User Manual

AMT-PVM-10

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Doc Version: 1.2

English

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About the Company

ARMATURA is a leading global developer and supplier of biometric solutions which incorporate the latest technologies on biometric hardware design, algorithm research and software development. ARMATURA holds numerous patents in the field of biometric recognition technologies. Its products are primarily used in business applications which require high-secured, high-accurate and fast matching and identification processes.

ARMATURA biometric hardware and software are built into the product of world top workforce management (WFM) solution providers, Point-of-Sale (PoS) terminals vendors, intercoms, electronic safes, metal key lockers, dangerous machinery, and many other product vendors which heavily rely on accurate, secured and fast user identification features.

About the Manual

This manual introduces the operations of AMT-FAM-10, a dual-lens near-infrared light and visible light face module.

All figures displayed in this manual are for illustration purposes only which may not be exactly consistent with the actual product.

Document Conventions

Conventions used in this manual are listed below:

GUI Conventions

For Software	
Convention	Description
Bold font	Used to identify software interface names e.g. **OK**, **Confirm**, **Cancel.**
>	Multi-level menus are separated by these brackets. For example, File > Create > Folder.
For Device	
Convention	Description
< >	Button or key names for devices. For example, press <OK>.
[ ]	Window names, menu items, data table, and field names are inside square brackets. For example, pop up the [New User] window.
/	Multi-level menus are separated by forwarding slashes. For example, [File/Create/Folder].

Symbols

Convention	Description
	This represents a note that needs to pay more attention to.
	The general information which helps in performing the operations faster.
	The information which is significant.
	Care taken to avoid danger or mistakes.
	The statement or event that warns of something or that serves as a cautionary example.

Table of Contents

1 Product Introduction

1.1 Overview

AMT-PVM-10 is a single-lens near infrared light camera module that supports to capture the palm print and palm vein grayscale images for recognition process. The module is configured with near-infrared LED lights, wide dynamic image sensor, and aspherical distortion-free camera lens. The module's built-in high-performance, low-power-consumption processor is up to 400MHz. Single USB cable is utilized to provide low-voltage power supply and rich communication interfaces, making it easy to integrate with 3rd party host device.

AMT-PVM-10 captures the surface-area palm prints and subcutaneous palm veins in a single image. The associated PalmLite SDK takes the approach of the surface-area palm print patterns such as palm lines and ridges, as well as subcutaneous palm vein patterns, to identify individual user.

The near-infrared (NIR) light has the feature to penetrate the skin and present subcutaneous vascular patterns in grayscale image when active fresh blood flows over the vessel system. As a result it provides high-secured anti-spoofing protection benefit, in addition, the palm veins are not exposed to public and requires special device to collect, it has less privacy concerns compared to face recognition approach.

The combination of palm print and palm vein patterns together provide an unreplicable, robust, and unique biometric features of for individual identification and verification.

The software development kits AMT PalmLite SDK allows easy and agile integration of palm recognition functions to 3rd party applications. The palm module and the SDK together provide an affordable biometric solution to SMB customers. The solution is widely applied to workforce management, access control and security, single sign-on, identity management areas and more...

1.2 Features

- Supports Near-Infrared Palm Vein acquisition.
- Provides hygienic, non-invasive and stress-free usage in public with 100% contactless experience.
- Easy and agile integration with compact and light-weight size and USB 2.0 interface.
- Saves the power and extends module lifespan with built-in distance detection sensor.
- Adaptable to various lighting conditions with wide dynamic image sensor.
- High process speed up to 25 frames per second with built-in high-performance processor.
- Supports wide palm recognition range from 15 cm ~ 35 cm or 6 inches ~ 14 inches.
- Supports high-quality palm vein image from wet or dry hand.
- The PalmLite SDK supports common operating systems including Windows, Android and Linux.

- Low power consumption less than 2.0 Watts.

