HITACHI CONFIDENTIAL

June 17, 2011
Rev. 0.21

Hitachi Finger Vein Authentication Device

Data sheet

Table of Contents

PRELIMINARY

All the information contained in this document is subject to change without prior notice.

Urban Planning and Development Systems,
Hitachi, Ltd.

Revision History

No.	Date	Chapter	Description	Remarks
0.1	June 8, 2009	-	New release	Based on Japanese Ver. 02
0.2	Oct. 2, 2010	1,3,4	Revised model name (PCT-KCC5001 to PCT-KCC50*1)	Based on Japanese Ver. 03
		3,4,	Changed marking of finger guide	
		3	Added remarks about EMI.	
		4.2	Added maximum number of enrollment fingers	
		4.2.15, 4.3	Added verification time of PCT-KCC5031/9031.	
		4.4	Added remarks for usage condition	
0.21	June 17, 2011	5,	Changed firmware version from 02-00 to 02-01	Based on Japanese Ver. 04

Important notice

1. Verify legal regulations in each country in addition to U.S. regulations for export control, and take all necessary procedures accordingly before exporting the product. This applies to all hardware and all related software, including documents, attachments and software surrounding the hardware device.

2. The usage of information in this document does not allow the usage of patents, copyrights or other intellectual property owned by Hitachi or third party. Hitachi does not warrant problem arises from third party's intellectual property by using this document.

3. Please refer to the latest specification to design, purchase since the products or it's specification may be subject to change without prior notice.

4. The product you have purchased has been designed and manufactured with high quality. However, avoid usage in applications that require extremely high reliability and/or where lives and/or property may be risk. Hitachi, Ltd. disclaims all liability for such uses and for any derived circumstances. That may lead to accidents if used inappropriately or in cases where a high level of reliability is required for its use or cases involving the control of chemical plants, medical devices, urgent communications, medical equipment to support life, nuclear equipments etc.

5. To use the product, maximum rating, operating voltage, installation conditions or other conditions must be within specifications described in our documents. Hitachi, Ltd. assumes no liability for problem or defects when the specifications are not kept. Please note, even if it is used under the specification, such as failsafe system is necessary for the host system to avoid accidents or problems by our product's damage or trouble.

6.This product is not designed against radiant rays.

7. Do not copy or transfer, in part or in whole, this document without prior notice and permission from Hitachi, Ltd.

1. Introduction

This document describes the specifications of embedded type finger vein authentication device PCT-KCC50*1 and PCT-KCC90*1.

2. Features

The small size embedded type finger vein authentication device uses transmissive optical method to read vein pattern and it is suitable for various security products.

1. Easy to use
   - The shape of the finger guide is designed to fit user’s finger
   - Marking on the finger guide lead user’s finger to the right place
   - Open type structure is accomplished by placing LEDs both sides.

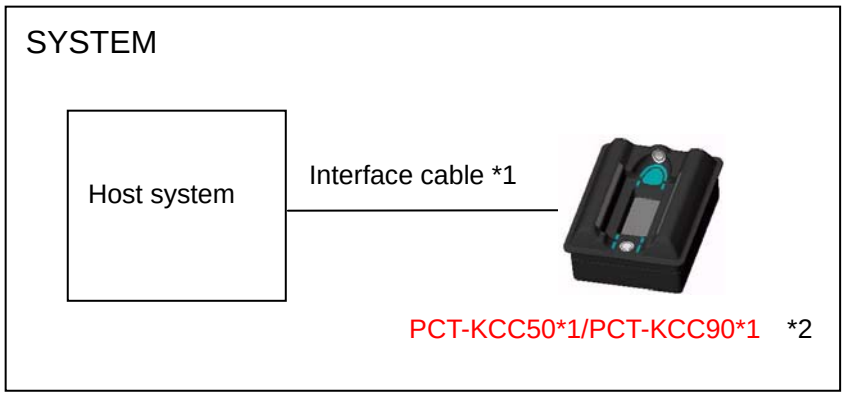
2. High accuracy
   - Transmissive method enables to capture clear vein pattern
   - The stable finger guide reduces false rejection by a positioning error.
   - Two touch sensors reduce floating error of a finger.

