Hardware Development Manual

Columbo

Fingerprint Scanner (SAP30)

Version 1.5

Revision History

Revision No.	Issue Date	Comments
1.0	2013.12	1.0 Version Preliminary
1.1	2014.3	Reformatted

Contents

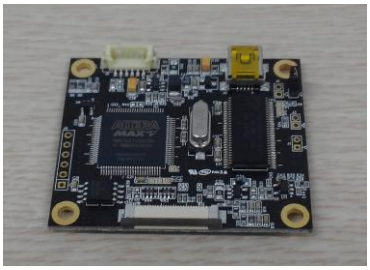
1. Outline

Figure 1.

- Columbo is a USB fingerprint scanner. It has two components namely, Columbo Sensor and integrated Biometric's patented LE sensor technology. Columbo supports communication with the PC using USB.
- Columbo is FBI certified. (Mobile ID IQS FAP30)
- Columbo can capture wet and dry fingerprints without deterioration in fingerprint image quality.
- Columbo is designed to be dust and water proof so that it is easy to use and allows portability.
- It can be used to add biometrics technology to the existing security systems, based on password, to improve security level. Also, it works with a SDK to do all processes such as fingerprint registration, 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 XP/Vista/Windows 7, Linux, Android 4.0.

1.1. Components lists

Table 1.

COLUMBO 	**Columbo USB Board(NC110)**  **Columbo Sensor(SC110)**  **FPC Cable**  **USB Cable(IBK Cable)** 

2. Features

2.1. Hardware Features

- **It can capture a fingerprint image with high speed thanks to internal CPLD**
- **Designed to be dust proof and water proof (minimum IP65)**
- **The verification of compatibility and interoperability using USB I/F certification**
  - It can capture and transfer a fingerprint image most effectively using USB 2.0 interface.
  - It supports USB 2.0 Plug and play.
- **It has touch sensor for user friendliness.**

2.2. Software Features

- **High security level**
  - It can distinguish between real and fake fingerprint.
  - U.S patented Contact Light Emitting Sensor.
- **High image quality**
  - It is PIV, Mobile ID IQS SAP45 certified.
- **Automatic fingerprint capturing**
- **SDK**
  - The SDK provided supports development of programs in Windows, Android & Linux (Visual Basic, Visual C++, .NET, Android API)

3. Applications

- Immigration system
- Electronic ID
- Electronic passport

4. Hardware Overview

4.1. Operational Modes

4.1.1 General(Desktop windows/Linux)mode

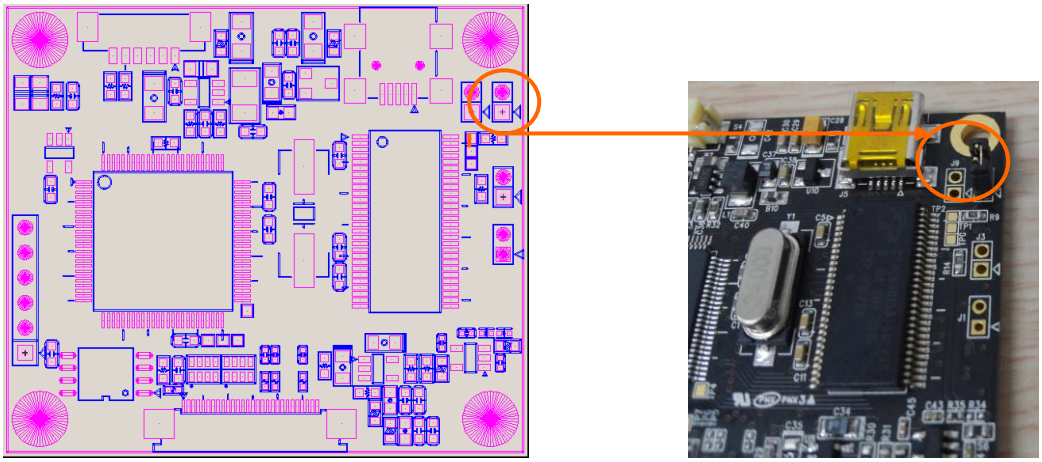


Figure 2.

Table 2.