2 Product Specifications

2.1 Technical Specifications

Features	Technical Specifications
Processor	Low-power-consumption processor, 400MHz
Image Sensor	1/2.7", HDR CMOS, Near-infrared light
Connector	7-pin 1.25mm USB 2.0
Communication Interface	USB 2.0 (High speed)
Power Requirements	USB 5V
Power Consumption	0.5W (Standby) / 1.5W (Operating)
Lighting Environment	Enrollment <800 Lux; Matching <2000 Lux
Humidity	0 to 90% RH
Dimensions	52.4 * 52.4 * 16.8mm (±1 mm)
Certifications	CE, FCC, RoHS

2.2 Electrical Features

Specifications	Test Conditions	Min	Standard	Max
Operating Voltage	-	4.75V	5.0V	5.25V
Operating Current	T = 25℃/77°F, VCC = 5.0 V	-	350mA	400mA
Operating Power Consumption	T = 25℃/77°F, VCC = 5.0 V	-	1.75W	2.0W
Standby Current	T = 25℃/77°F, VCC = 5.0 V	-	150mA	170mA
Standby Power Consumption	T = 25℃/77°F, VCC = 5.0 V	-	0.75W	0.85W
Operating Temperature	-	–10℃/14°F	-	55℃/131°F
Storage Temperature	-	–20℃/-4°F	-	80℃/176°F

2.3 Optical and Image Specifications

Features	Technical Specifications
Sensor Model	HDR CMOS Sensor
Sensor Size	1/2.7 inch
Sensor Type	Optical
Image Size (pixel)	480W x 640H
Grayscale	256 levels
Dynamic Range	83 dB

Max. Frame Rate	25 fps
Lens Type	IR
Optical Wavelength	840 - 860 nm
Field of View (FOV)	Diagonal = 58°, Horizontal = 37°, Vertical = 48°
Optical Distortion Rate	≤1%
Lens Composition	Composed of 4-Plastic Lens and an IR-Filter (4P+1IR)

2.4 Model Specifications

Features	Technical Specifications
SDK	AMT PalmLite SDK v12
Recognition Angle	Yaw≤20°, Pitch≤ 20°, Roll≤90°, Bend ≤ 15°
Recognition Method	1:1 and 1:N
Capacity	6,000 templates
Accuracy	TAR=98.2% when FAR=0.05%
Recognition Time	<300ms (Quad-core Cortex-A9 up to 1.6GHz)
Windows	Windows XP / Windows 7 / Windows10 (32/64bits)
Android	Android 4.1 or higher version

3 Algorithm Specifications

3.1 Palm Recognition Algorithm

Palm recognition technology captures near-infrared light reflections to form images of surface-area palm lines and subcutaneous palm veins pattern and utilizes convergence to identify or verify individual identity. The technology boosts powerful anti-spoofing protection, as only active refresh blood flowing over the vessels can present grayscale images.

AMT PalmLite SDK is a high-performance and high-accuracy near-infrared palm recognition algorithm developed for large-volume palm recognition and tolerant to palm postures in various lighting conditions. It makes the algorithm and SDK suitable to a variety of applicable environments with very friendly user-experience.

The proper palm postures for enrollment and matching are shown in Figure 3.1:

