

# Mifare<sup>®</sup> Configurable Sector Reader User's Manual



(For MF7XX Series)

REV.E  
August 10, 2012

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## Mifare® Configurable Sector Reader

### Overview:

MF7xx is a user configurable Mifare® sector data reader. It can be configured to read Mifare® card with MAD1/MAD2 standard in a Mifare® application open system, or can be configured to read the user-defined sector data (Non-MAD) in a user defined closed system.

Output interface can be configured as an RS232 output or Wiegand output. Wiegand output is selectable from 26 bits to 128 bits.

MF7xx can also be set with a Reader ID number for multi-unit communication.

### Features:

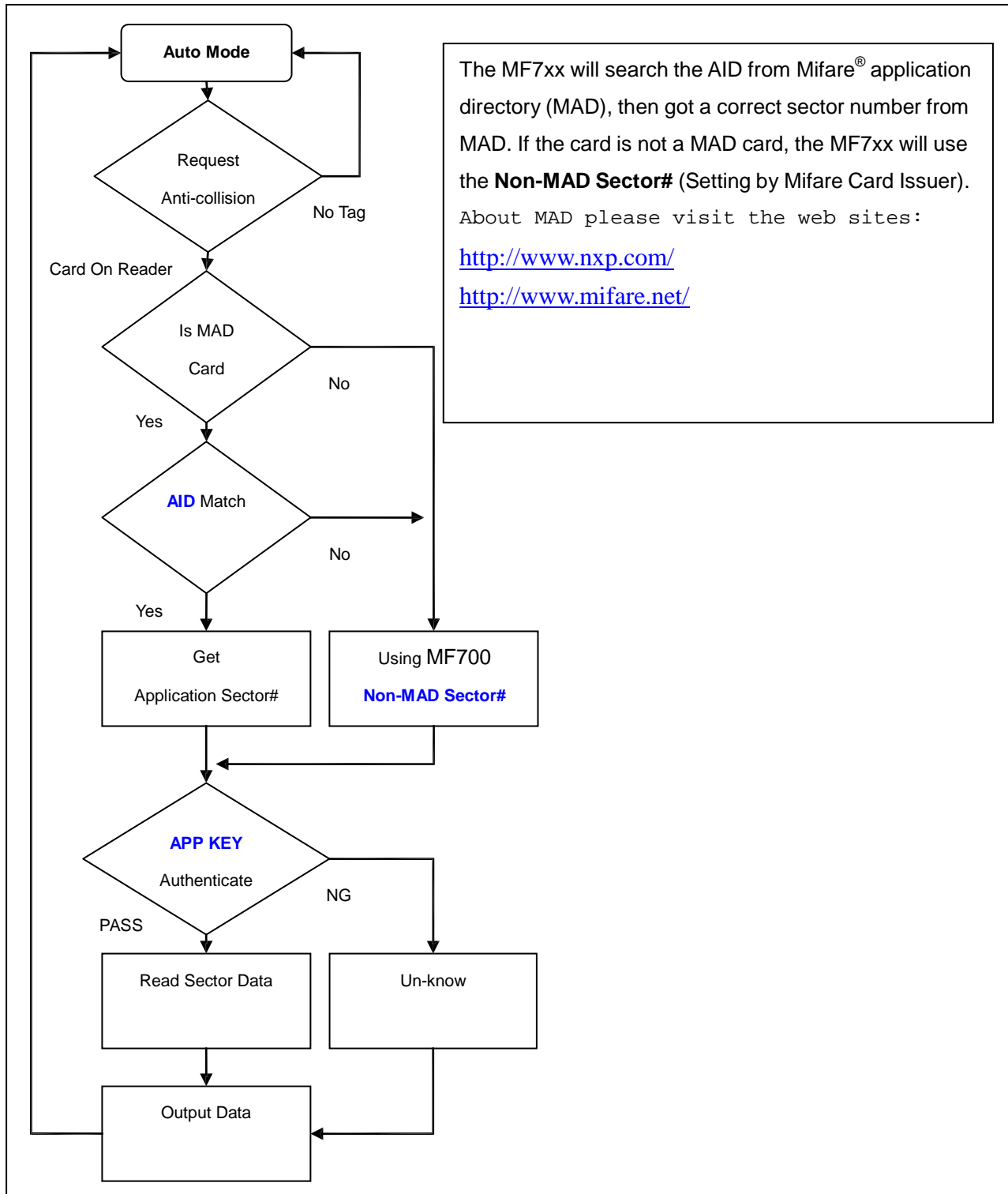
1. Support MAD1/MAD2 standard, and support customer MAD-AID setting.
2. Support Non-MAD format with user-defined sector number.
3. Support Anti-Collision (Two cards together can be read at the same time).
4. Support used card with data offset and length.
5. Support Multi Sectors.
6. Support Mifare® Classic 1K/4K card, Mifare® Pro, Mifare® Ultra-light.
7. Each Reader with Reader ID for multi-link application.
8. Output interface: Wiegand (Default), ABA-TK2 and RS232.
9. Wiegand output selectable from 26 bits to 128 bits.
10. RS232 output packet can be set with Header, Reader ID and Trailer.

### Application:

1. Access Control.
2. Time Attendance.
3. Guest Registration System.
4. Academic Services.
5. Info Services.

## Mifare® Application Directory (MAD) Support:

MF7xx support the MAD format card, the MAD (Mifare® application directory) standard proposes the introduction of common data structures for card application directory entries. MF7xx reader should take advantage of this feature using those sector pointers instead of physical sector number.



**Mifare® User-Data Format**

MF7xx will send out the data following the format as below, the user data length defined by the Data-Info. At Wiegand output format, the data output length is fixed (defined by Number Of Bits), so the user data would be cut if longer than Number of Bits, or the user data would be appended with zero "0" if shorter than Number of Bits.

		Byte 0	Byte 15
Application Sector #	Block 0	<b>Data-Info</b>	<b>USER DATA (Max 64 Bytes)</b>
	Block 1		
	Block 2		
	Block 3		



Data-Info			
bit7	bit6	bit5	bit0
Data Type (11b)		Data Length	

Data Type is fixed with 11b which meets "any other data" type of "Card Holder information" as MAD standard. And data length is including the data with ending zero "0", so the number of data byte sent by MF7xx is equal to data length with one less for RS232 output.

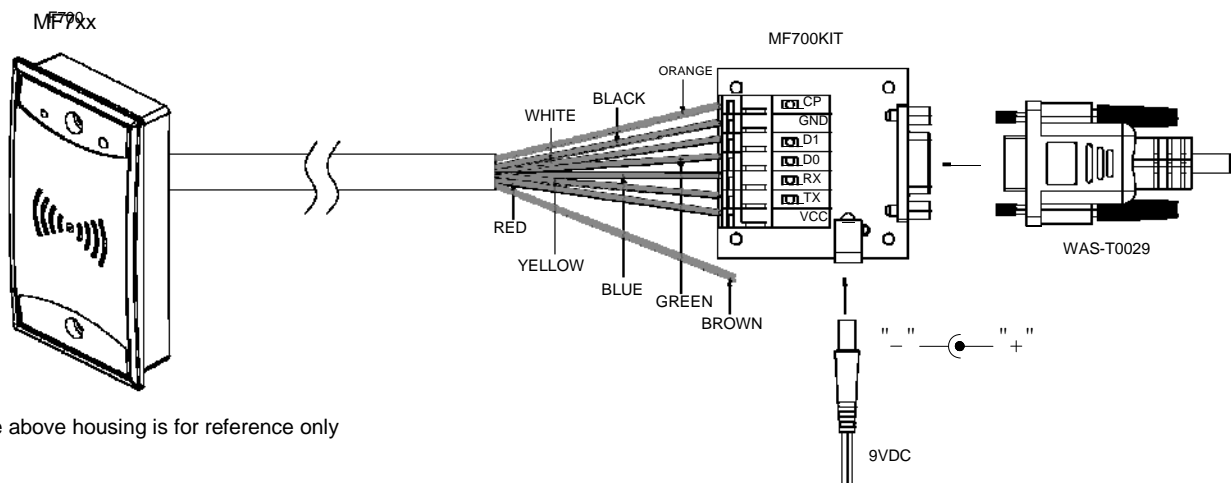
Example: Data Length is 16, MF7xx only sends out 15 bytes for RS232 output.

