SmaFinger.NET®

Contactless Smart Card & Fingerprint Reader

User's Manual

REV.B

March 20, 2012

Table of Contents

Introduction

SmaFinger® is a fingerprint reader developed on the so-call contactless smart card 13.56 Mhz RFID technology. The integration of biometric technology by fingerprint identification and 13.56Mhz RFID technology make Smafinger® be capable of biometric and contactless performance without spending large amount of expenses in running system upgrading with fingerprint system extension. On the aspect of personal privacy issue, SmaFinger supply the high secure of protection on privacy concern due to every fingerprint is stored on a card. Also the reader itself supports Mifare MAD1/MAD2 format make user end be able to issue their customized ID cards.

Features:

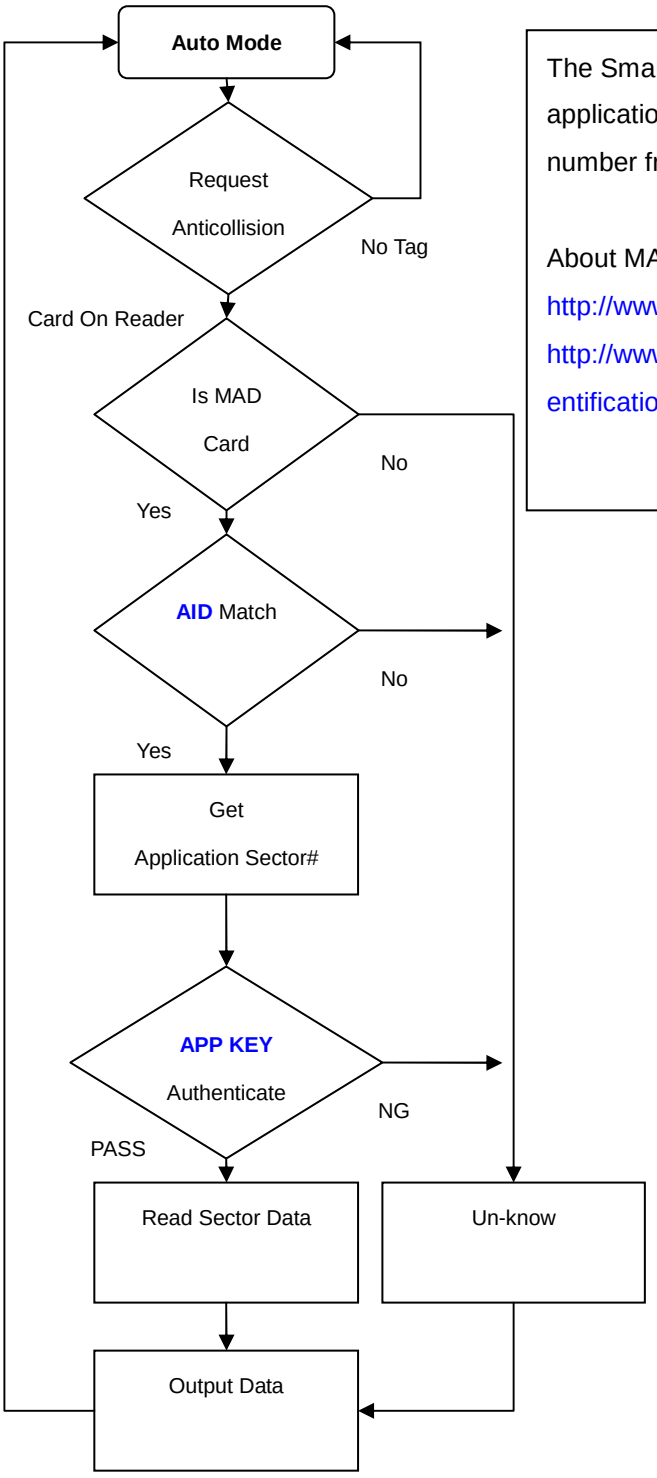
1. Biometric fingerprint reader and store fingerprint template in reader or in card.
2. Support standard TCP/IP interface and pure web-base administrator utility
3. Support MAD1/MAD2 standard, and support customer MAD-AID setting.
4. Support Anti-Collision (Two cards together can be read at the same time).
5. Support used card with data offset and length.
6. Support Multi Sectors.
7. Support Mifare® Standard 4K or Mifare® Standard 1K card.
8. Each Reader with Reader ID for multi-link application.
9. Output interface: Wiegand (Default), ABA-TK2 and RS232.
10. Wiegand output selectable from 26 bits to 128 bits.
11. 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.

1. Mifare® Application Directory (MAD) Support:

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



The SmaFinger® will search the AID from mifare® application directory (MAD) , then got a correct sector number from MAD.

About MAD please see the web pages:
http://www.mifare.net
http://www.semiconductors.philips.com/acrobat/other/identification/M001824.pdf

2. User-Data Format:

SmaFinger® 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 #n	Block 0	**Data-Info**	**USER DATA (Max 128 Bytes)**
	Block 1		
	Block 2		
	Block 3		

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

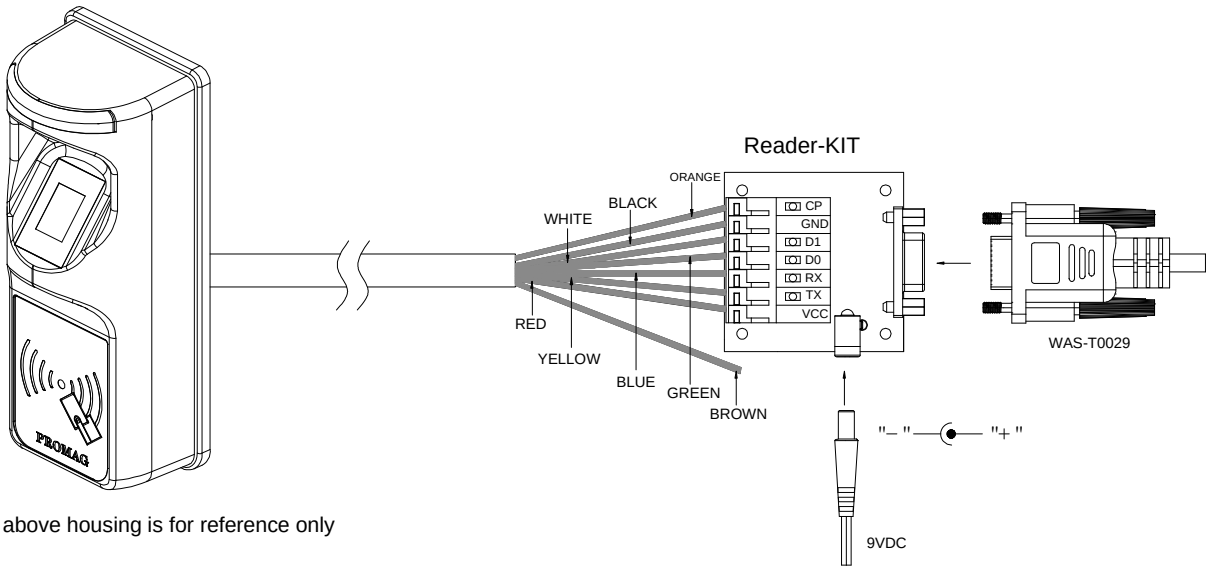
Data Type is fixed with 11b which meets "any other data" type of "Card Holder information" as MAD standard. And data length is including the data with ending zero "0", so the number of data byte sent by SmaFinger® is equal to data length with one less for RS232 output.

Example: Data Length is 16, the SmaFinger® reader only sends out 15 bytes for RS232 output.

3. Wires Assignment:

Color	Symbol	I/O	Description
Red	VCC	IN	Power Input : DC 7.5V~12V
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)
Blue	RXD	IN	RS232 RXD (To Host TXD)
Orange	CP	OUT	ABA TK2 Card Present
Brown	LED/BUZEER	IN	External LED/BUZZER Control

Connect an RJ45 cable (via TCP/IP) or a reader-kit (via RS-232) before you configure the SmaFinger® Reader.



The above housing is for reference only

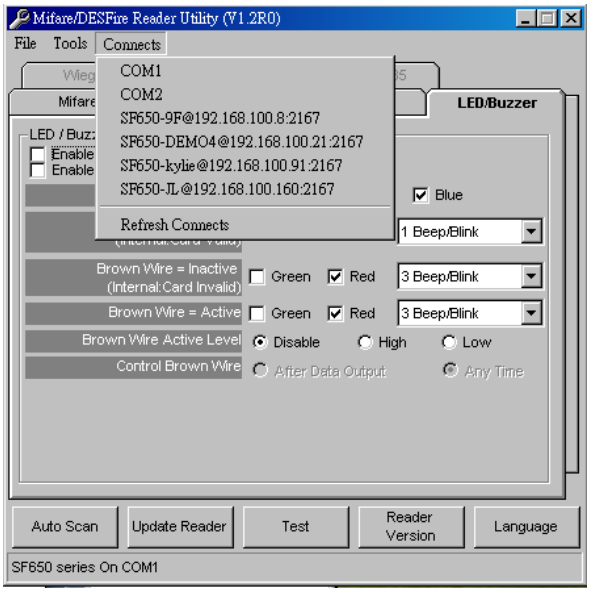
Note:

Reader-Kit is a test connection kit for SmaFinger® configuration use. It is an optional item for purchasing.

Software Operation

Mifare® Reader Utility:

1. Connection



Method 1:

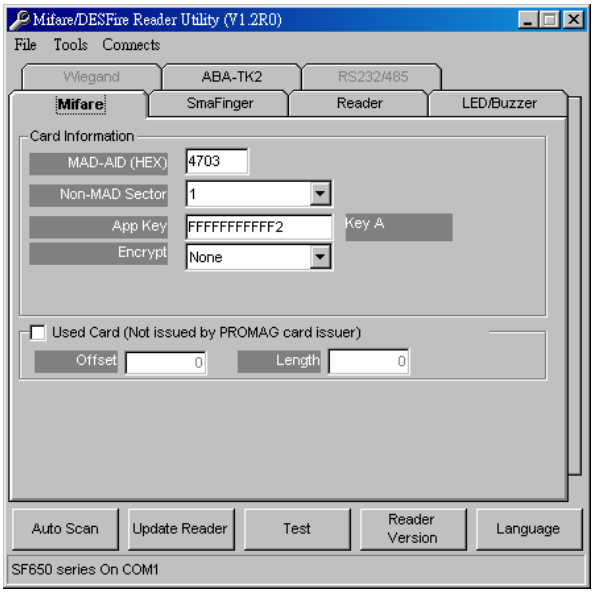
Click [Auto Scan] to search all port to find the device

Method 2:

Click [Connects] and choose the port to detect device

2. Instruction

- **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, SmaFinger® can find and read the corresponding sector on the MAD card.

App Key (KEY_A): (Default=FFFFFFFFFFFF)

App Key must be the same as the KEY_A of the card issued. This means SmaFinger® 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 protected your card data. (Remark: Encrypt mode must to work together with the same encrypt mode of "Mifare® Card Issuer" software.)

