

SmaFinger®

Mifare Configurable Sector Reader

User's Manual



REV.A
October 26, 2006

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 :

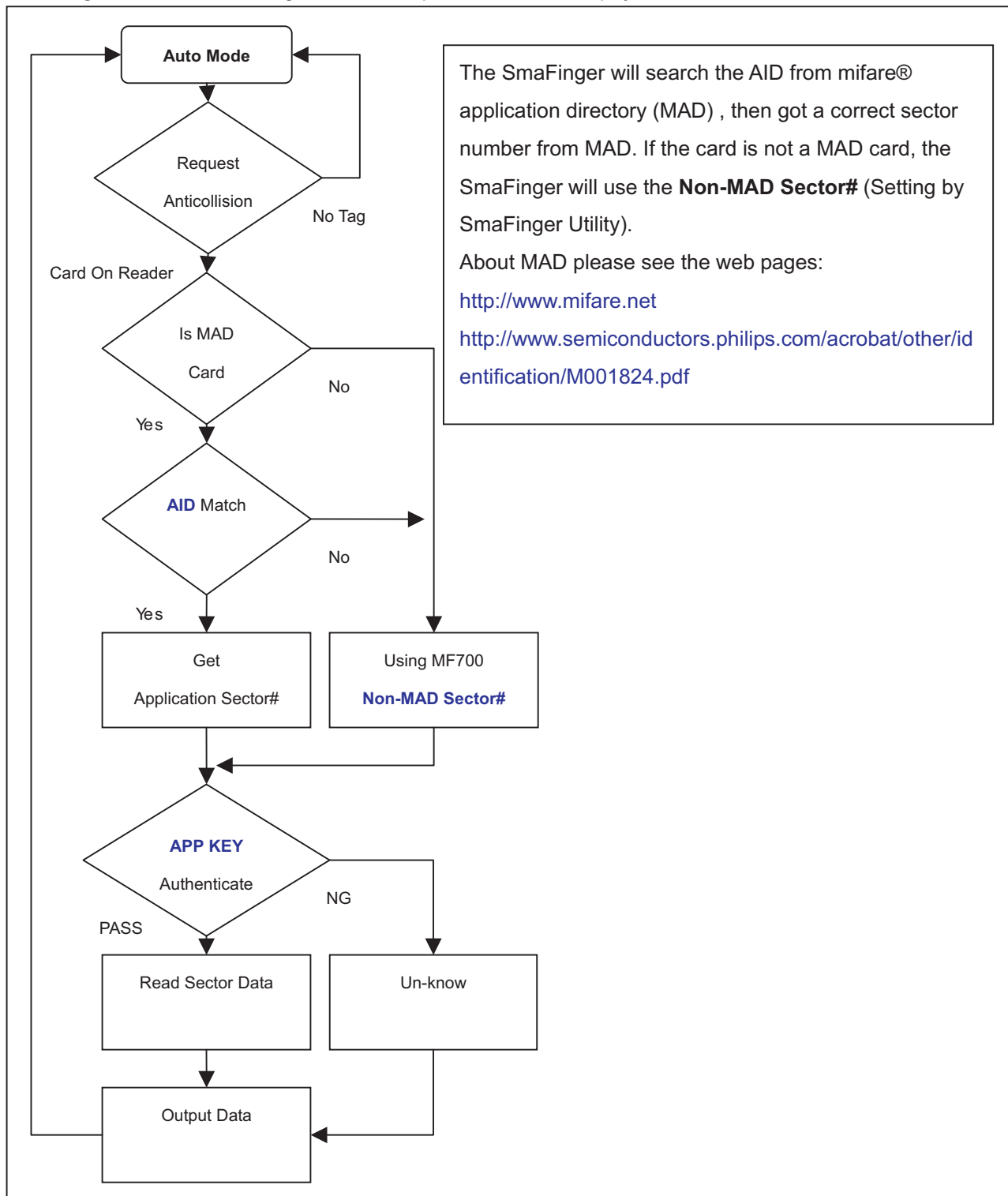
1. Support MAD1/MAD2 standard, and support customer MAD-AID setting.
2. Support Non-MAD format with user-defined sector number.
3. Support Anti-Collision (Two cards together can be read at the same time).
4. Support used card with data offset and length.
5. Support Multi Sectors.
6. Support Mifare® Standard 4K or Mifare® Standard 1K card.
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:

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.



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 #	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.

