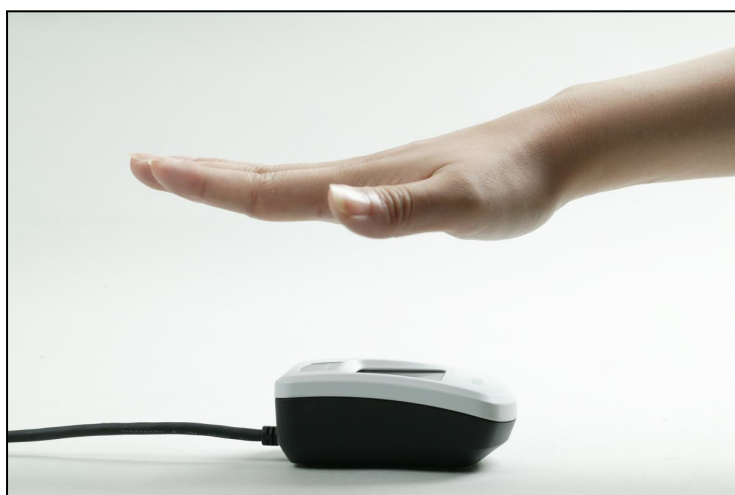


PalmSecure™ SDK V01

Authentication library V31

reference guide



Revision History

Revision	Issued Date	Revised Page	Modification Details
			* For information on the 1st to 15th revision history, refer to the "Previous revision history" at the end of this document.
16th Rev.	Apr 2013	Cover page	Manual name modified <ul style="list-style-type: none"> Modified the manual name to the "Authentication library V31 reference guide".
		Entire document	Description added <ul style="list-style-type: none"> Added all descriptions concerning Linux x86 and x64 in order to make the Authentication library V31 manual for both Windows x86 and x64, and Linux x86 and x64.
		Entire document	Expression improved <ul style="list-style-type: none"> Improved the overall expression.
		Page 4	Description added <ul style="list-style-type: none"> Added " Authentication Library for x86 and x64" in "1.1 Overview".
		Page 5 to 6	Description deleted <ul style="list-style-type: none"> Deleted "F3BC4FRM.DLL" from the stored file list in the Basic Edition for Windows x86 and x64 in "1.2 List of Contents".
		Page 12 to 16	Description modified <ul style="list-style-type: none"> Modified the following descriptions in "2.1 Hardware and Software Requirements". <ul style="list-style-type: none"> Modified the OSes. Modified VL of the Windows Sensor driver for extended function.
		Page 17	Description modified <ul style="list-style-type: none"> Improved the expressions in Step 2 in "2.2.1 Windows Version".
		Page 22	Description modified <ul style="list-style-type: none"> Modified the "EE" column of "(1-5) CBGUIMessageDetail" to "x" in "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".
		Page 37	Description deleted <ul style="list-style-type: none"> Deleted the "Status notification callback (capturing phase complete)" from "3.3.3 Palm Vein Data Enrollment Sequence".
		Page 41	Description modified <ul style="list-style-type: none"> Modified the process sequence in "3.3.6 Palm Vein Data Capture and Verification Sequence (for Client Server Configuration)".

Revision	Issued Date	Revised Page	Modification Details
16th Rev.	Apr 2013	Page 43	Description modified <ul style="list-style-type: none"> Modified the process sequence in "3.3.7 Palm Vein Data Capture and Identification Sequence (for Client Server Configuration)".
		Page 85	Description modified <ul style="list-style-type: none"> Modified the member name in "3.4.18 PvAPI_GetErrorInfo".
		Page 89	Description modified <ul style="list-style-type: none"> Modified the member name in "3.4.20 PvAPI_Cancel".
		Page 92	Description modified <ul style="list-style-type: none"> Modified the member name of the Sensor information structure in "3.4.21 PvAPI_PreSetProfile".
		Page 130 to 139	Description added, modified, and deleted <ul style="list-style-type: none"> Added, modified, and deleted the following descriptions in Step 4 in "Appendix C Authentication Library Firmware Update Function (Basic Edition Only)". <ul style="list-style-type: none"> Deleted "Caution Before and after "=" in each setting item". Modified the explanation for setting items "(1) Path" and "(5) LogPath" in the operational environment setting file. Added descriptions not to use full-width characters in the setting item "(2) Name, Name2, Name3" in the operational environment setting file.
		Page 164 to 165	Description added <ul style="list-style-type: none"> Moved "Appendix J Approximate Authentication Duration" from the "System development guide".
		Page 166 to 168	Description added <ul style="list-style-type: none"> Added "Appendix K Notes on Errors in Linux OSes".

◆ Introduction

Thank you for purchasing PalmSecure™ SDK V01 (hereinafter called "this product").

This document describes the interface between the Authentication library and the Palm vein authentication system applications. It is aimed at readers with the following experience:

- A basic knowledge of Windows or Linux operation
- A basic knowledge of the C language

Screens shown in this document may be a little different from the screens actually displayed depending on your environment.

April 2013

April 2013 : 16th Edition

Regarding to High Safety Required Usage

This Product is designed, developed and manufactured as contemplated for general use, including without limitation, general office use, personal use, household use, and ordinary industrial use, but is not designed, developed and manufactured as contemplated for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could lead directly to death, personal injury, severe physical damage or other loss (hereinafter "High Safety Required Use"), including without limitation, nuclear reaction control in nuclear facility, aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system. You shall not use this Product without securing the sufficient safety required for the High Safety Required Use. If you wish to use this Product for High Safety Required Use, please consult with the sales representatives in charge before such use.

Cautions for Exporting This Product

When exporting or providing this product and this document to a foreign country, check relevant laws such as "Foreign Exchange and Foreign Trade Control Law", and regulations such as U.S. export control law, and follow the necessary procedures.

Warnings

- Reprinting or reproducing this document in part or in whole without permission is forbidden.
- Items described in this document are subject to change without prior notice.

PalmSecure is a trademark of Fujitsu Ltd.

Microsoft, Windows, and Windows Server are registered trademarks of Microsoft Corporation in the United States and/or other countries.

Linux is a registered trademark or trademark of Linus Torvalds in the United States and/or other countries.

Red Hat is a registered trademark of Red Hat Software, Inc.

Intel, Celeron and Pentium are registered trademarks of Intel Corporation.

BioAPI is a trademark of BioAPI Consortium.

Other company names and product names described in this document are trademarks or registered trademarks of each company.

All Rights Reserved, Copyright © Fujitsu Limited 2006 - 2013

◆ Composition of This Document

This document consists of the following four chapters and the appendix.

Chapter Title	Descriptions
Chapter 1 Overview of the Authentication Library	Describes an overview of the Authentication library.
Chapter 2 Before Using the Authentication Library	Describes the basic knowledge you need before using the Authentication library.
Chapter 3 Authentication Library Interface	Describes how to use functions in the Authentication library.
Chapter 4 Error Information	Describes error information returned from the Authentication library.
Appendix	
Appendix A Structures	Describes the necessary structures to use the Authentication library.
Appendix B Connecting Multiple Sensors (Windows Basic Edition Only)	Describes the procedure and notes for connecting multiple Sensors.
Appendix C Authentication Library Firmware Update Function (Basic Edition Only)	Describes the procedure to update the firmware in the Sensor unit.
Appendix D Auto-recovery Function from the Hibernation State and Removal/Re-insertion of the Sensor USB Receptacle (Windows Basic Edition Only)	Describes operational differences and notes for enabling and disabling the auto-recovery function from the hibernation state and at removal/re-insertion of the Sensor USB receptacle.
Appendix E Duration Required for the Start Sequence of the Sensor (Basic Edition Only)	Describes the duration required for the start sequence of the Sensor.
Appendix F Guide Mode (Basic Edition Only)	Describes the procedure and notes for using guide mode.
Appendix G Compatibility of Palm Vein Data	Lists viability of authentication (compatibility) using enrolled palm vein data with the Authentication library V31.
Appendix H Enrolled Data Conversion Library	Describes the enrolled data conversion library which converts palm vein data enrolled by the Authentication library V21 or V24 to be able to identified by the Authentication library V30 or later.
Appendix I Using the x64 Version	Describes notes on developing applications using the x64 version.

Chapter Title		Descriptions
Appendix		
	Appendix J Approximate Authentication Duration	Describes the approximate authentication duration.
	Appendix K Notes on Errors in Linux OSes	Describes effects caused by errors in Linux OSes on the operations of the Authentication library (Linux version)





◆ Abbreviations and Common Terms

Abbreviations and common terms used in this document are as follows:

Abbreviations and Common Term	Description
This product	Abbreviation for "PalmSecure™ SDK V01".
PalmSecure Sensor	Abbreviation for "PalmSecure™ Sensor". This is the one which has been supplied with PalmSecure™ SDK since V01L01.
PalmSecure Sensor V2	Abbreviation for "PalmSecure™ Sensor V2". This Sensor is the successor of PalmSecure Sensor.
Sensor	Common term for "PalmSecure Sensor" and "PalmSecure Sensor V2".
Windows XP	Abbreviation for "Microsoft® Windows® XP".
Windows 7	Abbreviation for "Microsoft® Windows® 7".
Windows 8	Abbreviation for "Microsoft® Windows® 8".
Windows Server 2008 R2	Abbreviation for "Microsoft® Windows Server® 2008 R2".
Windows Server 2012	Abbreviation for "Microsoft® Windows Server® 2012".
Windows	Common term for "Windows XP", "Windows 7", "Windows 8", "Windows Server 2008 R2", and "Windows Server 2012".
BIR	Abbreviation for "Biometric Information Record".
Authentication library	Abbreviation for "Authentication library V31".

◆ Notations

The following symbols are used in this document.

Symbol	Description
 Caution	Describes things that you have to look out for. You must read it.
 Tip	Provides reference information. Read it as necessary.
 See	Indicates an item to be referred.
 Operation	Operation Describes operation procedures.
[] button	Indicates a button displayed on the screen.