Pin Number	Description
J7	Operational mode header pin Set jumper to the J7 Pin to use the general mode.

The setup for general mode is shown below.

1. Please check if the jumper is set to J7 header pin.
2. Please connect a USB cable to J6 USB connector.
3. Run the IBScan_Implementation program.

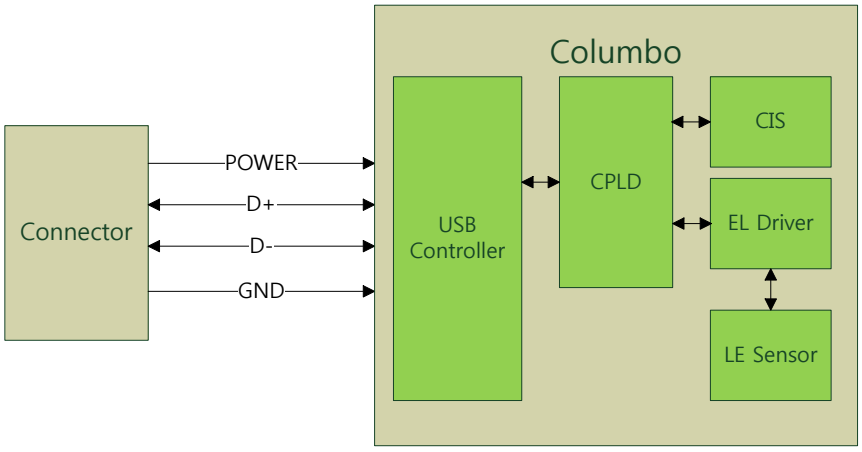


Figure 3.

4.1.2 Embedded (Only support gumstix) mode

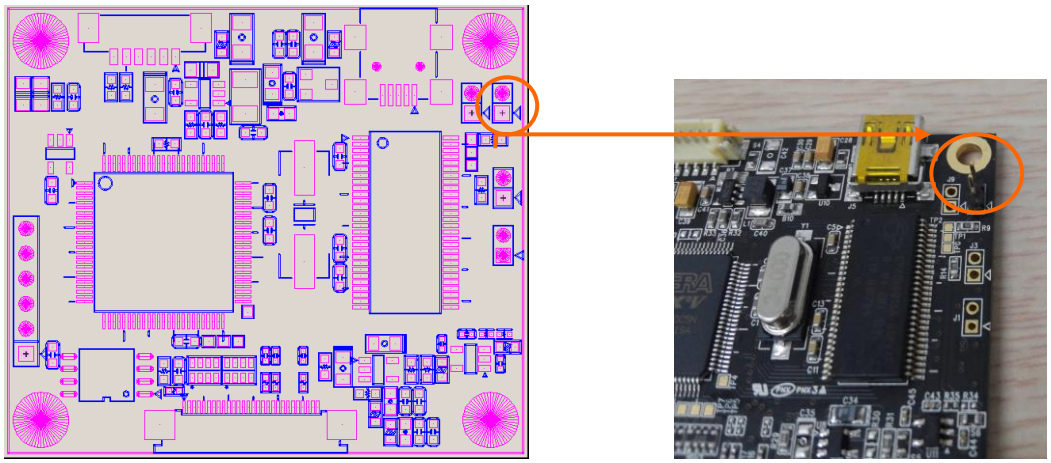


Figure 4.

Table 3.

Pin Number	Description
J7	Operational mode header pin Remove this jumper from the J7 pin to use the embedded mode.

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

1. Please check if the jumper is removed from J7 header pin.
2. Please connect a USB cable to J5 or J6 USB connector.
3. Please input the wakeup signal to pin 5 in J6 as shown in the figure below during 10ms.
4. Run the IBScan_Implementation program.