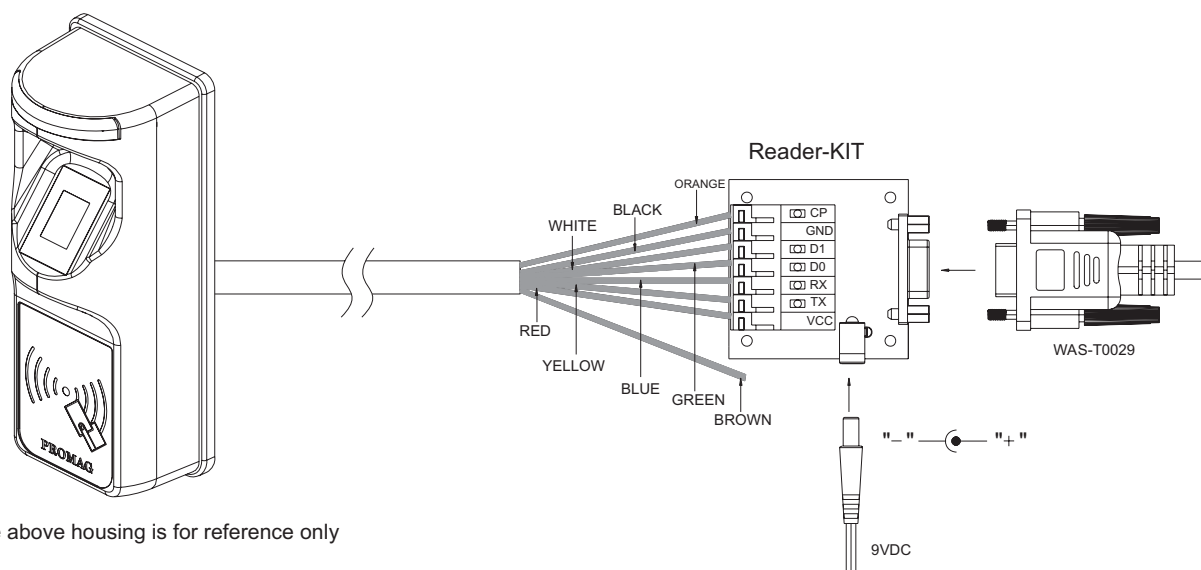
Example: Data Length is 16, SmaFinger only send out 15 bytes for RS232 output.

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 (for SmaFinger REV.D and later)
Brown	LED/BUZEER	IN	External LED/BUZZER Control

Connect To Reader Kit before configure the SmaFinger Reader.

To configure the SmaFinger reader you need connect the reader to the Reader-Kit first as below:



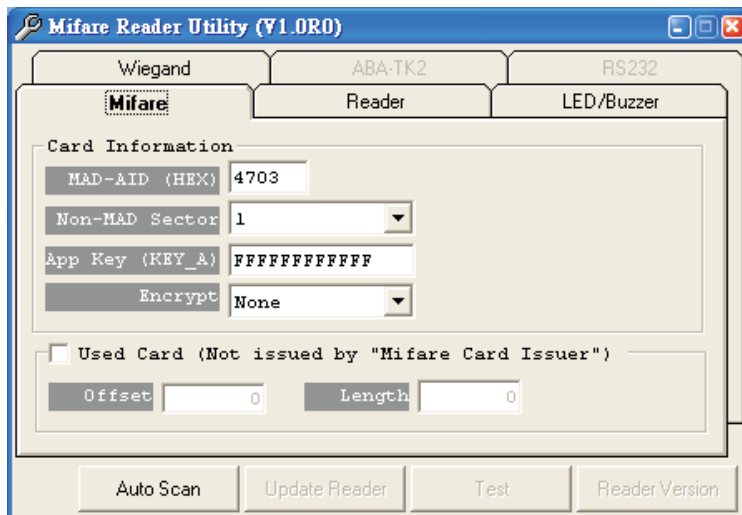
The above housing is for reference only

Note:

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

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

Non-MAD Sector: (Default =0)

When the card is Non-MAD format, SmaFinger 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 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")

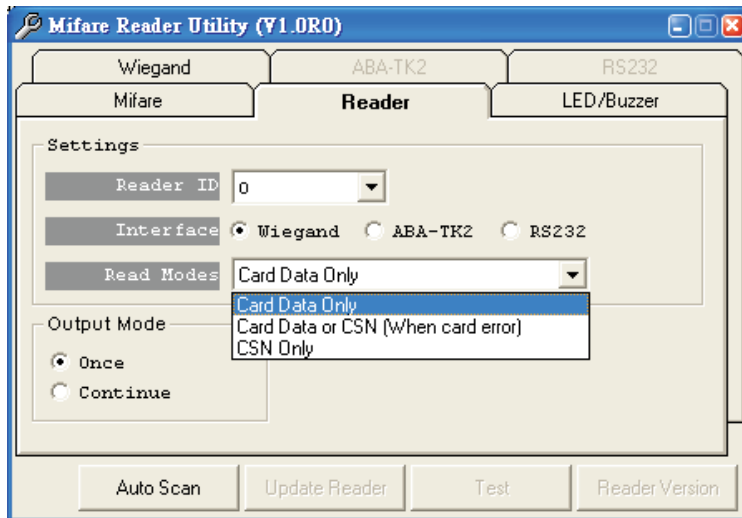
You have to indicate the data position in the card, when the card is not issued by "Mifare Card Issuer" software. And you must set the "Offset" (Max 255, and base from zero) from the beginning of sector and set your data "Length" (Max 128).

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)

SmaFinger Reader ID for multi link application. (ID: 0~99).

Interface : (Default=Wiegand)

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

Read Mode: (Default=Card Data Only)

- Card Data Only: Read card sector data only; If any error (ex. mifare key error), reader will show "Card Invalid" status.
- Card Data or CSN (Card Serial Number): Read card sector data, If any error (ex. mifare key error), reader will send the CSN to host.
- CSN Only: CSN read only.

Output Mode: (Default=Once)

- Once: Send data (or CSN) to host once.
- Continue: Keeping sending data (or CSN) to host till card remove.

3. LED / Buzzer Settings



New SmaFinger support the LED/Alarm Configuration. Setting 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 1 Time
6 (36h)	Buzzer Beep 3 Time
7 (37h)	Green LED ON with Beep 1 Time
8 (38h)	Red LED ON with Beep 3 Time
9 (39h)	All LED ON (Orange)

Remark: If Enable the RS232 Command Set Control (for LED/Buzzer), the external LED/Buzzer control with high/low level control will be disable.

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 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: Set Brown wire Active level condition with Host status.