◆ Table of Contents

Chapter1 Overview of the Authentication Library 1

1.1 Overview	2
1.2 List of Contents	5
1.2.1 Windows (x86) Version	5
1.2.2 Windows (x64) Version	6
1.2.3 Linux (x86) Version	8
1.2.4 Linux (x64) Version	10

Chapter2 Before Using the Authentication Library11

2.1 Hardware and Software Requirements.....	12
2.2 Preparation before Using the Authentication library.....	17
2.2.1 Windows Version.....	17
2.2.2 Linux Version	19
2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information.....	20

Chapter3 Authentication Library Interface27

3.1 List of Functions	28
3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication.....	30

3.3 Basic Process Sequence	34
3.3.1 Initialization Sequence.....	34
3.3.2 Termination Sequence.....	36
3.3.3 Palm Vein Data Enrollment Sequence	37
3.3.4 Palm Vein Data Capture and Verification Sequence (for Stand Alone Configuration)	38
3.3.5 Palm Vein Data Capture and Identification Sequence (for Stand Alone Configuration)	39
3.3.6 Palm Vein Data Capture and Verification Sequence (for Client Server Configuration)	41
3.3.7 Palm Vein Data Capture and Identification Sequence (for Client Server Configuration)	43
3.3.8 Multi-threaded Verification Sequence (for the Enterprise Edition)	45
3.3.9 Multi-threaded Identification Sequence (for the Enterprise Edition)	46
3.3.10 Cancellation Sequence	47
3.3.11 Individual Encryption Key Setting Sequence	48
3.3.12 Sensor Switching Sequence	49
3.4 Interface	50
3.4.1 BioAPI_ModuleLoad	50
3.4.2 BioAPI_ModuleUnload	51
3.4.3 BioAPI_ModuleAttach.....	52
3.4.4 BioAPI_ModuleDetach.....	54
3.4.5 BioAPI_FreeBIRHandle	55
3.4.6 BioAPI_GetBIRFromHandle	56
3.4.7 BioAPI_GetHeaderFromHandle	57
3.4.8 BioAPI_SetGUICallbacks	58
3.4.9 BioAPI_Capture.....	60
3.4.10 BioAPI_Process	62
3.4.11 BioAPI_VerifyMatch	63
3.4.12 BioAPI_IdentifyMatch	66

3.4.13 BioAPI_Enroll	70
3.4.14 BioAPI_Verify.....	72
3.4.15 BioAPI_Identify.....	75
3.4.16 PvAPI_ApAuthenticate	79
3.4.17 PvAPI_SetProfile.....	80
3.4.18 PvAPI_GetErrorInfo.....	85
3.4.19 PvAPI_Sense	87
3.4.20 PvAPI_Cancel	89
3.4.21 PvAPI_PreSetProfile	91
3.4.22 PvAPI_PresetIdentifyPopulation	94
3.4.23 PvAPI_GetConnectSensorInfoEx	96
3.4.24 PvAPI_GetLibraryInfo.....	98
3.5 Callback Function Interface	100
3.5.1 BioAPI_GUI_STATE_CALLBACK	100
3.5.2 BioAPI_GUI_STREAMING_CALLBACK	108

Chapter4 Error Information111

4.1 List of Error Information	112
4.2 Error Notifications for Each Function	119

Appendix123

Appendix A Structures	124
A.1 BioAPI_INPUT_BIR Structure	124
A.2 Population Structure	125
A.3 Candidates Structure.....	127

Appendix B	Connecting Multiple Sensors (Windows Basic Edition Only)	128
Appendix C	Authentication Library Firmware Update Function (Basic Edition Only).....	130
Appendix D	Auto-recovery Function from the Hibernation State and Removal/Re-insertion of the Sensor USB Receptacle (Windows Basic Edition Only)	140
Appendix E	Duration Required for the Start Sequence of the Sensor (Basic Edition Only)	143
Appendix F	Guide Mode (Basic Edition Only)	144
Appendix G	Compatibility of Palm Vein Data	146
G.1	Palm Vein Data Enrolled by the Authentication Library V31	147
G.2	Palm Vein Data Enrolled before the Authentication Library V31	149
Appendix H	Enrolled Data Conversion Library	153
H.1	Overview of the Enrolled Data Conversion Library	153
H.2	Palm Vein Data for Enrollment Conversion Sequence.....	155
H.3	Enrolled Data Conversion Library Interface.....	157
Appendix I	Using the Windows (x64) Version	162
Appendix J	Approximate Authentication Duration	164
Appendix K	Notes on Errors in Linux OSes.....	166
K.1	Effects of an Error in the Kernel USB Driver.....	167
K.2	Effects of an Error in Glibc	168

Chapter1 Overview of the Authentication Library

1.1 Overview

1.2 List of Contents

1.1 Overview

The Authentication library is a library of programs which enrolls palm vein data and authenticates users.

The Authentication library enables development of customized applications for the Palm vein authentication system which runs on Windows or Linux.



★Tip The Authentication library interface

The Authentication library interface conforms to the BioAPI 1.1 Framework which is currently being standardized by the BioAPI™ Consortium.

The specifications of BioAPI 1.1 "BioAPI Specification Version 1.1" can be downloaded from the homepage of the BioAPI™ Consortium. Refer to the specifications as necessary.

◆ Main Functions of the Authentication Library

The following table lists main functions of the Authentication library.

Function		Descriptions
Palm vein data enrollment		A function to enroll the captured palm veins as vein data.
Authentication	Verification (1 to 1 authentication)	Authenticates a person by matching the captured palm veins against the enrolled palm vein data under the corresponding user identification information such as the ID. This method is generally called "1 to 1 authentication".
	Identification (1 to many authentication)	Authenticates a person by searching through the entire enrolled palm vein data for one which is similar to the captured palm veins. This method is generally called "1 to many authentication". The Authentication library returns the vein data item which is similar to the captured palm veins as the candidate.

!Caution Authentication with identification

Identification has higher risks of false acceptance compared to verification.

Therefore, when deploying the identification mode for authentication, carefully consider measures against false acceptance when designing an application.



>See> For information on measures against false acceptance when authenticating with the identification mode, refer to the "System development guide".

◆ Editions of the Authentication library

There are two editions of Authentication libraries as follows.

- **Basic Edition**

This library allows you to enroll, capture, verify and identify palm vein data.

The Basic Edition supports only calls from single threads.

Authentication libraries up to V24 are equivalent to the Basic Edition.

Use the Basic Edition for the following cases.

- In a stand alone configuration
- On the client side in a client server configuration
- On the server side in a client server configuration (when not using multi-threaded authentication processes)

>See> For information on the stand alone configuration and client server configuration, refer to the "System development guide".

- **Enterprise Edition**

This edition has been added from the Authentication library V30 for servers.

This edition can call verification and identification of palm vein data from multi-threads.

However, you cannot enroll or capture palm vein data with the Enterprise Edition.

!Caution **Using the Enterprise Edition**

You must acquire a license for the Enterprise Edition separately.

!Caution **Functions for generating threads**

Use one of the following C standard functions.

<For Windows environment>

- `_beginthread`
- `_beginthreadex`

<For Linux environment>

- `pthread_create()`
-

!Caution **Number of threads in multi-threaded processes**

Up to 512 threads excluding cancellation threads can be called in multi-thread processes; however, this number is a logical value and there is no guarantee on issues such as processing speed and operation.

The number of threads should be determined at the user's own risk on examination of the operational environment when developing palm vein authentication systems.

An error will be returned when the number of operational threads is exceeded.

!Caution When you are using previous versions

There are several considerations which should be given when the customer is migrating to the Authentication library V31.

>See>

For information on the migration to the Authentication library V31, refer to the "System development guide".

◆ **Authentication Library for x86 and x64**

There are Authentication libraries for x86 and x64.

- **x86 version**

This Authentication library operates on x86 OSes.

x86 OSes can be one of the following.

- Windows (x86)
- Linux (x86)

!Caution Operations of the Authentication library for x86 on Windows x64 WOW64

Please note that operations of the Authentication library for x86 on Windows x64 WOW64 is not guaranteed.

- **x64 version**

This Authentication library operates on x64 OSes.

x64 OSes can be one of the following.

- Windows (x64)
- Linux (x64)

1.2 List of Contents

1.2.1 Windows (x86) Version

The following lists the provided files of the Authentication library for Windows (x86) version.

◆ Basic Edition

Folder			Stored File	Description
1st Hierarchy	2nd Hierarchy	3rd Hierarchy		
Authentication Library	Windows	dll	PvFw.dll	DLL files and operational environment setting files for the Authentication library (used to run applications)
			F3BC4BSP.DLL	
			F3BC4COM.DLL	
			F3BC4CAP.DLL	
			F3BC4MAT.DLL	
			F3BC4TIC.DLL	
			F3BC4BSP.DAT	
			PvAPI.INI	
			pvfwvl.txt	
		include	pvapi_api.h	Header files (used to build source programs)
			pvapi_type.h	
			pvapi_err.h	
			bioapi_api.h	
			bioapi_type.h	
			bioapi_err.h	
			f3bc4tic.h	
		lib	PvFw.lib	Library files (used to build source programs)
			F3BC4TIC.lib	



★Tip F3BC4TIC.DLL

F3BC4TIC.DLL is an enrolled data conversion library which converts palm vein data enrolled by the Authentication library V21 or V24 into the format which can be used for identification by the Authentication library V30 or later.



>See>

For detailed information on the enrolled data conversion library, refer to "Appendix H Enrolled Data Conversion Library".

1.2.2 Windows (x64) Version

The following lists the provided files of the Authentication library for Windows (x64) version.

◆ Basic Edition

Folder			Stored File	Description
1st Hierarchy	2nd Hierarchy	3rd Hierarchy		
Authentication Library	Windows 64	dll	F3BC4BIO.DLL	DLL files and operational environment setting files for the Authentication library (used to run applications)
			F3BC4BSP.DLL	
			F3BC4COM.DLL	
			F3BC4CAP.DLL	
			F3BC4MAT.DLL	
			F3BC4TIC.DLL	
			F3BC4BSP.DAT	
			PvAPI.INI	
			pvfwvl.txt	
		include	pvapi_api.h	Header files (used to build source programs)
			pvapi_type.h	
			pvapi_err.h	
			bioapi_api.h	
			bioapi_type.h	
			bioapi_err.h	
			f3bc4tic.h	
		lib	F3BC4BIO.lib	Library files (used to build source programs)
			F3BC4TIC.lib	



★Tip F3BC4TIC.DLL

F3BC4TIC.DLL is an enrolled data conversion library which converts palm vein data enrolled by the Authentication library V21 or V24 into the format which can be used for identification by the Authentication library V30 or later.



>See>

For detailed information on the enrolled data conversion library, refer to "Appendix H Enrolled Data Conversion Library".

◆ Enterprise Edition

Folder			Stored File	Description
1st Hierarchy	2nd Hierarchy	3rd Hierarchy		
Authentication Library	Windows 64	dll	F3BC4BIOSV.DLL	DLL files and operational environment setting files for the Authentication library (used to run applications)
			F3BC4BSPSV.DLL	
			F3BC4COMSV.DLL	
			F3BC4MATSV.DLL	
			F3BC4TICSV.DLL	
			F3BC4BSPSV.DAT	
			F3BC4LICSV.DAT	
			PvAPISV.INI	
			pvfwvlSV.txt	
		include	pvapi_api.h	Header files (used to build source programs)
			pvapi_type.h	
			pvapi_err.h	
			bioapi_api.h	
			bioapi_type.h	
			bioapi_err.h	
			f3bc4tic.h	
		lib	F3BC4BIOSV.lib	Library files (used to build source programs)
			F3BC4TICSV.lib	

!Caution Using the Enterprise Edition

You must acquire a license for the Enterprise Edition separately.

★Tip F3BC4TICSV.DLL

F3BC4TICSV.DLL is an enrolled data conversion library which converts palm vein data enrolled by the Authentication library V21 or V24 into the format which can be used for identification by the Authentication library V30 or later.