3. Low cost
   - Use one chip custom LSI (Hitachi FVP1000) for finger vein authentication
   - Use CMOS sensor

4. Others
   - Authentication is done within the device
   - Template data of finger vein is memorized in a non-volatile memory in the device
   - Use serial interface (3.3V CMOS level) to communicate with a host system

3. Connection configuration

This device is supposed to connect as the following figure.



*1 The interface cable must be less than 200mm.

It is recommended to change the interface signals to RS-232C level if longer cable is required.

And it is recommended to add a ferrite core to the interface cable and turn once.

*2 Hitachi provides only the finger vein authentication device.

4. Configuration and function

4.1 Appearance and dimensions

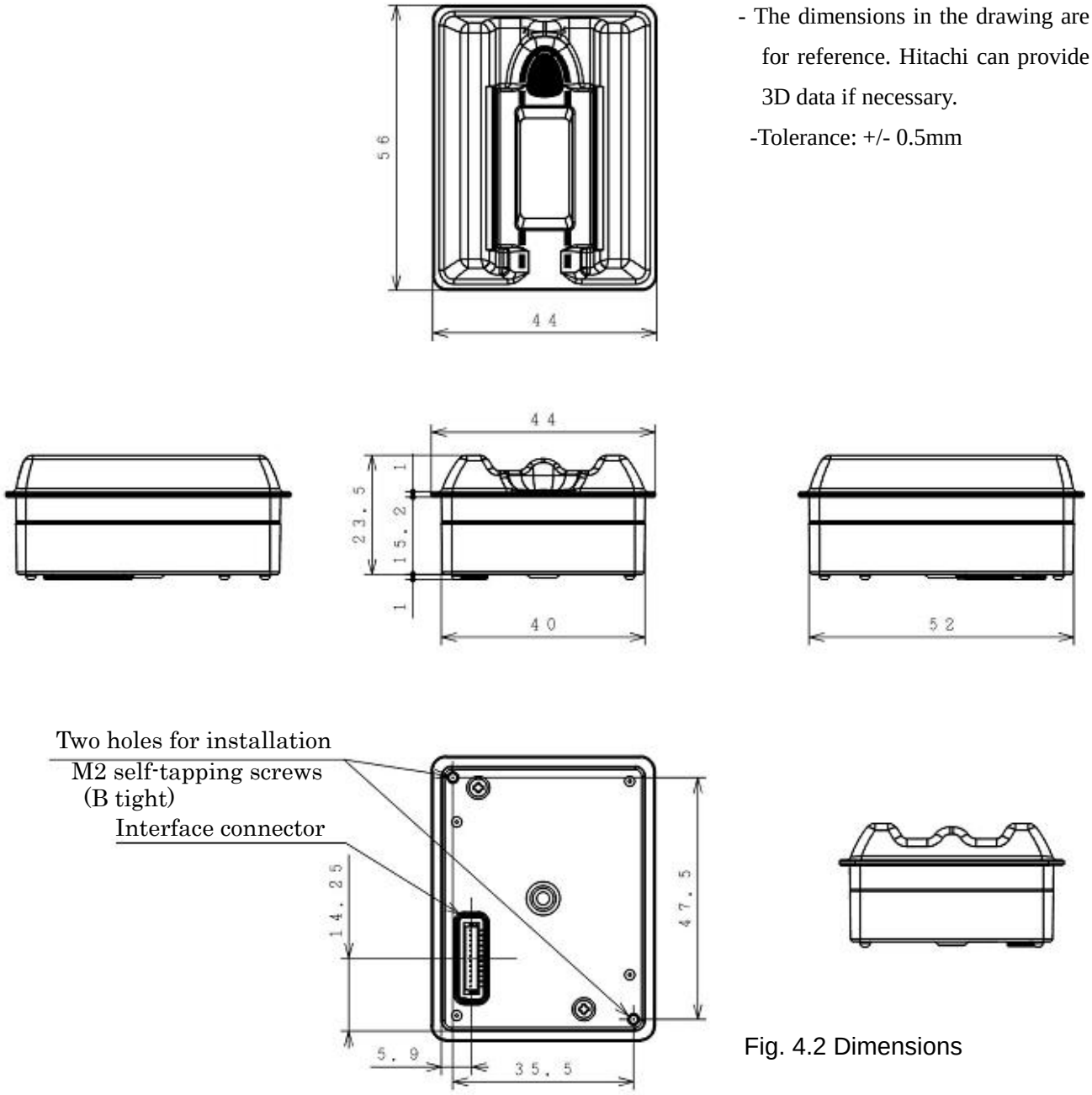
(1) Appearance

PCT-KCC5001（F/W Ver.01-00） PCT-KCC9001（F/W Ver.01-00） PCT-KCC5011（F/W Ver.01-01） PCT-KCC9011（F/W Ver.01-01）	PCT-KCC5021（F/W Ver.01-02） PCT-KCC9021（F/W Ver.01-02） PCT-KCC5031（F/W Ver.02-01） * 1 PCT-KCC9031（F/W Ver.02-01） * 1
	

Fig. 4.1 Appearance

* 1：The template data of PCT-KC5031/9031 is not compatible with other models.

(2) Dimensions



- The dimensions in the drawing are for reference. Hitachi can provide 3D data if necessary.
-Tolerance: +/- 0.5mm

Fig. 4.2 Dimensions

(3) Label specification

	Label specification	Remarks
Label 1	Size:20 x 10mm Factory's internal model number 3100HI KJ18B 00001 LotNo. 4 digits Serial No. 5digits Product Ver. (B.C・・・) QR code	- There is no version character print if the product version is "A". - Serial number (5 digits) is for factory's internal use.
