Hardware Development Manual

Watson

Fingerprint Scanner (SAP45)

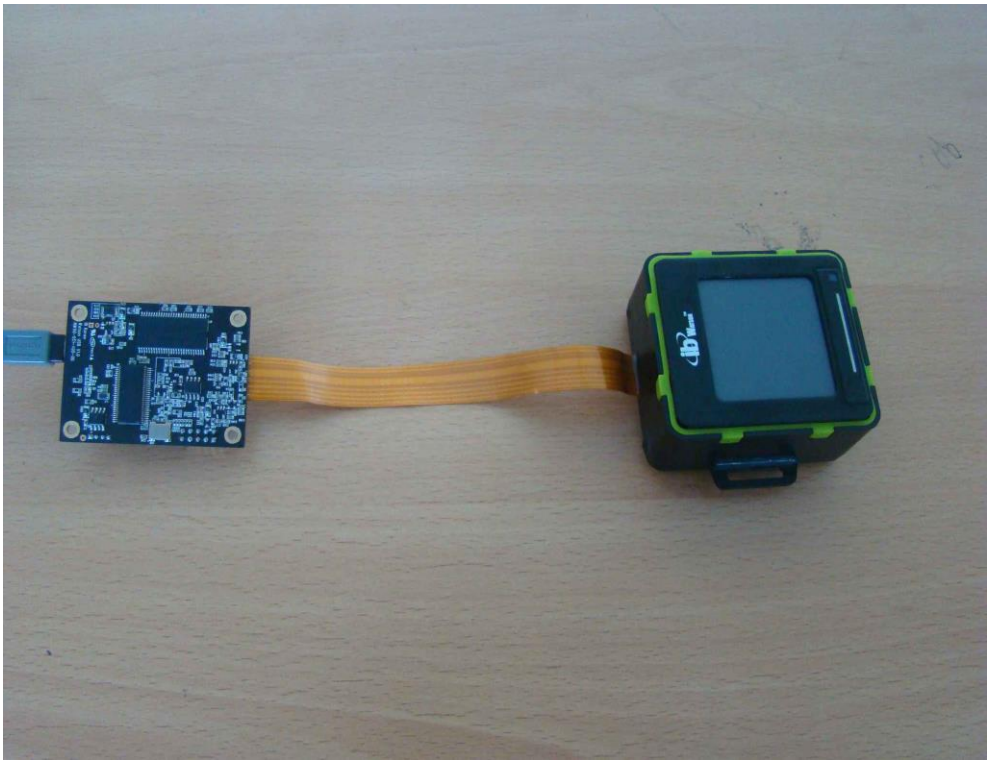
Version 1.1

Revision History

Revision No.	Issue Date	Comments
1.0	2012.2	1.0 Version Preliminary
1.1	2014.3	Reformatted

Contents

1. Outline



- Watson is a USB fingerprint scanner. It has a SW110 with our LE sensor technology and it can communicate with PC using USB.
- Watson can capture single flat fingerprint, single rolled fingerprint, and two flat fingerprints.
- We get the FBI certification (IAFIS IQS Appendix F)
- Watson can get wet and dry fingerprint without deterioration in fingerprint image quality.
- Watson is made by design of vibration-isolation and waterproofing so it can provide user friendliness and portability.
- It can add biometrics technology to security system which is based on password to improve security level. Also, it works with a SDK to do all processes such as fingerprint registration and identification and it provides reliability and high speed thanks to high performance fingerprint capturing algorithms that has outstanding image processing ability.
- USB scanner is compatible with Windows 2000/XP/Vista/Windows 7, Linux.

2. Component

2.1. Components lists

WATSON

USB Board (NW11O)

Sensor Board (SW11O)

FPC Cable

USB Cable

3. Features

3.1. Hardware Features

- **It can get a fingerprint image with high speed thanks to internal FPGA**
- **Design of vibration-isolation and waterproofing (IP67)**
- **The verification of competiablity and interoperability using USB I/F certification**
  - It can get and transfer a fingerprint image most effectively using USB 2.0 interface.
  - It supports USB 2.0/1.1 Plug and play.
- **It has touch sensor and LED for user friendliness.**

3.2. Software Features

- **It can capture single flat fingerprint, single rolled fingerprint, and two flat fingerprints.**
- **High security level**
  - It can distinguish between real and fake fingerprint.
  - U.S patented Contact Light Emitting Sensor
- **High image quality**
  - We get the FBI Appendix F Mobile ID IQS SAP45 certification.
- **Automatic fingerprint capturing**
- **Provide SDK**
  - We provide a SDK for developing Windows & Linux program (Visual Basic, Visual C++, .Net).