>See>

For detailed information on the enrolled data conversion library, refer to "Appendix H Enrolled Data Conversion Library".

1.2.3 Linux (x86) Version

◆ Basic Edition

Folder			Stored File	Description
1st Hierarchy	2nd Hierarchy	3rd Hierarchy		
Authentication Library	Linux	LM	libpvfw.so (Note)	.so files and operational environment setting files for the Authentication library (used to run applications)
			libf3bc4bsp.so	
			libf3bc4com.so	
			libf3bc4cap.so	
			libf3bc4mat.so	
			libf3bc4tic.so (Note)	
			F3BC4BSP.DAT	
			PvAPI.INI	
			pvfwvl.txt	
		Inc	pvapi_api.h	Header files (used to build source programs)
			pvapi_type.h	
			pvapi_err.h	
			bioapi_api.h	
			bioapi_type.h	
			bioapi_err.h	
			f3bc4tic.h	

Note) "libpvfw.so" and "libf3bc4tic.so" are also used to build source programs as a library file.

★Tip

libf3bc4tic.so

libf3bc4tic.so is an enrolled data conversion library which converts palm vein data enrolled by the Authentication library V21 or V24 into the format which can be used for identification by the Authentication library V30 or later.

>See>

For detailed information on the enrolled data conversion library, refer to "Appendix H Enrolled Data Conversion Library".

◆ Enterprise Edition

Folder			Stored File	Description
1st Hierarchy	2nd Hierarchy	3rd Hierarchy		
Authentication Library	Linux	LM	libf3bc4biosv.so (Note)	.so files and operational environment setting files for the Authentication library (used to run applications)
			libf3bc4bspsv.so	
			libf3bc4comsv.so	
			libf3bc4matsv.so	
			libf3bc4ticsv.so (Note)	
			F3BC4BSPSV.DAT	
			F3BC4LICSV.DAT	
			PvAPISV.INI	
			pvfwlSV.txt	
		Inc	pvapi_api.h	Header files (used to build source programs)
			pvapi_type.h	
			pvapi_err.h	
			bioapi_api.h	
			bioapi_type.h	
			bioapi_err.h	
			f3bc4tic.h	

Note) "libf3bc4biosv.so" and "libf3bc4ticsv.so" are also used to build source programs as a library file.

!Caution Using the Enterprise Edition

You must acquire a license for the Enterprise Edition separately.

★Tip libf3bc4ticsv.so

libf3bc4ticsv.so is an enrolled data conversion library which converts palm vein data enrolled by the Authentication library V21 or V24 into the format which can be used for identification by the Authentication library V30 or later.

>See>

For detailed information on the enrolled data conversion library, refer to "Appendix H Enrolled Data Conversion Library".

1.2.4 Linux (x64) Version

◆ Enterprise Edition

Folder			Stored File	Description
1st Hierarchy	2nd Hierarchy	3rd Hierarchy		
Authentication Library	Linux64	LM	libf3bc4biosv.so (Note)	.so files and operational environment setting files for the Authentication library (used to run applications)
			libf3bc4bspsv.so	
			libf3bc4comsv.so	
			libf3bc4matv.so	
			libf3bc4ticsv.so (Note)	
			F3BC4BSPSV.DAT	
			F3BC4LICSV.DAT	
			PvAPISV.INI	
			pvfwvlSV.txt	
		Inc	pvapi_api.h	Header files (used to build source programs)
			pvapi_type.h	
			pvapi_err.h	
			bioapi_api.h	
			bioapi_type.h	
			bioapi_err.h	
			f3bc4tic.h	

Note) "libf3bc4biosv.so" and "libf3bc4ticsv.so" are also used to build source programs as a library file.

!Caution Using the Enterprise Edition

You must acquire a license for the Enterprise Edition separately.

★Tip libf3bc4ticsv.so

libf3bc4ticsv.so is an enrolled data conversion library which converts palm vein data enrolled by the Authentication library V21 or V24 into the format which can be used for identification by the Authentication library V30 or later.

>See>

For detailed information on the enrolled data conversion library, refer to "Appendix H Enrolled Data Conversion Library".

Chapter2 Before Using the Authentication Library

- 2.1 Hardware and Software Requirements**
- 2.2 Preparation before Using the Authentication library**
- 2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information**

2.1 Hardware and Software Requirements

The following describes the required hardware and software to use the Authentication library.

◆ Basic Edition

Hardware and Software Requirements		Description
Hardware Requirement	CPU	Intel® Core™ 2 Duo 2.40GHz or more However, Intel® ULV Celeron® 650MHz or more for Windows XP (must also comply with the recommended value for the given OS)
	Memory (Note 2)	x86 version : 1GB or more x64 version : 2GB or more However, 256MB or more for Windows XP (must also comply with the recommended value for the given OS)
	USB	USB 2.0 only
	HDD space (Note 3)	222MB or more
	Sensor	<ul style="list-style-type: none"> • PalmSecure Sensor • PalmSecure Sensor V2 For information on the firmware version level on the Sensor unit, refer to the "System development guide".
Software Requirement	OS (Note 4)	<ul style="list-style-type: none"> • Windows XP SP3 (x86) (Home / Professional) • Windows 7 SP1 (x86 and x64) (Ultimate / Enterprise / Professional / Home Premium) • Windows 8 (x86 and x64) (Note 5) (Windows 8 / Windows 8 Pro) • Linux (x86) (kernel 2.6.32 or later)
	Sensor driver	< Windows Sensor driver > (Note 6) Download the latest version from the SDK support Web site. The supported Sensor driver versions level are as follows. <ul style="list-style-type: none"> ● Windows Conventional Sensor driver <ul style="list-style-type: none"> • Windows (x86) V11L04 • Windows (x64) V20L02 ● Windows Sensor driver for extended function <ul style="list-style-type: none"> • Windows (x86) V31L31 • Windows (x64) V31L41
	Authentication library (Note 6)	< Linux Sensor driver for extended function > Contact the sales representatives for the availability. The supported Sensor driver version level is as follows. <ul style="list-style-type: none"> • Linux (x86) V31L01
		Download the latest version from the SDK support Web site.

Note 1) Use an Intel® Pentium®4 at 3.0 GHz or faster CPU when identifying or using the detailed information notification function for the guidance image display.

Use an Intel® Core™2 Duo at 2.40GHz or faster CPU when using extended functions of the Sensor.

>See> For information on the identification, refer to the "System development guide".

>See> For information on the detailed information notification function for the guidance image display, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

>See> For information on extended functions of the Sensor, refer to the "System development guide".

Note 2) The Authentication library requires 32MB or more memory.

Note 3) Minimum required space only for the Authentication library.

The required space is the module size of the Authentication library (8MB for x86, 12MB for x64) only if trace file is not output.

The following space is required when connecting multiple Sensors.

Module size of the Authentication library + Trace file size (210MB) x (Number of Sensors + 1)

Example 1) When connecting 8 Sensors with trace file output in x86:

$$8\text{MB} + 210\text{MB} \times (8 + 1) = 1898\text{MB}$$

Example 2) When connecting 8 Sensors with trace file output in x64:

$$12\text{MB} + 210\text{MB} \times (8 + 1) = 1902\text{MB}$$

>See> For information on trace file, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

>See> For information on multiple Sensor connection, refer to the "System development guide" and "Appendix B Connecting Multiple Sensors (Windows Basic Edition Only)".

Note 4) Operations have not been tested in virtual environments (such as XP mode in Windows 7). Please verify the operations yourself if you are using this product in a virtual environment.

Note 5) Use PalmSecure Sensor V2 with the Windows Sensor driver for extended function for Windows 8.

Note 6) The downloaded Sensor driver and Authentication library are compressed. Extract them using an extract tool.

!Caution Linux environment

Operations of the Authentication library is confirmed in the following Linux environment.

However, operations are not confirmed in virtual environments.

Distribution	Kernel Version	Gcc Version	Glibc Version
CentOS6.3	2.6.32-279.el6.i686	4.4.6 20120305 (Red Hat 4.4.6-4)	2.12

◆ Enterprise Edition

Hardware and Software Requirements		Description
Hardware Requirement	CPU	Intel® Core™2 Duo 2.40GHz or more (must also comply with the recommended value for the given OS)
	Memory (Note 1)	2GB or more (must also comply with the recommended value for the given OS)
	HDD space (Note 2)	222MB or more
Software Requirement	OS (Note 3)	<ul style="list-style-type: none"> • Windows Server 2008 R2 SP1 (x64) (Standard / Enterprise) • Windows Server 2012 (x64) (Standard) • Linux (x86 and x64) (kernel 2.6.32 or later)
	Authentication library (Note 4)	Download the latest version from the SDK support Web site.

Note 1) The Authentication library requires 48MB or more memory.

The memory requirement of the Authentication library for multi-threaded authentication processes is shown below.

- For multi-threaded verification or identification processes

Thread shared memory (48 MB) + verification or identification thread memory (6 MB) x number of threads

Example) When identifying with 8 threads:

$$48 \text{ MB} + 6 \text{ MB} \times 8 \text{ threads} = 96 \text{ MB}$$

- For multi-threaded identification processes (when the initialization process includes the advance loading process of palm vein data group for identification)

Thread shared memory (48 MB) + identification thread memory (9 MB) x number of threads

Example) When identifying with 8 threads:

$$48 \text{ MB} + 9 \text{ MB} \times 8 \text{ threads} = 120 \text{ MB}$$

Note 2) Minimum required space only for the Authentication library.

The required space is the module size of the Authentication library (8MB for x86, 12MB for x64) only if trace file is not output.

>See> For information on trace file, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

Note 3) Operations have not been tested in virtual environments (such as Hyper-V).

Please verify the operations yourself if you are using this product
in a virtual environment.

Note 4) The downloaded Authentication library is compressed.

Extract them using an extract tool.

!Caution Linux environment

Operations of the Authentication library is confirmed in the following
Linux environment.

However, operations are not confirmed in virtual environments.

Distribution	Kernel Version	Gcc Version	Glibc Version
CentOS6.3	2.6.32-279.el6.i686 2.6.32-279.el6.x86_64	4.4.6 20120305 (Red Hat 4.4.6-4)	2.12

2.2 Preparation before Using the Authentication library

2.2.1 Windows Version

This section describes the preparations before using the Authentication library for Windows version.

Operation

Step1 If the target hardware is using the Basic Edition and designated to be connected to a Sensor, install the Sensor driver.

>See> For information on how to install the driver, refer to the "Sensor driver installation guide".

Step2 Install the Authentication library on the target hardware as follows.

(1) Copy the "dll" folder created by decompressing the downloaded Authentication library to any folder on the target hardware.

!Caution Copy destination folder

Avoid using system directories ("C:\", "C:\Program Files", "C:\Windows", etc.) on the target hardware as the destination folder to copy the "dll" folder.

Operations are not guaranteed if the "dll" folder is copied into system directories.

(2) Set the path to the "dll" folder on the target hardware as follows.