## Wires Assignment

Color	Symbol	I/O	Description
Red	VCC	IN	Power Input : DC 7.5V~24V
Black	GND	IN	Power Ground
White	DATA 1	OUT	Wiegand Data 1 Signal / ABA TK2 Clock (Strobe)
Green	DATA 0	OUT	Wiegand Data 0 Signal / ABA TK2 Data
Yellow	TXD	OUT	RS232 TXD (To Host RXD)/ RS485+(for DF710)
Blue	RXD	IN	RS232 RXD (To Host TXD)/ RS485-(for DF710)
Orange	CP	OUT	ABA TK2 Card Present
Brown	LED/BUZEER	IN	External LED/BUZZER Control

Before connect to MF700KIT, please configure MF7xx reader.

To configure the MF7xx Reader you need connect the reader to the MF700KIT first as below:



The above housing is for reference only

### Remark:

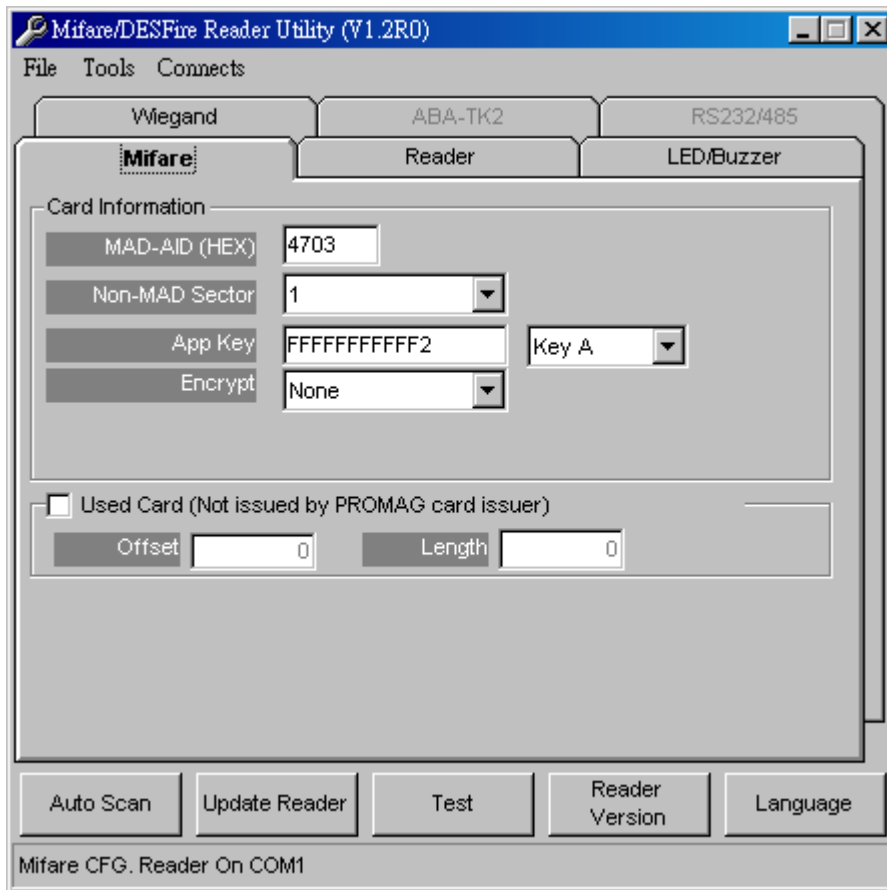
Brown wire is for External LED/Buzzer Control, and Blue wire is keeping in RS232 RX signal for communication only.

### Note:

MF700KIT is a test connection kit for MF7xx configuration use. It is an optional item for purchasing.

## Mifare® Reader Utility

### 1. Mifare® Settings



#### **MAD-AID: (Default=4703)**

MAD Application Identifier number is authorized and assigned by Mifare®.net upon the customer's request for registered Application Identifier in a Mifare® application open system (AID: 0000h~FFFFh). Or it is also possible for the user to define the AID himself for the application in user defined closed system without registering into MAD group. According to the AID, MF7xx can find and read the corresponding sector on the MAD card.

#### **Non-MAD Sector: (Default =0)**

When the card is Non-MAD format, MF7xx will only read the "Non-MAD Sector".

(1K Card Sector: 0~15, 4K Card Sector: 0~39). For the Non-MAD application, user can freely define the Sector.

**App Key (KEY\_A): (Default=FFFFFFFFFFFF)**

App Key must be the same as the KEY\_A of the card issued. This means MF7xx only can read the sector data on the card with the same KEY\_A.

**Encrypt: (Default=None)**

Fraud prevention, Select Encrypt Mode (None, Encrypt 1, Encrypt 2, Encrypt 3, Encrypt 4, Encrypt 5) to protect your card data. (Remark: Encrypt mode must work together with the same encrypt mode of "Mifare Card Issuer" software.)

**Used Card (Not issued by "Mifare Card Issuer")**

You have to indicate the data position in the card, when the card is not issued by "Mifare Card Issuer" software. And you must set the "Offset" (Max 255, and base from zero) from the beginning of sector and set your data "Length" (Max 64).

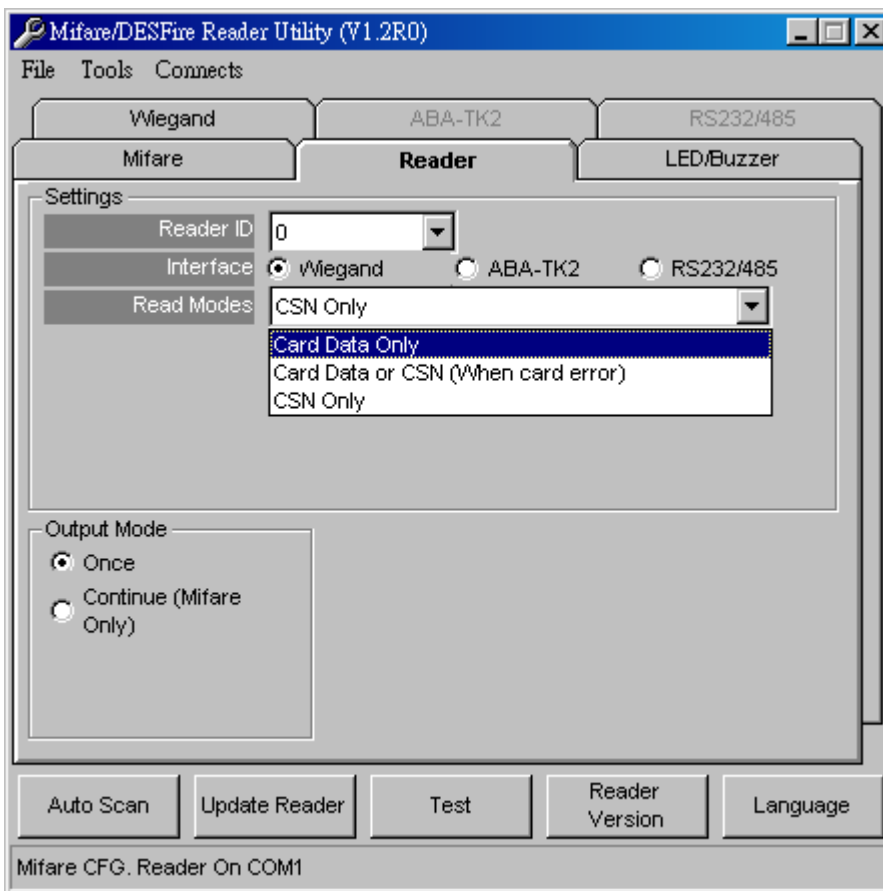
Example:

If your card data in the grey grid of sector, you have to set the "Offset" = 17, and set the "Length" = 20.