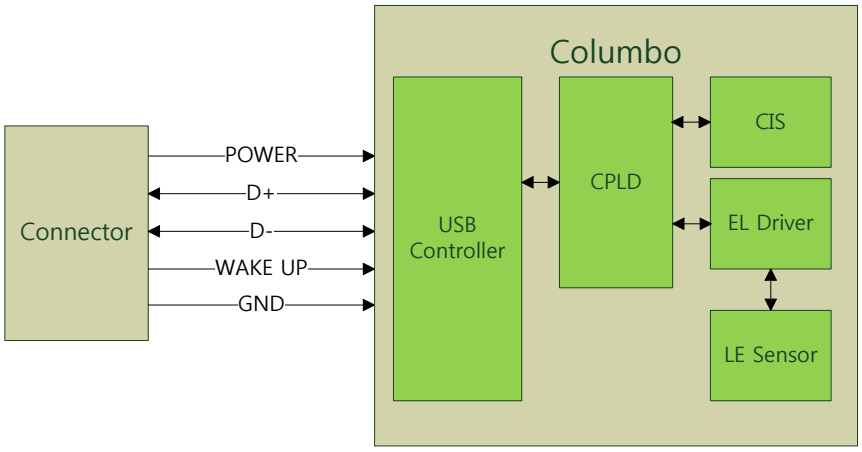


Figure 5.

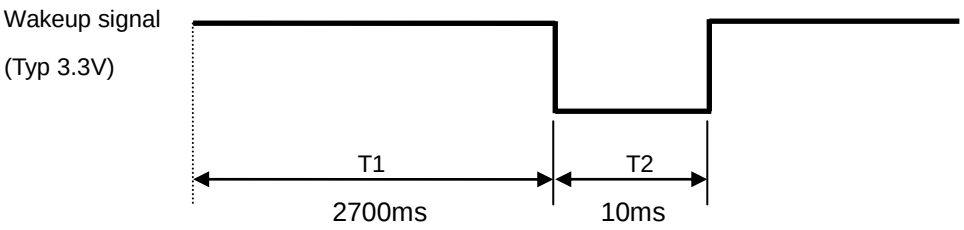


Figure 6.

Table 4.

Parameter	Symbol	Description	Min.	Typ.	Max.	Unit
Wakeup signal	T1	USB Driver connection	-	2500	3000	ms
(Typ 3.3V)	T2	Wake up activation	-	10	20	

5. USB Specification

5.1. Supported OS Driver

Table 5

Section	Spec.	Remarks
Windows	XP	
	VISTA	
	7	
Linux	Kernel 2.6	
Android	4.0	

5.2. Recommended specification for PC

Table 6

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

5.3. Minimum specification for PC

Table 7

Section	Spec.	Remarks
CPU	Pentium4 - 1.0GHz or higher	
Memory	256RAM or higher	
USB	USB 2.0	

6. Specification

6.1. Hardware Specification

Table 8

Section		Spec.	Remarks
NW11O (USB Board)	Interface	USB 2.0 High speed Plug & Play	
	Frames	8 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	25.4mm(W) x 20.3mm(H), 1”(W) x 0.8”(H)	
	Image Size	500(W) x 400(H) pixels	
Product Weight		Less than 70 grams	
Safety		UL/CE	Not Fixed
		IEC60950	Not Fixed

6.2. Software Specification

Table 9

Section	Spec.	Remarks
FBI Certifications	PIV	
	Mobile ID IQS FAP30	
Supported Operating System	Windows XP, Windows 7, Vista, Linux, Android	

6.3. Environmental

Table 10

Section	Spec.	Remarks
Operating Temperature	-10℃ ~ 55℃	Not Fixed
Humidity	20 ~ 95 %RH < 40℃ Non-condensing	Not Fixed
Hazardous Material	RoHS Compliant	Not Fixed
Storage Temperature	-30℃ ~ 80℃	Not Fixed
Enclosure	Minimum IP65 Compliant	Not Fixed

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

Table 11

Section	Min.	Typ.	Max.	Units
Power Supply Voltage (VBUS)	4.5		5.5	V
Full Scanning	-	-	130	㎃
Scanner in Sleep Mode	-	-	2	㎃
USB only (Driver connection)			40	㎃
On/Off VIH (LVTTL)	2			V
On/Off VIL (LVTTL)		0.8		V
On/Off MAX (LVTTL)			3.6	V
D+ and D-	USB			