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

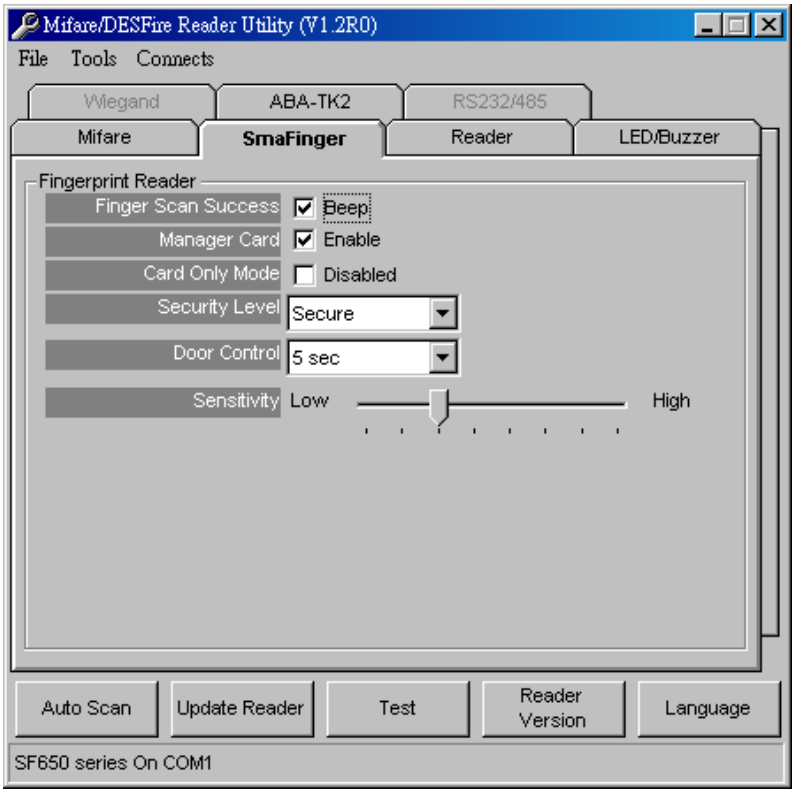
You have to indicate the data position in the card, when the card is not issued by "Mifare® Card Issuer" software. And you must set the "Offset" (Max 255, and base from zero) form the beginning of sector and set your data "Length" (Max **12**).

Example:

If your card data in the grey grid of sector, you have to set the "Offset" = 17, and set the "Length"= **12**.

	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

➢ **SmaFinger® Settings**



Finger Scan Success:

After finger scan success, the beeper will sound or not.

Manager Card:

Enable/Disable Offline function (Manager Card Function).

Card Only Mode:

Enable/Disable the "card-only" function. If disable this mode, the reader will be unable to read the "card-only" card.

SF650 Fingerprint Security Level for FAR (False Acceptance Ratio) :

Level	Verification (1:1)	Identification (1:N)			
		1~9	10~99	100~999	>=1000
Normal (Default)	1/10,000	1/10,000	1/100,000	1/1,000,000	1/10,000,000
Secure	1/100,000	1/100,000	1/1,000,000	1/10,000,000	1/100,000,000
More Secure	1/1,000,000	1/1,000,000	1/10,000,000	1/100,000,000	1/100,000,000

Door Control:

Set 5,10,15…75 seconds or disable for the delay open period time.

Command Set Control: (For 38400,n,8,1 Only)

RS232 door control command set frame as below:

STX	R	NUMBER	CR
02h	52h	30h~3Fh	0Dh

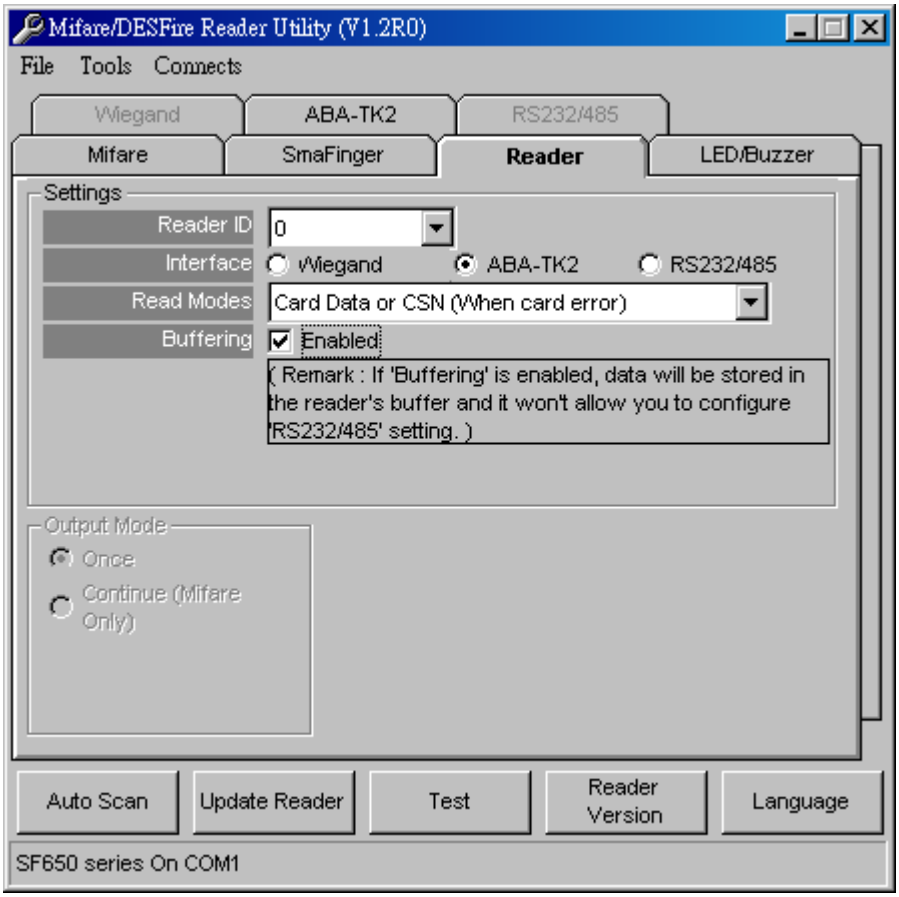
Command Table:

NUMBER	Descriptions
30h	Disable Door Control
31h~3Fh	Delay 5 seconds ~ 75 seconds

Sensitivity:

Set sensor sensitivity level, default=2

➢ **Reader Settings**



Reader ID (Default=0): SmaFinger® Reader ID for multi links application. (ID: 0~**63**).

Interface (Default=ABA-TK2):

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

Read Modes:

1. Card Data Only

   Read card sector data only; If any error (ex. Mifare® key error), the reader will show "Card Invalid" status.

2. Card Data or CSN

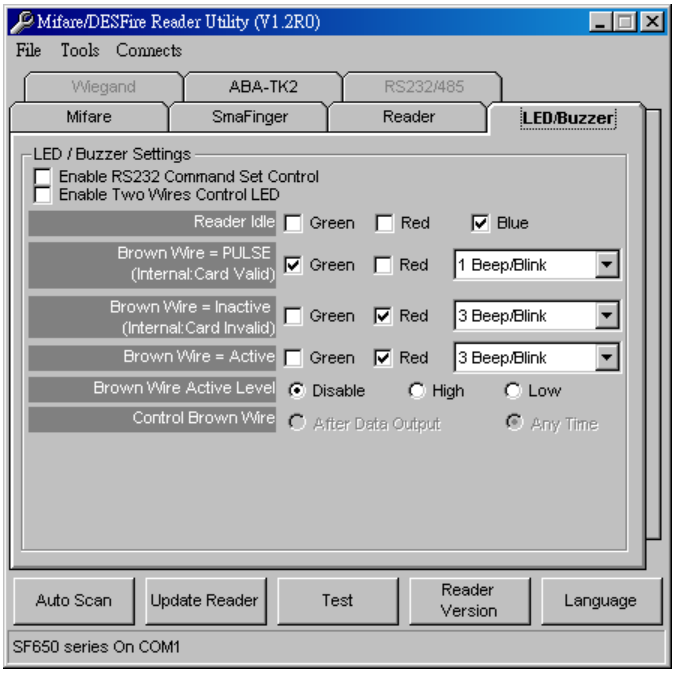
   Read card sector data; When any error (ex. Mifare® key error), the reader will show "CSN".

3. CSN Only

   Read card CSN (card ID) only.

Buffering: To Enabled/Disabled the access data buffering. There are 32 access data can be stored in the reader.

➢ **LED / Buzzer Settings**



SmaFinger® supports the LED/Alarm Configuration.

You can set the LED/Buzzer to indicate the system status for end-user.

Enable RS232 Command Set Control: (For 38400,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)	Red & Green 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)	Red & Green LED ON
A (41h)	Blue LED ON New!!
B (42h)	Blue LED OFF New!!

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 SmaFinger® 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 the SmaFinger® 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 (Default=Disable):

Set Brown wire Active level condition with Host status.

- Disable: Always disable the Brown wire. 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).

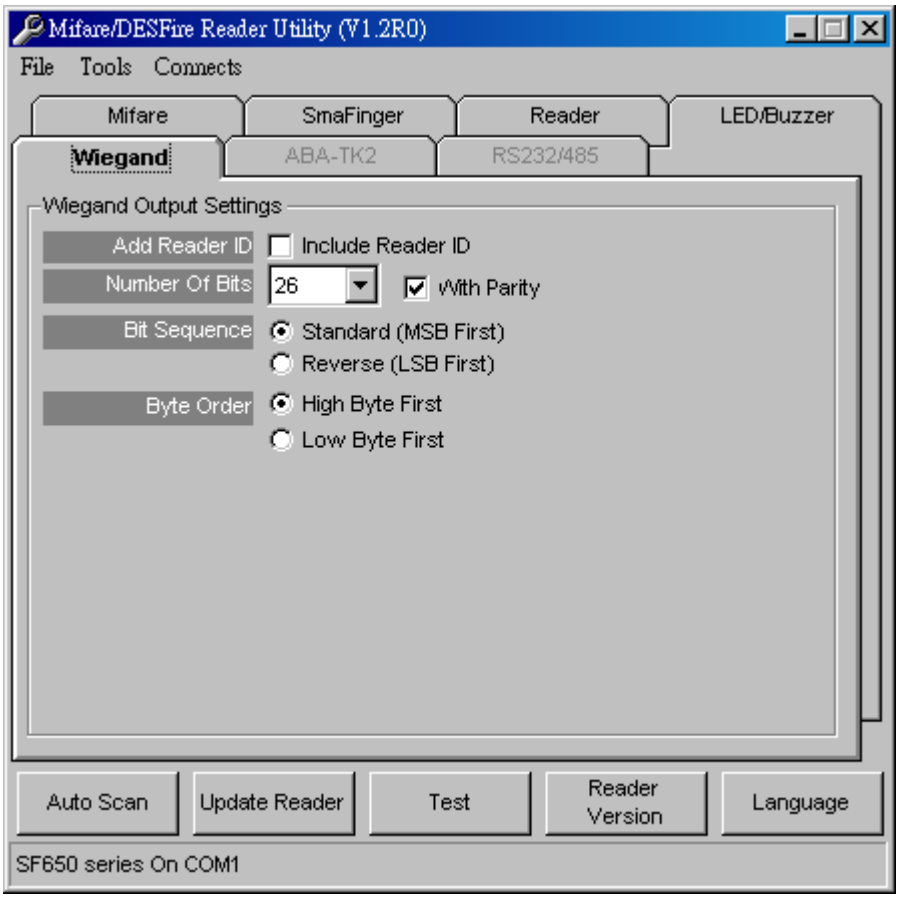
Control Brown wire:

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.