Label 2	Size: 33 x 11mm Model name PCT-KCC50*1 製番 ******** Serial number 8 digits	- Model PCT-KCC50*1 : Comm. speed 57.6kbps PCT-KCC90*1 : Comm. speed 19.2kbps The following example shows the detail of 8 digits serial number shown in the left figure. Example :81100001 Serial number Month Year : 1st digit of the year

4.2 Basic specifications

No.	Specification				Remarks
1	Outer dimensions		(W)44 x (D)56 x (H)23.5 mm		Except for the protruding part
2	Weight		32g		
3	Material - Case - Filter - LED cover		- PC+ABS (Mitsubishi Engineering-Plastics Co. MB1700) - PMMA (Mitsubishi Rayon Co., Ltd. PF079)		
4	Waterproof		Corresponds to IEC IPX3		The host system needs waterproof mechanism to assemble the device.
5	Power supply voltage		DC 5.0V +/- 5%		
6	Power supply current	Stand-by	MAIN_PWR_ON: High	120mA Typ.	
			MAIN_PWR_ON: Low	75micro A Typ. *1	When sensor does not detect.
		Enrollment, Verification	230mA Typ. *2		
			470mA Max. *3		Reference value
7	Interface signal format		Asynchronous serial communication		
8	Interface signal level		3.3V CMOS input/output level		Except for open collector signal
9	Interface connector		JST Mfg. Co., Ltd. BM12B-SRSS-TB		12pin
10	Communication speed		57.6kbps	PCT-KCC50*1	
			19.2kbps	PCT-KCC90*1	
11	Finger vein capturing system		Infrared LED + optical camera Transmissive type		
12	Storage of template data		Stored in the device. <Max. Enroll template data> Twice scanning mode: 150 fingers (360 fingers) Three times scanning mode: 100 fingers (230 fingers)		The connected host system can store template data as well. Max. number varies depend on enroll mode. The number in brackets is for PCT-KCC5031/9031.