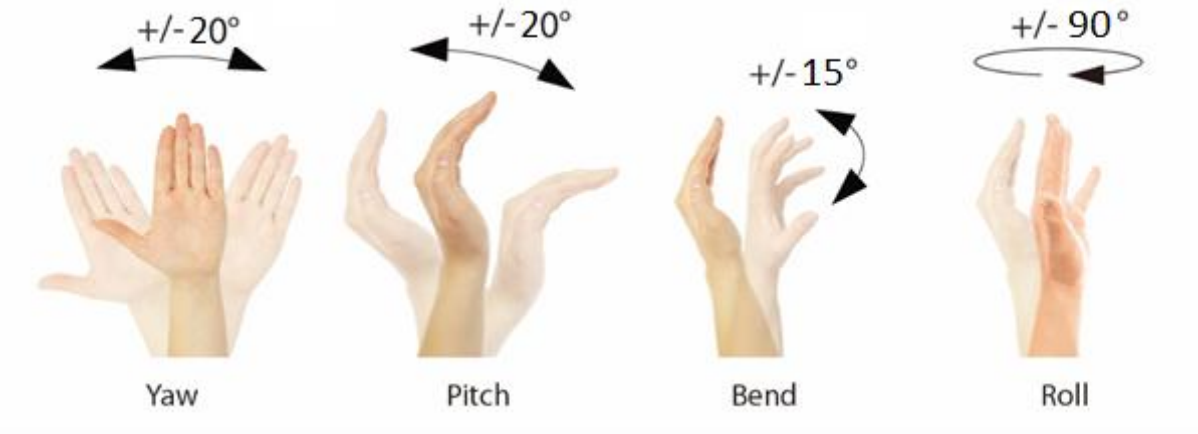


Figure 3.1 Definitions of palm postures

3.1.1 Palm Recognition Specifications

Algorithm Version	AMT PalmLite 12.0
Palm Detection Speed	< 50 ms
Biometric Template Extraction Speed	< 220 ms
Biometric Comparison Speed	< 150 ms
Palm Capacity	6,000
Posture Adaptability	Yaw ≤ 20°, Pitch ≤ 20°, Roll ≤ 90°, Bend ≤ 15°
Precision	TAR=98.2% when FAR=0.05%

3.1.2 Palm Registration Image Quality Requirements

The image for palm registration is in JPG or BMP format and the minimum resolution is 160 x 120 pixels. Please follow the following guidelines while registering the individual's palm:

- The palm should be separated from the background.
- The palm should be evenly illuminated to ensure good quality of the palm print and palm vein image.
- The whole palm (including the wrist) should be within the camera frame and the aspect ratio of the palm must not be distorted.
- Put the palm posture properly and keep the pitch, roll, yaw, and bend within 5 degrees.

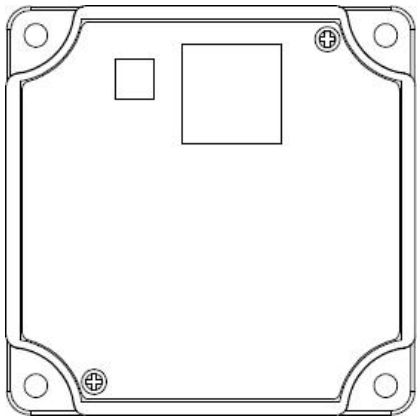
Figure 3.2 Example of a palm registration image

4 Application Scenarios

The AMT-PVM-10 module is is optimized on its physical structure for the purpose of the built-in design and integration, facilitating easy and fast integration into third-party hardware device. Kept the integration thought into design, the module can be built into a host device using a single USB cable which provides both the power supply and data communication, this approach simplifies the integration development work considerably.

With AMT PalmLite SDK, you only need to write a few lines of code to call the SDK interfaces to achieve palm recognition in your application. It speeds the development work and improves the productivity. The integration solution can be applied to various business applications such as time attendance, access control, entrance management, payment kiosks, intercom units, turnstiles, PCs, tablets, and more.