	AID Sector (or Non-MAD Sector)															
Block 0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Block 1	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Block 2	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47



## 2. Reader Settings



### Reader ID: (Default=0)

MF7xx Reader ID for multi link application. (ID: 0~63)

### Interface: (Default=Wiegand)

MF7xx can be set as Wiegand , RS232 or ABA-TK2 output.

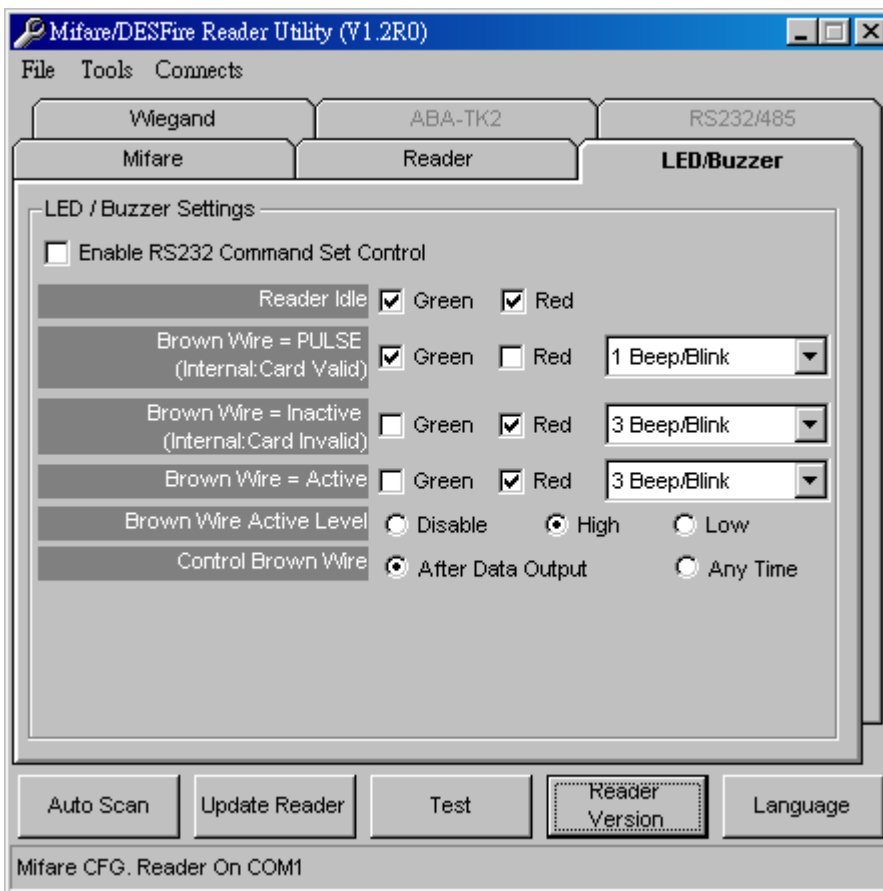
### Read Mode: (Default=Card Data Only)

- a. Card Data Only: Read card sector data only; If any error (ex. Mifare<sup>®</sup> key error), reader will show "Card Invalid" status.
- b. Card Data or CSN (Card Serial Number): Read card sector data, If any error (ex. Mifare<sup>®</sup> key error), reader will send the CSN to host.
- c. CSN Only: CSN read only.

### Output Mode: (Default=Once)

- a. Once: Send data (or CSN) to host once.
- b. Continue: Keeping sending data (or CSN) to host till card remove. Only for Mifare<sup>®</sup> Card.

### 3. LED / Buzzer Settings



MF7xx supports LED/Alarm configure. Set the LED/Buzzer to indicate the system status for end-user.

**Enable RS232 Command Set Control: (For 19200,n,8,1 Only)**

RS232 LED/Buzzer command set frame as below:

STX	J	NUMBER (0~9)	CR
02h	4Ah	30h~39h	0Dh

Command Table:

NUMBER	Descriptions
0 (30h)	All LED Off, Buzzer Off
1 (31h)	Green LED ON
2 (32h)	Green LED OFF
3 (33h)	Red LED ON
4 (34h)	Red LED OFF
5 (35h)	Buzzer Beep once
6 (36h)	Buzzer Beep 3 Times
7 (37h)	Green LED ON with Beep once
8 (38h)	Red LED ON with Beep 3 Times
9 (39h)	All LED ON (Orange)

**Remark: If “Enable RS232 Command Set Control (for LED/Buzzer)” checkbox is checked, the external LED/Buzzer control with high/low level control will be disabled.**

**Read Idle:** Show LED color after power on or idle state.

**Brown wire = PULSE (or Card is valid):** Show LED color and beeps to indicate the end-user when brown wire = PULSE, or card was passed by MF7XX Reader.

**Brown wire = Inactive (or Card is invalid):** Show LED color and beeps to indicate the end-user when brown wire = Inactive, or card was failed by MF7XX Reader.

**Brown wire = Active:** Show LED color and beeps to indicate the end-user that brown wire = Active signal from Host.

**Brown wire Active level:** Set Brown wire Active level condition with Host status.

Disable: Always disable the Brown wire. (Default), LED/Buzzer controls by reader self.

High: Active High / Normal keep in Low.

Low: Active Low / Normal keep in High.

**Remark:**

**If set Active Low, you may have to connect brown wire to a pull-up resistor (1K~10K) with 5VDC).**

**Control Brown wire:**

After Data Output: The brown wire will be enabling after finished output the card data or CSN. (Default)

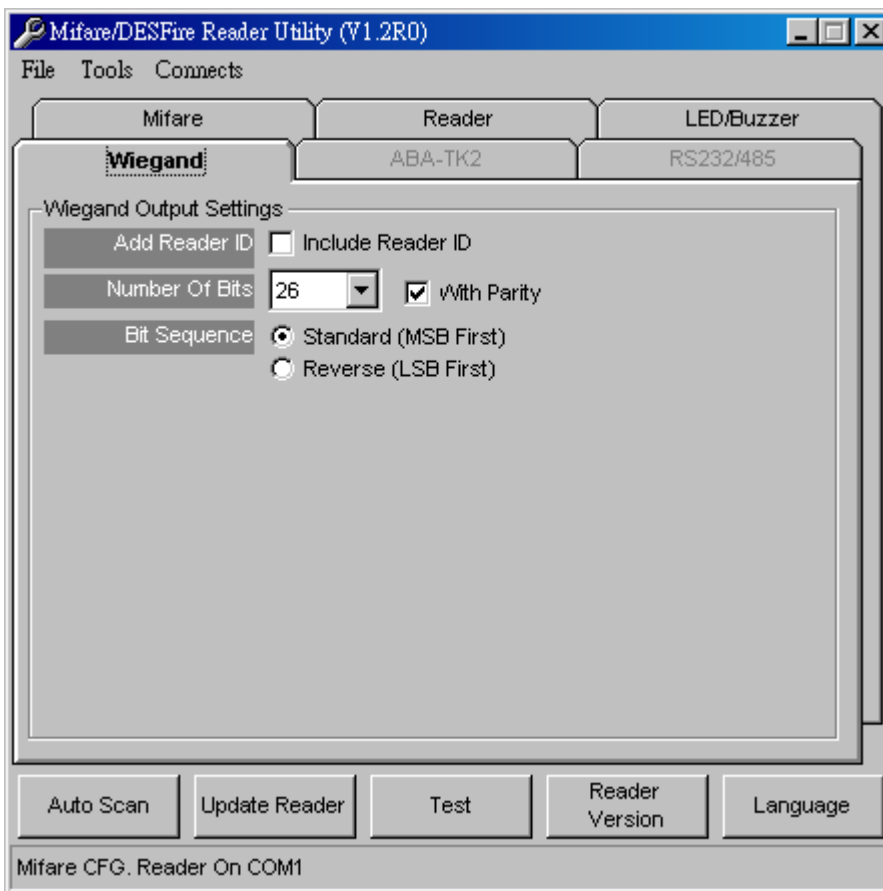
Any Time: The brown wire enabled in any time.