➢ **Wiegand Settings**



Add Reader ID (Default=Disable):

Set Wiegand output data includes the Reader ID when it is checked.

Number of Bits (Default=26):

Set the Wiegand output type you want to meet your Host (or Terminal). It can be 26 to 128.

With parity:

Set data with or without parity bit. If enabled this, softer ware will be automatically add parity bit when send out data.

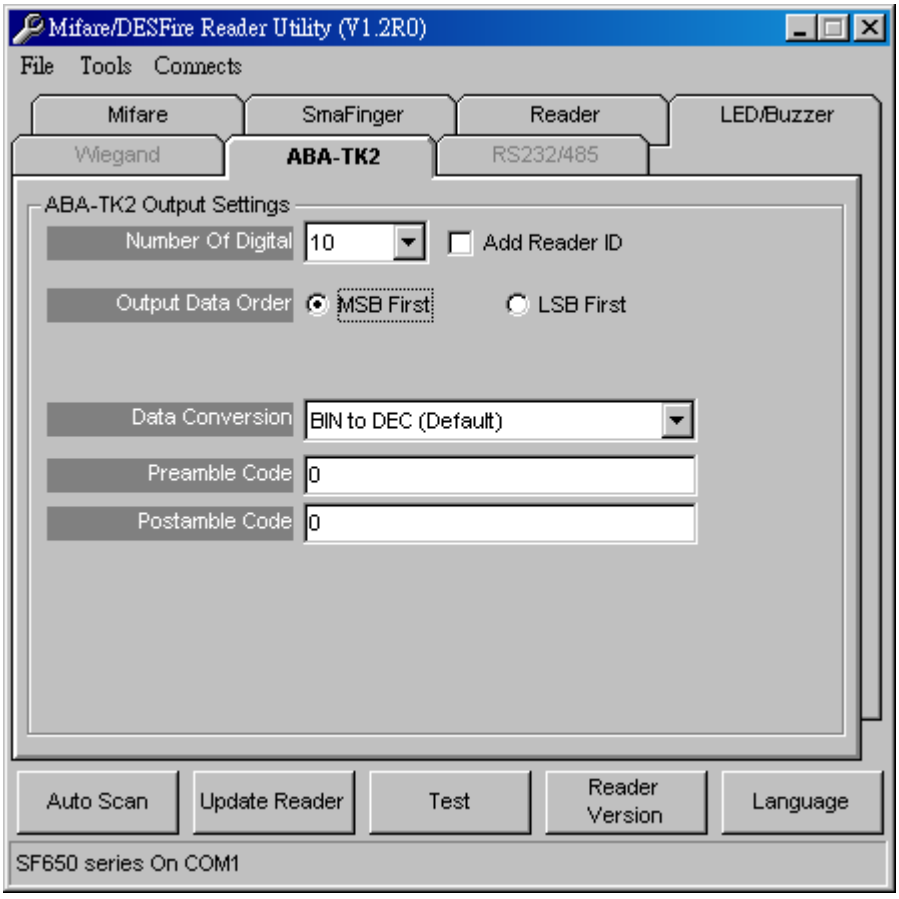
Bit Sequence (Default=Standard):

Set the Wiegand output data sequence, it can be a standard data sequence (MSB first) or a reverse data sequence (LSB first).

Byte Order (Default=High Byte First):

Set the Wiegand output data byte order; it can be high byte first or low byte first.

➢ **ABA-TK2**



Number of Digital (Default=10):

Set the number of digital codes for TK2 output.

Add Reader ID (Default=Disable):

Add Reader ID into TK2 data.

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

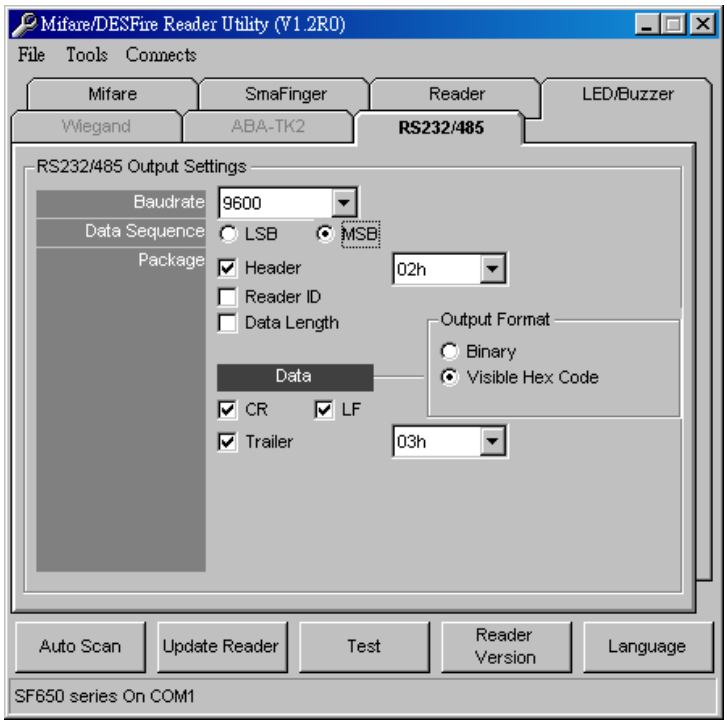
Data Conversion(Default= BIN to DEC): Select card data format to convert,

- BIN to DEC (card issue by Mifare® Card Issuer Utility)
- Decimal String (ex. "123456")
- BCD
- Direct (Memory Map)
- Byte to DEC

Preamble Code: Set a number to add front of the output data

Postamble Code: Set a number to add back of the output data

➢ **RS232/485 Settings**



Baud rate (Default=9600)

The working range can be set at 2400 to 57600 (depends on the device).

Data Sequence (Default= “MSB” first)

The output data sequence order can be set to "LSB" first or "MSB" first.

Package (Default = Header (02h) + CR + LF + Trailer (03h))

To set a packet which includes the “Header”, “Reader ID”, “Data Length”, “CR”, “LF” and “Trailer”. (Header: 00h~FFh, Trailer: 00h~FFh).

Output Format (Default="Hex String")

The output format can be "Binary" or "Hex String”.

Note:

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

Standard	Parity(**Even**)	Reader ID	(MSB)	Data Bits	(LSB)	Parity(**Odd**)
Reverse	Parity(**Odd**)	Reader ID	(LSB)	Data Bits	(MSB)	Parity(**Even**)

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

Header	Reader ID	(MSB)	Data Bytes	(LSB)	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:

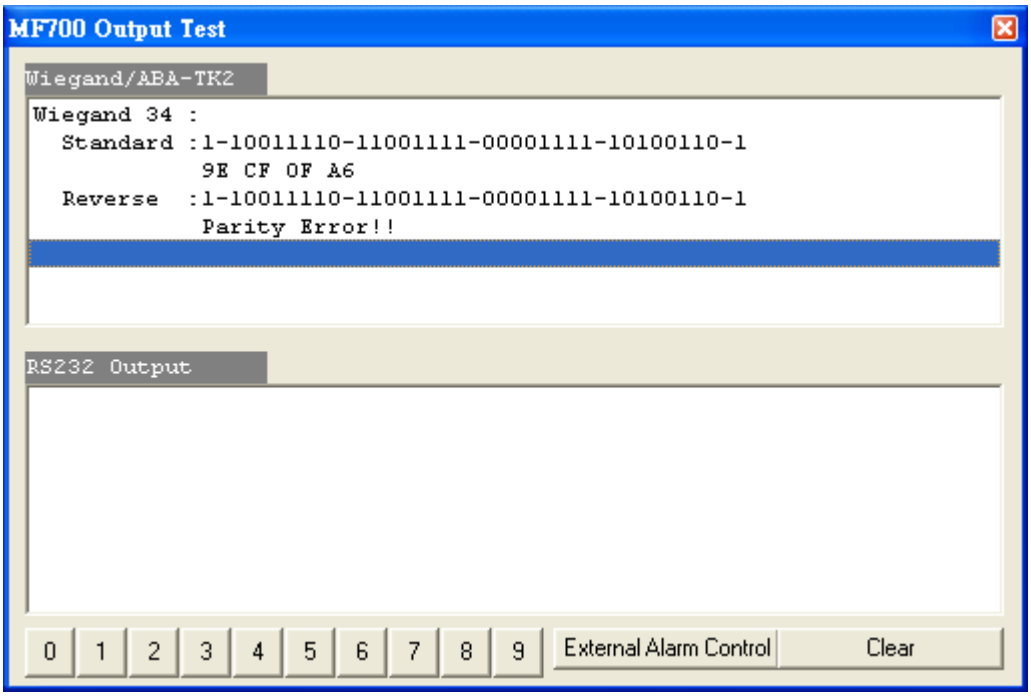
SmaFinger® all configuration settings are writable only, so user can not read the configuration settings from SmaFinger® to get the **App Key**, this is very important to protect your **App Key** and all configuration settings.

➢ **Test SmaFinger® Reader after Configuration**

After SmaFinger® configuration is updated; you may use Mifare® Reader Utility "Test" function to test the SmaFinger® to check if the configuration is done correctly. “Test” function is available when using communication port connection only.

1. After set configuration on the Mifare® Reader Utility software, you should click [Update Reader] to update the current configuration to the SmaFinger® Reader.
2. After SmaFinger® configuration is updated; you may click [Test] to test SmaFinger® Reader.
3. Get an issued Mifare® card to approach to the SmaFinger® reader and check the output data in the window of SmaFinger® "Output Test".

Example as below: Wiegand 34 bits output data with standard bit sequence (If "Bit Sequence" is standard, Reverse will detect a wrong with parity error.)