Disable: Always disable the Brown wire. (Default), LED/Buzzer control 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).

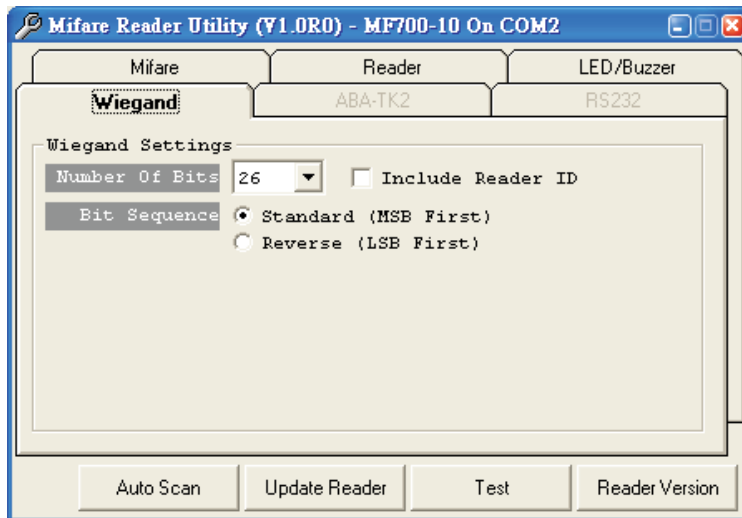
Control Brown wire:

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.

4. Wiegand Setting:

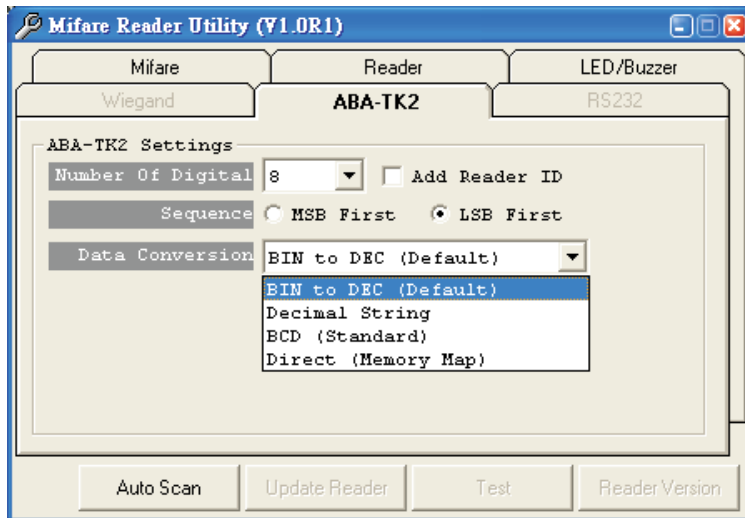


Number of Bits is to set the Wiegand output type you want to meet your Host (or Terminal). It can be 26 to 128 (Default=26).

Include Reader ID¹ is to set the Wiegand output data to include Reader ID when it is enabled. (Default=Disable).

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).

5. ABA-TK2 Settings



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

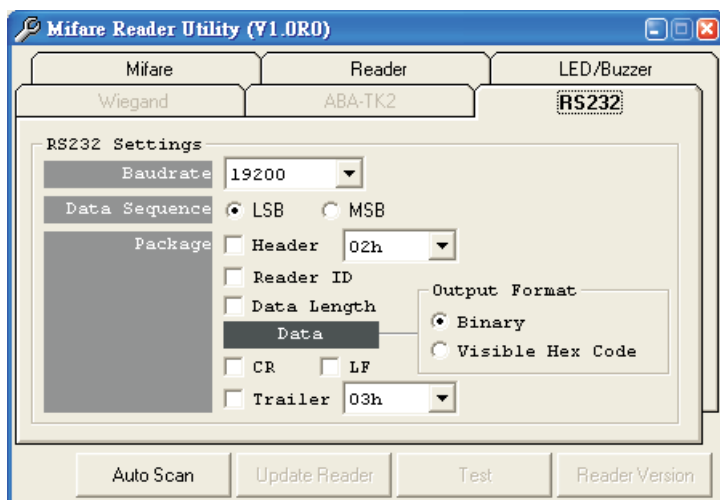
Add Reader ID: Add Reader ID into TK2 data. (Default=Disable)

Sequence: Set the TK2 data sequence. (Default=MSB First)

Data Conversion: Select card data format to convert ,

- a. BIN to DEC (Default, card issue by Mifare Card Issuer Utility)
- b. Decimal String (ex. "123456")
- c. BCD
- d. Direct (Memory Map)

6. RS232 Setting:



Baudrate can be set 2400bps~57600bps (Default=19200bps)

Data Sequence can be set "LSB" first (Default) and "MSB" first.

Package² 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 = None included)

Output Format can be "Binary" or "Hex String" for output format.