1. Select the "Path" variable from the list of system variables in the screen to set environment variables, and click the [Edit] button.
2. In the entry area for [Variable value] on the Edit System Variable screen, add the path to the "dll" folder as follows:

; (the path to the "dll" folder copied in (1)) \dll

!Caution Setting a path

Paths are delimited by a ";" (semi-colon).

Take care not to insert the path at the middle of another path.

!Caution When the Authentication library is no longer in use

Delete the copied folder and the added path.

Step3 Specify operation mode of the Authentication library and trace acquisition information to the operational environment setting file ("PvAPI.INI" or "PvAPISV.INI") under the "dll" folder copied on the target hardware.

>See> Refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

Step4 Follow the procedure below to update the firmware on the Sensor unit to the latest version as necessary.

!Caution Firmware

For information on the firmware version level on the Sensor unit, refer to the "System development guide".

(1) Check the firmware version level on the Sensor unit using the Sensor maintenance tool.

>See> For information on the Sensor maintenance tool, refer to the "Sensor maintenance tool operation guide".

(2) Compare the version level of the firmware in the SDK support Web site and the version level of the firmware in the Sensor unit.
If the versions are the same and the level on the Sensor unit is older, upgrade it using the firmware update function of the Authentication library or the Firmware update tool.

>See> For information on how to update the firmware to the latest version, refer to the "System development guide" and "Appendix C Authentication Library Firmware Update Function (Basic Edition Only)", or the "Firmware update tool operation guide".

2.2.2 Linux Version

This section describes the preparations before using the Authentication library for Linux version.

Operation

Step1 If the target hardware is using the Basic Edition and designated to be connected to a Sensor, install the Sensor driver.

>See> For information on how to install the driver, refer to the "Sensor driver installation guide".

Step2 Install the Authentication library on the target hardware as follows.

- (1) Copy all of the files in "LM" folder under the downloaded and extracted to any folder on the target hardware.
- (2) Use the "export" command to set the folder path to where the files have been copied, to an environment variable LD_LIBRARY_PATH.
Command example) export LD_LIBRARY_PATH=
\$LD_LIBRARY_PATH:/opt/palmsecure/linux/lib

!Caution When the Authentication library is no longer in use

Delete the copied files and the added path.

Step3 Specify operation mode of the Authentication library and trace acquisition information to the operational environment setting file ("PvAPI.INI" or "PvAPISV.INI") which has been copied into a folder on the target hardware.

>See> Refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

Step4 Update the firmware on the Sensor unit to the latest version as necessary.

The method to upgrade the firmware on the Sensor unit to the latest version is the same as for a Windows environment.

>See> Refer to Step 4 of "2.2.1 Windows Version".

2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information

Set operation mode for the Authentication library (below 1-1 to 1-7) and trace acquisition information (below 2-1 to 2-5) in the operational environment setting file ("PvAPI.INI" or "PvAPISV.INI").

The following shows a setting example of the operational environment setting file.

```
[Common]
Sensor = 1      . . . . . (1-1)
GuideMode      = 0 . . . . . (1-2)
ScoreNotifications = 0 . . . . . (1-3)
CBRegistDataScore = 0 . . . . . (1-4)
CBGUIMessageDetail = 0 . . . . . (1-5)
CaptureTimes    = 2 . . . . . (1-6)
CaptureCompress = 0 . . . . . (1-7)

[PvAPITrace]
TraceMode = 0x03 . . . . . (2-1)
TraceSize = 1024 . . . . . (2-2)
TracePath = c:\F3BC4\log . . . . . (2-3)
TraceFile = PvAPITrc.dat . . . . . (2-4)
TraceNum  = 10 . . . . . (2-5)
```

!Caution **Missing item in the operational environment setting file**
Enter as necessary.

!Caution **Note on setting items**
Each setting item in the operational environment setting file must be up to 256 single byte ASCII characters (except control codes apart from a carriage return and a tab) and must be terminated with a carriage return.
Each setting item must not be repeated.

!Caution **Comment notation**
Describe comments (descriptions starting with ";") on a separate line from sections ([Common], [PvAPITrace]) and setting items.

!Caution **Delimiting paths**
Delimit paths using "\" in a Windows environment or "/" in a Linux environment.

◆ Setting Items of Operation Mode for Authentication Library

BE: Basic Edition

EE: Enterprise Edition

○: Can be specified

×: Cannot be specified

Setting Item		Description	Default	BE	EE
(1-1)	Sensor	<p>Specify whether a Sensor is connected or not. 0: Do not connect a Sensor 1: Connect a Sensor</p> <p>Do not set this item for the Enterprise Edition since it operates without a sensor connected. (An error occurs if "Connect a Sensor" is specified.).</p>	1	○	×
(1-2)	Guide Mode	<p>Specify the guide mode for capturing palm veins. 0: Without guide mode (Note) 1: With guide mode</p> <p>Note) Be sure to specify "without guide mode" for the following cases. • When connecting a mouse type Sensor (sold separately)</p> <p>>See> For information on guide mode, refer to the "System development guide".</p> <p>There are several issues which should be considered when using guide mode. >See> For notes on using guide mode, refer to "Appendix F Guide Mode (Basic Edition Only)".</p>	0	○	×

Setting Item		Description	Default	BE	EE
(1-3)	Score Notifications	<p>Specify whether to use the authentication result score notification function. 0: Do not use 1: Use (Note)</p> <p>Note) Palm vein data must satisfy the following conditions when "Use" is specified.</p> <ul style="list-style-type: none"> Enrollment format of palm vein data is non-compressed format <p>>See> For information on the authentication result score notification function, refer to the "System development guide".</p> <p>The time required for verification is slightly longer if this function is used in verification processes.</p>	0	○	○
(1-4)	CB Regist Data Score	<p>Specify whether to use the enrolled data score notification function. 0: Do not use 1: Use</p> <p>>See> For information on the enrolled data score notification function, refer to the "System development guide" and "3.5.1 BioAPI_GUI_STATE_CALLB ACK".</p>	0	○	×
(1-5)	CBGUI Message Detail	<p>Specify whether to use the detailed information notification function for the guidance image display. 0: Do not use 1: Use</p> <p>The detailed information notification function for the guidance image display returns detailed information in order to display the guidance image to instruct the palm position.</p> <p>>See> For detailed information to display the guidance image, refer to "3.5.1 BioAPI_GUI_STATE_CALLB ACK".</p> <p>>See> For information on the guidance image to instruct the palm position, refer to "3.5.2 BioAPI_GUI_STREAMING_C ALLBACK".</p>	0	○	×

Setting Item		Description	Default	BE	EE
(1-6)	Capture Times	<p>Specify whether to use the continuous capture function when authenticating using PalmSecure Sensor V2. 1 : Do not use (capture once) 2~5: Use (capture 2 to 5 times)</p> <p>However, "Do not use" is assumed if the conditions for the extended functions of the Sensor are not satisfied.</p> <p>>See> For information on the continuous capture function and conditions to use the extended functions of the Sensor, refer to the "System development guide".</p>	2	○	×
(1-7)	Capture Compress	<p>Specify whether to use the image compression function when authenticating using PalmSecure Sensor V2. 0: Do not use 1: Use</p> <p>However, "Do not use" is assumed if the conditions for the extended functions of the Sensor are not satisfied.</p> <p>>See> For information on the image compression function and conditions to use the extended functions of the Sensor, refer to the "System development guide".</p> <p>The time required for the capturing process and identification process is slightly longer if this function is used.</p>	0	○	×

★Tip**Settings for Operation mode in the previous versions of Authentication library**

Internal format of palm vein data and index type settings are no longer required since the Authentication library V30.

The Authentication library V30 and later are automatically configured as follows.

- Internal format of palm vein data is I-format
- Index type is F27-Index (Note)

Note) The index is not added when the enrollment format of palm vein data is compressed format.

Settings for the identification mode of palm vein data, Sensor initialization mode, and detailed guidance notification are no longer required from the Authentication library V31.

The Authentication library V31 and later are automatically configured as follows.

- Identification mode of palm vein data: F27-method
- Sensor initialization mode : Quick initialization
- Detailed guidance notification : Detailed notification

>See>

For information on the internal format of palm vein data and index type, refer to the "System development guide".

>See>

For information on the enrollment format of palm vein data, "System development guide" and "3.4.17 PvAPI_SetProfile".

>See>

For information on the identification mode of palm vein data, refer to the "System development guide".

★Tip**Specifying operation mode of the Authentication library using PvAPI_SetProfile**

The following item among operation mode of the Authentication library can be dynamically changed using PvAPI_SetProfile.

- GuideMode (guide mode)
- ScoreNotifications (authentication result score notification function)

>See>

For information on PvAPI_SetProfile, refer to "3.4.17 PvAPI_SetProfile".

◆ Setting Items of Trace Acquisition Information

BE: Basic Edition

EE: Enterprise Edition

○: Can be specified

×: Cannot be specified

Setting Item		Description	Default	BE	EE
(2-1)	Trace Mode	Specify whether or not to output trace information. 0x00 : Not output 0x03 : Output (recommended) Specify "Output" as a general rule. Trace information may be used for diagnosis in the event of operational faults. Also, trace information does not include any data which may indicate any individuals.	0x03	○	○
(2-2)	Trace Size	Specify the size of the trace file in Kbyte units in the range from 1 to 10240. The default value (1024) is applied if any values other than 1 - 10240 are specified.	1024	○	○
(2-3)	Trace Path	Specify the output destination of the trace file (Note) with an absolute path. Note) Specify a directory other than a system directory ("C:\", "C:\Program Files", "C:\Windows", etc.) for the output destination of the trace file. If the specified folder does not exist, the trace file is output to the folder where Authentication library modules are installed. The trace file is not output if read/write privileges are not granted for the specified folder.	(The same folder as the Authentication library modules)	○	○
(2-4)	Trace File	Specify the name of the trace file. The trace file is newly created if the specified file does not exist. However, the trace file is not output if the specified file exists, and read/write privileges to the specified file are not granted.	BE : PvAPI Trc.dat EE : PvAPI TrcSV. dat	○	○

Setting Item		Description	Default	BE	EE
(2-5)	Trace Num	<p>Specify the number of trace generations in the range from 0 to 20. The file specified in TraceFile only is output if 0 is specified. In addition to the file specified in TraceFile, other files with the same name followed by a number "01" - "20" are also output if 1 - 20 is specified. Example) In the case of Basic Edition, the following 4 files are output if 3 is specified.</p> <ul style="list-style-type: none"> • PvAPITrc.dat • PvAPITrc01.dat • PvAPITrc02.dat • PvAPITrc03.dat <p>The default (10) applies if a number outside of the above range is specified.</p>	10	<input type="radio"/>	<input type="radio"/>

★Tip

Trace file with multiple Sensor connections using the Basic Edition

Trace information before "BioAPI_ModuleAttach" and after "BioAPI_ModuleDetach" is output to the specified trace file if multiple Sensors are connected while using the Basic Edition.
Also, trace information after "PvAPI_PreSetProfile" is output to trace files for each Sensor.
The format of the trace file name for each Sensor is shown below.
However, trace files for Sensors which are no longer in use are not deleted.