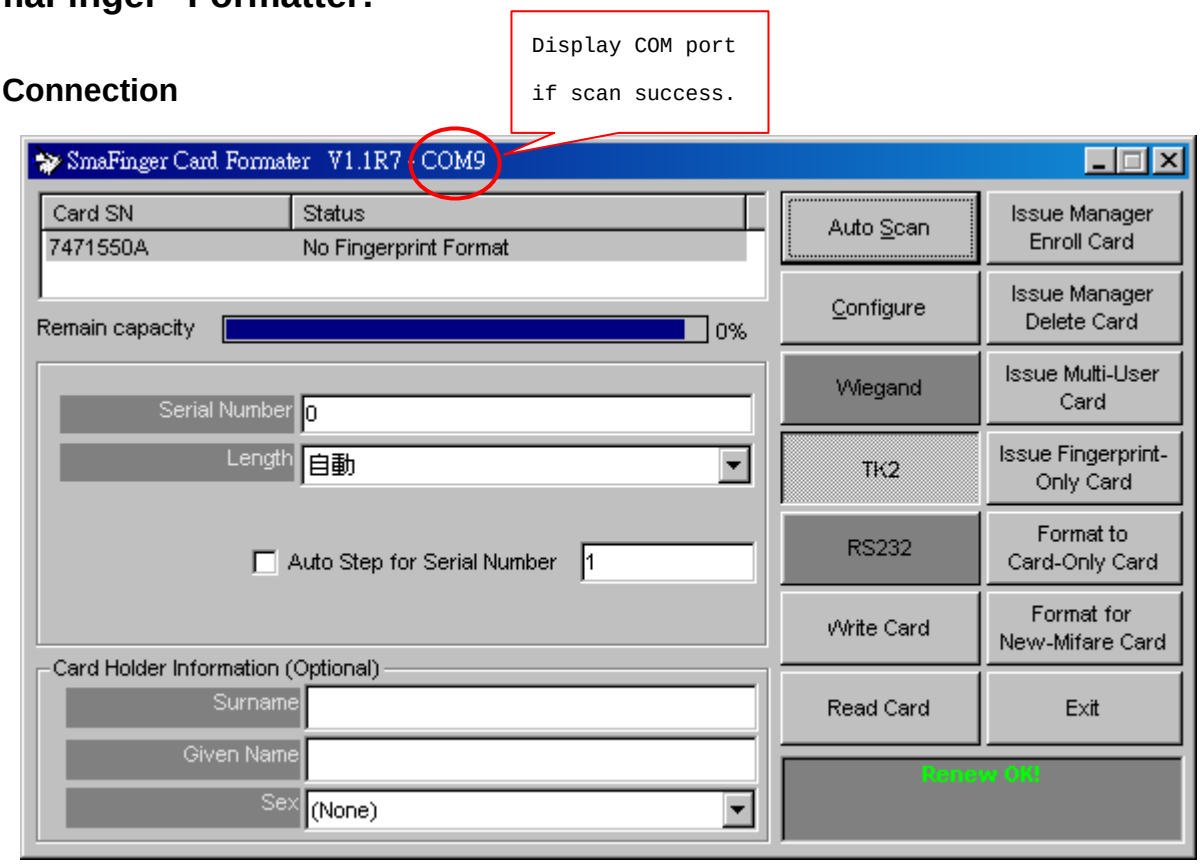


Remark:

1. Using Reader-Kit to test Wiegand (or TK2) signal, this test may be failed if the processor of computer is too slow.
2. Using Reader-Kit to test Wiegand (or TK2) signal, you have to connect to the physical Comm. Port.

SmaFinger® Formatter:

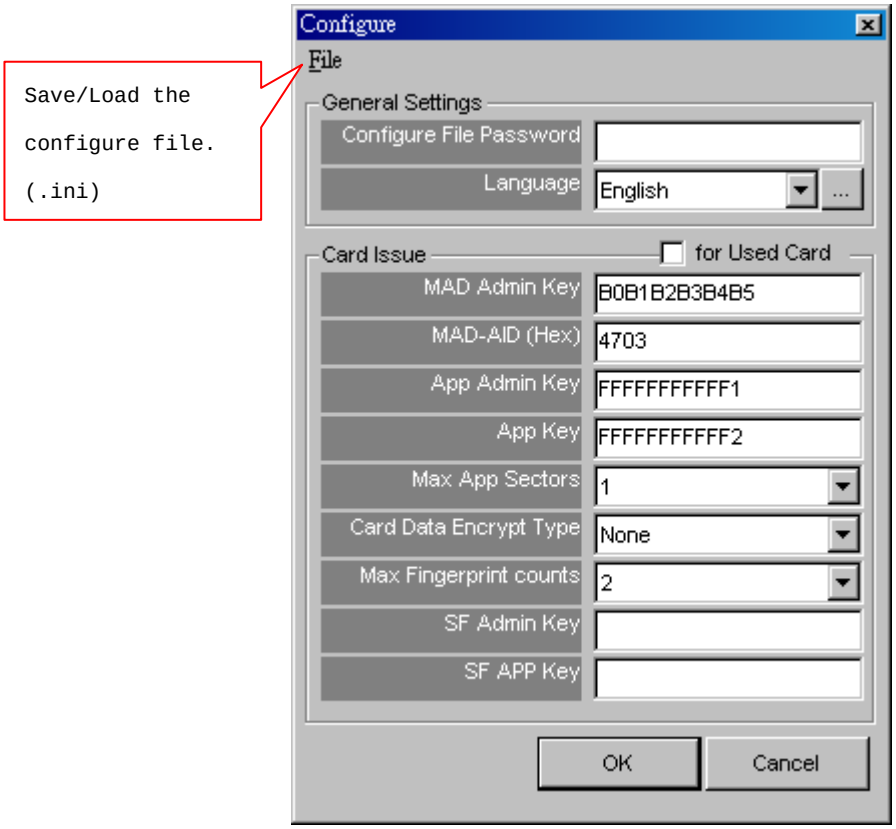
1. Connection



Click [Auto Scan] to search the “PCR310” reader.

2. Instruction

- **Configure Settings**



General Settings

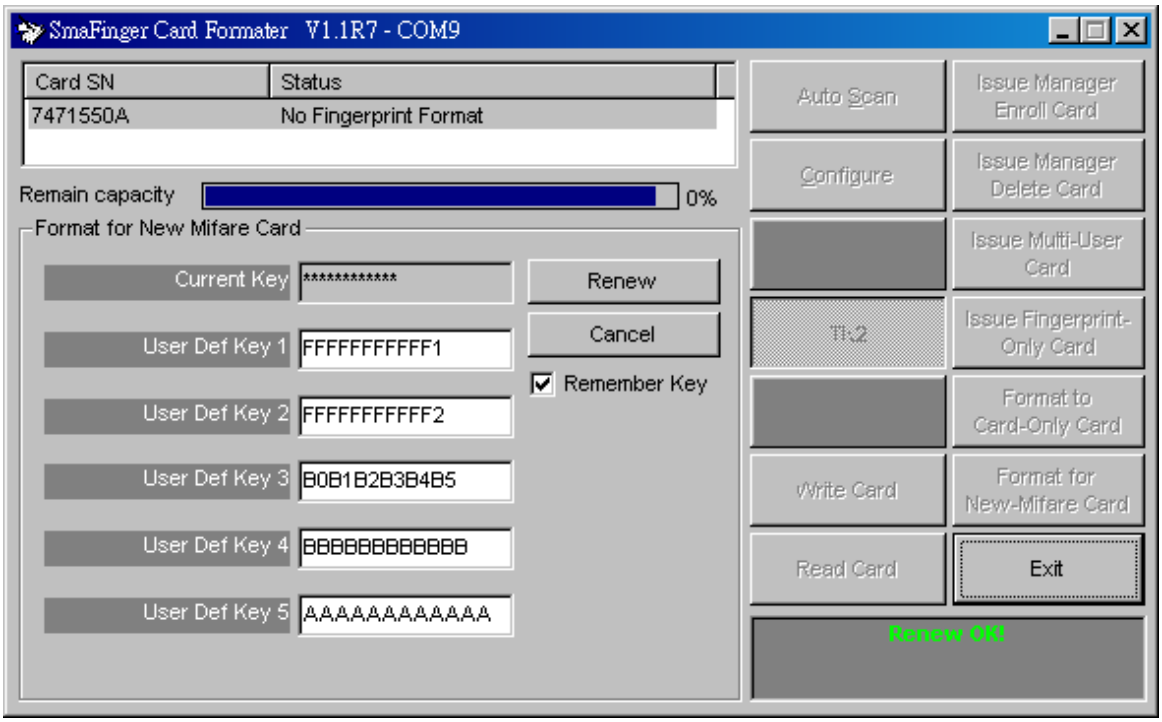
- Configure File Password: You can keep the configure file confidential by this password.
- Language: To change the display language.
  (Chinese/Czech/English/Japanese/Spanish/Thai)

Card Issue

These information are using to issue/format/read/write card.

The “SF Admin Key” and “SF APP Key” are using at SmaFinger® format for fingerprint MAD.

➢ **Renew Card**



Renew

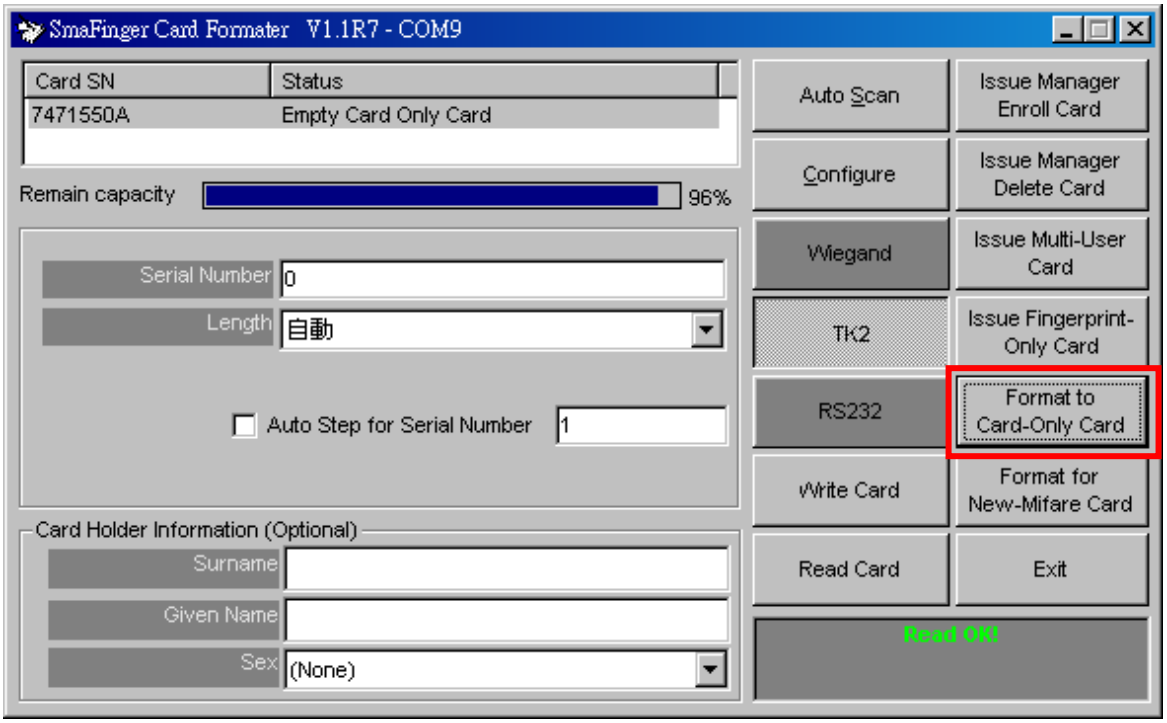
After you click [Renew], the software will try to make a Mifare® card revert to default settings. That means, if one of the user def keys is correctly, then the card data will be formatted, and all of the keys will be set to “FFFFFFFFFFFF”.

