1, D2

**CN Type:** On-board LED

There are two LED indicators located on the solder side of the IRFR-410 module to indicate the power status and RFID tag type.



Chapter

3

# Installation

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### 3.1 Anti-static Precautions



**WARNING:**



If the following anti-static precautions are not followed, a user may be injured and the system irreparably damaged.



Electrostatic discharge (ESD) can cause serious damage to electronic components, including the IRFR-410 module. (Dry climates are especially susceptible to ESD.) It is therefore critical that whenever the IRFD-410 is opened and any electrical component handled, the following anti-static precautions are strictly adhered to.

- **Wear an anti-static wristband:** Wearing a simple anti-static wristband can help to prevent ESD from damaging the board.
- **Self-grounding:** Before handling the board, touch any grounded conducting material. During the time the board is handled, frequently touch any conducting materials that are connected to the ground.

### 3.2 Unpacking

After the IRFD-410 is received make sure the following components are included in the package. If any of these components are missing, please contact the IRFD-410 reseller or vendor where it was purchased or contact an IEI sales representative immediately.

Quantity	Item	Image
1	IRFD-410	
1	Power adaptor for RS-232 serial port	

2	Wall mount brackets	
1	Utility and manual CD	

**Table 3-1: Package List Contents**

### 3.3 Connection

The IRFD-410 connects to the main system through the RS-232/USB Y cable. To connect the IRFD-410 to the main system, follow the steps below.

**Step 1:** Choose either RS-232 serial port or USB port to connect to the main system.

**Step 2:** If choose to use the RS-232 serial port, please also connect the power adapter to the RS-232 DB-9 female connector (**Figure 3-1**) to provide power to the RS-232 serial port.


**Figure 3-1: RS-232 DB-9 Power Connection**

**Step 3:** If using USB port, just simply connect the USB port from the IRFD-410 reader to the main system.

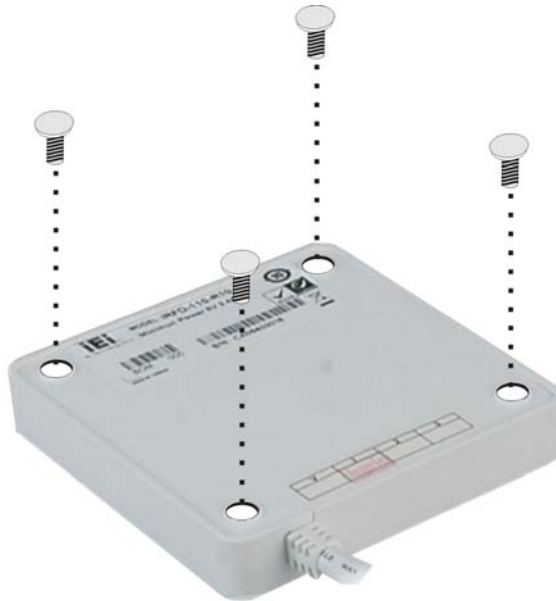
## IRFD-410 RFID Reader

### 3.4 Mounting the RFID Reader

To mount the IRFD-410 onto a wall or some other surface using the two mounting brackets, please follow the steps below.

**Step 1:** Turn the IRFD-410 over.

**Step 2:** Remove the four retention screws on the bottom surface of the IRFD-410.



**Figure 3-2: Bottom Surface Retention Screws Removal**

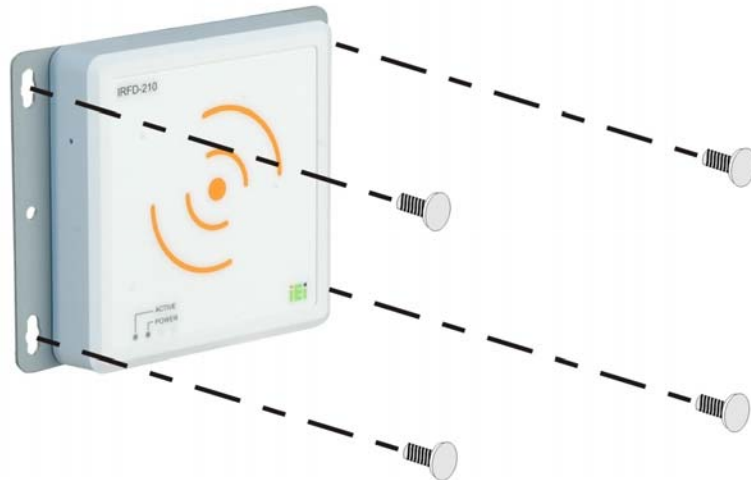
**Step 3:** Align the two retention screw holes in each bracket with the corresponding retention screw holes on the sides of the bottom surface.