PvAPI_serial number_model_trace file name

Item	Description
Serial number	The serial number of the Sensor specified in PvAPI_PreSetProfile.
Model	The model of the Sensor specified in PvAPI_PreSetProfile.
Trace file name	The trace file name specified in the operational environment setting file "PvAPI.INI".

>See> For information on multiple Sensor connections, refer to the "System development guide" and "Appendix B Connecting Multiple Sensors (Windows Basic Edition Only)".

>See> For information on BioAPI_ModuleAttach, BioAPI_ModuleDetach, and PvAPI_PreSetProfile, refer to "Chapter3 Authentication Library Interface".

Chapter3 Authentication Library Interface

- 3.1 List of Functions**
- 3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication**
- 3.3 Basic Process Sequence**
- 3.4 Interface**
- 3.5 Callback Function Interface**

3.1 List of Functions

The Authentication library provides the following functions.

BE: Basic Edition

EE: Enterprise Edition

○: Can be called

×: Cannot be called

Function Name		BE	EE	Ref.
BioAPI_ModuleLoad		○	○	3.4.1
BioAPI_ModuleUnload		○	○	3.4.2
BioAPI_ModuleAttach		○	○	3.4.3
BioAPI_ModuleDetach		○	○	3.4.4
BioAPI_FreeBIRHandle		○	×	3.4.5
BioAPI_GetBIRFromHandle		○	×	3.4.6
BioAPI_GetHeaderFromHandle		○	×	3.4.7
BioAPI_SetGUICallbacks		○	○	3.4.8
BioAPI_Capture		○	×	3.4.9
BioAPI_Process		○	×	3.4.10
BioAPI_VerifyMatch		○	○	3.4.11
BioAPI_IdentifyMatch		○	○	3.4.12
BioAPI_Enroll		○	×	3.4.13
BioAPI_Verify		○	×	3.4.14
BioAPI_Identify		○	×	3.4.15
PvAPI_ApAuthenticate		○	○	3.4.16
PvAPI_SetProfile		○	○	3.4.17
PvAPI_GetErrorInfo		○	○	3.4.18
PvAPI_Sense		○	×	3.4.19
PvAPI_Cancel		○	○	3.4.20
PvAPI_PreSetProfile		○	×	3.4.21
PvAPI_PresetIdentifyPopulation		○	○	3.4.22
PvAPI_GetConnectSensorInfoEx		○	×	3.4.23
PvAPI_GetLibraryInfo		○	○	3.4.24
Callback Function	BioAPI_GUI_STATE_CALLBACK	○	○	3.5.1
	BioAPI_GUI_STREAMING_CALLBACK	○	×	3.5.2

★Tip

BioAPI compliant functions and our proprietary functions

Functions begin with "BioAPI" are BioAPI compliant functions. Also, ones which begin with "PvAPI_" are Fujitsu's proprietary function.

★Tip **Definition of variable types used by BioAPI**

Variable types (uint8, etc.) used in BioAPI are defined in the header file "bioapi_type.h" as follows.

```
typedef unsigned char uint8;
typedef unsigned short uint16;
typedef short sint16;
typedef unsigned int uint32;
typedef int sint32;
typedef char sint8;
```

!Caution **Calling from multiple threads in the Basic Edition**

Function other than PvAPI_Cancel can't be called from multiple threads in the Basic Edition.

!Caution **Header files to be included**

The header files need to be included in the following order for source programs which use the functions in the Authentication library.

- bioapi_type.h
 - bioapi_api.h
 - bioapi_err.h
 - pvapi_type.h
 - pvapi_api.h
 - pvapi_err.h
-

!Caution **When building a source code**

The following library should be specified in advance.

<For the Windows(x86) Basic Edition>

- PvFw.lib

<For the Windows(x64) Basic Edition>

- F3BC4BIO.lib

<For the Windows(x64) Enterprise Edition>

- F3BC4BIOSV.lib

<For the Linux(x86) Basic Edition>

- libpvfw.so

<For the Linux(x86) Enterprise Edition>

- libf3bc4biosv.so

<For the Linux(x64) Enterprise Edition>

- libf3bc4biosv.so
-

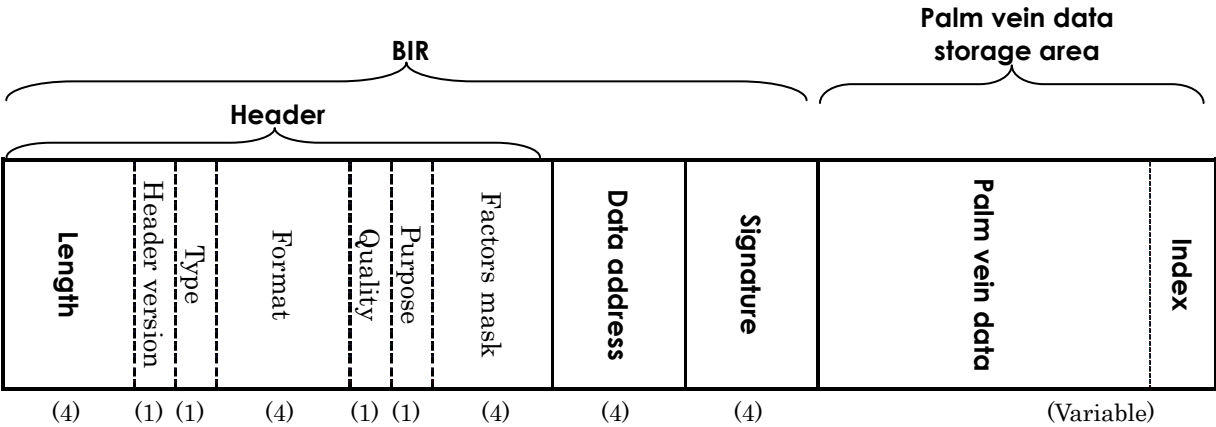
!Caution **When using the DIIMain entry point**

Do not call functions from the Authentication library at the entry point.

3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication

Both palm vein data for enrollment which is notified by BioAPI_Enroll, and palm vein data for authentication notified by BioAPI_Capture are a single consecutive area that has the following structure.

★Tip **Palm vein data for enrollment and authentication**
While palm vein data for enrollment and palm vein data for authentication share the same structure, their purposes are different. In order to authenticate, palm vein data for enrollment and palm vein data for authentication must be matched up. Palm vein data for enrollment cannot be matched up against palm vein data for enrollment, and also palm vein data for authentication cannot be matched up against palm vein data for authentication.



Remark: Numbers in () indicate the size of each field (bytes).

The following are brief descriptions of fields in palm vein data for enrollment and palm vein data for authentication.

Field	Description
BIR	A field to notify palm vein data subject to verification, a group of palm vein data subject to identification, or the captured palm vein data for authentication to the Authentication library.
Header	The information section of BIR.
Length	The total of the header size (16 bytes) and the storage size of palm vein data (variable). Note that Length does not include the size of the data address (4 bytes) and of the signature (4 bytes).
Data address	The address which points to the beginning of the palm vein data storage area. It is assumed that palm vein data is stored immediately after the signature when the data address is NULL. However, this is always set to 0 for x64 version and palm vein data is stored immediately after the signature.
Signature	Normally this field indicates the pointer of the signature, however, this Authentication library uses this field for a consistency check.
Palm vein data storage area	The field which contains palm vein data only, without BIR.
Index	A field to be referenced in the identification process. Index does not generate to the compressed format of palm vein data.



Size of the palm vein data storage area

The size of the palm vein data storage area can be calculated by subtracting the header size (16 bytes) from the value specified in the Length field.

The maximum size of the area combining BIR and the palm vein data storage area is as follows.

Palm vein data type	Enrollment format (Note1)	Maximum size
Palm vein data for enrollment	Non-compressed format	Up to 3072 bytes
	Compressed format	Up to 832 bytes
Palm vein data for authentication (Note2)		Up to 4096 bytes

Note1) Only palm vein data for enrollment can be compressed when compressed format is specified for the enrollment format. Palm vein data for authentication is not compressed.

Note2) The maximum size of palm vein data for authentication is 4096 bytes x the number of capture at authentication when using the continuous capture function.

Example 1: Capture 2 times in authentication

$$4096 \text{ bytes} \times 2 \text{ times} = 8192 \text{ bytes}$$

Example 2: Capture 5 times in authentication

$$4096 \text{ bytes} \times 5 \text{ times} = 20480 \text{ bytes}$$

- >See> For information on enrollment format of palm vein data, refer to the "System development guide" and "3.4.17 PvAPI_SetProfile".
- >See> For information on continuous capture function, refer to the "System development guide" and "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

!Caution Signature field

Never modify the value set in the signature field.
Any subsequent operations are not guaranteed if the value is modified.

!Caution BIR structure for the x64 version

Use the PvAPI_BIR structure for BIR.
The PvAPI_BIR structure can also be used in the x86 version.
The following describes the BioAPI_BIR structure, and the PvAPI_BIR structure.

[BioAPI_BIR structure]

```
typedef struct bioapi_hrs_bir
{
    BioAPI_BIR_HEADER          Header;
    BioAPI_BIR_BIOMETRIC_DATA_PTR BiometricData;
    BioAPI_DATA_PTR            Signature;
} BioAPI_BIR, *BioAPI_BIR_PTR;
```

[PvAPI_BIR structure]

```
typedef struct pvapi_hrs_bir
{
    BioAPI_BIR_HEADER          Header;
    uint32                     BiometricData;
    uint32                     Signature;
} PvAPI_BIR, *PvAPI_BIR_PTR;
```

!Caution Casting palm vein data to BIR and setting the data address

You need to cast palm vein data to BIR when handling the data.
Also, you need to reset the data address in one of the following methods when casting.

<x86 version>

- Reset as the data address to point at the starting position of the palm data storage area.
- Reset the data address to NULL and store palm vein data immediately after the signature.

<x64 version>

- Always reset the data address to 0 and store palm vein data immediately after the signature.
-

★Tip **Compatibility of palm vein data**
Items of palm vein data registered by x86 version and x64 version are compatible.