6.5. Connector Specification

Table 12

Section	Spec.
J7	Firmware mode 2pins header (2.00mm Pitch) Open : Embedded (Only support Gumstix) mode Close : General (Desktop windows / Linux) mode
J5	USB Interface connector
J6	
J8	Sensor Interface connector FPC cable (0.5mm Pitch, 28pins, 120mm)

6.6. J7 Pin Description

Table 13

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

6.7. J5 Pin Description

Table 14

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

6.8. J6 Pin Description

Table 15

Pin No.	Type	Description
1	P	+5Vdc
2	I/O	D+
3	I/O	D-
4	G	GND
5	N/I	General : No connection, Embedded : Waku up(3.3V)
6	G	Shield GND

6.9. J8 Pin Description

Table 16

Pin No.	Type	Description
1	G	GND
2	O	Master Clock
3	G	GND
4	I/O	I2C serial data
5	O	I2C serial clock
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	I	CIS Vsync clock
19	I	CIS Hsync clock
20	G	GND
21	O	Reserve
22	I	Reserve
23	G	GND
24	O	LE Enable
25	I	CIS Pixel clock
26	G	GND
27	P	LE Power.
28	P	CIS Power. 3.3Vdc

7. Dimension

Table 17

Board Name		Size	Remarks
Columbo USB Board		52(W) x 45(L) x8.29mm(H)	
Columbo Sensor		53.1mm(W) x 46.5mm(L) x 27.2mm(H)	
FPC Cable		120mm ± 1mm	
USB Cable	J6Pin	1000 ± 30mm	IBK cable
	J5 Pin	1500 ± 30mm	Mini USB-B cable