**Step 4:** Secure the brackets to the system by inserting two retention screws into each bracket.



**Figure 3-3: Mounting Bracket Retention Screws**

- Step 5:** Drill holes in the intended installation surface.
- Step 6:** Align the mounting holes in the sides of the mounting brackets with the predrilled holes in the mounting surface.
- Step 7:** Insert four retention screws, two in each bracket, to secure the system to the wall.



**Figure 3-4: Wall Mounting**

Chapter

**4**

# Software Application

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## 4.1 Chapter Overview

This chapter describes the use of the IRFR-410 module control program. The IRFD-410 Tools is a program providing end user interface to help the user to communicate with 13.56 MHz operating frequency transponders using IRFD-410.

The IRFD-410 Tools provides almost complete command set to control the IRFD-410 reader and communicate with the ISO 14443A (MIFARE) transponders.

## 4.2 System Requirement

IEI IRFD-410 Tools can be installed in the following OS:

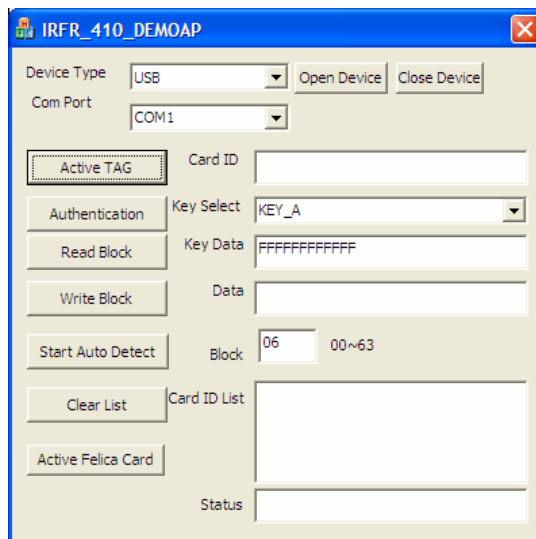
- Windows 2000
- Windows XP

## 4.3 IEI IRFD-410 Tool Support Library

- Standard C DLL Library

## 4.4 Software Interface

The IRFD-410 Tools window is shown following.



**Figure 4-1: Software Interface**

## IRFD-410 RFID Reader

### 4.4.1 Open IRFD-410

To start using the IEI IRFD-410 Tools with the IRFD-410 reader, follow the steps below.

**Step 1:** Launch the IRFD-410 Tools.

**Step 2:** Select a device type (USB or RS-232). Select a connected COM port (COM1 -- COM255).

**Step 3:** Click **Open Device** button.



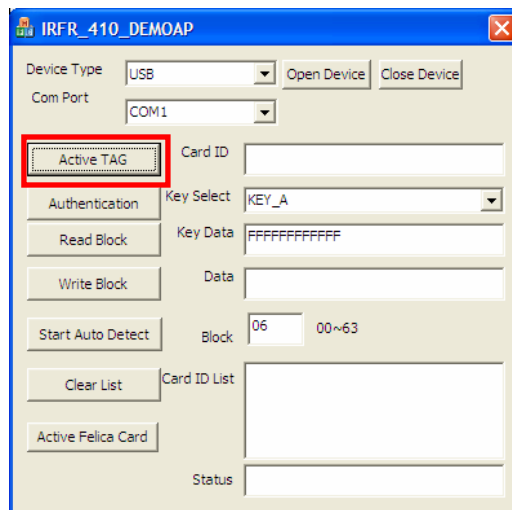
**Figure 4-2: Open IRFD-410**

## 4.5 ISO 14443A

The IRFD-410 is capable of reading ISO 14443 (MIFARE) tag UID. To activate MIFARE tag, follow the steps below.