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	(LSB)	Data Bytes	(MSB)	Trailer
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(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:

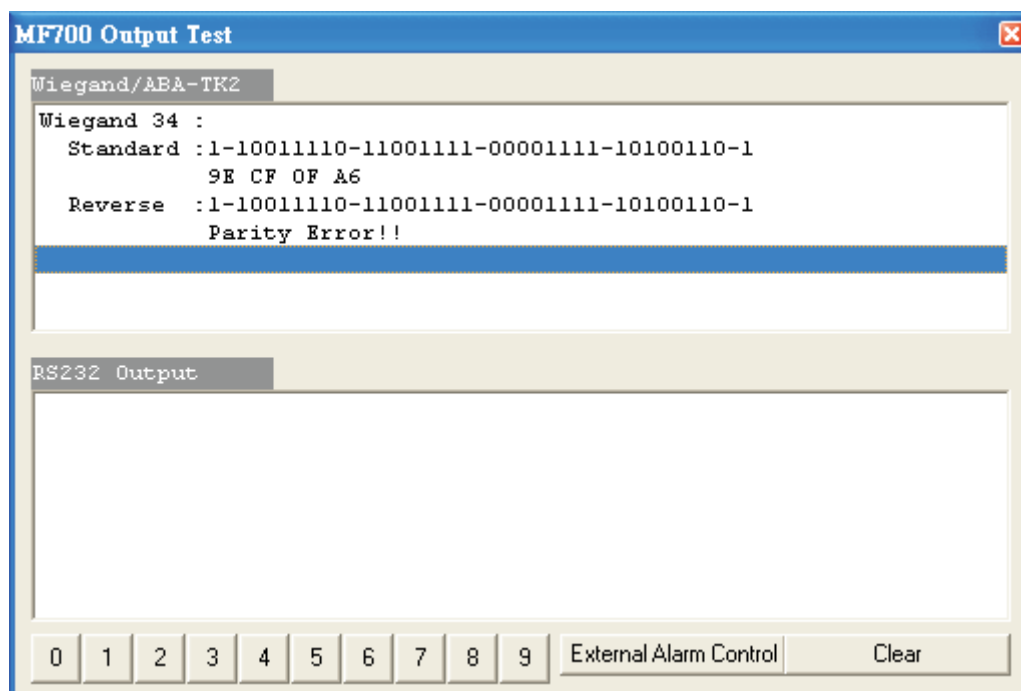
*SmaFinger all configuration items are write only, so any users can not read the configuration items from SmaFinger to get the **App Key**, that is very important to protect your **App Key** and all configuration items.*

Test SmaFinger Reader after configuration

After SmaFinger configuration is completed you may use Mifare Reader Utility "Test" function to test the SmaFinger to see if the configuration is done correctly.

1. After the configuration on the Mifare Reader Utility software is made, you should click [Update Reader] to download the current configuration to the SmaFinger Reader.
2. After SmaFinger configuration is completed, you may click [Test] to test SmaFinger Reader.
3. Get an issued mifare[®] card to put on SmaFinger reader to be read and see the output data on the window of "SmaFinger Output Test".

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

ANNEX A. Hardware Specification

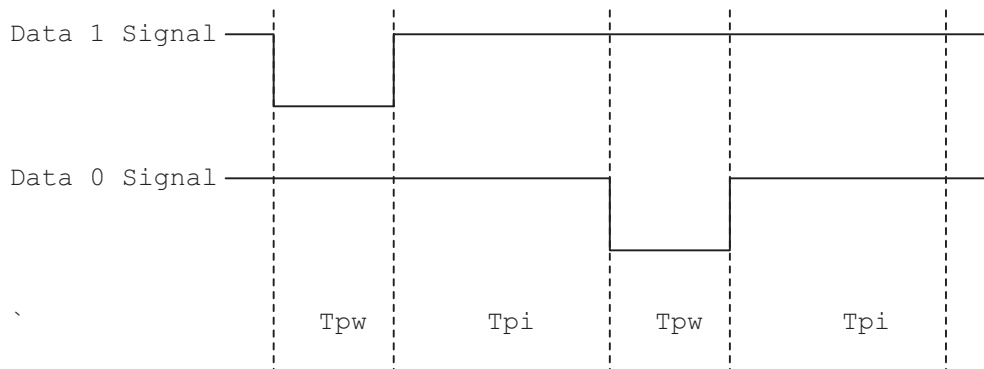
	SmaFinger
Major Feature	Mifare® Application Directory Reader Access Control & Security
Card Type	ISO14443A, Mifare Class ¹ (Mifare® 1K, Mifare® 4K for MAD1/MAD2)
RF Frequency	13.56MHz
RF Distance²	50mm (Using the MFA01 Mifare® card of GIGA-TMS INC.)
DC Power	7.5VDC~12VDC (Max 200mA @ 12V)
Interface	Wiegand 26~128 bits (Standard / Reverse) RS232 2400bps~57600bps ABA-TK2 40IPS
Power Input	DC 7.5~12V
Power Consume	200mA @ 12V
Operating Temp.	0~50 degree C
Humidity	10~90% Humidity
Dimension	H13.00mm x W54.00mm x D43.00mm

Note:

1. Mifare Class: Mifare Standard 1K/4K.
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.



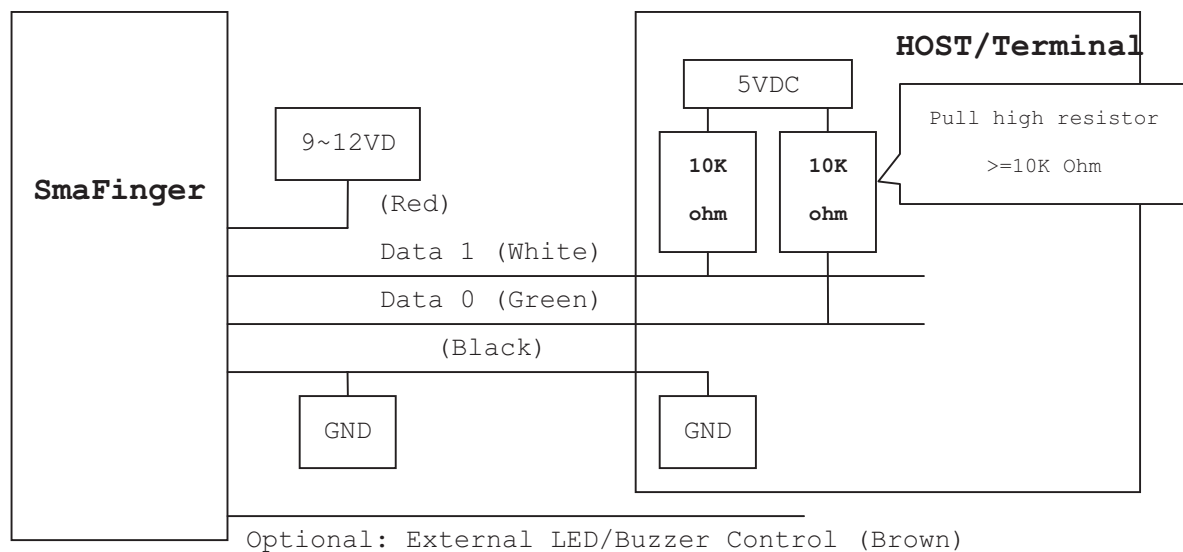
Pulse Times

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

Wiegand Packet (Without Reader ID)

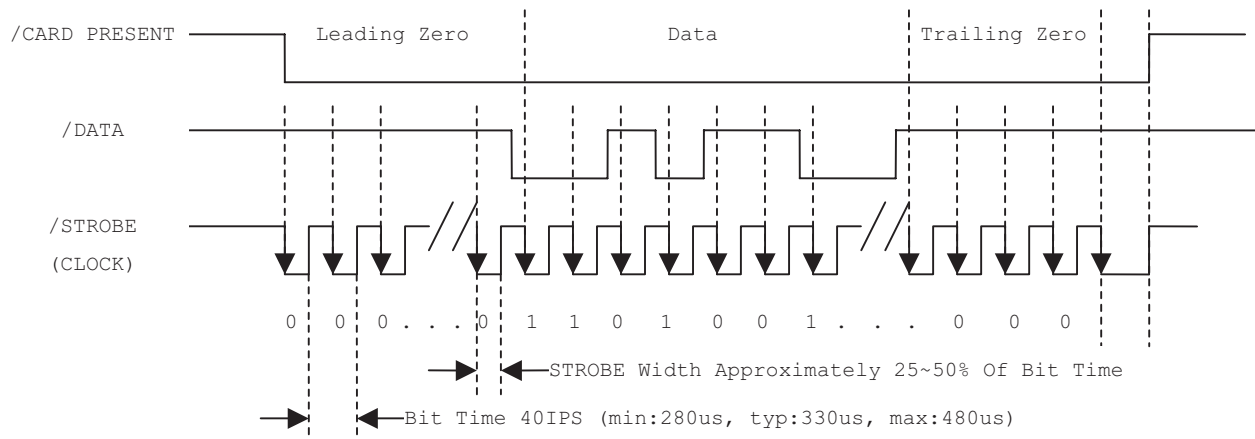
Standard (Default)	Parity(Even)	(MSB)	Data Bits	(LSB)	Parity(Odd)
Reverse (Option)	Parity(Odd)	(LSB)	Data Bits	(MSB)	Parity(Even)

Connect the Wiegand wires, example as below: (The pull high 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.

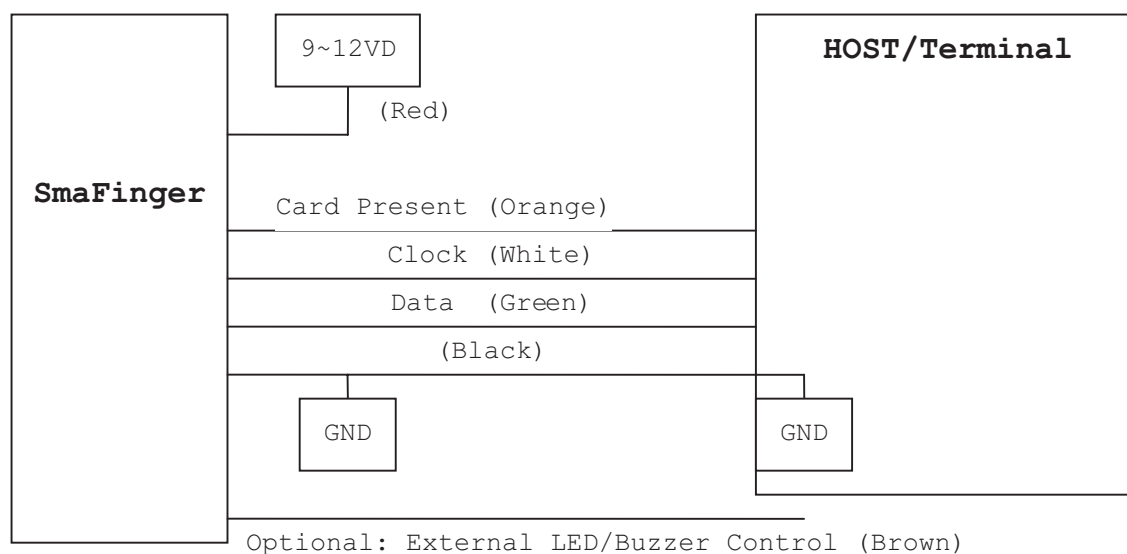
CLOCK (STROBE)