7.1. USB Board dimension(NC110)

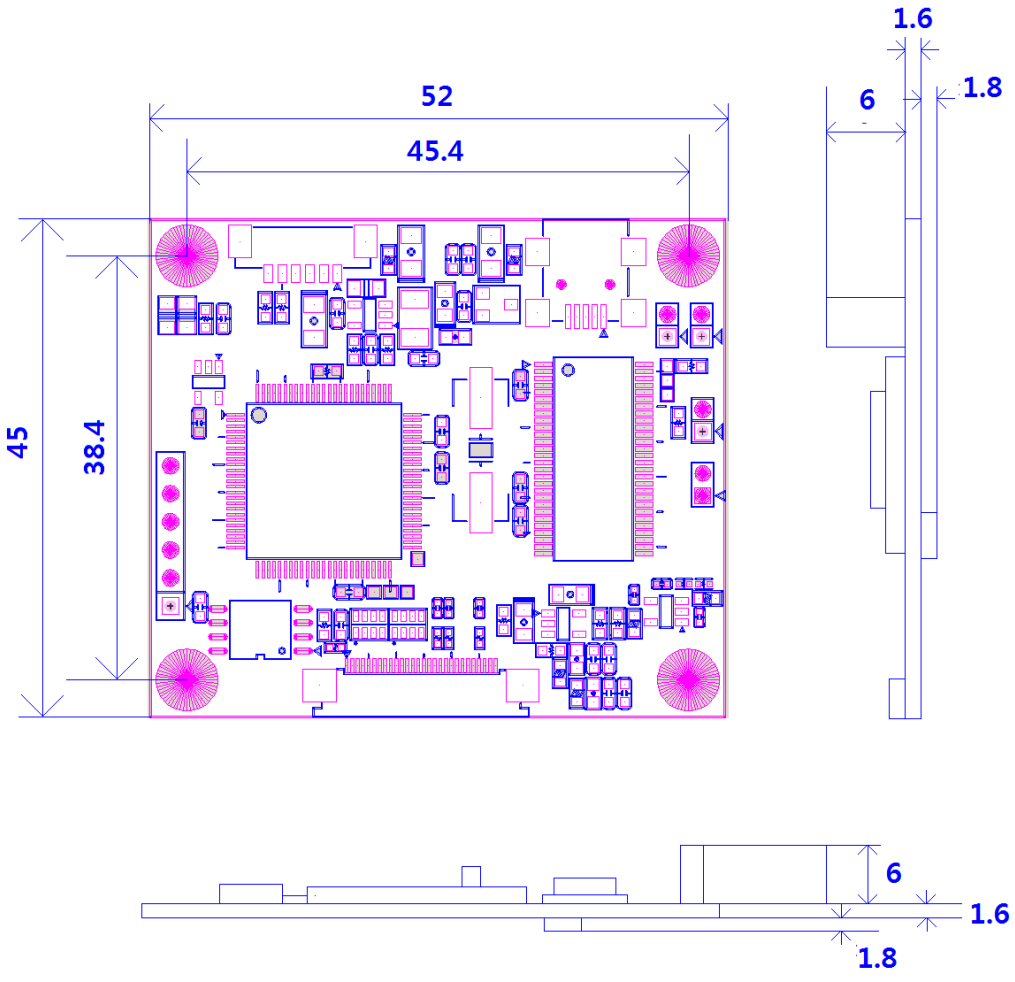


Figure 7.