**Note:** See Annex E, the LED/Buzzer also can be controlled externally with High/Low level control.

**Brightness:**

Change value to brighten or darken led. More high and more brighten..

## 4. Wiegand Settings



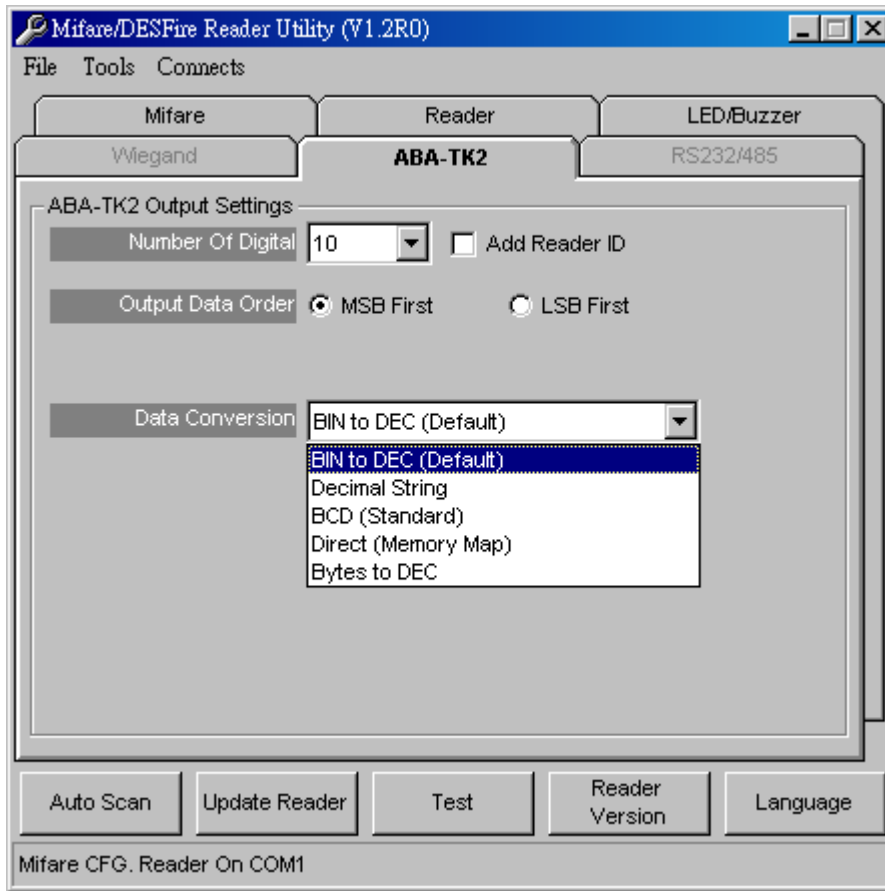
**Include Reader ID** is to set the Wiegand output data to include Reader ID when it is enabled. (Default=Disable).

**Number of Bits** is to set the Wiegand output type you want to meet your Host (or Terminal). It can be 26 to 128 (Default=26).

**Bit Sequence** is to set the Wiegand output data sequence, it can be standard data sequence (MSB first) or Reverse data sequence (LSB first). (Default=Standard).

**With Parity** is to set the Wiegand output data with Parity bits or not. (Default=Enable)

## 5. ABA-TK2 Settings



**Number Of Digital:** Set number of digital codes for TK2 output. (Default=10)

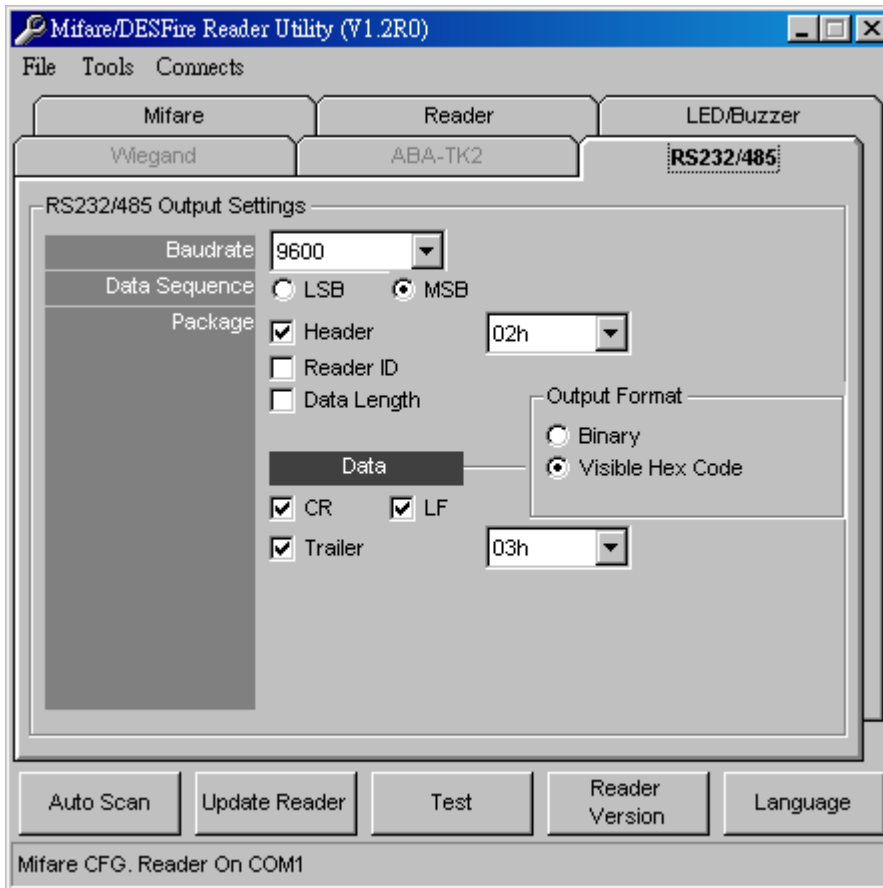
**Add Reader ID:** Add Reader ID into TK2 data. (Default=Disable)

**Output Data Order:** Set the TK2 output data sequence order. (Default=MSB First)

**Data Conversion:** Select card data format to convert,

- BIN to DEC (Default, card issue by Mifare Card Issuer software)
- Decimal String (ex. "123456")
- BCD
- Direct (Memory Map)
- Bytes to DEC

## 6. RS232 Output Settings



**Baud rate** can be set 2400~57600 (Default=9600)

**Data Sequence** can be set “LSB” first and “MSB” first (Default).

**Package** is to set the output data packet to include Header, Reader ID, Data Length, CR, LF and Trailer. (Header: 00h~FFh, Trailer: 00h~FFh). (Default = 02h+Visible Hex Code+CR+LF+03h)

**Output Format** can be “Binary” or “Hex String” for output format.

Note:

(1).Wiegand output data packet with Reader ID:

Standard	Parity( <b>Even</b> )	Reader ID	(MSB)	Data Bits	(LSB)	Parity( <b>Odd</b> )
Reverse	Parity( <b>Odd</b> )	Reader ID	(LSB)	Data Bits	(MSB)	Parity( <b>Even</b> )

(2).RS232 output data packet with Header, Reader ID and Trailer:

Header	Reader ID	(LSB)	Data Bytes	(MSB)	Trailer
--------	-----------	-------	------------	-------	---------

(3).ABA-TK2 with Reader ID:

MSB First	SS	Reader ID	(MSB)	Digital Code	(LSB)	ES	LRC
LSB First	SS	Reader ID	(LSB)	Digital Code	(MSB)	ES	LRC