5 Structural Dimensions



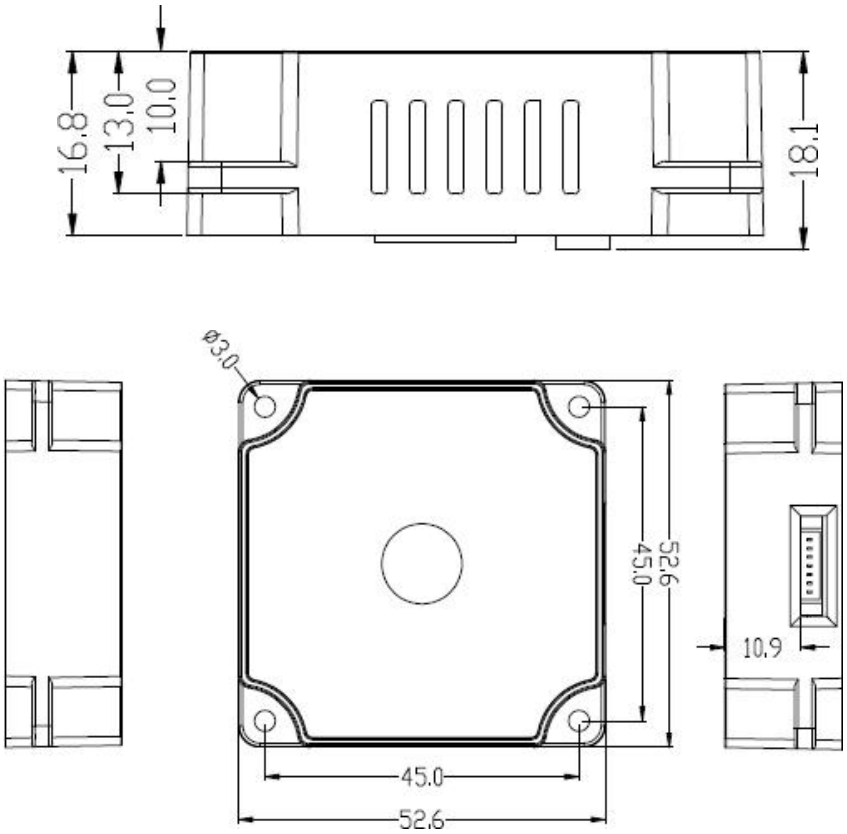


Figure 5.1 Structural dimensions (Unit: mm)

6 Pin Socket Definition

6.1 Pin Socket Position and Definition

The PIN Socket includes the USB communication and power supply pins, and the position and pin definition of the interface is shown in Figure 6.1.

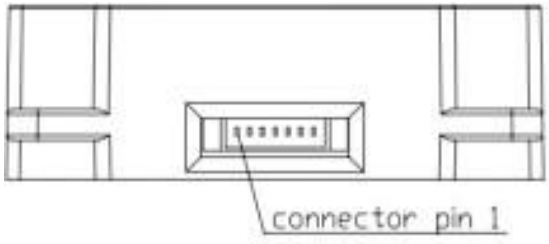


Figure 6.1 Connector Pin

Pin Description:

7pin (1.25mm)

PIN No.	1	2	3	4	5	6	7
Definition	+5V	GND	Shield GND	USB-	USB+	Reserved	Reserved

6.2 Pin Socket Dimensions

The structural dimensions of the 7-pin socket of the module are shown in Figure 6.2.

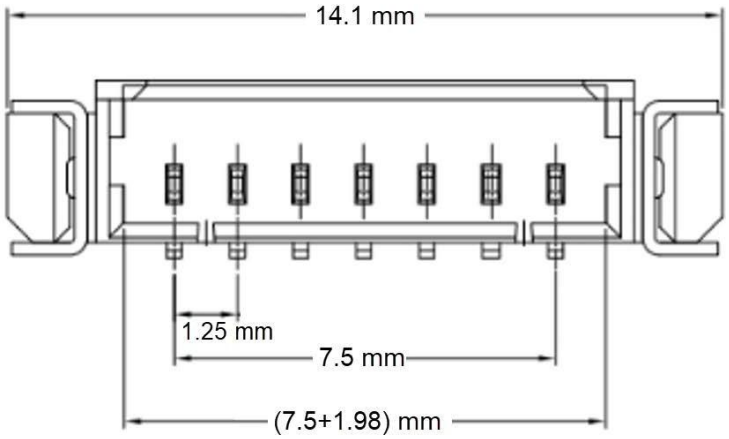


Figure 6.2 Dimensions of a 7-pin socket

7 USB Cable Requirements

7.1 USB Type-A cable

The total length of the USB cable is recommended to be 1.2 meters/4 feet or less. The wire needs to be shielded and the braiding number is 64 or more. The D+/D- data cable needs to be twisted and uses a 26AWG wire. The wire is on the side of the module with a magnetic ring. The reference design diagramis shown in the figure 7.1.