Remember Key

Check this to automatically stores user def keys after unloading this software.

By checked “Remember Key”, you do not need to type user def keys again every open the SmaFinger® Formatter software.

➢ **Format to a Card-Only Card**

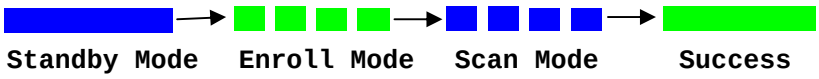


Click [Format to Card-Only Card] to makes a SmaFinger® card-only card format,
and the entire card data will be erased after format complete.

Check the reader's "Reader Mode".
For "CSN Only" mode, read Card-Only Card can be passed without key,
For "Card Data" mode, read Card-Only Card can be passed after authenticate the APP Key pass.

- **Make a Card + Fingerprint Card**

  After make a Card-Only Card, read Manager Enroll Card to enter the enroll mode after the reader in standby mode (LED status: blue on).



In enroll mode (LED status: green blink), please read Card-Only Card to store UID. Or read Manager Enroll Card to exit enroll mode.

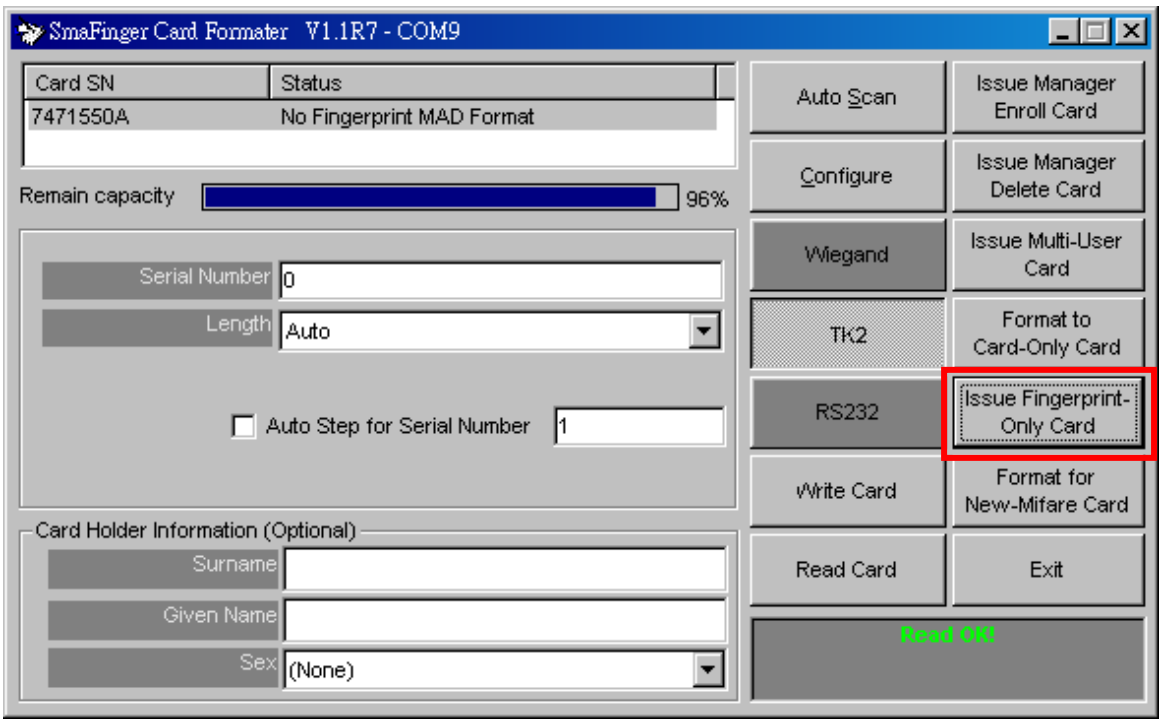
In scan mode (LED status: blue blink), please scan user's fingerprint till beeper sound. Or read Manager Enroll Card to exit the enroll mode.

Scan same fingerprint again till beeper sound.

Finally, please read Card-Only Card twice to store fingerprint templates into the card and check (LED status: green on).

- **Issue Fingerprint-Only Card**

  You can issue a Fingerprint-Only Card to enroll fingerprint templates into the reader, but no need to use the software.

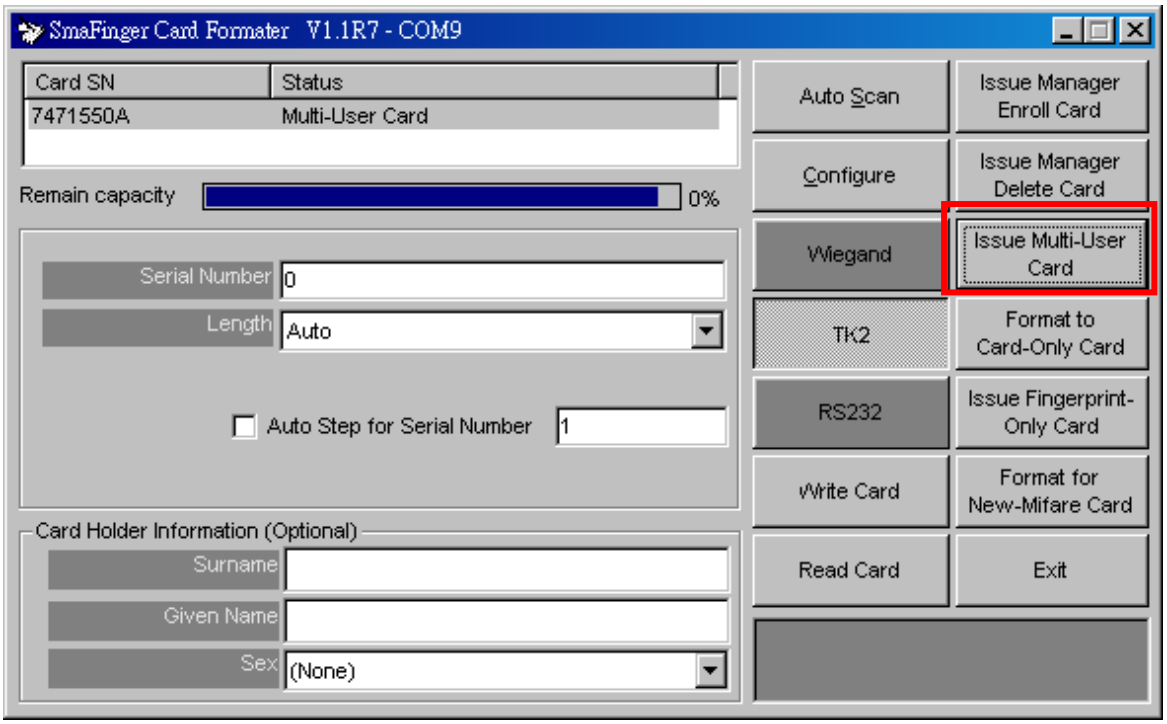


Click [Issue Fingerprint-Only Card] to issue the Fingerprint-Only Card.

- **Issue Multi-User Card**

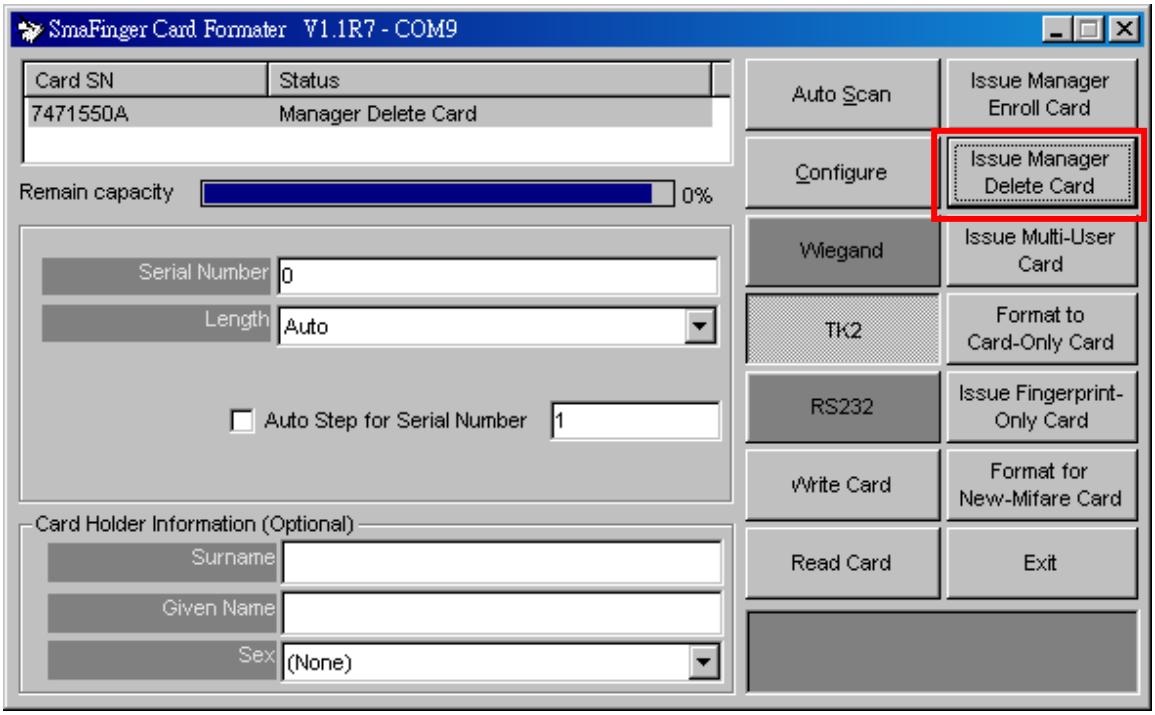
  You can issue a Multi-User Card to append user accounts into the reader, but no need to use the software.

  A user account includes a 4 bytes random user data (HEX string), and the user's fingerprint templates.