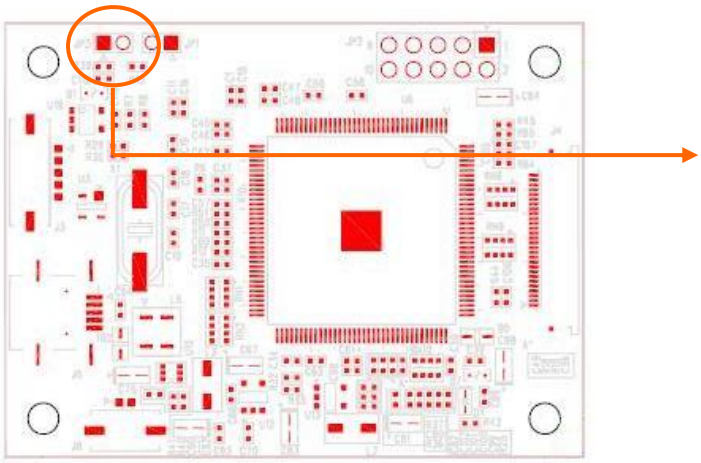
4. Applications

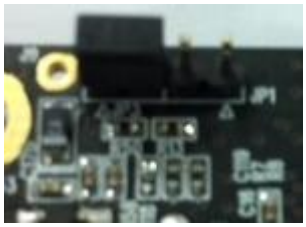
- Immigration system
- Electronic ID
- Electronic passport

5. Hardware Overview

5.1. Operational Modes

5.3.1 General (Desktop windows / Linux) mode



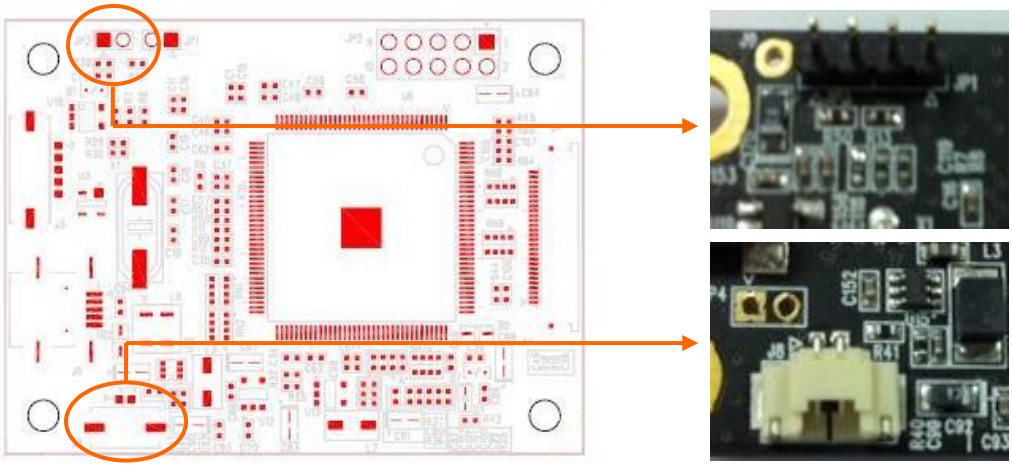


Pin Number	Description
JP3	Operational mode header pin Set this jumper to the JP3 pin to use the general mode.

The way to use the general mode is like shown below.

1. Please check if a jumper is set to the JP3 header pin.
2. Please connect a USB cable to J3 or J5 USB Connector.
3. Running an IBScan_Implementation program.