7.2. Sensor dimension(SC110)

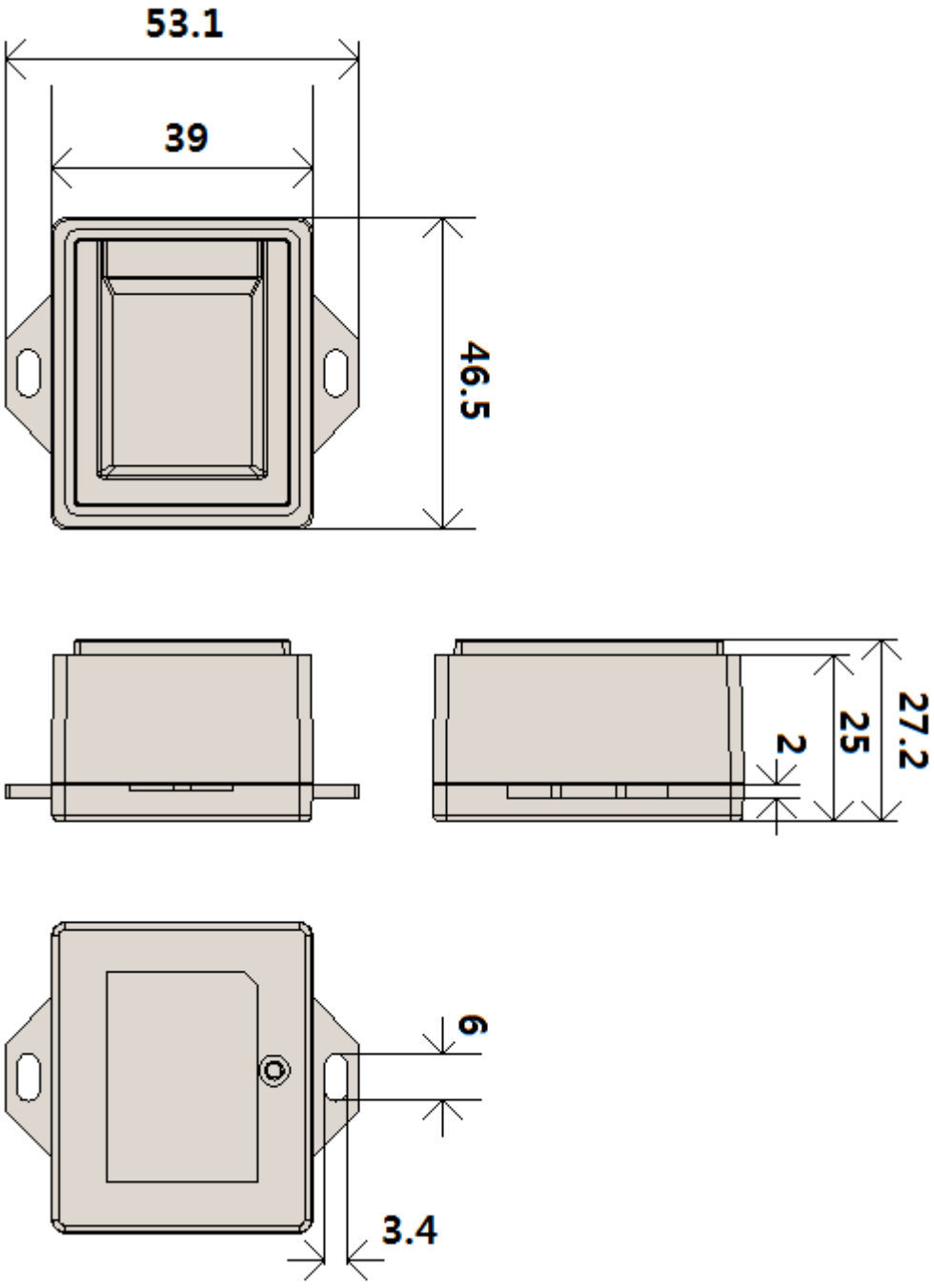


Figure 8.

7.3. USB Cable specification (J6 Pin)

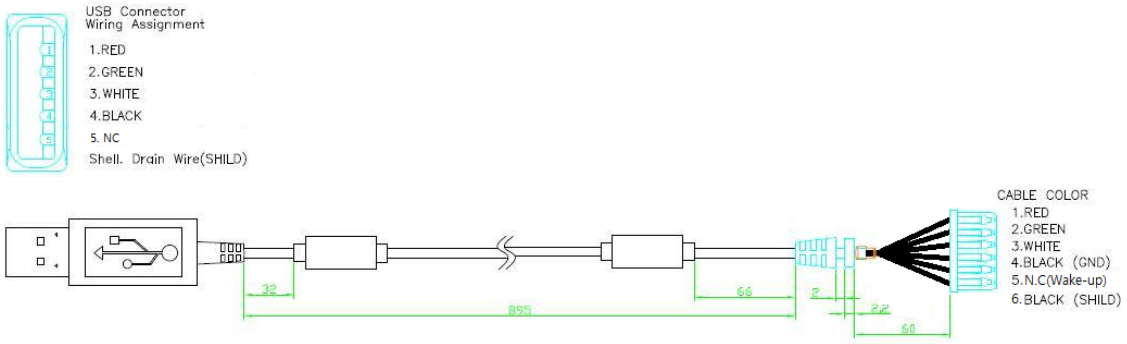


Figure 9.

8. Diagram

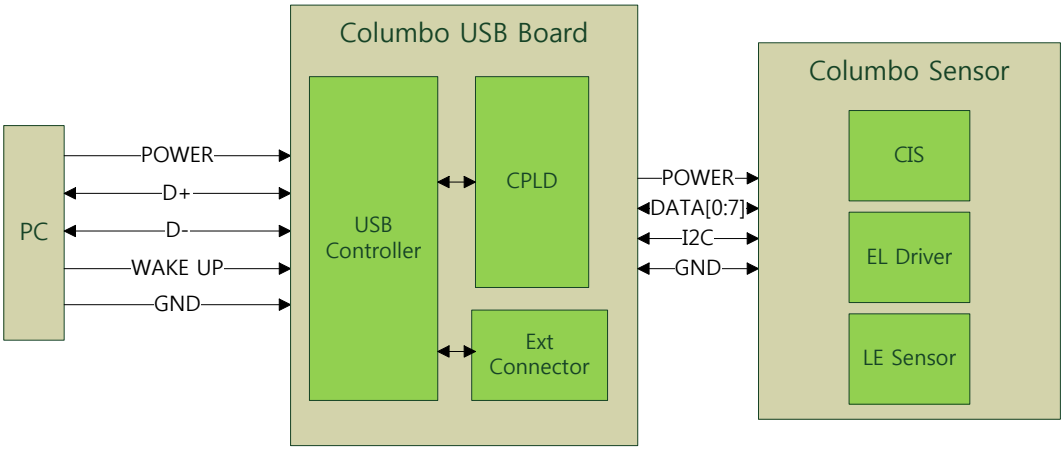


Figure 10.