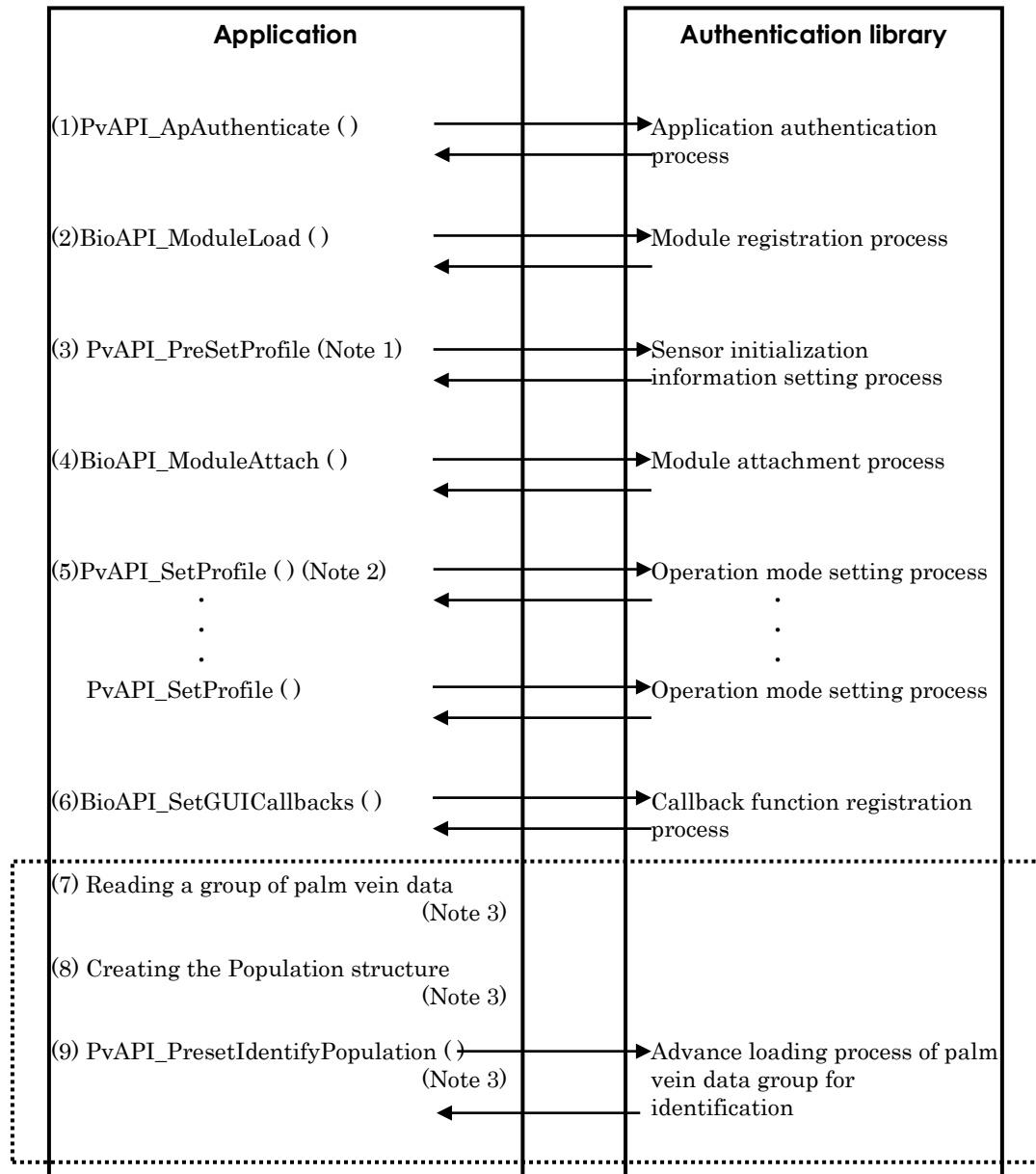
★Tip **Palm vein data**
Generally, palm vein data is stored either as raw image data as it was captured by the Sensor, or as intrinsic characteristics extracted from the raw image data. This Authentication library stores data as intrinsic characteristics extracted from the raw image data.

★Tip **Processed BIR**
The whole palm vein data including BIR and the intrinsic characteristic data extracted from the raw image data, is generally called "processed BIR".

3.3 Basic Process Sequence

3.3.1 Initialization Sequence

The following diagram indicates the basic initialization sequence.



Note 1) Call PvAPI_PreSetProfile for each setting item when connecting multiple Sensors.

>See> For information on multiple Sensor connections, refer to the "System development guide" and "Appendix B Connecting Multiple Sensors (WindowsBasic Edition Only)".

Note 2) Call PvAPI_SetProfile for each setting item when dynamically changing operation mode of the Authentication library.

The following item which is specified in PvAPI_SetProfile can also be specified in the operational environment setting file.

- Guide mode
- The authentication result score notification function

!Caution Authentication result score notification function

The time required for verification is slightly longer if the authentication result score notification function is used in verification processes.

Therefore, use the authentication result score notification function to test authentication after enrolling palm vein data, and identification processes.

In such cases, specify "Do not use" in the operational environment setting file and call PvAPI_SetProfile before test of enrolled palm vein data or an identification process to specify "Use" each time.

>See> For information on an operational environmental setting file, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

Note 3) (7) to (9) are effective when identifying in an environment where a large number of palm vein data items is enrolled and re-enrollment of palm vein data is rare. Executing (7) to (9) reduces the duration required for the identification process.

Use these processes with system security measures since these processes result in the retention of the decoded palm vein data for enrollment in memory for a long duration of time.

>See> For information on the Population structure, refer to "A.2 Population Structure".

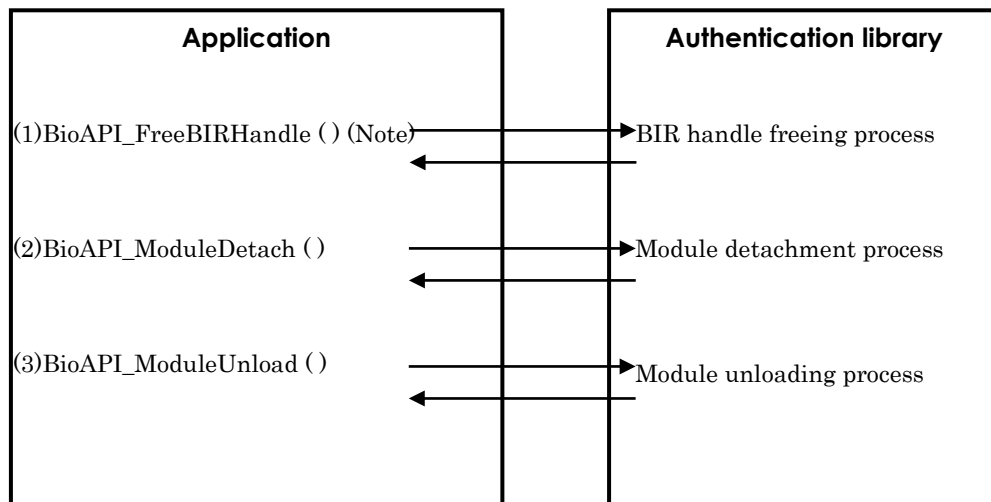
★Tip The initialization sequence of the Authentication library and the start sequence of the Sensor

Start sequence of Sensor will be execute simultaneously by executing initialization sequence of Authentication library (from (1) to (4) in above figure).

>See> For information on the duration required for the Sensor's start sequence, refer to "Appendix E Duration Required for the Start Sequence of the Sensor (Basic Edition Only)".

3.3.2 Termination Sequence

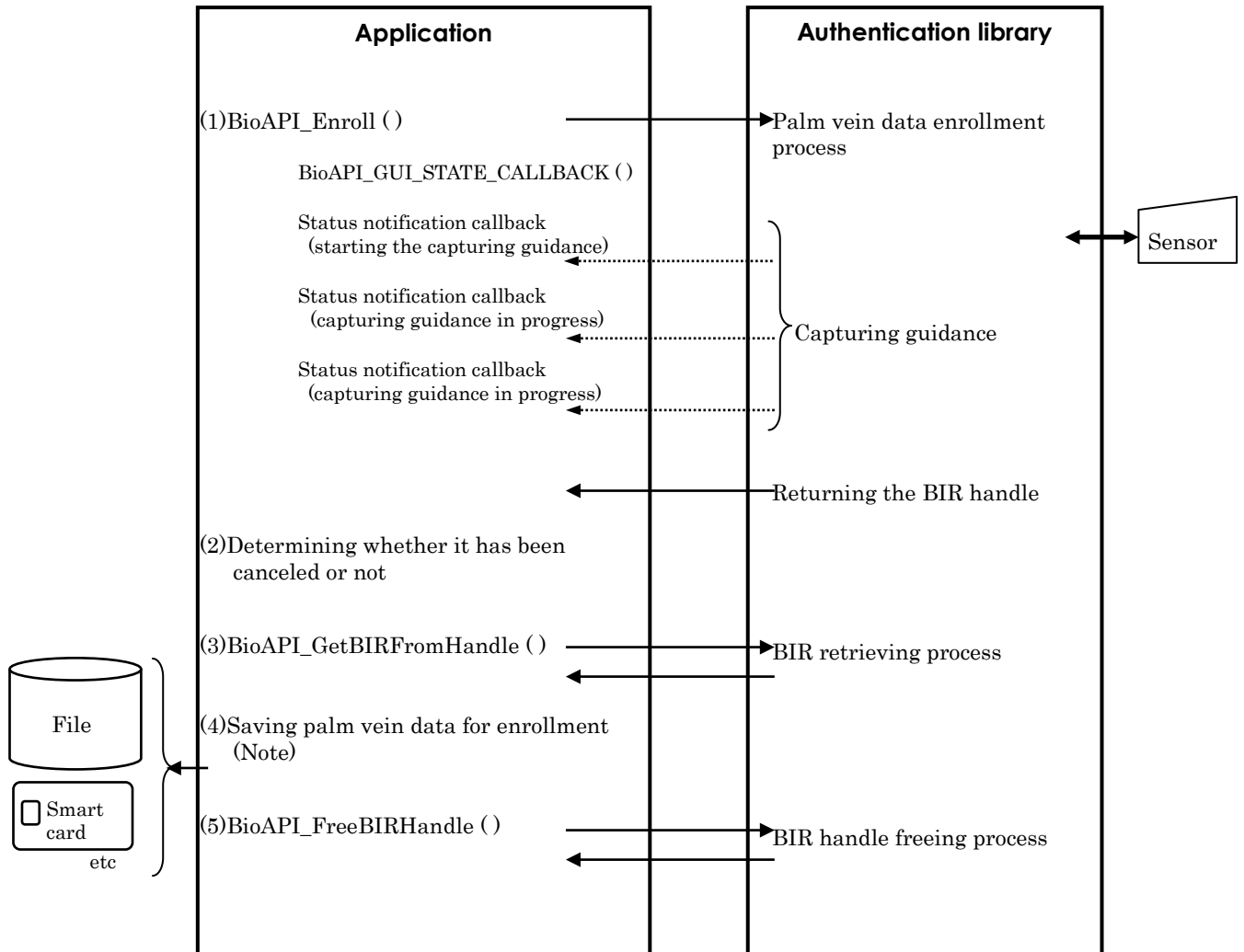
The following diagram indicates the basic termination sequence.



Note) BioAPI_FreeBIRHandle is called when a BIR handle which is notified by BioAPI_Enroll or BioAPI_Capture has not been freed.

3.3.3 Palm Vein Data Enrollment Sequence

The following diagram indicates the basic palm vein data enrollment sequence.



Note) When saving palm vein data for enrollment, save it as a complete set with its BIR.