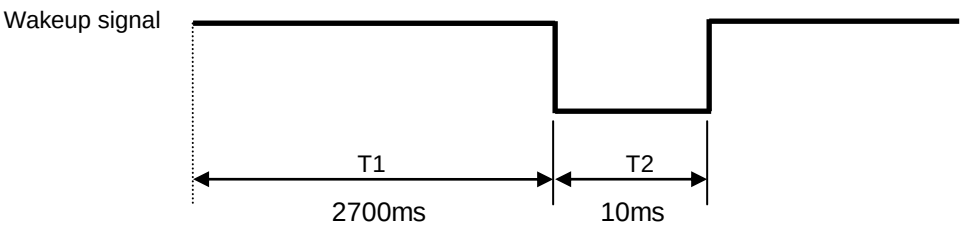
5.3.2 Embedded (Only support gumstix) mode



Pin Number	Description
JP3	Operational mode header pin Remove this jumper from JP3 pin.
J8	Wake up connector Please input the wakeup signal to J8 connector to get out of the idle state.

The way to use an embedded mode like shown below

1. Please check if a jumper is opened at JP3 header pin.
2. Please connect a USB cable to J3 or J5 USB connector.
3. Please input the wakeup signal to J8 connector during 300ms.



Parameter	Symbol	Description	Min.	Typ.	Max.	Unit
Wakeup signal	T1	USB Driver connection	-	2500	3000	ms
	T2	Wakeup activation	-	10	20	

4. Running an IBScan_Implementation program.

6. USB Specification

6.1. Supported OS Driver

Section	Spec.	Remarks
Windows	2000	
	XP	
	VISTA	
	7	
Linux	Kernel 2.6	

6.2. Recommended specification for PC

Section	Spec.	Remarks
CPU	Pentium4 - 2.0GHz or higher	
Memory	512 RAM or higher	
USB	USB 2.0	

6.3. Minimum specification for PC

Section	Spec.	Remarks
CPU	Pentium4 - 1.0GHz or higher	
Memory	256RAM or higher	
USB	USB 1.1	

7. Specification

7.1. Hardware Specification

Section		Spec.	Remarks
NW11O (USB Board)	Interface	USB 1.1/2.0 High speed/Full speed, Plug & Play	
	Frames	15 FPS	
	Power	USB Level 4.40V ~ 5.25V	
	Static Discharge	IEC61000-4-2 Air Discharge : ±15kV Contact Discharge : ±8kV	
SW11O (Sensor)	Sensor Type	Light Emitting Sensor (LES)	
	Resolution	500DPI	
	Capture area	40mm(W) x 38mm(H), 1.6”(W) x 1.5”(H)	
	Image Size	800(W) x 750(H) pixels	
Product Weight		Less than 200 grams	

7.2. Software Specification

Section	Spec.	Remarks
FBI Certifications	Appendix F Mobile ID IQS SAP45	
API Interface	Capture Two finger	
	Capture roll image	
	BIOAPI 2.0	
Supported Operating System	Windows 2000, XP, Windows 7, Vista, Linux	

7.3. Environmental

Section	Spec.	Remarks
Operating Temperature	-10℃ ~ 55℃	
Humidity	20 ~ 95 %RH < 40℃ Non-condensing	
Hazardous Material	RoHS Compliant	
Storage Temperature	-30℃ ~ 80℃	
Enclosure	IP67 Compliant	

7.4. Electrical DC Characteristics (VDD = 5Vdc, Top = 25℃)

Section		Min.	Typ.	Max.	Unit
Power Supply Voltage		4.5		5.5	V
Idle State Current	Embedded	-	1.5	2	㎃
	General		36	40	㎃
Touch On Current			50	60	㎃
Capture State Current		-	270	300	㎃

7.5. Connector Specification

Section	Spec.
JP3	Firmware mode 2pins header (2.54mm Pitch) Open: Embedded (Only support Gumstix) mode Close : General (Desktop windows / Linux) mode
J3	USB Interface connector
J5	
J8	Wakeup connector
JP4	
J4	Sensor Interface connector FPC cable (0.5mm Pitch, 28pins, 120mm)