**Remark:**

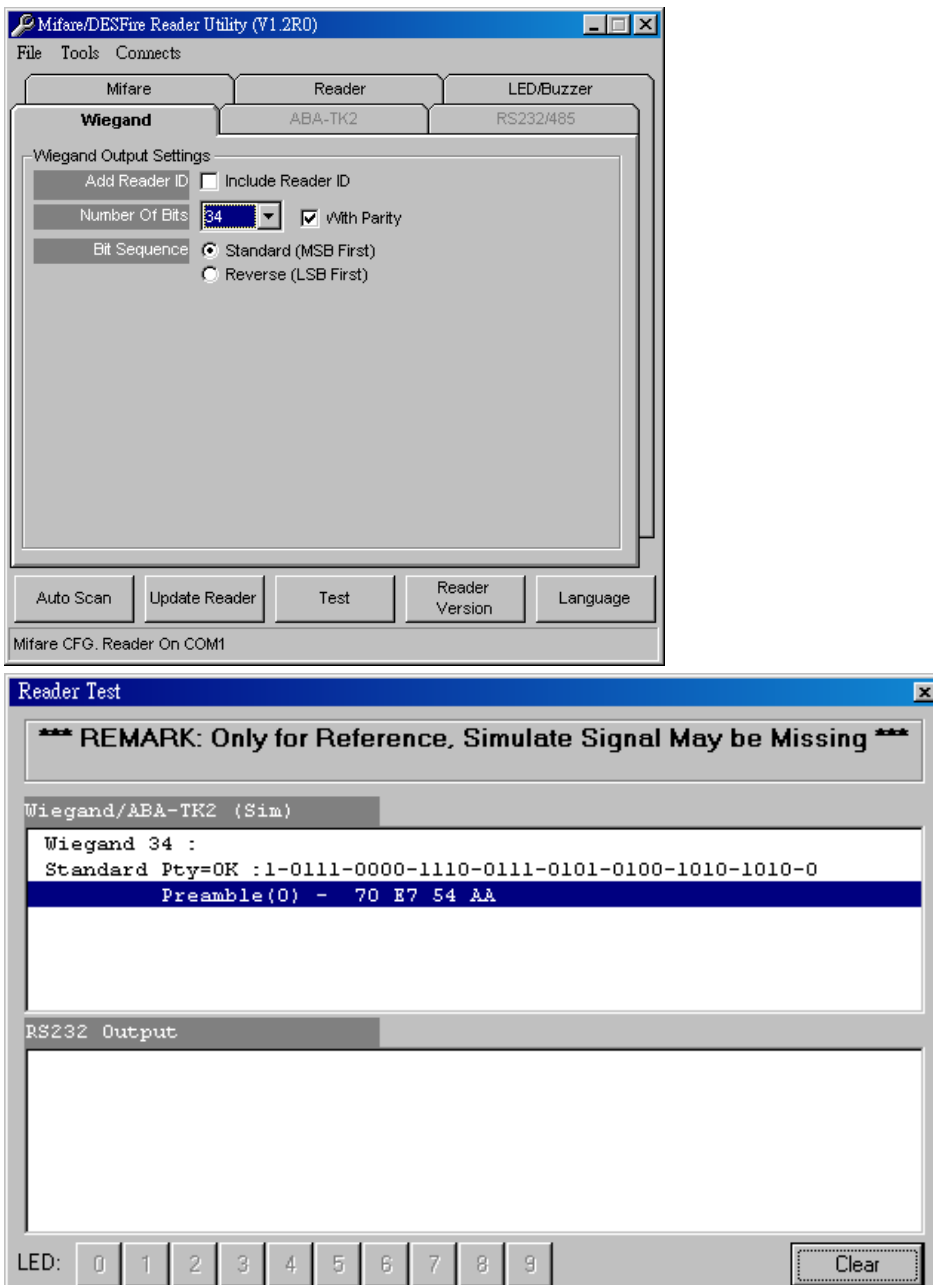
*MF7XX all configuration items are write only, so any users can not read the configuration items from MF7XX to get the **App Key**, that is very important to protect your **App Key** and all configuration items.*

## 7. Test Reader After Update

After reader's configurations have been updated success, you can use [Test] function to check reader's configurations have been correctly stored.

1. After set configurations in the Reader Utility software, you can click [Update Reader] to update the currently configurations to the reader.
2. Or, click [Test] to update configurations and verify output data.
3. Got an issued Mifare<sup>®</sup> card and approach the reader, you can see the output data on "Reader Test" window.

Wiegand 34 bits output data with standard bit sequence, example as below:





## ANNEX A. Hardware Specification

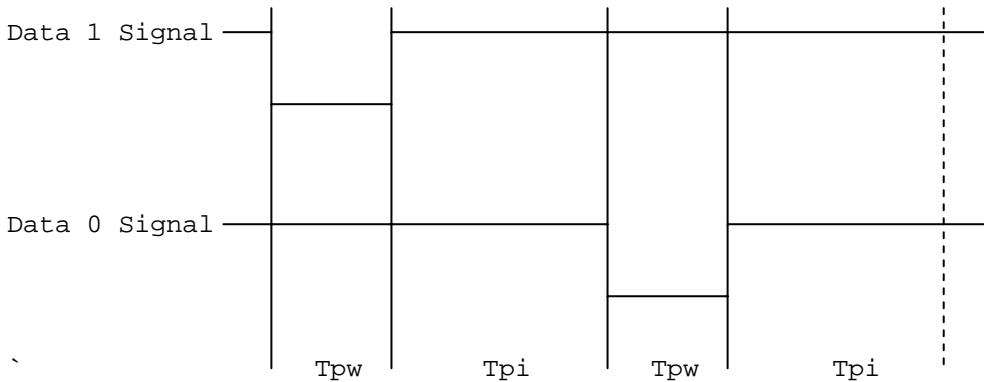
	MF7XX READER
Major Feature	Mifare® Application Directory Reader Access Control & Security
Card Type	ISO14443A, Mifare® Classic 1K/4K for MAD1/MAD2, Mifare® Pro, Mifare® Ultra-light
RF Frequency	13.56MHz
RF Distance <sup>2</sup>	50mm (Using the MFA01 Mifare® Classic card of GIGA-TMS INC.)
DC Power	7.5VDC~24VDC (Min 250mA@7.5V, 150mA@12V)
Interface	Wiegand 26~128 bits (Standard / Reverse) RS232 2400~57600 (baud rate) ABA-TK2 40IPS
Dimension	H82.5mm x W46.5mm x D15.0mm
Weight	120g

Note:

1. MF7XX READER RF distance can reach up to 50mm with MFA01 (Mifare® Classic 1K Card) of GIGA-TMS INC.

## ANNEX B. Wiegand Interface

The Data 1 and Data 0 signals are held at a logic high level unit, the reader is ready to send a data stream. The reader places data as asynchronous low-going pulses on the Data 1 or Data 0 lines to transmit the data stream to Host. The Data 1 and Data 0 pulses will allowable pulse width times and pulse interval times for the MF7XX Reader.



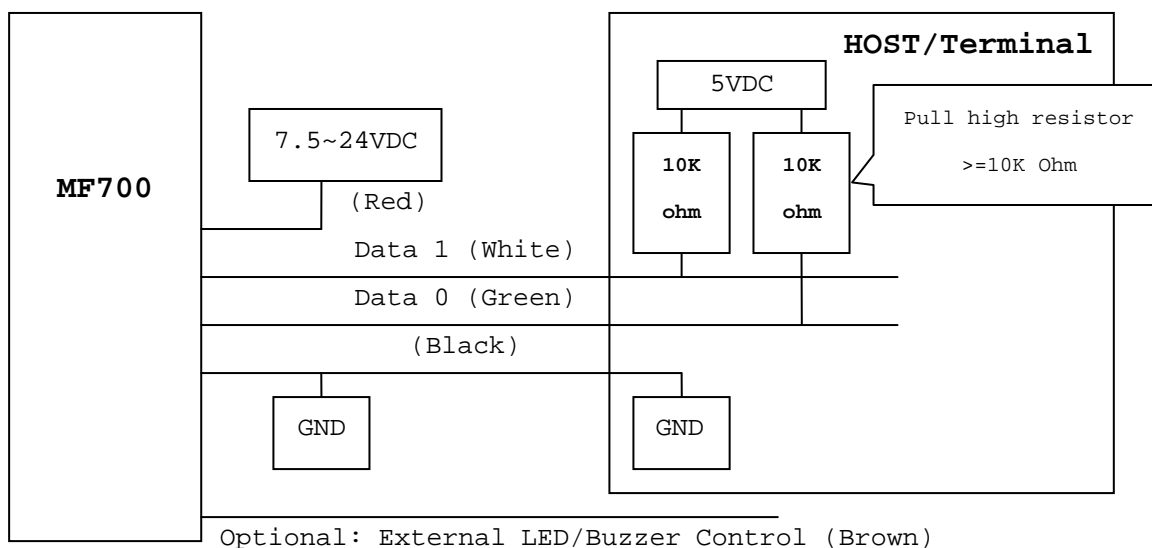
### Pulse Times

Symbol	Description	Typical Time
$T_{pw}$	Pulse Width Time	100us +/- 3%
$T_{pi}$	Pulse Interval Time	1.9ms +/- 3%