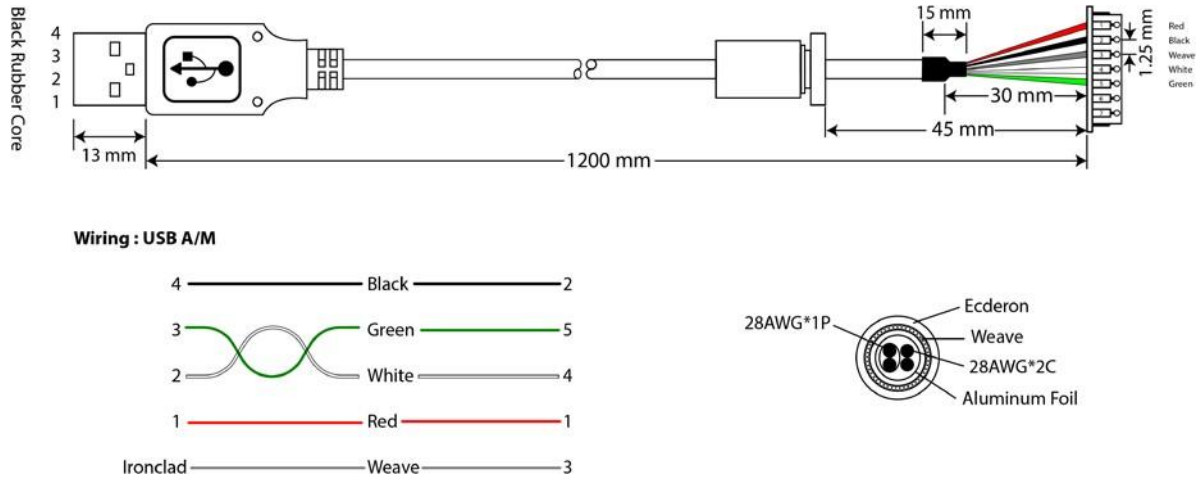


Figure 7.1 Cable Interface

7.2 Plug Wire

It is recommended that the USB signal cable D+/D- twisted-pair uses a 26AWG wire. The total length of thedouble-plug wire should be less than 15cm/6 inches or less. With a shielding layer, the number of weaves is 64 or moreto enhance the anti-interference ability of the USB cable. The reference design diagram is shown in Figure 7.2.

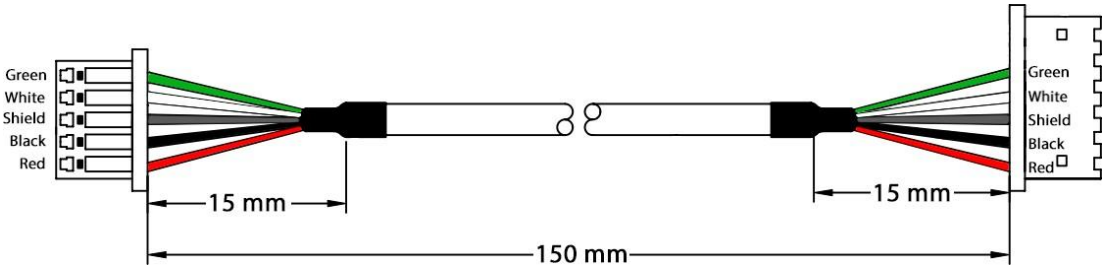


Figure 7.2 Plug Interface

8 Design Guide

8.1 Heat Dissipation Design

It is recommended to take the heat dissipation method. The surface of the CPU chip and the heat sink (or the metal shell of the device) are kept in close contact by a thermal conductive silicone pad. The thickness of the thermal conductive silicone pad is recommended to be less than 3mm. The schematic diagram is shown in Figure 6.

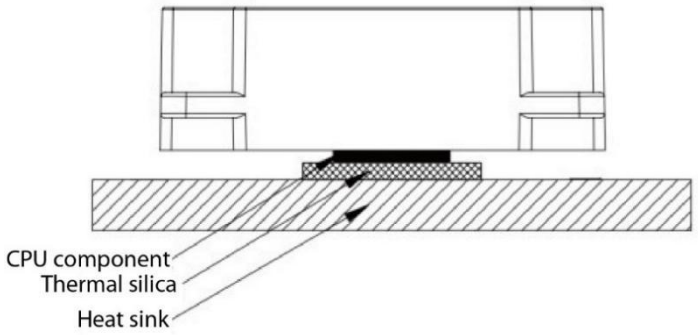


Figure 8.1 Thermal conduction design

9 Installation Guide

9.1 Installation Method

The screw holes at the four corners of the module are used to fix the module with the hole diameter of 3.0 mm, as shown in Figure 9.1.