7.6. JP3 Pin Description

Pin No.	Type	Description
1	P	+3.3Vdc
2	I	Mode Input Signal

7.7. J3 Pin Description

Pin No.	Type	Description
1	P	+5Vdc
2	I/O	D+
3	I/O	D-

4	G	GND
5	G	Shield GND

7.8. J5 Pin Description

Pin No.	Type	Description
1	P	+5Vdc
2	I/O	D-
3	I/O	D+
4	N	No Connection
5	G	GND
6	G	Shield GND

7.9. J8 Pin Description

Pin No.	Type	Description
1	I	Wakeup Input Signal
2	G	GND

7.10. JP4 Pin Description

Pin No.	Type	Description
1	G	GND
2	I	Wakeup Input Signal

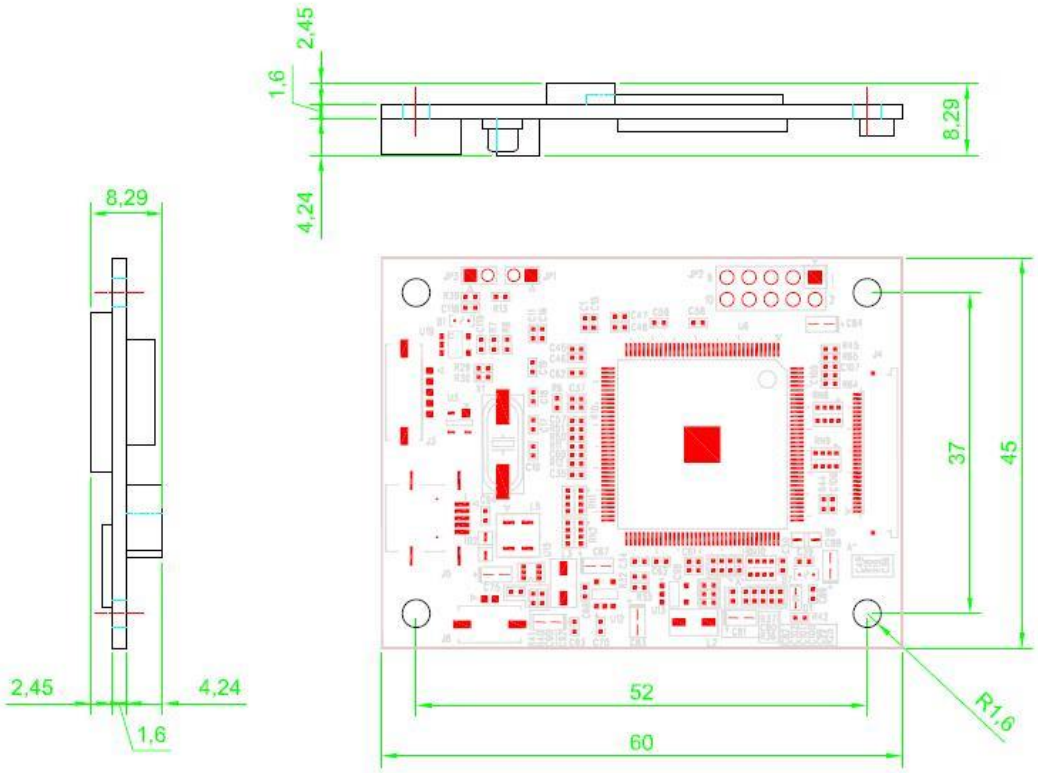
7.11. J4 Pin Description

Pin No.	Type	Description
1	G	GND
2	I	Pixel clock
3	G	GND
4	I	Frame valid
5	I	Line valid output
6	G	GND
7	I	Image Input data Bit 7
8	I	Image Input data Bit 6
9	I	Image Input data Bit 5
10	I	Image Input data Bit 4
11	G	GND
12	I	Image Input data Bit 3
13	I	Image Input data Bit 2
14	I	Image Input data Bit 1
15	I	Image Input data Bit 0
16	G	GND
17	O	CIS Reset Signal
18	N	No Connection
19	O	LED
20	G	GND
21	P	Touch Power. 3.3Vdc
22	O	Touch Input Signal
23	G	GND
24	I/O	I2C Serial Data
25	O	I2C Serial Clock
26	G	GND
27	P	LE Power.
28	P	CIS Power. 5Vdc