9. Frequently Asked Questions

▪ Product is not working at all

- Install driver again and connect the USB Scanner to PC and Check ‘Device Manager’, if the driver has installed correctly
- If the driver is not listed under ‘Device Manager’ even though you installed the driver, then connect the USB Scanner to other USB port and check for the driver in ‘Device Manager’. If you still don’t see the driver listed under ‘Device Manager’, please contact our customer service

▪ Driver has been installed and listed in ‘Device Manager’ but, the fingerprint image is not seen during capture

- Check for the image after placing the finger correctly on the sensor and the metal frame. The finger must be in contact with both the sensor capture area and the metal frame as shown in Figure 11. Please refer to Table 18 for correct finger positioning on the sensor
- Please contact our customer service, if you cannot see the fingerprint image even though the finger is placed correctly

▪ Correct fingerprint placement

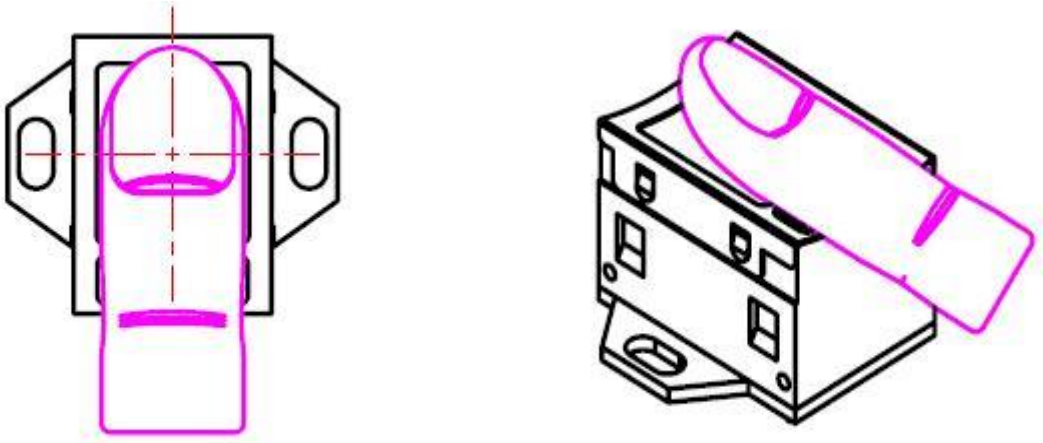
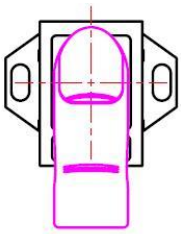
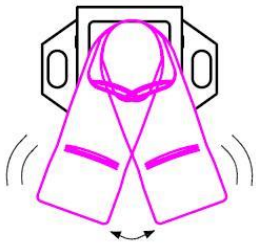
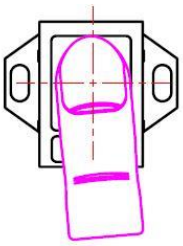
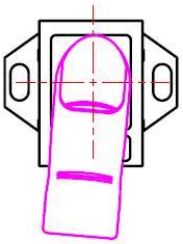
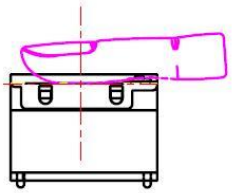
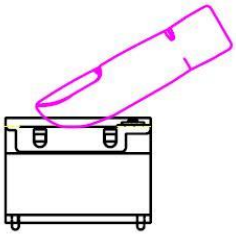
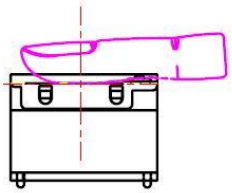
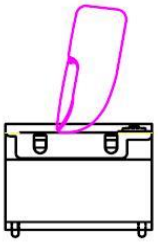


Figure 11: Illustration for correct placement of the finger on the scanner

- Place the finger on the sensor as shown in Figure 11
- Place the finger softly on the sensor and do not apply too much pressure

Table 18 Illustration of Finger positioning on the scanner

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

▪ **Can wet and greasy finger be identified?**

- Wet and greasy fingers can distort fingerprint patterns a little bit but, IBK algorithm can recover this distortion
- However, if a finger is too wet or too dirty, it interferes with finger capture so please wipe the sweat and oil using dry cloth

▪ **Which operating systems are supported?**

- Windows XP/Vista/7 and Linux are supported

▪ **Can USB cable extender be used in the Desktop mode?**

- Yes, but the entire lenght of the USB cable after extension shall not be longer than 5m

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