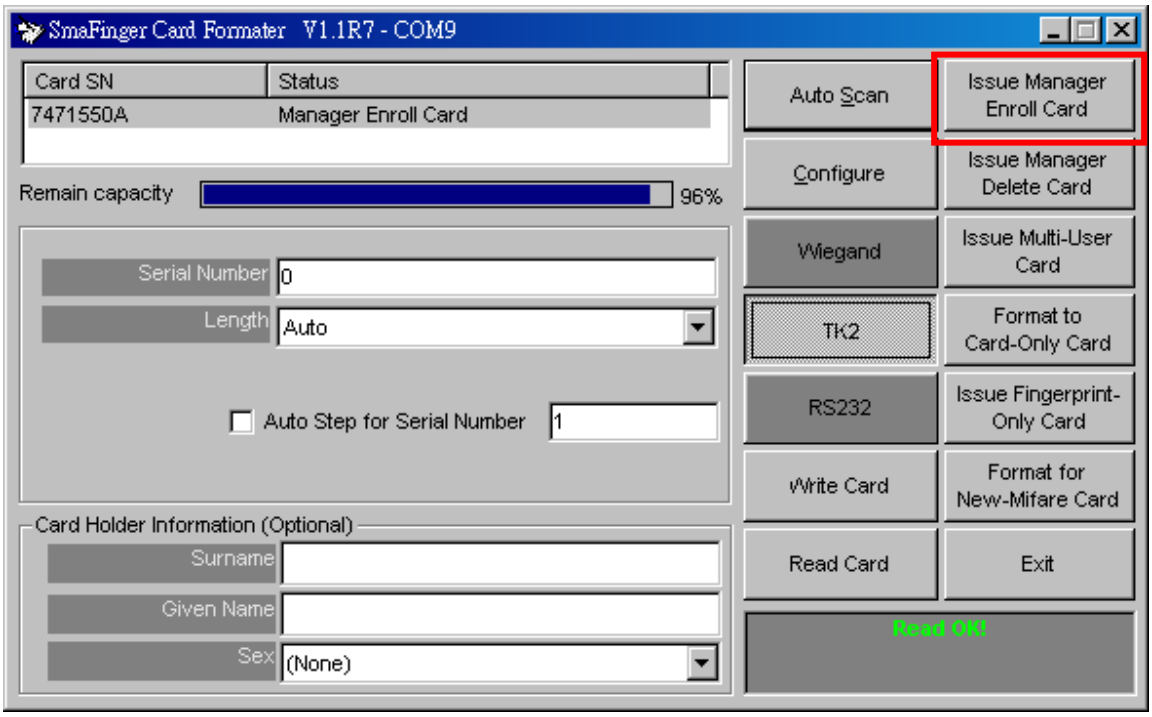
Click [Issue Multi-User Card] to issue the Multi-User Card.

➢ **Issue Manager Delete Card**



Click [Issue Manager Delete Card] to issue the Manager Delete Card.

➢ **Issue Manager Enroll Card**



Click [Issue Manager Enroll Card] to issue the Manager Enroll Card.

3. Operation

- **Delete a User Account (Enrolled by Card+Fingerprints Card) in a Offline Reader**

In standby mode, read Manager Delete Card to enter the delete mode.

In delete mode, please read Card + Fingerprints Card to start to delete. Or read Manager Delete Card to exit the delete mode.

Read again Card + Fingerprints Card to confirm delete.

- **Delete Fingerprint Templates in a Offline Reader**

In standby mode, read Manager Delete Card to enter the delete mode.

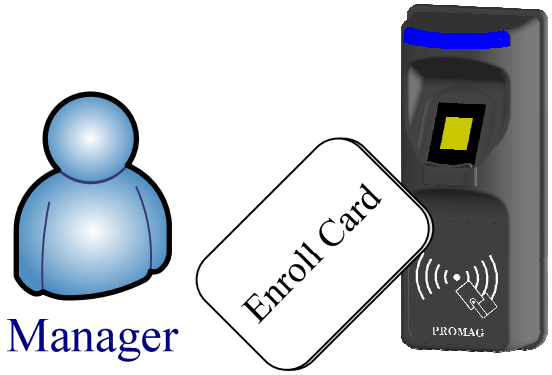
In delete mode, please scan the fingerprint to start to delete. Or read Manager Delete Card to exit the delete mode.

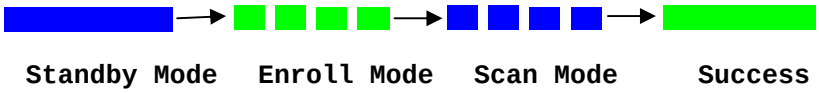
Read again Card + Fingerprints Card to confirm delete.

After delete complete, all of the user's data of the scan fingerprint will be erased.

- **Append Fingerprint Templates to a Offline Reader**

  First of all, read Manager Enroll Card to enter the enroll mode after the reader in standby mode (LED status: blue on).





In enroll mode (LED status: green blink), please read Fingerprint-Only Card to enter the scan mode. Or read Manager Enroll Card to exit enroll mode.

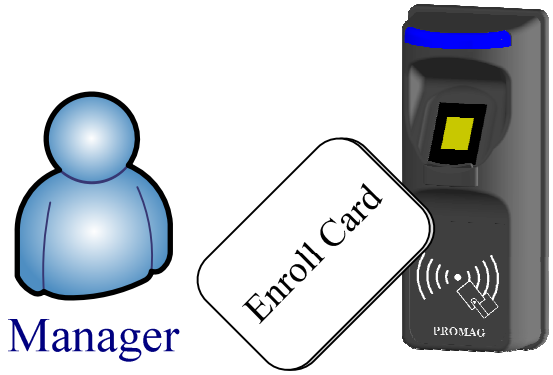
In scan mode (LED status: blue blink), please scan user's fingerprint till beeper sound. Or read Manager Enroll Card to exit the enroll mode.

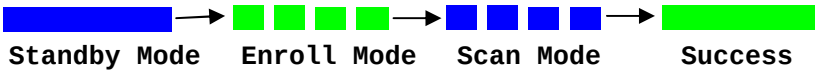
Scan same fingerprint again till beeper sound.

Finally, please read Fingerprint-Only Card to finish the scan mode (LED status: green on).

- **Append a User Account to a Offline Reader**

  First of all, read Manager Enroll Card to enter the enroll mode after the reader in standby mode (LED status: blue on).





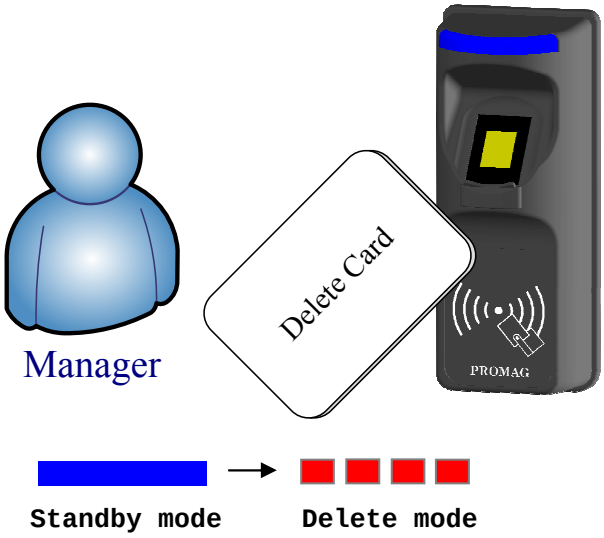
In enroll mode (LED status: green blink), please read Multi-User Card to enter the scan mode. Or read Manager Enroll Card to exit enroll mode.

In scan mode (LED status: blue blink), please scan user's fingerprint till beeper sound. Or read Manager Enroll Card to exit the enroll mode.

Scan same fingerprint again till beeper sound.

Finally, please read Multi-User Card to finish the scan mode (LED status: green on).

➢ **Delete a User Account (Enrolled by User Card) in a Offline Reader**



In standby mode, read Manager Delete Card to enter the delete mode.

In delete mode,

please read User Card to delete the user. Or read Manager Delete Card to exit the delete mode.

Appendix

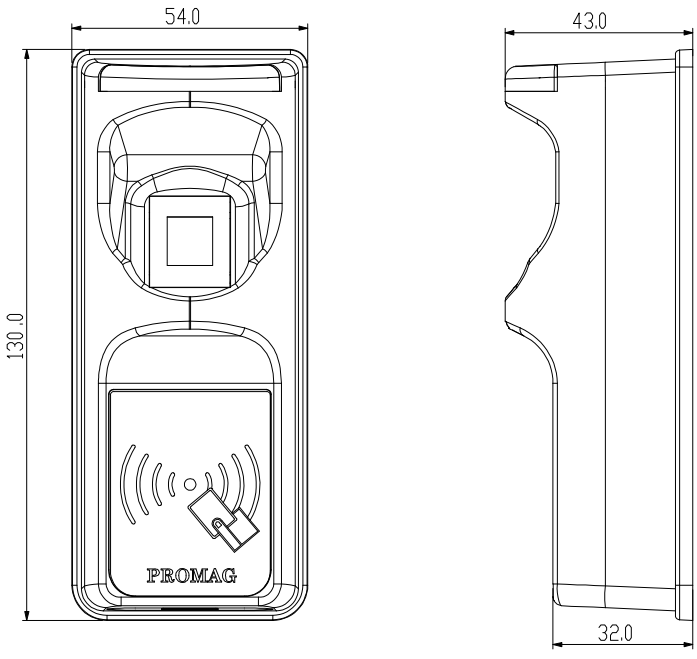
ANNEX A. Hardware Specification

Reader Specification:

	SmaFinger
Major Feature	Mifare® Application Directory Reader Access Control & Security
Card Type	ISO14443A, Mifare Class (Mifare® 1K, Mifare® 4K for MAD1/MAD2)
RF Frequency	13.56MHz
RF Distance[2]	50mm (Using the MFA01 Mifare® card of GIGA-TMS INC.)
DC Power	7.5VDC~12VDC (Max 250mA @ 12V)
Interface	Wiegand 26~128 bits (Standard / Reverse) RS232 2400~57600(baud rate) ABA-TK2 40IPS: 2~48 codes
Power Input	DC 7.5~12V
Power Consuming	210mA @ 12V
Operating Temp.	0~50 degree C
Humidity	10~90% Humidity
Dimension	H130.0mm x W54.0mm x D43.0mm

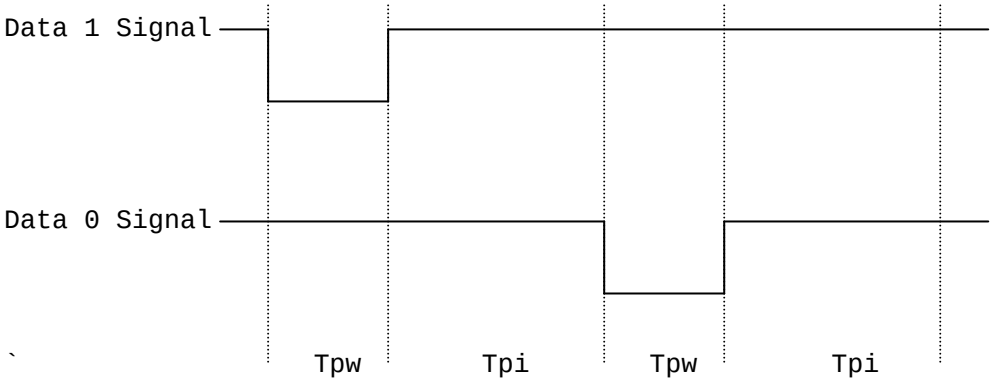
Note:

1. Mifare® Class: Mifare® Standard 1K/4K/Pro (without Mifare® Ultra-Light).
2. SmaFinger® RF distance can reach up to 50mm with MFA01 (Mifare® Standard 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 SmaFinger® reader.