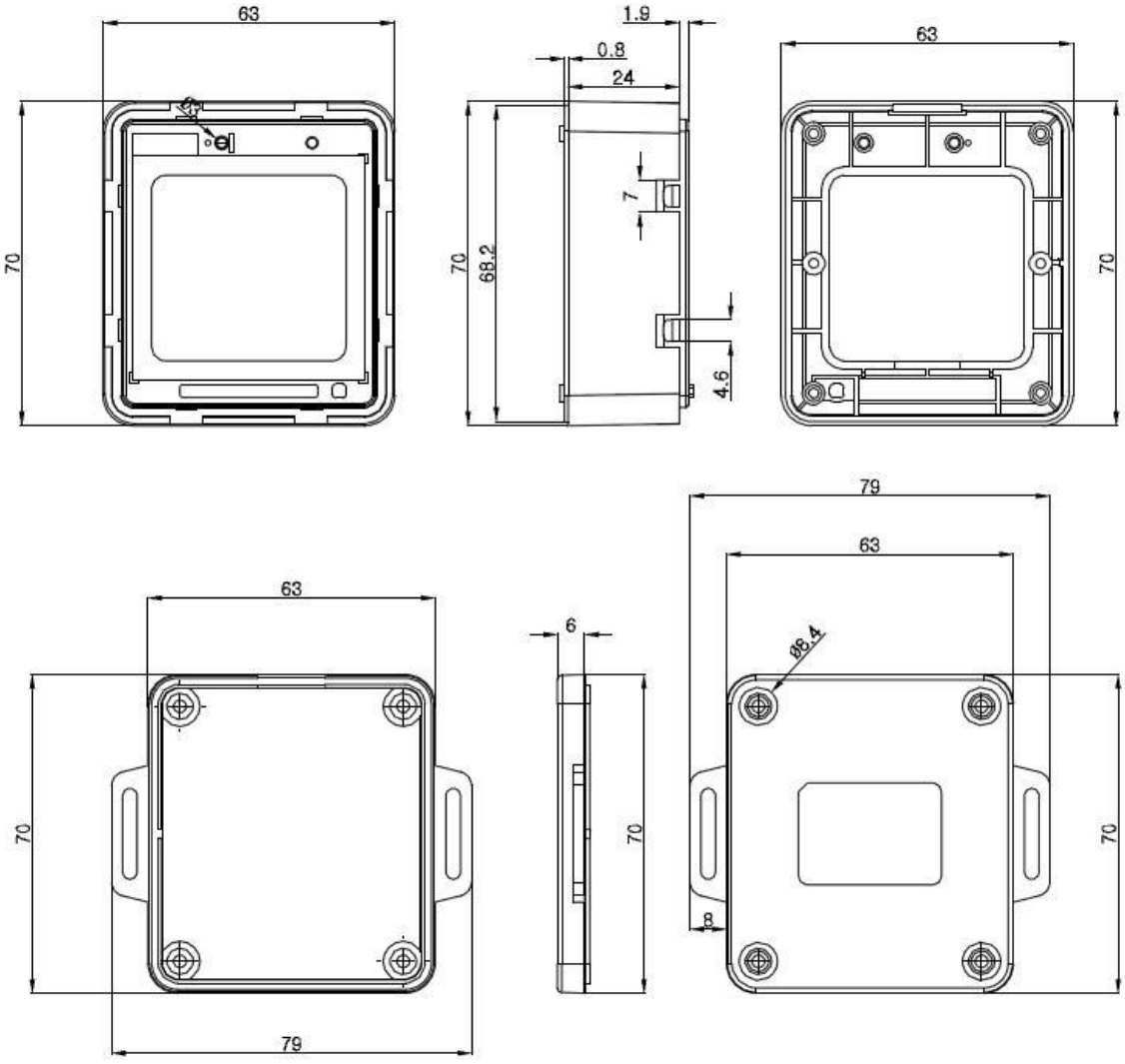
8. Dimension

Board Name		Size	Remarks
NW11O (USB Board)		60(W) x 45(L) x8.29mm(H)	
SW11O (Sensor)		79mm(W) x 70mm(L) x 33mm(H)	
FPC Cable		120mm ± 1mm	
USB Cable	J3 Pin	1000 ± 30mm	Made by IBK
	J5 Pin	1500 ± 30mm	Mini USB-B cable