### Wiegand Packet (Without Reader ID)

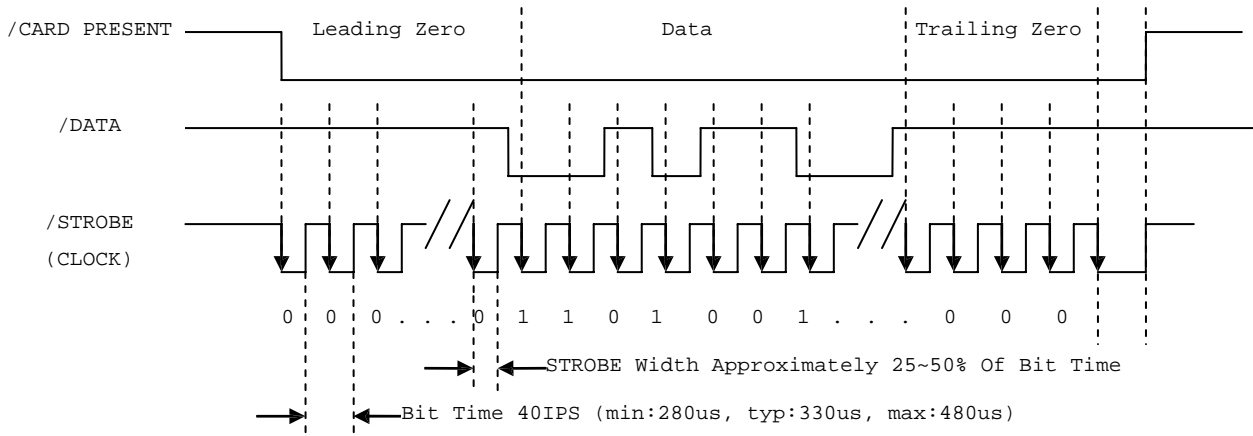
Standard (Default)	Parity(Even)	(MSB)	Data Bits	(LSB)	Parity(Odd)
Reverse (Option)	Parity(Odd)	(LSB)	Data Bits	(MSB)	Parity(Even)

Connect the Wiegand wires, example as below: (The pull high resistor must  $\geq 10K$  Ohm)



## ANNEX C. ABA TK2 Interface

The timing for Card Present, Clock (Strobe) and Data, example as below:



### DATA

The data signal is valid while the clock is low. If the Data signal is high, the bit is a zero. If the Data signal is low, the bit is a one.

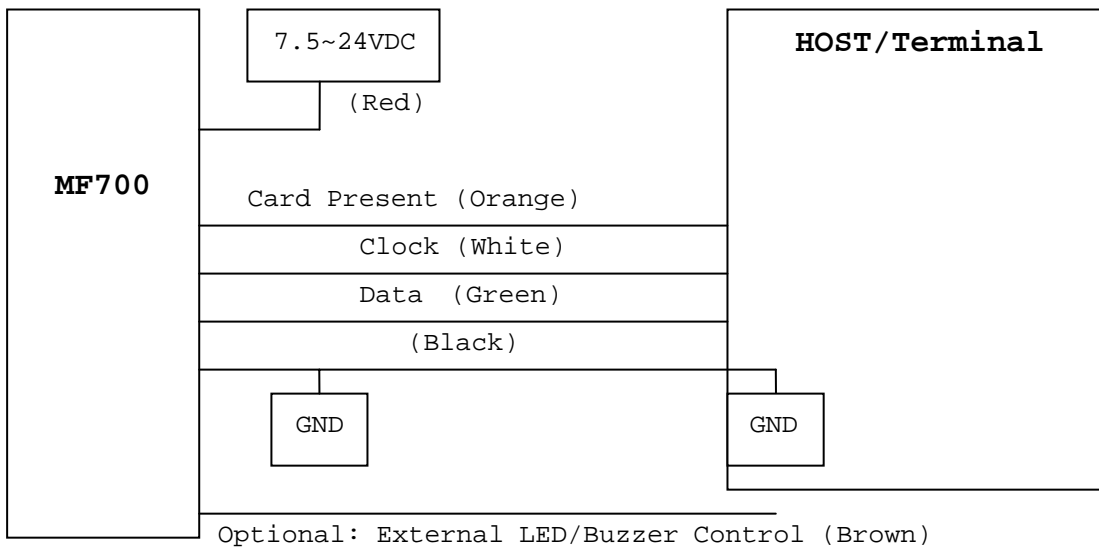
### CLOCK (STROBE)

The Clock signal indicates when Data is valid. It is recommended that Data be loaded by the user with the leading edge (negative) of the Strobe.

### CARD PRESENT

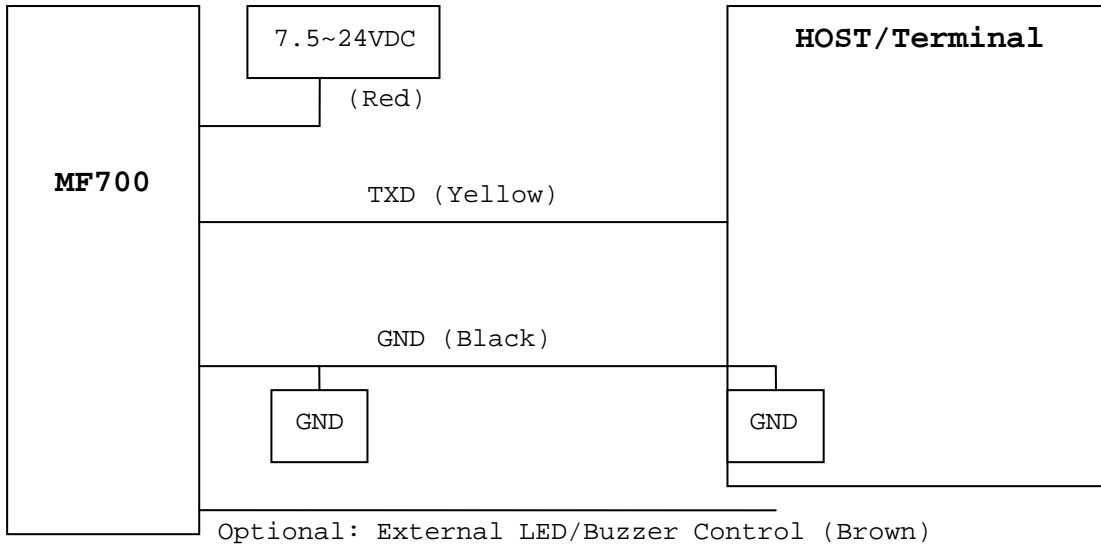
Card Present will go low after flux reversals from the Reader. Card Present will return high after the last flux reversal.