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

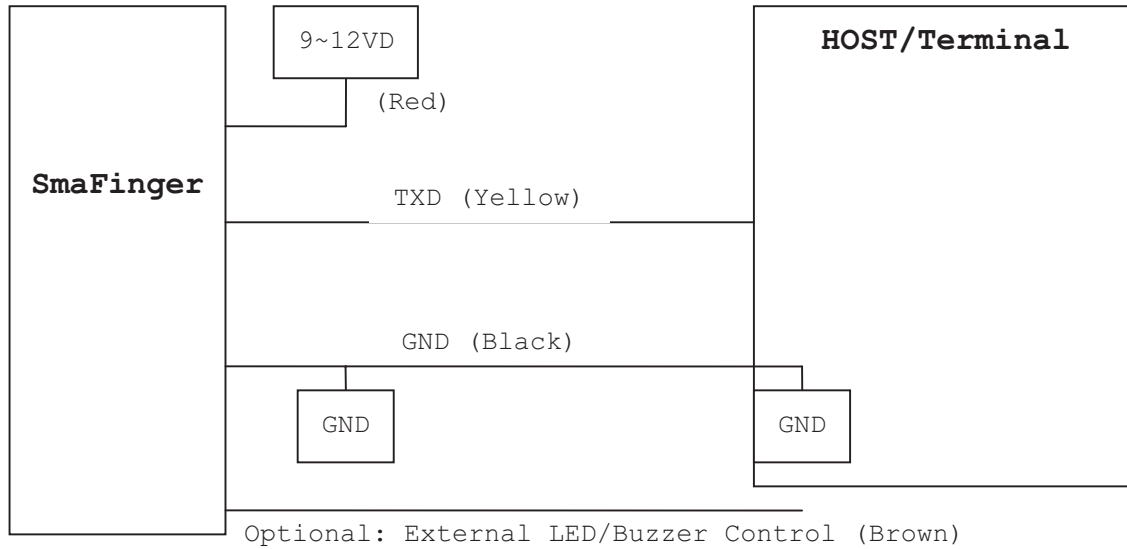
Card Present will go low after flux reversals from the Reader. Card Present will return high after the last flux reversal.

Connect the ABA TK2 wires, example as below:



ANNEX D. RS232 Interface

Connect the RS232 wires, example as below:

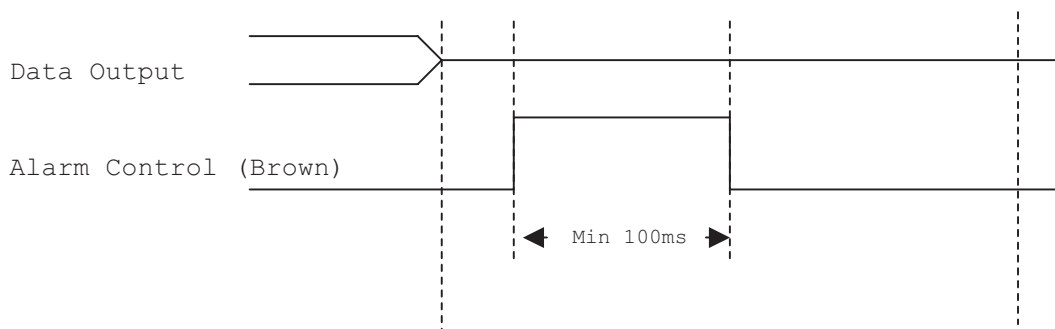


ANNEX E. External LED/Buzzer Control

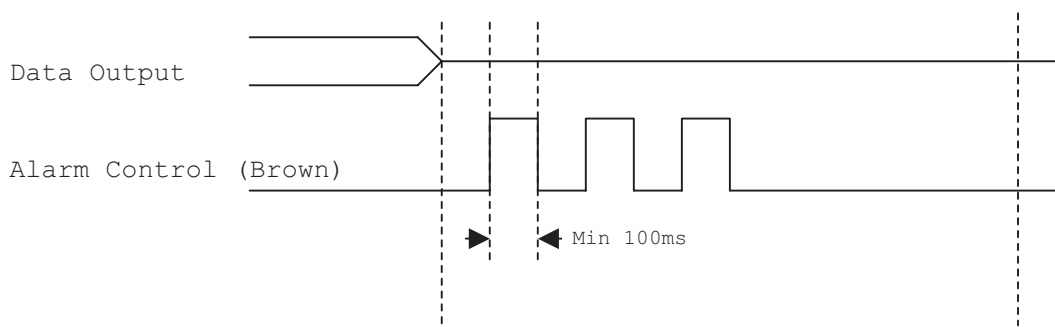
SmaFinger supports the external LED/Buzzer control for Terminal (or Host) to prompt end-user the card data is invalid or valid. Use **Brown wire** to control the LED/Buzzer of SmaFinger

Examples as below: (Active High)