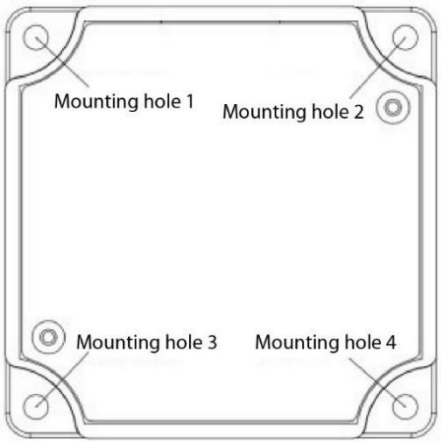


Figure 9.1 Mounting Hole Location

9.2 Installation Direction

The center axis of the lens passes vertically through the palm. The installed direction of the module USB cable should be aligned with the direction of the fingertip during enrollment and matching operations, as shown in Figure 8.

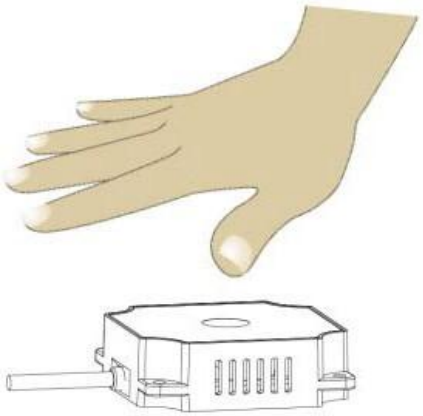


Figure 9.2 Palm Placement

9.3 Installation Height and Angle

The installation heights and corresponding angles are recommended in Figure 9. The angle in the figure is the angle between the center axis of the lens and the horizontal ground (which is the same angle between the module lens plane and the vertical direction), and the height is the distance from the module to the ground.