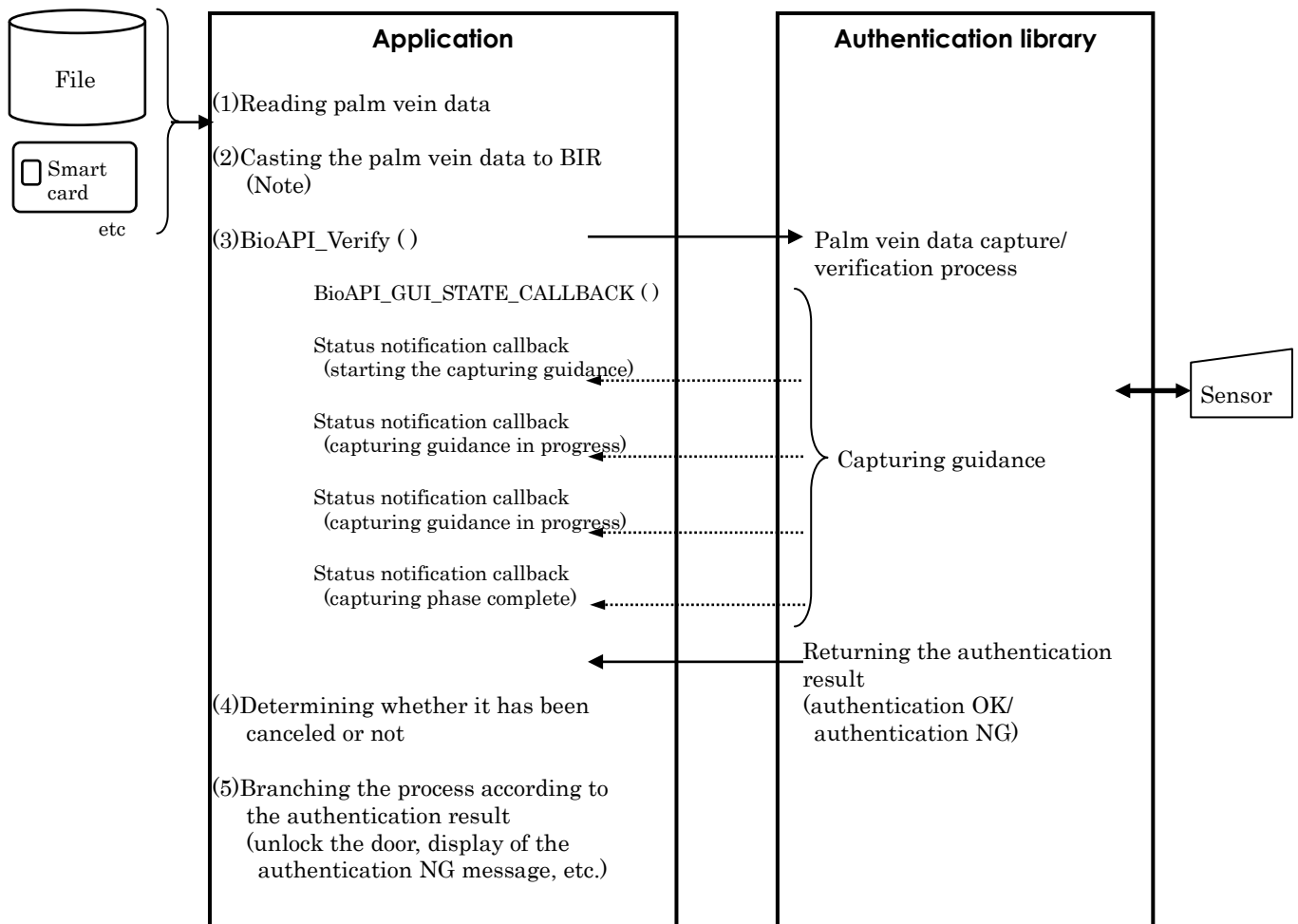
Note that the size set in Length in the BIR header does not include the size of the data address (4 bytes) and of the signature (4 bytes).

>See> For information on the palm vein data for enrollment, refer to "3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication".

>See> For information on how to determine cancellation, refer to "3.3.10 Cancellation Sequence".

3.3.4 Palm Vein Data Capture and Verification Sequence (for Stand Alone Configuration)

The following diagram indicates the basic palm vein data capture and verification sequence for stand alone configuration.



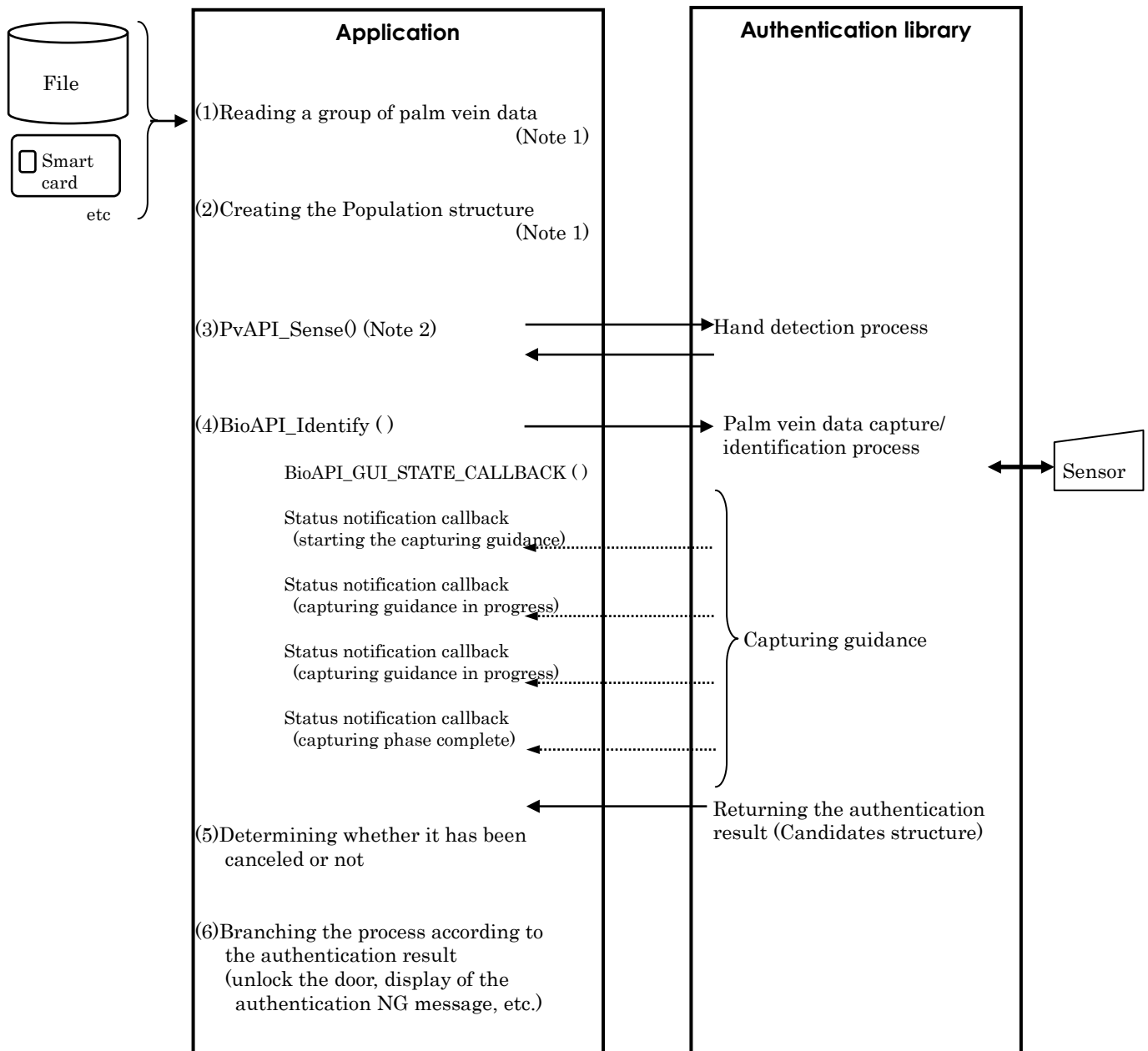
Note) Cast palm vein data to BIR and reset the data address.

>See> For information on the BIR, refer to "3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication".

>See> For information on how to determine cancellation, refer to "3.3.10 Cancellation Sequence".

3.3.5 Palm Vein Data Capture and Identification Sequence (for Stand Alone Configuration)

The following diagram indicates the basic palm vein data capture and identification sequence for stand alone configuration.



Note 1) (1) to (2) are not required where the advance enrollment process of palm vein data group for identification ((7) to (9) in the initialization sequence) has been executed.

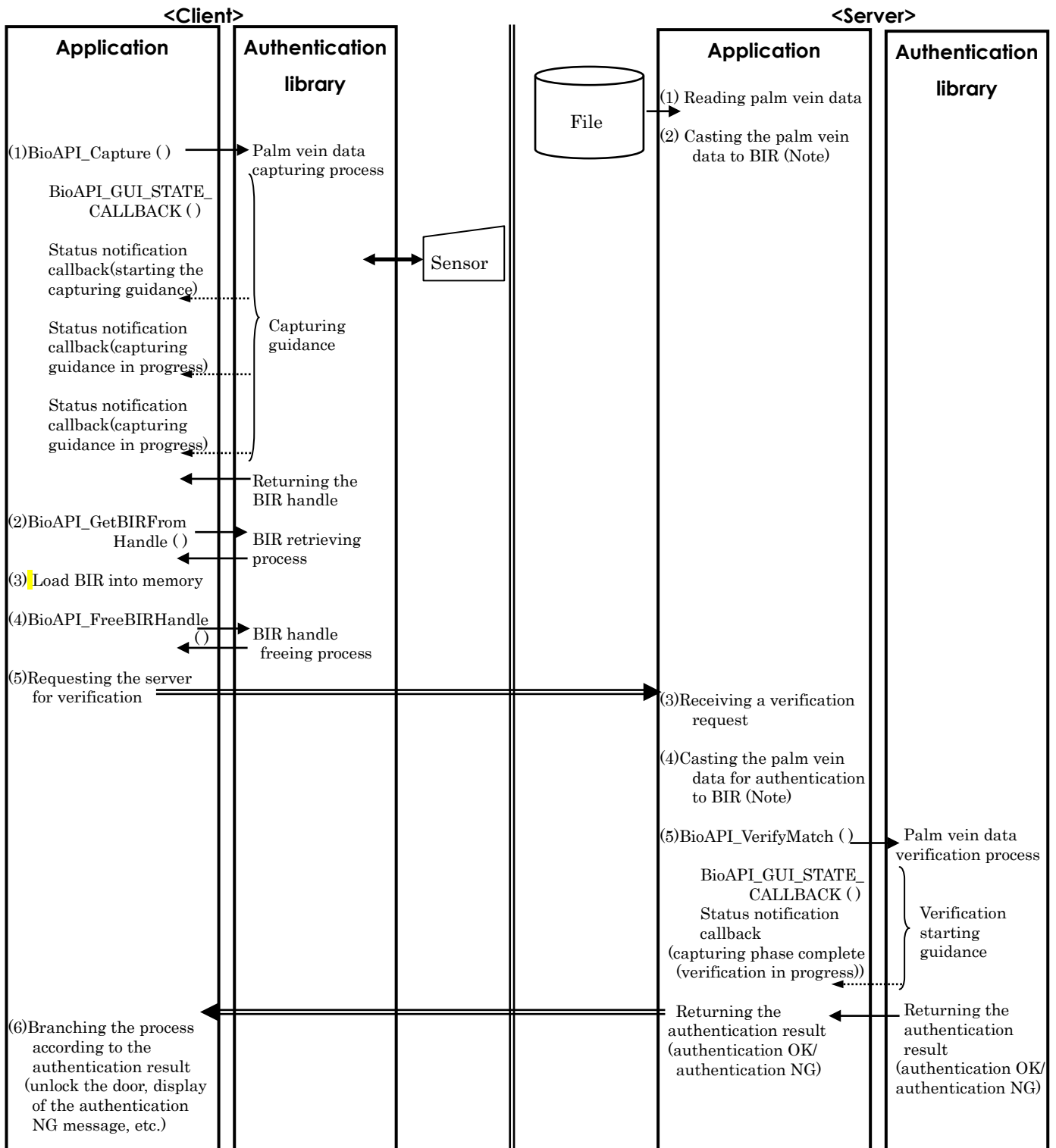
>See> For information on the advance loading process of palm vein data group for identification, refer to "3.3.1 Initialization Sequence".