13	Verification method	1:1 to 1:15 verification. -Twice enroll mode: 1:15 -3 times enroll mode: 1:10 (In case of group verification)	It is recommended to use 1:1 verification for any application. The device can verify over plural groups.
14	Accuracy	False rejection rate: 0.01% False acceptance rate: 0.001% Failure to enroll rate: Less than 0.03%	1:1 verification Measurement based on ISO/IEC 19795-1
15	Verification time	1:1 Verification (recommended): Approx. 1 sec. 1:N Verification (group verification): Approx. 1 to 2 sec For your reference, the following are verification time over plural groups verification with 100 fingers. -Twice enroll mode: Less than 3 sec. (Less than 2.5 sec.) -3 times enroll mode: Less than 4 sec. (Less than 3.0 sec)	Timeout: 5 sec. The number in brackets is for PCT-KCC5031/9031
16	Environmental conditions Ambient temperature and humidity	0 to 40 deg. C Operation 0 to 50 deg. C Non operation -20 to 60 deg. C Storage 20 to 80% RH Operation 20 to 80% RH Non operation 10 to 90% RH Storage	No condensation
17	Environmental condition in use	Do not use in direct sun light	

*1 Changes by environmental temperature

*2 Changes depends on a finger

*3 Measured value when the infrared LED is maximum brightness

4.3 Accuracy

Item		Specification
Verification time		Approx. 1 to 2 sec. *1, *2 For your reference, verification time over plural groups with 100 fingers is 3 to 4 sec. *4
Verification accuracy	FRR (False Rejection rate)	0.01% *3 In case of standard threshold (i.e. Middle)
	FAR (False Acceptance Rate)	0.001% *3 In case of standard threshold (i.e. Middle)
Failure to enroll rate (FTE)		Less than 0.03%

*1 “Verification time” is the time between taking image and completion of verification.

*2 The time varies depend on the number of fingers. The number of fingers is less than 15.

Twice enroll mode: 1:15 verification

3 times enroll mode: 1:10 verification

*3 In case of 1:1 verification.

The measurement method is based on international standard for biometric performance testing ISO/IEC 19795-1.

*4 Approx. 2.5 to 3 seconds for PCT-KCC5031/9031.

4.4 Usage environment

The accuracy can be kept under the following environment.

Item	Specification
Sunlight (indirect)	Less than 4000 Lx
Bulb lamp	Less than 1,000 Lx
Fluorescence lamp	Less than 2,000 Lx

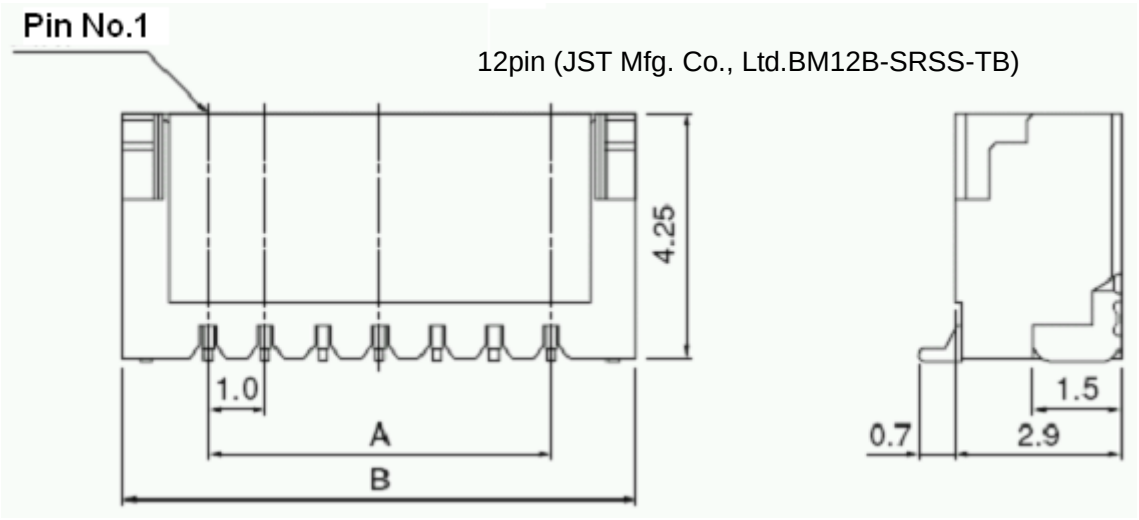
Condition: The light does not enter the image capturing area directly.