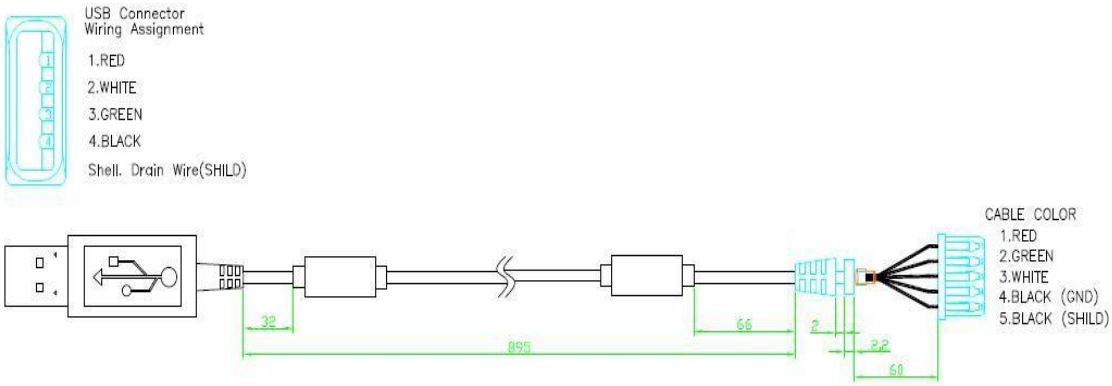
8.1. NW11O specification



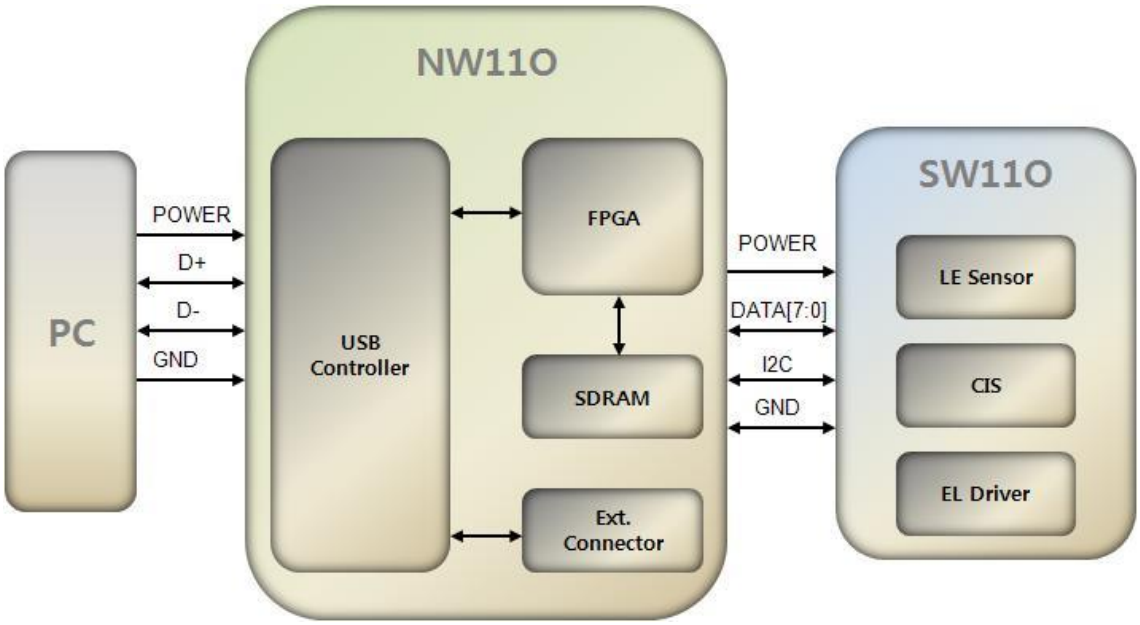
8.2. SW11O specification



8.3. USB Cable specification (J3 Pin)



9. Diagram



10. FAQ

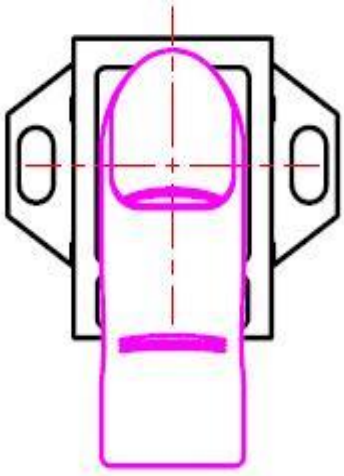
▪ **Product is not working at all.**

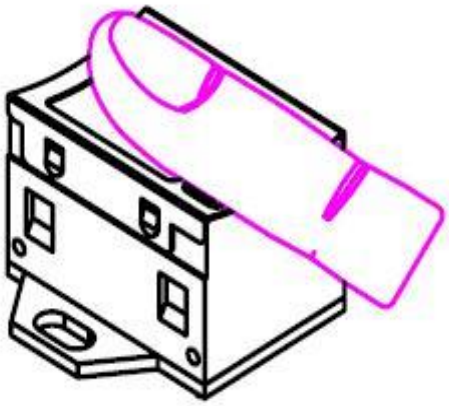
- Install driver again and connect USB Scanner to PC and Check ‘Device Manager’ if the driver is properly installed.
- If there is no driver shown in ‘Device Manager’ even though you installed the driver, connect USB Scanner to other USB port and check the driver in ‘Device Manager’. If you cannot see the driver installed in ‘Device Manager’ after that, please contact with our customer service.

▪ **Driver shown in ‘Device Manager’ but cannot see fingerprint image.**

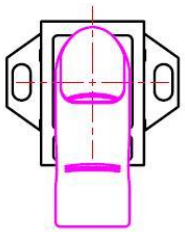
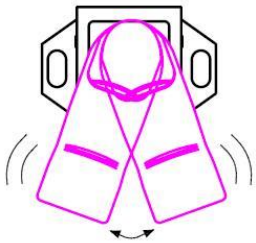
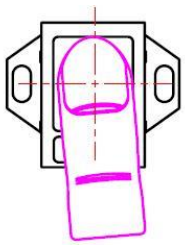
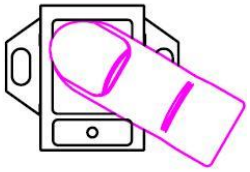
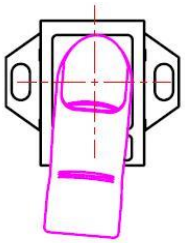
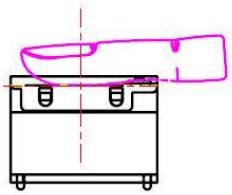
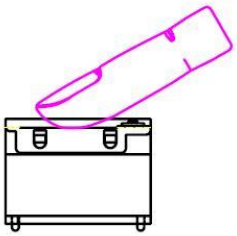
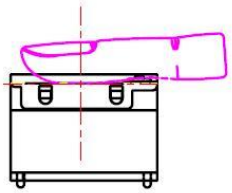
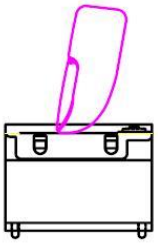
- Check the image after placing the finger on the right position like below and your finger must be touched the metal frame. Please refer to FAQ below for fingerprint placing method.
- Please contact with our customer service if you cannot see the fingerprint image even though you place a finger on the right place.

▪ **Correct fingerprint placement**





- Place the finger on the sensor like above figures.
- Place the finger softly and do not press too strong.

Section	Correct	Incorrect
Raked finger		
Rotated finger (±30°)		
		
Finger Contact		
		

- **Wet fingerprint by water or sweat can be identified?**

- If a finger is a little wet by water or sweat, the fingerprint patterns can be distorted, but if you use our company's algorithm, those distortions can be recovered.
- But if a finger is too wet, it can cause capture error, and so if a finger is very wet, wiping the sweat off is recommended for easy identification.

- **What kind of OS are supported?**

- Windows 7/2000/XP/Vista, Linux are available.

- **Can I use long USB cable extender?**

- If the USB is not connected to HUB, theoridically shorter than 5m will be available. So even though you use cable extender, do not use longer than 5m cable.

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