(1) Show External Invalid Status



(2) Show Card Valid Status

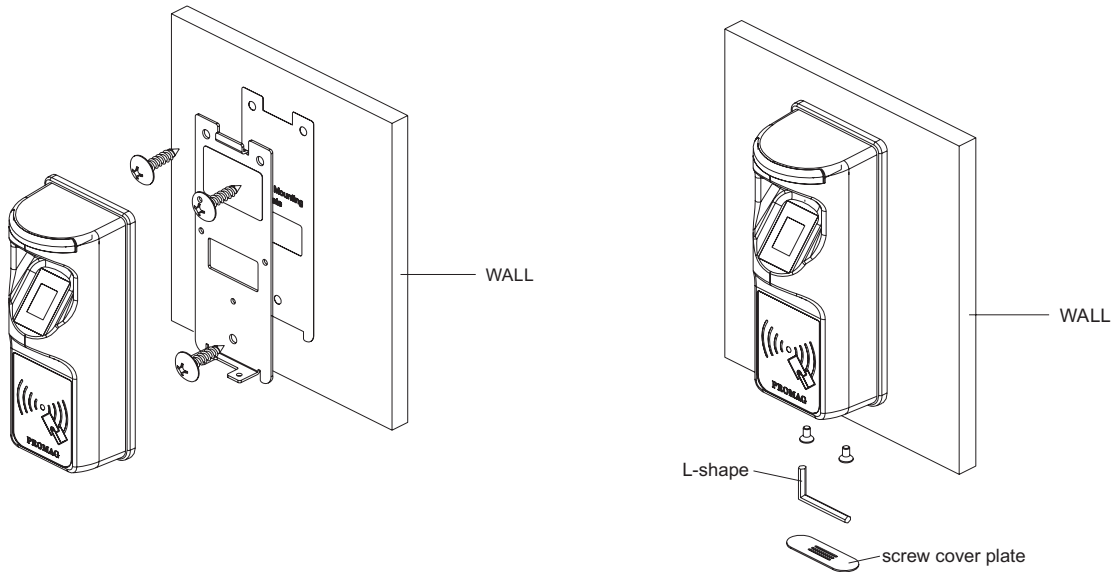


Note:

1. Send one pulse to show the "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 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. Order Information for SF500

Part Number	Include	Description
SF500SK-00	SF500P-00	SF500 Fingerprint USB Programmer
	SF500-00	SF500 Configurable Reader
	MF700KIT	MF700 Reader Kit
	WAS-T0029	RS232 Cable for Reader Kit
	Power Adaptor	DC Power Adaptor for Reader Kit
	PCR310U	SmaFinger Card Issue Programmer
	DISK5288	SmaFinger Card Issue and Utility Software
	User Card x 3	Mifare Standard 1K Card 3pcs
SF500-00	SF500-00	SF500 Configurable Reader
SF500P-00	SF500P-00	SF500 Fingerprint USB Programmer
	DISK5288	SmaFinger Card Issue and Utility Software
PCR310U-40	PCR310U	SmaFinger Card Issue Programmer
	DISK5288	SmaFinger Card Issue and Utility Software
MFA01	MFA01	Mifare® Standard 1K Card
MFA04	MFA04	Mifare® Standard 4K Card

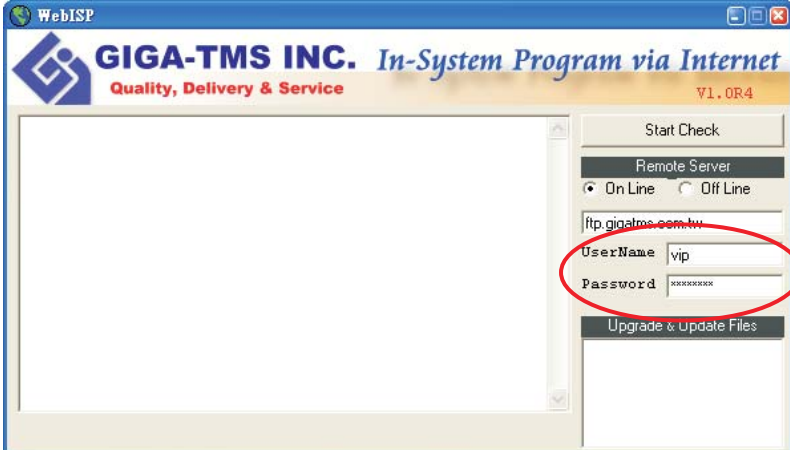
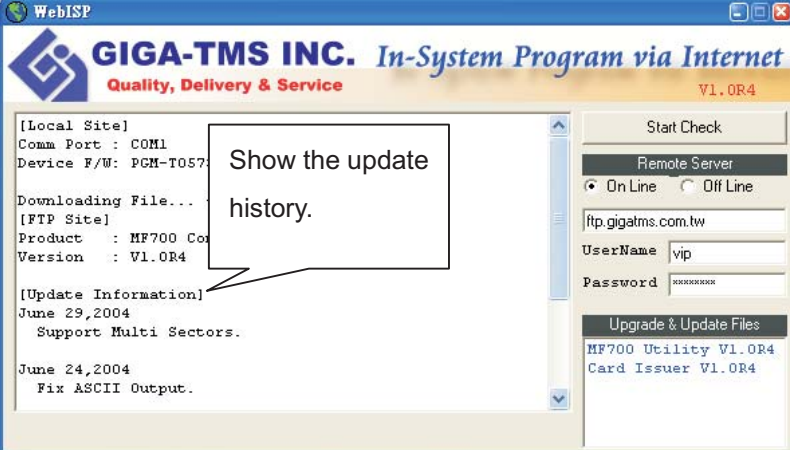
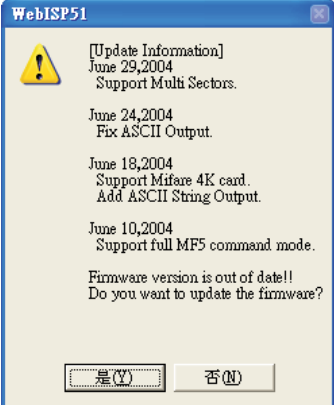
ANNEX H. Order Information for SF600