Do not install the device where it is exposed to intense light, such as under direct sun light or near a window.
If you cannot avoid installing at such places, setting “Strong light mode” for capture mode can make it easier to succeed verification. However, such as placement of a finger, individual difference or light coming into scanning area may cause verification error or false acceptance. Be sure to check if such error does not cause trouble to user’s operation before installation.

* “Strong light mode” is available only for PCT-KCC5031/9031.

4.5 Interface specification

1) Connector specification



Recommended housing: JST Mfg. Co., Ltd. SHR-12V-S-B or SHR-12V-S

Recommended wire: AWG28

2) Connector pin assignment

No.	Signal name	I/O	Function	Specification
1	VCC	-	Power supply	5.0V +/- 5%
2	VCC	-	Power supply	
3	RX	I	Serial communication data	Asynchronous receiving data. 3.3V CMOS level
4	TX	O	Serial communication data	Asynchronous transmission data. 3.3V CMOS level
5	GND	-	Ground	GND
6	MAIN_PWR_ON	I	Power control input	3.3V CMOS level "H": Power ON, "L": Power OFF * This signal is to control power of the device by a level control. (Not an edge trigger control)
7	BUSY	O	Busy output	3.3V CMOS level "H" means the device is busy. In this case, do not turn power off. *1 "L": In this case, power can be turned off. *1 This signal indicates the device is processing internally and ask a host system not to turn power off.
8	TOUCH_OUT1	O	Output of touch sensor (The tip side of the finger guide)	Open collector output Note *1) Detected a finger being placed: GND Others: Open (Hi-Z) * This signal shows whether a finger is placed on the unit.
9	PASS_DRVER	O	Verification result output	Open collector output Note *2) Verified: GND Others: Open (Hi-Z) * If a finger is verified, this signal shorts to GND.
10	TOUCH_OUT2	-	Output of touch sensor (The root side of the finger guide)	Same as pin #8
11	RESET	I	Hardware reset input	GND: Reset Open: Normal operation Note *3)
12	GND	-	Ground	GND

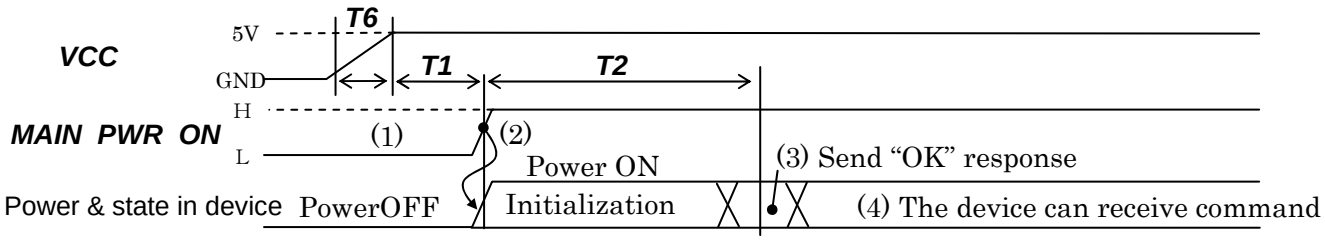
Note *1) ***TOUCH_OUT1 and TOUCH_OUT2*** signals operate even if the internal power of the device is off state (***MAIN_PWR_ON*** ="L").

Note *2) ***PASS_DRVER*** signal is used to drive an external mechanical part. This signal goes to Low level when the verification is succeeded, but it won't return Hi-Z automatically. Be sure to send "Release PASS_DRIVER" command on serial communication after verification in order to return Hi-Z level. Rating specification of "***PASS_DRVER***" signal is 24V max. and 100mA max.