Connect the ABA TK2 wires, example as below:



## ANNEX D. RS232 Interface

Connect the RS232 wires, example as below:

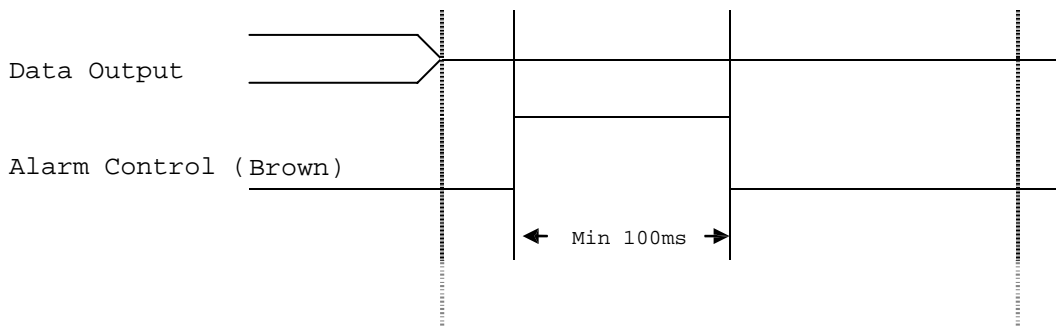


## ANNEX E. External LED/Buzzer Control

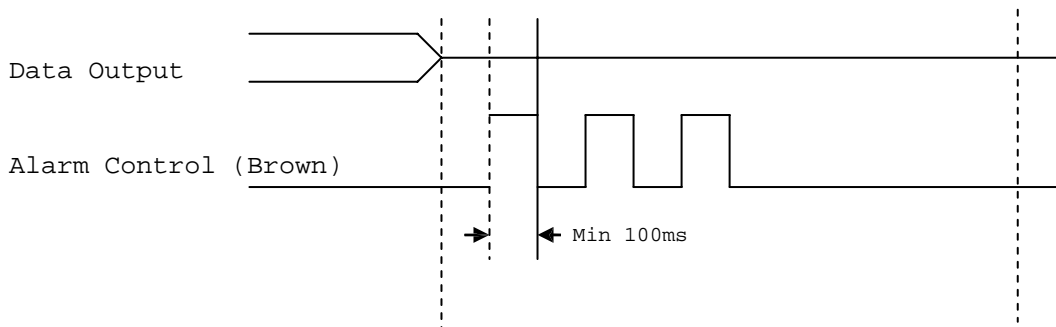
MF7XX READER supports the external LED/Buzzer control for Terminal (or Host) to prompt end-user the card data is invalid or valid. Use Brown wire to control the LED/Buzzer of MF7XX READER

### Examples as below: (Active High)

(1) Show External Invalid Status



(2) Show Card Valid Status



Note:

1. Send one pulse to show the "Extern Invalid" LED/Buzzer Status.
2. Send three or more pulse to show the "Card Valid" LED/Buzzer status.
3. You can configure the LED/Buzzer status by READER utility software.

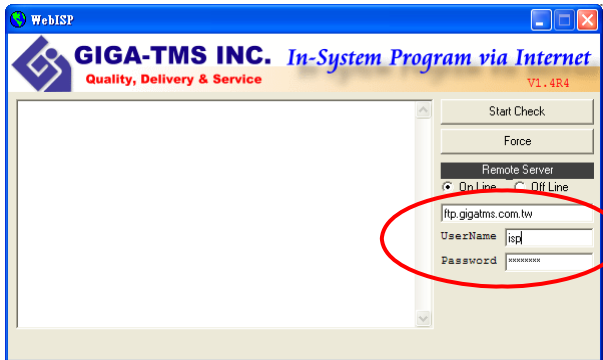
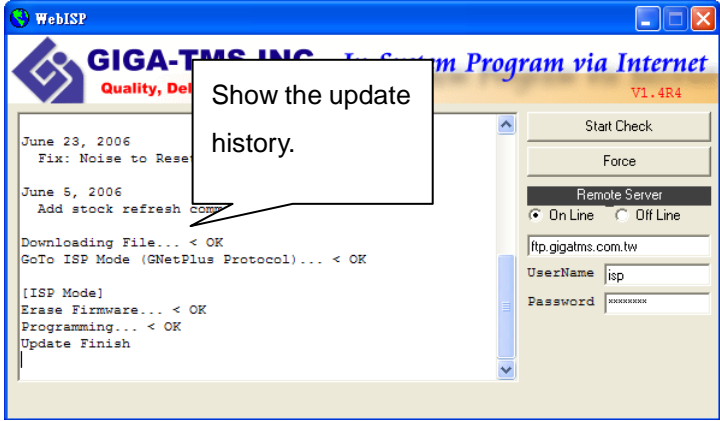
## ANNEX F. Order Information

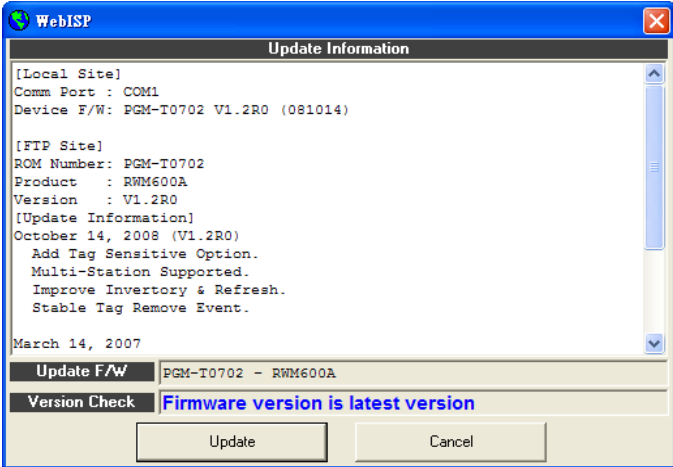
Part Number	Include	Description
MF700SK-10	MF700-10 MF700KIT WAS-T0029 PCR310U DISK5238 Power Adaptor MFA01 (3PCS)	MF7XX Configurable Reader MF7XX Configure Kit MF7XX Configure Cable Card Issue Programmer Card Issue and Utility Software DC Power Adaptor 9VDC for MF7XXKIT Mifare® Classic 1K Card
MF700-10	MF700-10	MF700 Configurable Reader (Encrypt Version)
MF700KIT-10	MF700KIT WAS-T0029 DISK5238 Power Adaptor	Reader Kit MF7XX Configure Cable Card Issue and Utility Software DC Power Adaptor 9VDC for MF7XXKIT
MFA01	MFA01	Mifare® Classic 1K Card
MFA04	MFA04	Mifare® Classic 4K Card

## ANNEX G. WebISP - Firmware Upgrade Utility

MF7XX READER also supports the ISP (In-System Program) function to upgrade the reader's firmware.

Install the WebISP (include in CD-ROM) in your Windows System first (It may need to reboot your system) and follow the steps as below: (First of all, you need to connect the reader or programmer to PC, and make sure they were power-on)