Part Number	Include	Description
SF600SK-00	SF600P-00	SF600 Fingerprint USB Programmer
	SF600-00	SF600 Configurable Reader
	MF700KIT	MF700 Reader Kit
	WAS-T0029	RS232 Cable for Reader Kit
	Power Adaptor	DC Power Adaptor for Reader for Reader Kit
	PCR310U	Card Issue Programmer
	DISK5288	Card Issue and Utility Software
	User Card x 3	Mifare Standard 1K Card 3pcs
SF600-00	SF600-00	SF600 Configurable Reader
SF600P-00	SF600P-00	SF600 Fingerprint USB Programmer
	DISK5288	SmaFinger Card Issue and Utility Software
PCR310U-40	PCR310U	SmaFinger Card Issue Programmer
	DISK5288	SmaFinger Card Issue and Utility Software
MFA01	MFA01	Mifare® Standard 1K Card
MFA04	MFA04	Mifare® Standard 4K Card

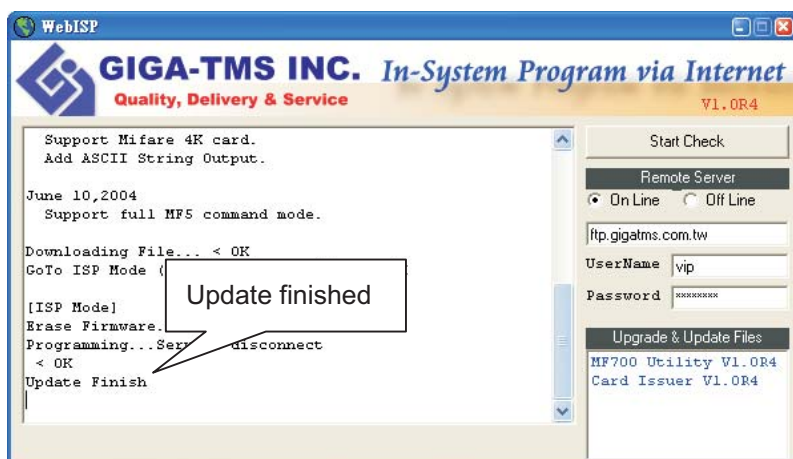
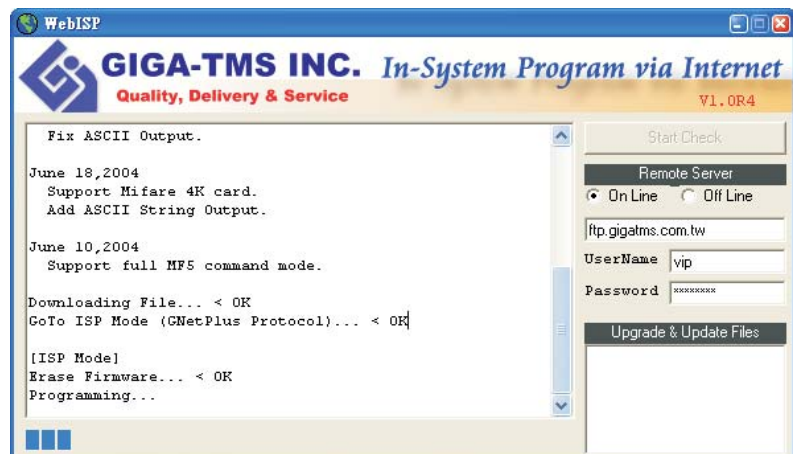
ANNEX I. WebISP - Firmware Upgrade Utility

SmaFinger 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>Step 1: Input your account (UserName and Password)</p> <p>Note: Contact us to get your account when needed.</p>	
<p>Step 2: Click [Start Check] to automatically check the firmware version from our FTP server.</p> <p>Note:</p> <ol style="list-style-type: none"> 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. 	
<p>Step 3: If your reader's or programmer's firmware out of date, then WebISP will prompt you to update the firmware. Click [Yes] to begin Updating the firmware.</p>	

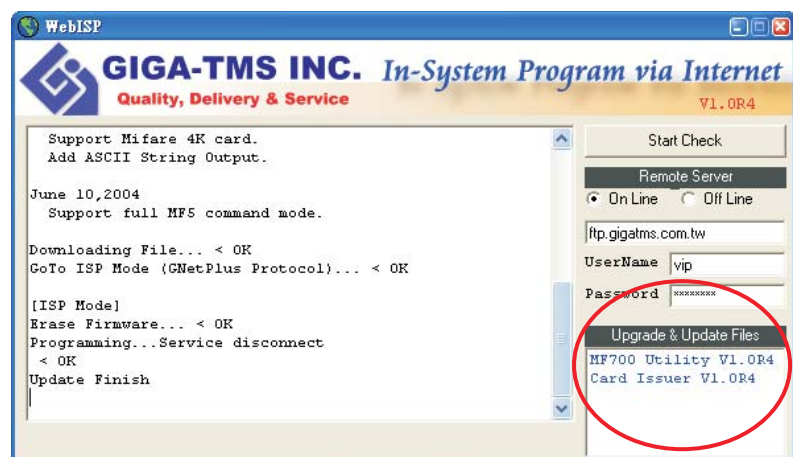
Step 4: Wait for the updating to finish. And repeat step 2 to update other readers or programmers.



Step 5: Check "Upgrade & Update Files" list to download the new and related software or utility to meet the updated firmware.

Note:

Click the new software or utility at "Upgrade & Update Files" to start downloading.



ANNEX J. History

Rev A: October 26, 2006

Initial SmfFinger Configurable Sector Reader.