Note *3) The host system must control RESET signal by an open collector device because the signal is pulled up in the device.

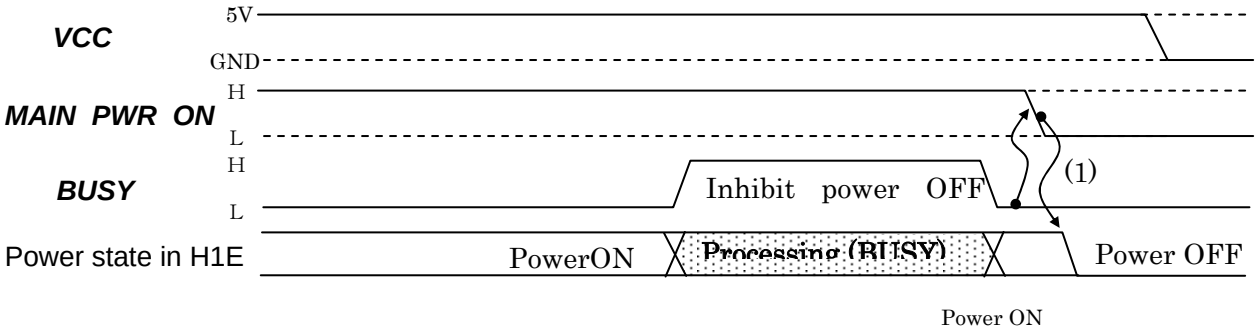
4.6 Control timing

1) Power ON sequence



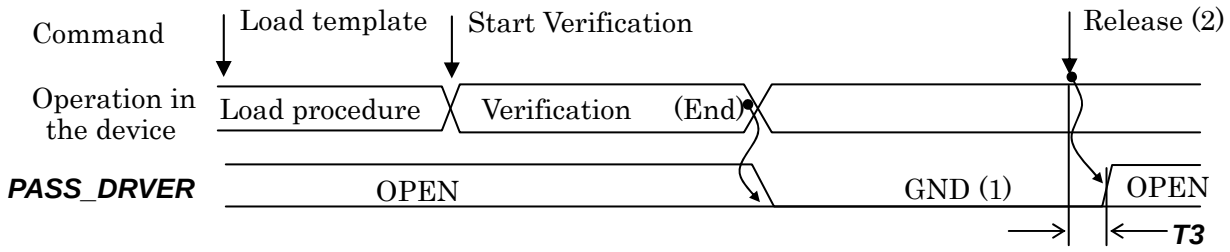
(1) VCC must rise from 0 to 5V within T6 time.
(2) The device turns on when ***MAIN_PWR_ON*** signal becomes "H" after T1 time from ***VCC*** rises to 5V.
(3) The device sends "OK" response to a host T2 time after power is turned ON.
(Refer to serial interface specification)
(4) After the sequence described above, the device becomes to be able to communicate by serial interface commands.

2) Power off sequence



(1) The device goes to power OFF state when ***MAIN_PWR_ON*** becomes "L" level or cut power supply.
However, a host system shall not turn off the device when ***BUSY*** signal is "H" because it means that the device is still processing internally.
Therefore, make sure that ***BUSY*** signal is "L" before turn ***MAIN_PWR_ON*** to 'L" level. If ***BUSY*** signal is "H", a host system shall wait until it becomes "L".

3) ***PASS_DRVER*** output specification

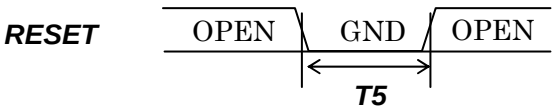


(1) ***PASS_DRVER*** signal becomes GND when a finger is verified with an enrolled template.
If it fails to verify, it maintains OPEN state.

(2) ***PASS_DRVER*** returns to OPEN state when the device receives "PASS_DRVER release" command.
This is the only way ***PASS_DRVE*** goes to OPEN status and there is no other one.