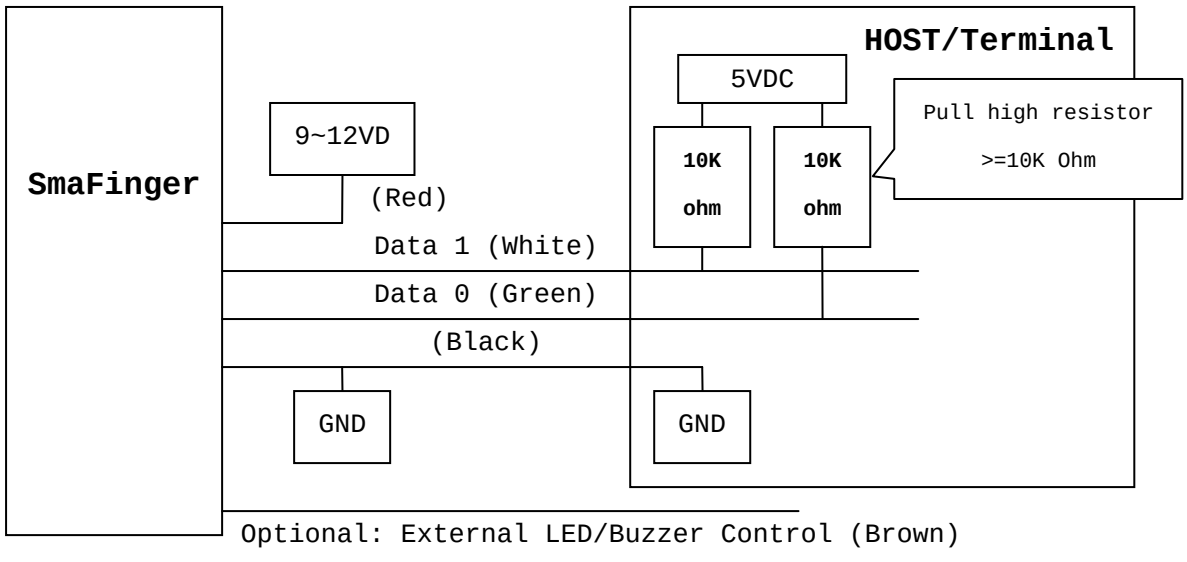
Pulse Times

Symbol	Description	Typical Time
Tpw	Pulse Width Time	100us +/- 3%
Tpi	Pulse Interval Time	1.9ms +/- 3%

Wiegand Packet (Without Reader ID)

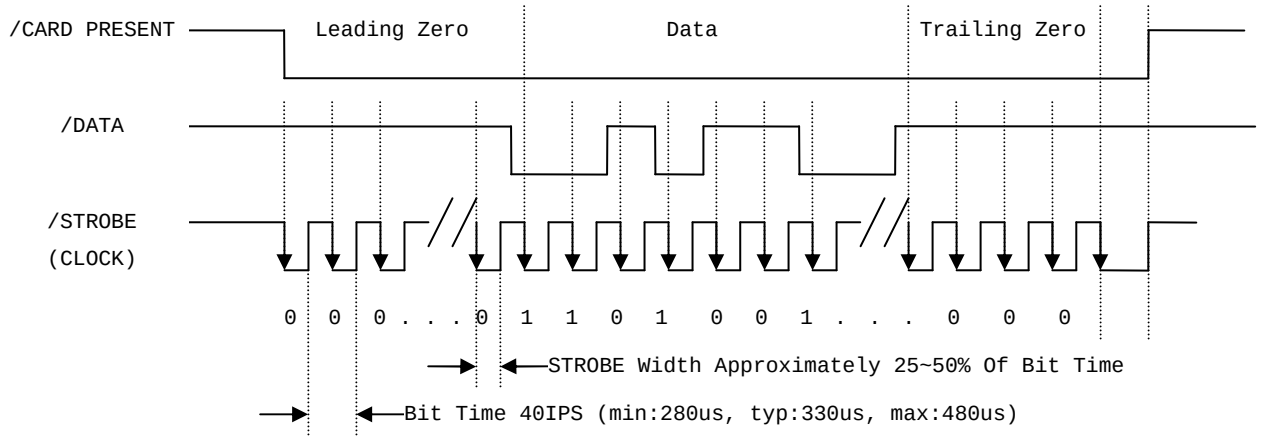
Standard (Default)	Parity(Even)	(MSB)	Data Bits	(LSB)	Parity(Odd)
Reverse (Option)	Parity(Odd)	(LSB)	Data Bits	(MSB)	Parity(Even)

Connect the Wiegand wires, example as below: (The pull high resister must >= 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.

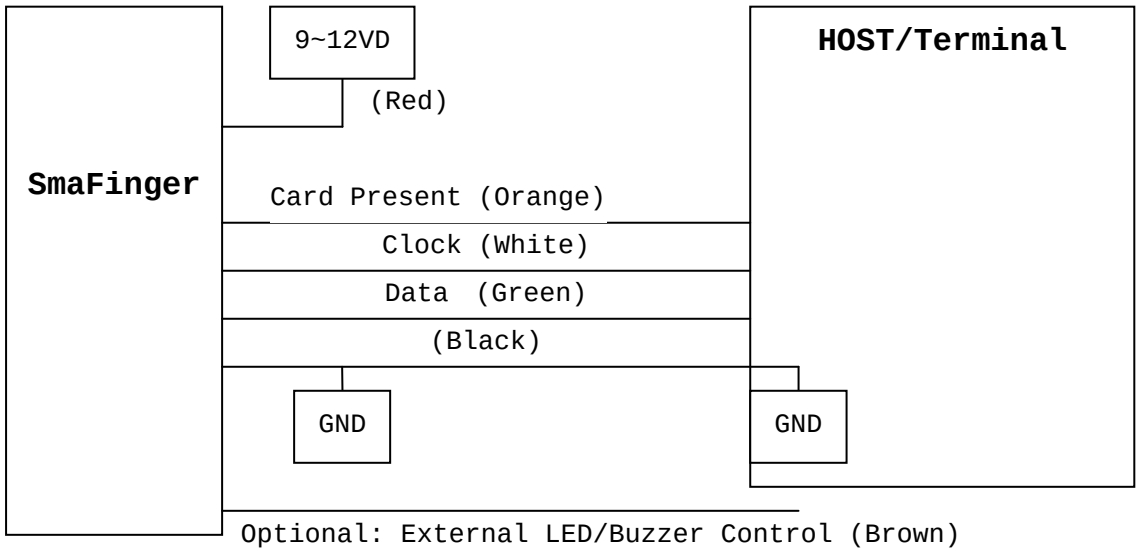
CLOCK (STROBE)

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

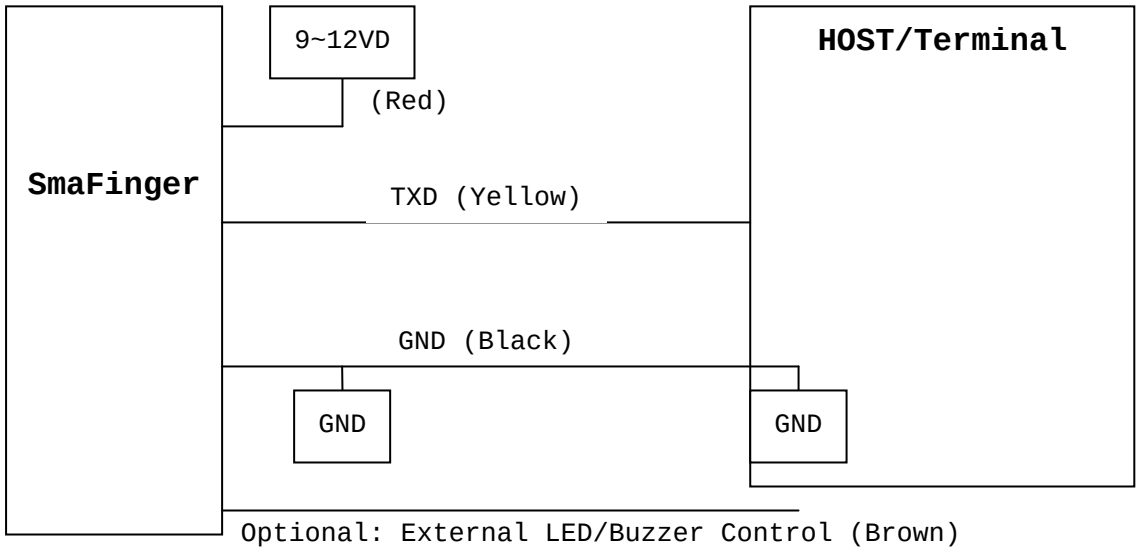
Card Present will go low after flux reversals from the Reader. Card Present will return high after the last flux reversal.

Connect the ABA TK2 wires, example as below:



ANNEX D. RS232 Interface

Connect the RS232 wires, example as below:

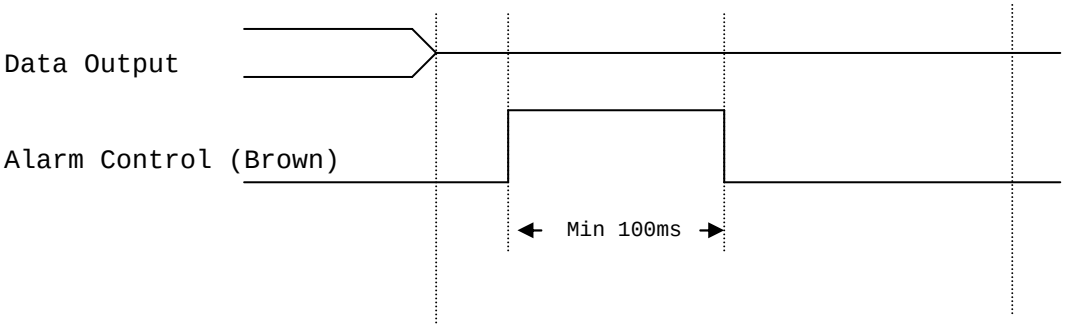


ANNEX E. External LED/Buzzer Control

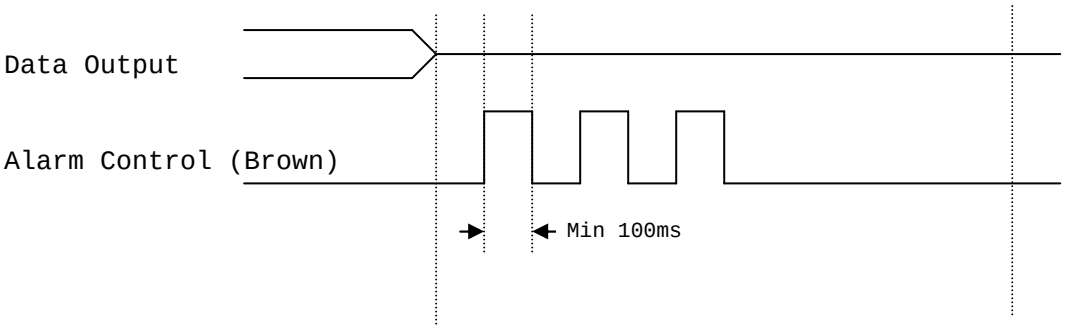
SmaFinger supports the external LED/Buzzer control for Terminal (or Host) to prompt end-user the card data is invalid or valid. Use Brown wire to control the LED/Buzzer of SmaFinger