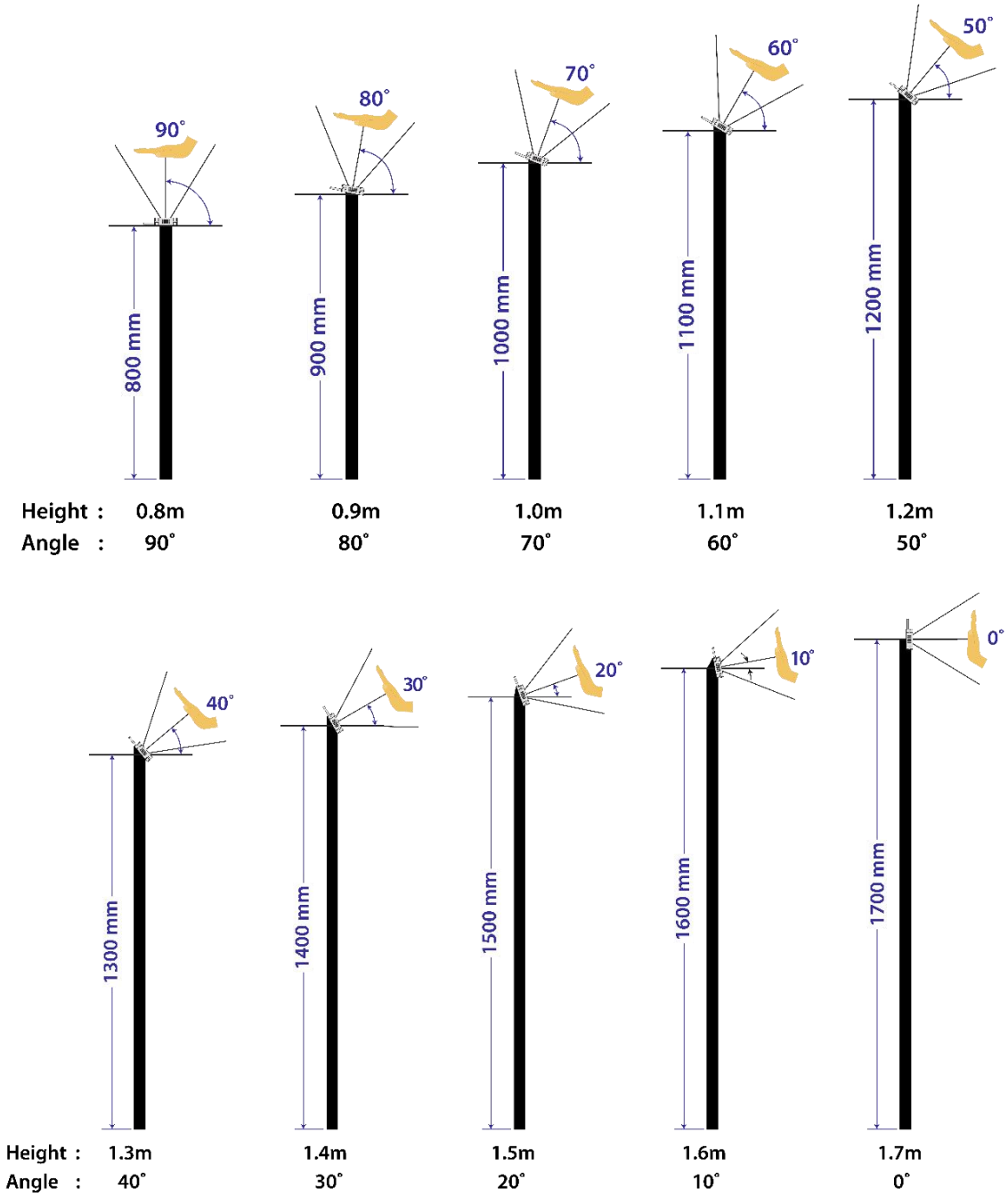


Figure 9.3 Installation Height and Angle

Installation Tips

- The module is installed and operated for indoor environment, please do not use it under direct sunlight.
- The module should not be disassembled without authorization, otherwise it voids its warranty.

9.4 Maintenance and Cleansing

9.4.1 Maintenance

1. Please keep the product dry and clean.
2. Prevent the product from falling or collision.
3. Do not power on or power off the product too frequently.

9.4.2 Cleansing

1. Please Keep the product away from dust.
2. Use an adhesive tape to clean the collecting area.
3. Wipe the sensor with special lens cloth or issue.
4. Keep the sensor clean and dry for storage.

10 FAQ

1. What shall I do when there is no response from the palm vein module even the module is connected?

Answer:

First, open the computer management from your windows system to check if AMT-PVM-10 has been successfully connected. Next, check whether the connection button in the demo (see attached software package) is enabled or not. If these two potential problems are excluded, please contact the technical support team in time to analyze the other reasons such as hardware failure, demo issues and so on.

2. What shall I do if it fails to register the user?

Answer:

Firstly, please confirm that AMT-PVM-10 has been already connected to the system, and then open the demo for initialization. Next, verify if the palm position, angle, and the palm placing distance are proper. Read the pop-up error code and check the reason for the error by comparing with the development document. If the issue still exists, please contact the technical support team to resolve the issue.

3. What if the product doesn't work during identification?

Answer:

Firstly, confirm that the scanner is successfully connected to the system, and the demo can be opened normally. If there is no response, pull out and re-plugin the module. If the problem still exists, check the error code or change the module and continue identification. If the problem cannot be resolved, please contact the technical support team to check if it is a hardware problem.

4. What shall I do if the user verification fails after the module is connected to the PC and identifies the user successfully?

Answer:

If the user has been registered, please confirm you present the same palm for verification. And ensure the palm is placed in proper posture and distance . During verification, you can adjust the palm posture and distance, so that AMT-PVM-10 can better take high quality palm image.

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