4) Hardware Reset

The host system can recover the device by hardware ***RESET*** signal to the device if there is no response from the device. This ***RESET*** signal is valid when ***VCC*** is supplied and ***MAIN_PWR_ON*** signal is in "H" state. (i.e. Power in the device is ON state)



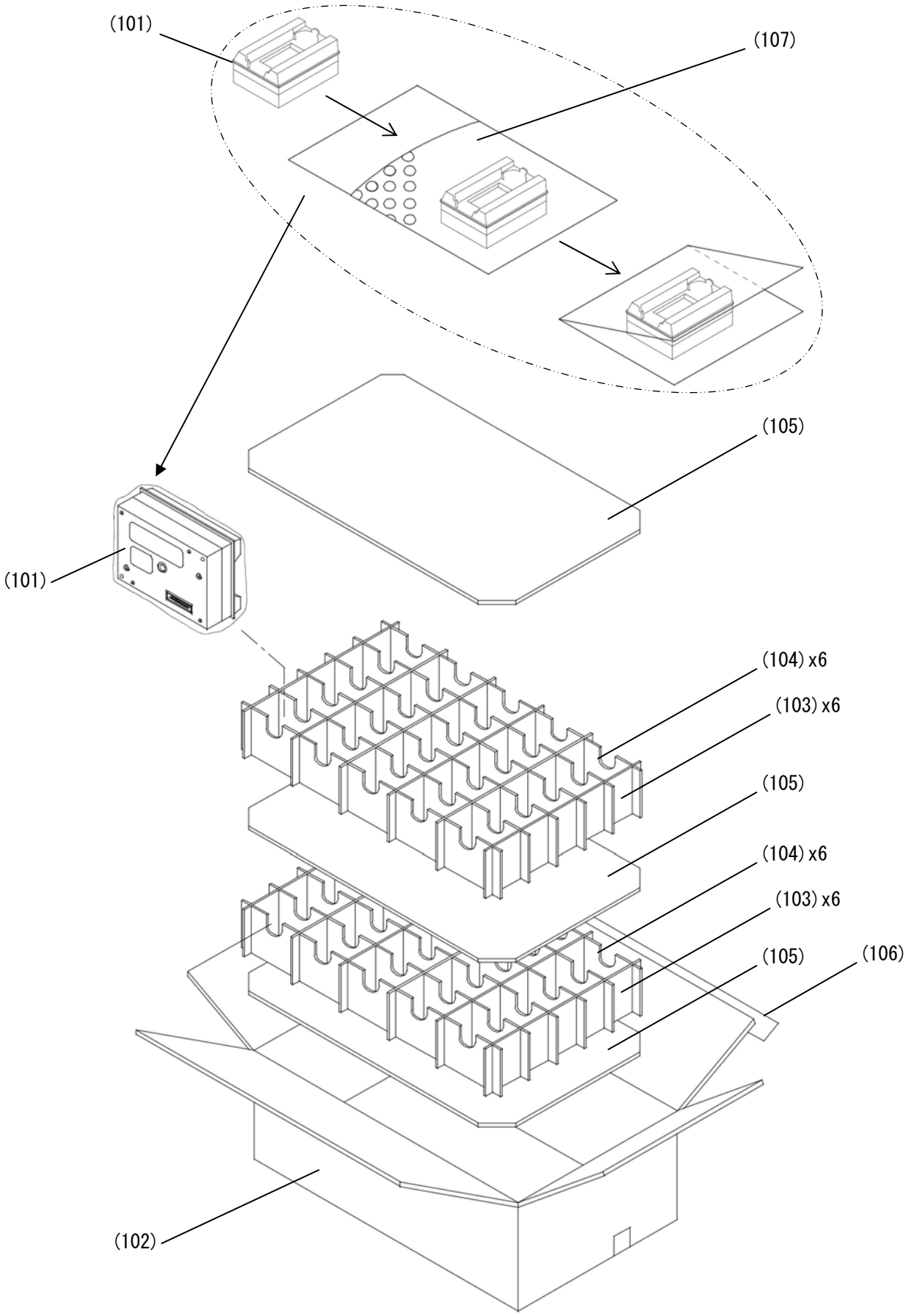
5) Health check

"Get information" command (12h) can be used to know whether the device is operating normally.