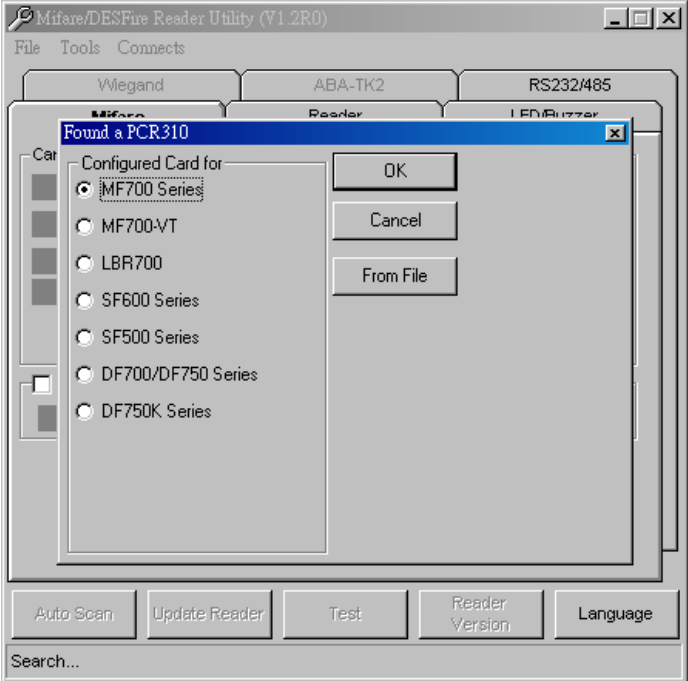
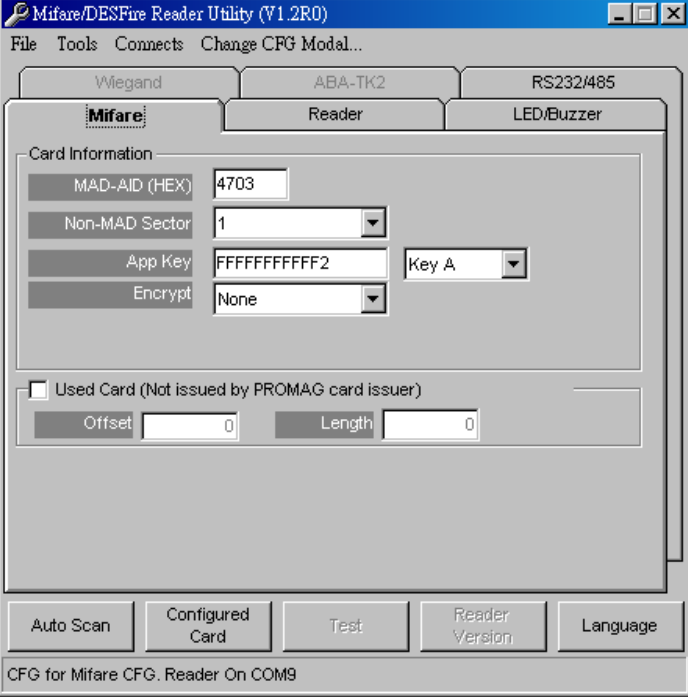
<p><b>Step 1:</b> Input your account (UserName and Password)</p> <p>Note: Contact us to get your account when needed.</p>	
<p><b>Step 2:</b> Click [Start Check] to automatically check the firmware version from our FTP server.</p> <p>Note:</p> <ol style="list-style-type: none"> <li>1. The WebISP will auto scan all COM ports to search the reader or programmer.</li> <li>2. The WebISP will show the [Update Information] and list the update history.</li> </ol>	

<p><b>Step 3:</b> If your reader's or programmer's firmware out of date, then WebISP will prompt you to update the firmware. Click [Update] to begin Updating the firmware.</p>	
<p><b>Step 4:</b> Wait for the updating to finish. And repeat step 2 to update other readers or programmers.</p>	<p>Update finished</p>



## ANNEX H. Configured Card

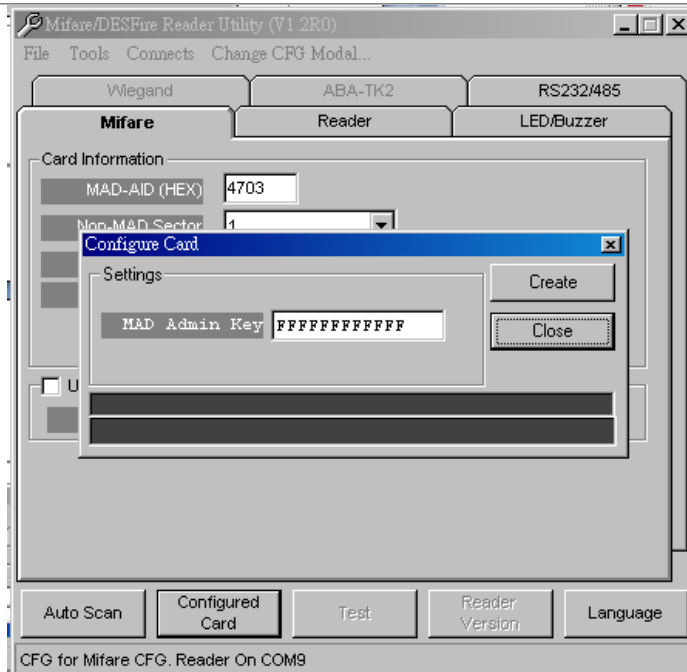
MF7XX reader supports updating the reader by reading Configured Card.

<p><b>Step 1:</b></p> <p>Only connect PCR310 to PC.</p> <p>Click "Auto Scan".</p> <p>It will pop a "Found a PCR310" window after scan success.</p> <p>Select "MF700 Series" option</p> <p>Click "OK"</p>	
<p><b>Step 2:</b></p> <p>Set all configurations as correctly.</p> <p>Click "Configure Card"</p>	

**Step 3:**

Type in the correct "MAD Admin Key".

Put an empty Mifare® Card on PCR310, and click "Create" to create the "Configured Card".



## ANNEX I. History

- Rev A: February 20, 2006  
Issue MF700 Configurable Sector Reader.
- Rev B: May 30, 2006  
Add "Direct (Memory Map)" Option item for Data Conversion of ABA-TK2.  
Firmware Version (PGM-T0724 V1.0R4).  
DISK 5238 REV.C (Mifare Reader Utility V1.0R1).
- Rev C: July 9, 2007  
Add "Configured Card" function for Update Reader via reading Configured Card (Firmware Version: PGM-T0724 V1.1R0).  
DISK 5238 REV.H (Mifare Reader Utility V1.0R10).
- Rev D: September 19, 2008  
Revise the DC power specification up to 24VDC.  
Revise the voltage range of example chart of ANNEX B,C,D.  
Revise the screen message of Mifare Reader Utility V1.1R8).
- Rev E. November 30, 2011 (Kylie)  
Update Mifare Reader Utility pics.  
Modify Reader ID limit to 63. (p.8)  
December 27, 2011 (Kylie)  
Modify Used Card max data length up to 64bytes. (p.8)  
August 10, 2012 (Kylie)  
Add mifare ultra-light card. (P.3, P.22)  
Modify data length. (p.5)

***NOTE!!!***

Hereby, GIGA-TMS INC., declares that the radio equipment type MF700 is in compliance with Directive 2014/53/EU.

GIGA-TMS INC., Address: 8F, NO.31, LANE 169, KANG-NING ST., HIS-CHIH, NEW TAIPEI CITY, 22180 TAIWAN R.O.C.

The operating frequency bands and the maximum RF power (target power) transmitted in each band of MF700 is following:

MF700: 13.56MHz band -10.09 dBuA.

# PROMAG<sup>®</sup>

**GIGA-TMS INC.**

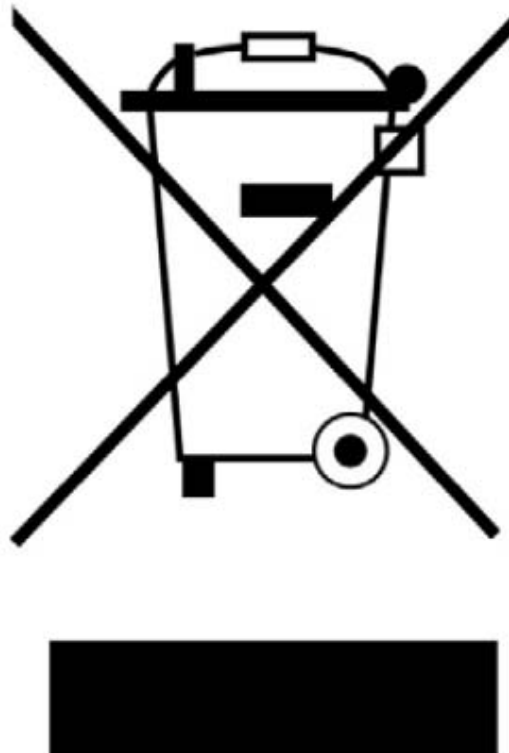
<http://www.gigatms.com.tw>

<mailto:promag@gigatms.com.tw>

**TEL : +886-2-26954214**

**FAX : +886-2-26954213**

Office: 8F, No. 31, Lane 169, Kang-Ning St., Hsi-Chih, Taipei, Taiwan



**Waste Electrical and Electronic Equipment  
(WEEE)**

This symbol means that according to local laws and regulations your product and/or its battery shall be disposed of separately from household waste. When this product reaches its end of life, take it to a collection point designated by local authorities.

Proper recycling of your product will protect human health and the environment.

TM951128B