**Step 1:** Place a single MIFARE tag on the IRFD-410.

**Step 2:** Click the **Active TAG** button.



**Figure 4-3: Activate Tag**

### 4.5.1 Authentication

**Step 1:** Select a key type: KEY A or KEY B.

**Step 2:** Enter a value for the key in the Key Data field.

**Step 3:** Enter a block ID.

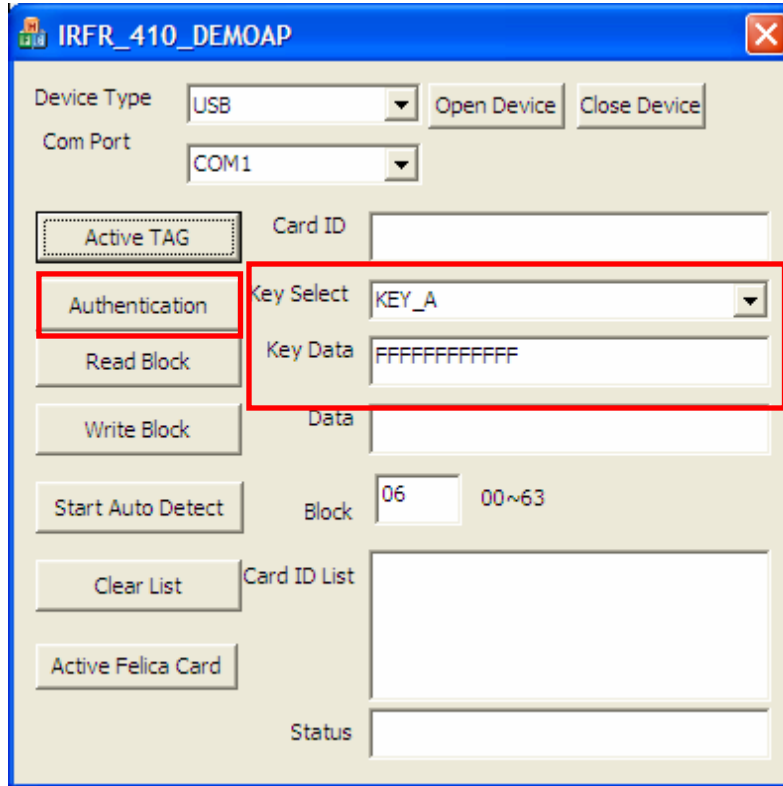


Figure 4-4: Authentication

## IRFD-410 RFID Reader

### 4.5.2 Read Block

To read a single block, the user should:

**Step 1:** Place a single MIFARE tag on the IRFD-410.

**Step 2:** Click the **Read Block** button.

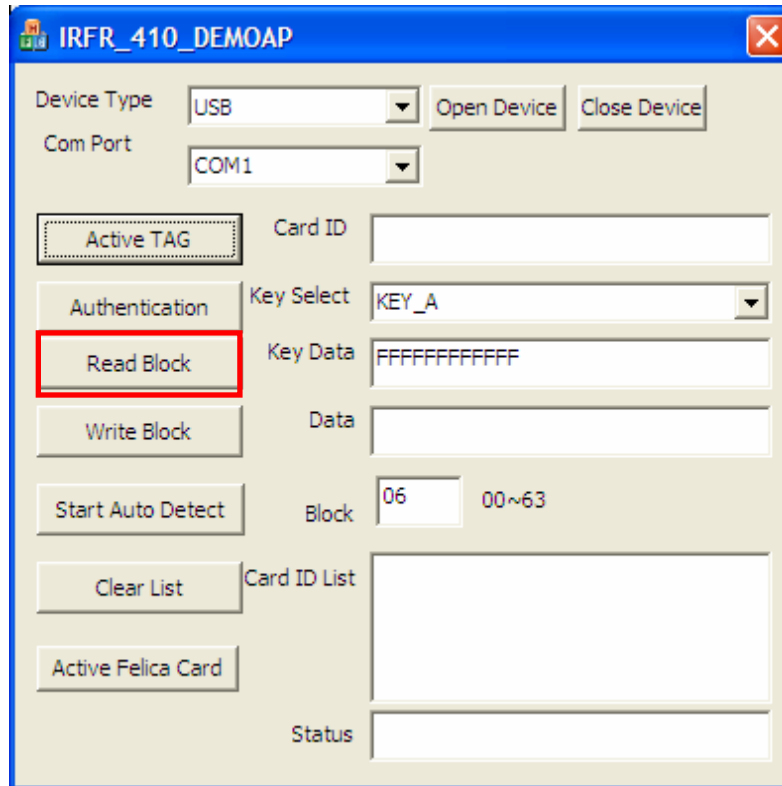


Figure 4-5: Read Block

### 4.5.3 Write Block

To write a block, the user should:

**Step 1:** Place a single MIFARE tag on the IRFD-410.

**Step 2:** Click the **Write Block** button.

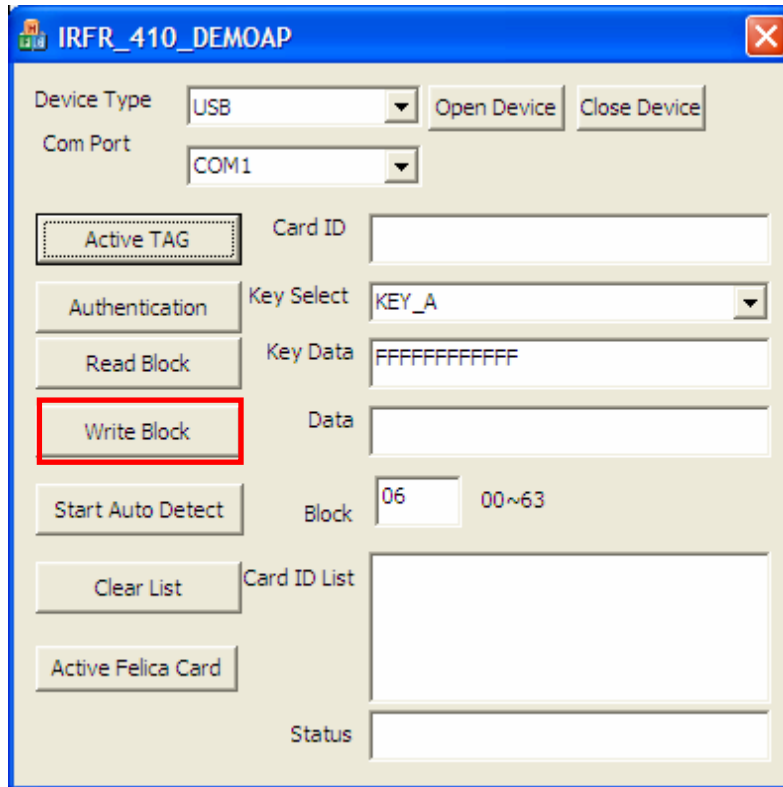


Figure 4-6: Write Block Value

Appendix

A

# IRFD-410 Tool Library

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## A.1 IRFD-410 API

```
IRFR_410_API int IRFR_410_OPEN(int i_DeviceType,int i_ComPort);
IRFR_410_API int IRFR_410_CLOSE();
IRFR_410_API int IRFR_410_ACTIVE(UCHAR *UID);
IRFR_410_API int IRFR_410_FELICA_ACTIVE(UCHAR *UID);
IRFR_410_API int IRFR_410_AUTH(STR_AUTH_DATA *data);
IRFR_410_API int IRFR_410_READBLOCK(STR_READ_DATA *data,UCHAR *BlockData);
IRFR_410_API int IRFR_410_WRITEBLOCK(STR_WRITE_DATA *str_write_data);
```

Appendix

C

# Hazardous Materials Disclosure

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## **B.1 Hazardous Materials Disclosure Table for IPB Products Certified as RoHS Compliant Under 2002/95/EC Without Mercury**

The details provided in this appendix are to ensure that the product is compliant with the Peoples Republic of China (China) RoHS standards. The table below acknowledges the presences of small quantities of certain materials in the product, and is applicable to China RoHS only.

A label will be placed on each product to indicate the estimated “Environmentally Friendly Use Period” (EFUP). This is an estimate of the number of years that these substances would “not leak out or undergo abrupt change.” This product may contain replaceable sub-assemblies/components which have a shorter EFUP such as batteries and lamps. These components will be separately marked.

Please refer to the table on the next page.

## IRFD-410 RFID Reader

Part Name	Toxic or Hazardous Substances and Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (CR(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
<b>Housing</b>	X	O	O	O	O	X
<b>Display</b>	X	O	O	O	O	X
<b>Printed Circuit Board</b>	X	O	O	O	O	X
<b>Metal Fasteners</b>	X	O	O	O	O	O
<b>Cable Assembly</b>	X	O	O	O	O	X
<b>Fan Assembly</b>	X	O	O	O	O	X
<b>Power Supply Assemblies</b>	X	O	O	O	O	X
<b>Battery</b>	O	O	O	O	O	O

O: This toxic or hazardous substance is contained in all of the homogeneous materials for the part is below the limit requirement in SJ/T11363-2006

X: This toxic or hazardous substance is contained in at least one of the homogeneous materials for this part is above the limit requirement in SJ/T11363-2006

此附件旨在确保本产品符合中国 RoHS 标准。以下表格标示此产品中某有毒物质的含量符合中国 RoHS 标准规定的限量要求。

本产品上会附有“环境友好使用期限”的标签，此期限是估算这些物质“不会有泄漏或突变”的年限。本产品可能包含有较短的环境友好使用期限的可替换元件，像是电池或灯管，这些元件将会单独标示出来。

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (CR(VI))	多溴联苯 (PBB)	多溴二苯 醚 (PBDE)
壳体	X	O	O	O	O	X
显示	X	O	O	O	O	X
印刷电路板	X	O	O	O	O	X
金属螺帽	X	O	O	O	O	O
电缆组装	X	O	O	O	O	X
风扇组装	X	O	O	O	O	X
电力供应组装	X	O	O	O	O	X
电池	O	O	O	O	O	O

O: 表示该有毒有害物质在该部件所有物质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。  
X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。