Examples as below: (Active High)

(1) Show External Invalid Status



(2) Show Card Valid Status



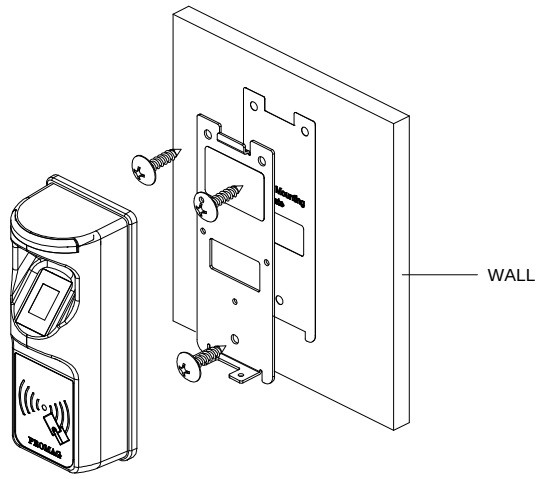
Note:

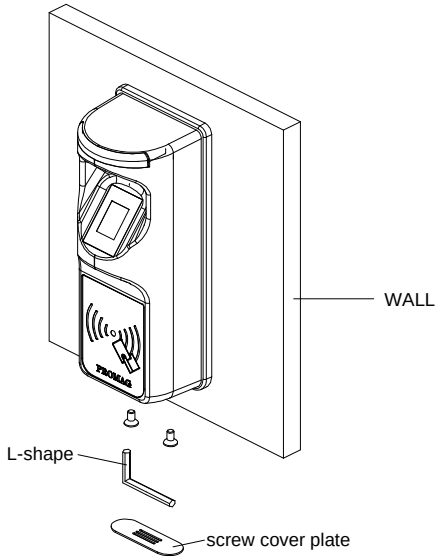
1. Send one pulse to show the "External Invalid" LED/Buzzer Status.
2. Send three or more pulse to show the "Card Valid" LED/Buzzer status.
3. You can configure the LED/Buzzer status by Mifare Reader utility.

ANNEX F. Secure Mounting Installation

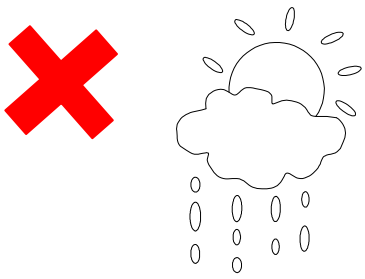
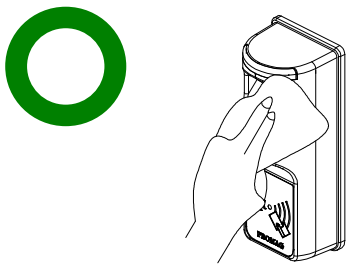
1. Attach the bottom plate label on the target position. Drill the holes to match the bottom plate then fix SmaFinger reader.

2. After fixing SmaFinger with attached screws (using the L-shape spanner), apply screw cover plate for completion.





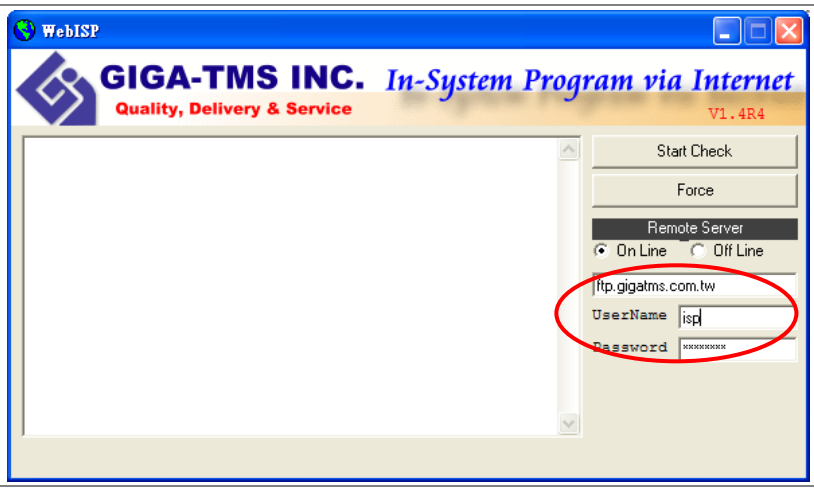
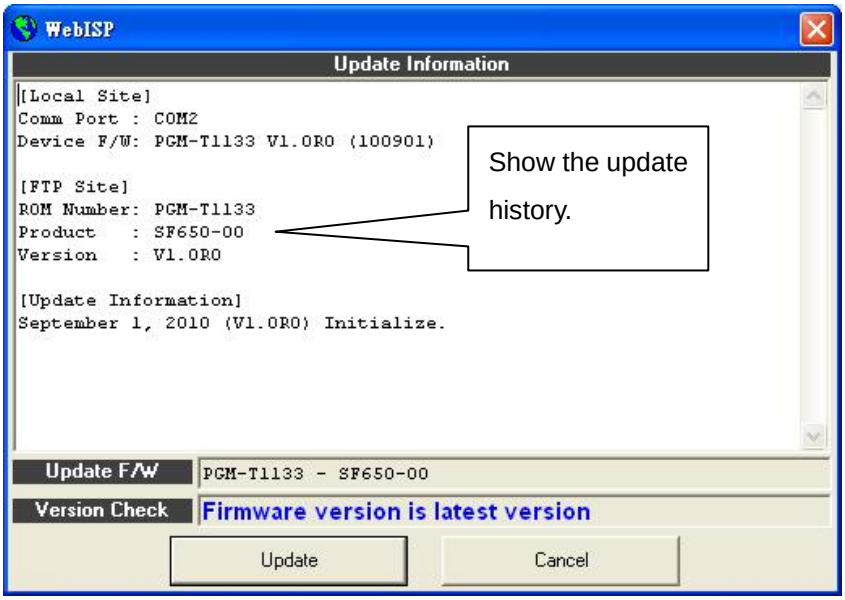
Remark:

SmaFinger is not designed for outdoor usage. Avoid the damage from sunshine or rains.	
To keep SmaFinger in good performance, it is recommended to have regular maintenance and clearance of the physical reader.	

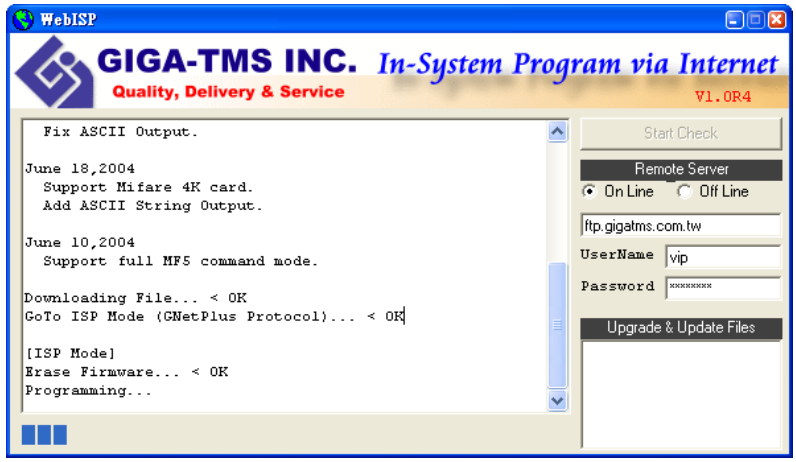
ANNEX G. WebISP - Firmware Upgrade Utility

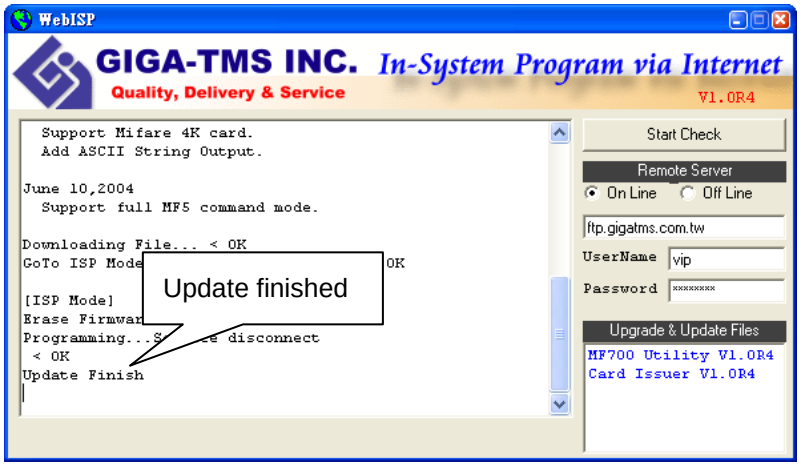
SmaFinger also supports the ISP (In-System Program) function to upgrade the reader's firmware.

Install WebISP (included in CD-ROM) in your PC (Windows System) first and follow the steps as below: (First of all, connect the reader or the programmer to PC via RS232 connection and make sure they are powered on.)

Step 1: Input your account (UserName and Password) Note: Contact us to get your account when needed.	
Step 2: Click [Start Check] to automatically check the firmware version from our FTP server. 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. Note: 1. The WebISP will auto scan all Comm ports to search the reader or programmer. 2. The WebISP will show the [Update Information] and list the update history.	

Step 3: After "Update Finish" message appears on the screen, it may still need to take several seconds to complete the update until LED shows back to normal.





ANNEX H. History

Rev A: September 28, 2010
Initial SmfFinger Configurable Sector Reader.

Rev B: July 27, 2011 (Kylie)
Specific How to install WebISP. (P.23)
September 30, 2011 (Kylie)
Update pics.
'Sequence' label edit to 'Output Data Order' (p.14)
October 03, 2011 (Kylie)
Modify several grammar mistakes.
Add remark (p.16)
Modify update describes (step #3). (p.24)
October 18, 2011 (Kylie)
Modify "Command Table" expressions. (p.11)
October 19, 2011 (Kylie)
Modify "Command Table" descriptions and remark. (p.11)
January 01, 2012 (Kylie)
Modify ReaderID's limit. (p.10)
January 11, 2012 (Kylie)
Modify data length limited to 12. (p.8)
February 08, 2012 (Kylie)
Modify CardOnlyMode and FingerScanSuccess descriptions. (p.9)
March 20, 2012(Kylie)
Add "Formatter" describes.
Re-typesetting.

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