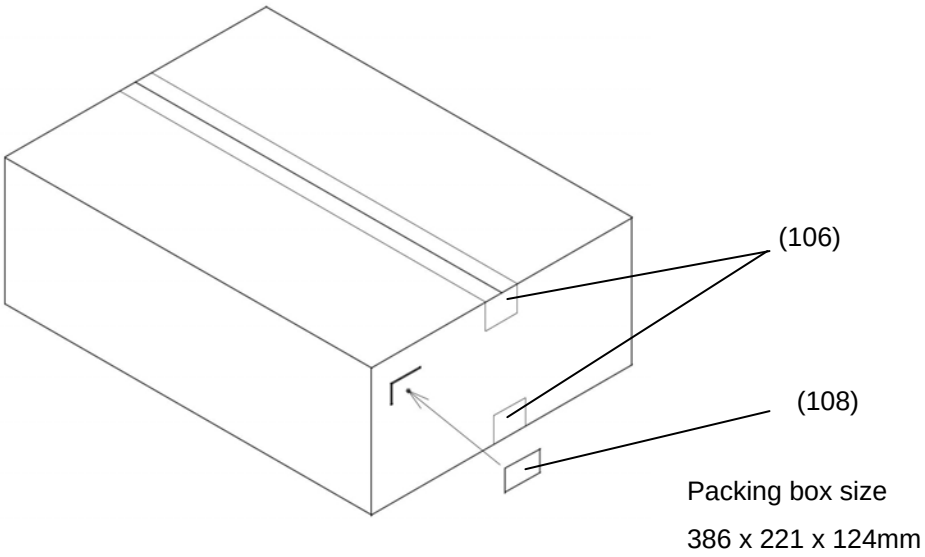
6) Timing specification

No.	Symbol	Minimum	Maximum	Unit	Remarks
1	***T1***	0	-	ms	
2	***T2***	-	1000	ms	OK response from the device indicates the end of initialization. (Reference value)
3	***T3***	-	3	ms	Release time of ***PASS_DRVER*** signal
4	***T4***	-	20	s	Timeout of serial command
5	***T5***	5	-	ms	***RESET*** pulse width
6	***T6***	-	5	ms	***VCC*** rising time

4.7 Packing specification



50 pieces max. in a box



No.	Item	Remarks
101	Finger vein authentication device	
102	Packing case	
103	Partition (big)	
104	Partition (small)	
105	Partition (floor)	
106	KU tape (transparent)	
107	Air bug	
108	Shipping label	

4.8 Others

A host system equipped with the device requires the following functions for security purposes.

1) The host system must be equipped with one of the following functions.
   - Invalidate the user.
   - Reject verification requests for specific time frame.
   - Send a warning to the administrator.
   - Record the rejection log.

   This function is necessary to avoid illegal verification such usages of a forged finger

2) Operations involving template data, such as enrollment and/or deletion of template data, should be performed by the administrator.

   e.g. setting user identification and/or limiting access to curtain level of information, etc.

3) A host system equipped with the device requires a way to identify whether the module has been intentionally removed or illegally modified.
e.g. adhere a tamper evident seal at the joint of the device and the host system.

Refer to “Serial Interface Specification” for serial communication command.
Refer to “Application note” for designing hardware.

5 Conforming regulations

No.	Item
1	RoHS

6. Quality

Item	Specification	Remarks
Reliability	Product life: 5 years	
Vibration	- Operating 2.45m/s^2, Frequency: 5 to 55Hz/min X,Y,Z direction No failure under the condition above. - Transportation/Storage 7.35 m/s^2 , Frequency: 5 to 500Hz, Sine sweep	
Packing box drop spec.	0.6m drop tests with 1 corner, 3 edges and 6 surfaces. No damage, no loose of screws and no failure under the condition above.	