Note 2) Call PvAPI_Sense in the case where you are calling BioAPI_Identify as a hand is placed. (This is not necessary if you are calling BioAPI_Identify by other triggers such as pressing a button.)

- >See> For information on the Population structure, refer to "A.2 Population Structure".
- >See> For information on the Candidates structure, refer to "A.3 Candidates Structure".
- >See> For information on how to determine cancellation, refer to "3.3.10 Cancellation Sequence".

3.3.6 Palm Vein Data Capture and Verification Sequence (for Client Server Configuration)

The following diagram indicates the basic palm vein data capture and verification sequence for client server configuration.

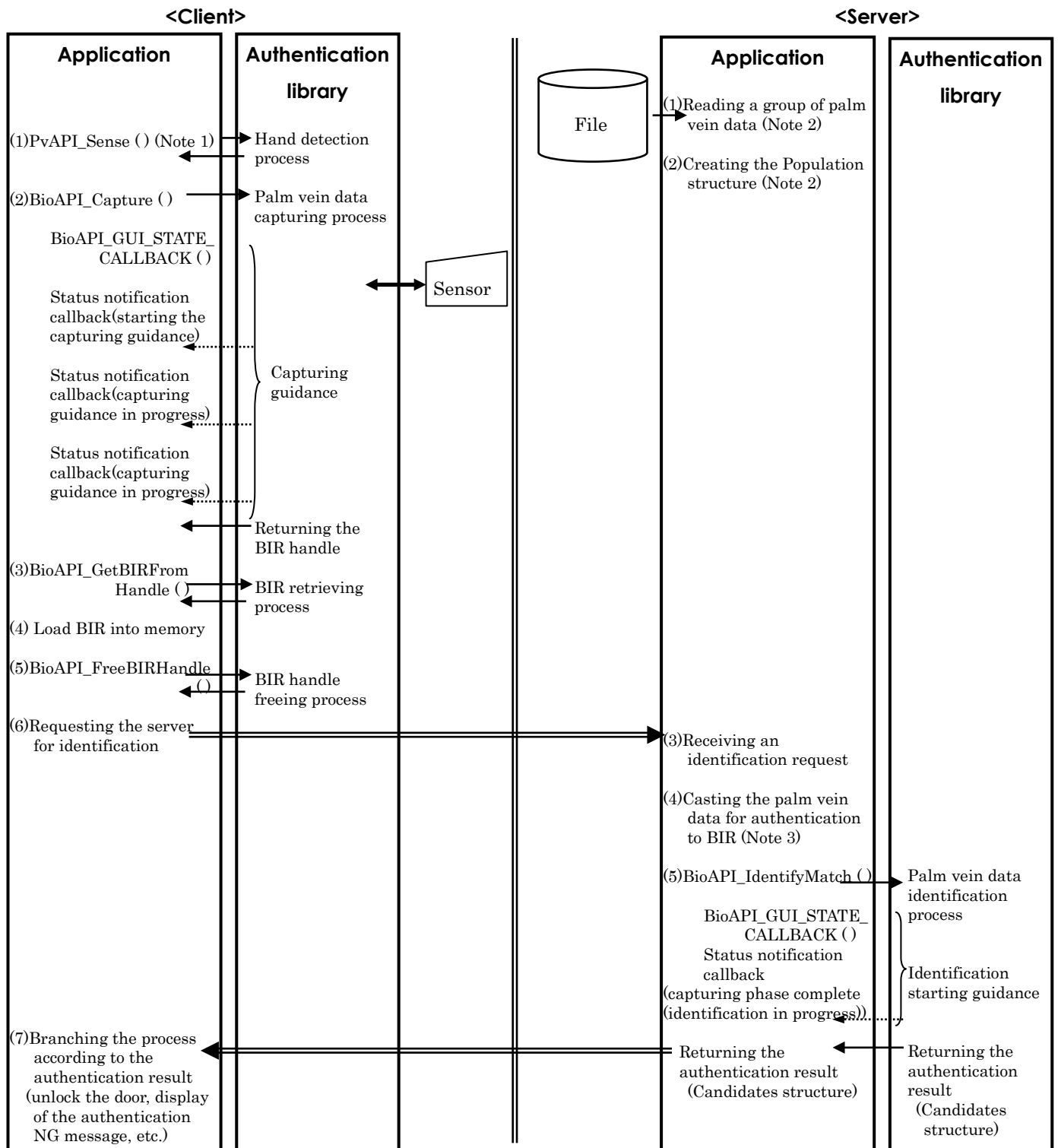


Note) Cast palm vein data to BIR and reset the data address.

>See> For information on the BIR, refer to "3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication".

3.3.7 Palm Vein Data Capture and Identification Sequence (for Client Server Configuration)

The following diagram indicates the basic palm vein data capture and identification sequence for client server configuration.



Note 1) Call PvAPI_Sense in the case where you are calling BioAPI_Capture as a hand is placed. (This is not necessary if you are calling BioAPI_Capture by other triggers such as pressing a button.)

Note 2) (1) to (2) are not required where the advance enrollment process of palm vein data group for identification ((7) to (9) in the initialization sequence) has been executed.

>See> For information on the advance loading process of palm vein data group for identification, refer to "3.3.1 Initialization Sequence".

Note 3) Cast palm vein data to BIR and reset the data address.

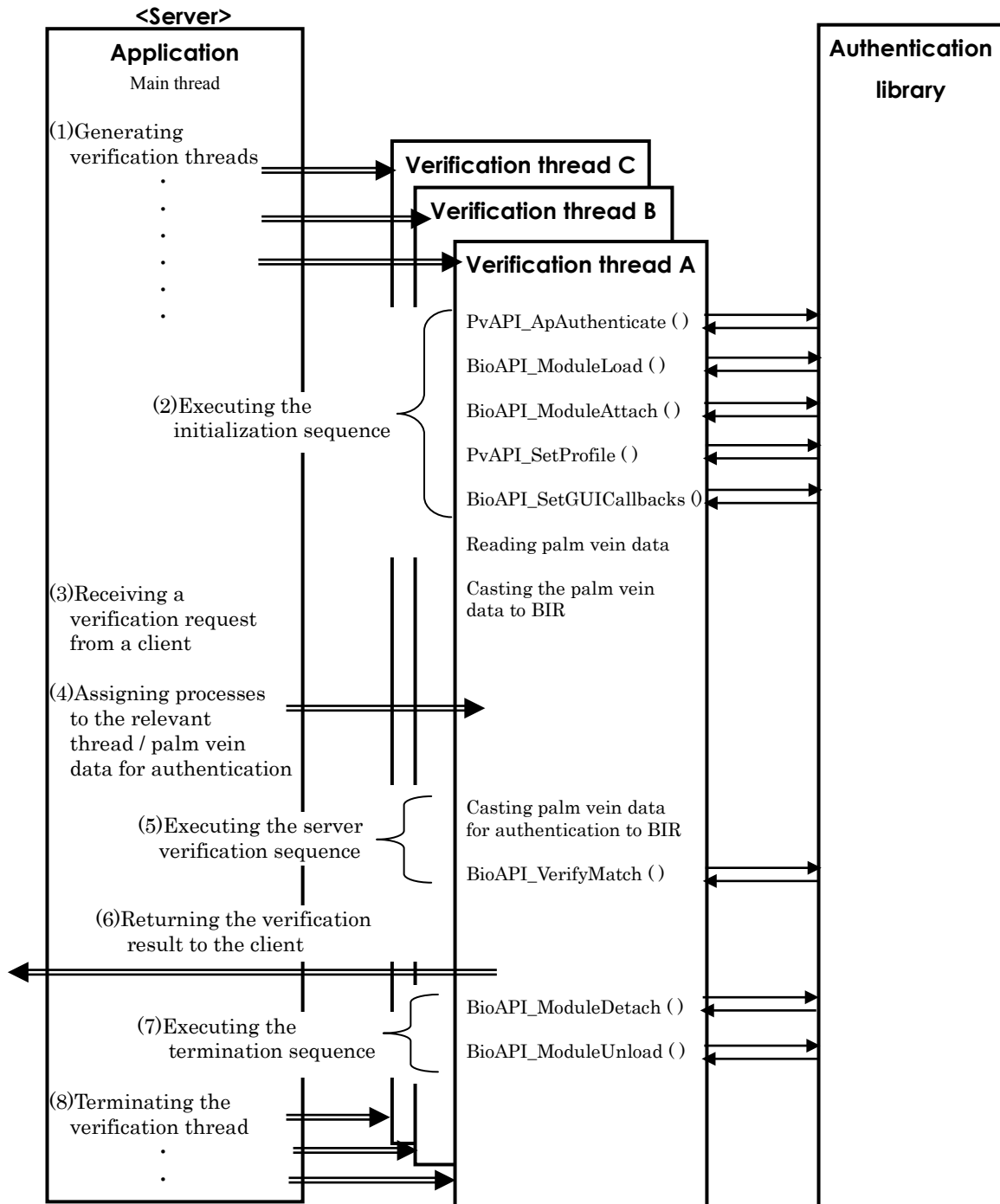
>See> For information on the BIR, refer to "3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication".

>See> For information on the Population structure, refer to "A.2 Population Structure".

>See> For information on the Candidates structure, refer to "A.3 Candidates Structure".

3.3.8 Multi-threaded Verification Sequence (for the Enterprise Edition)

The following diagram indicates the basic multi-threaded verification sequence for the Enterprise Edition.

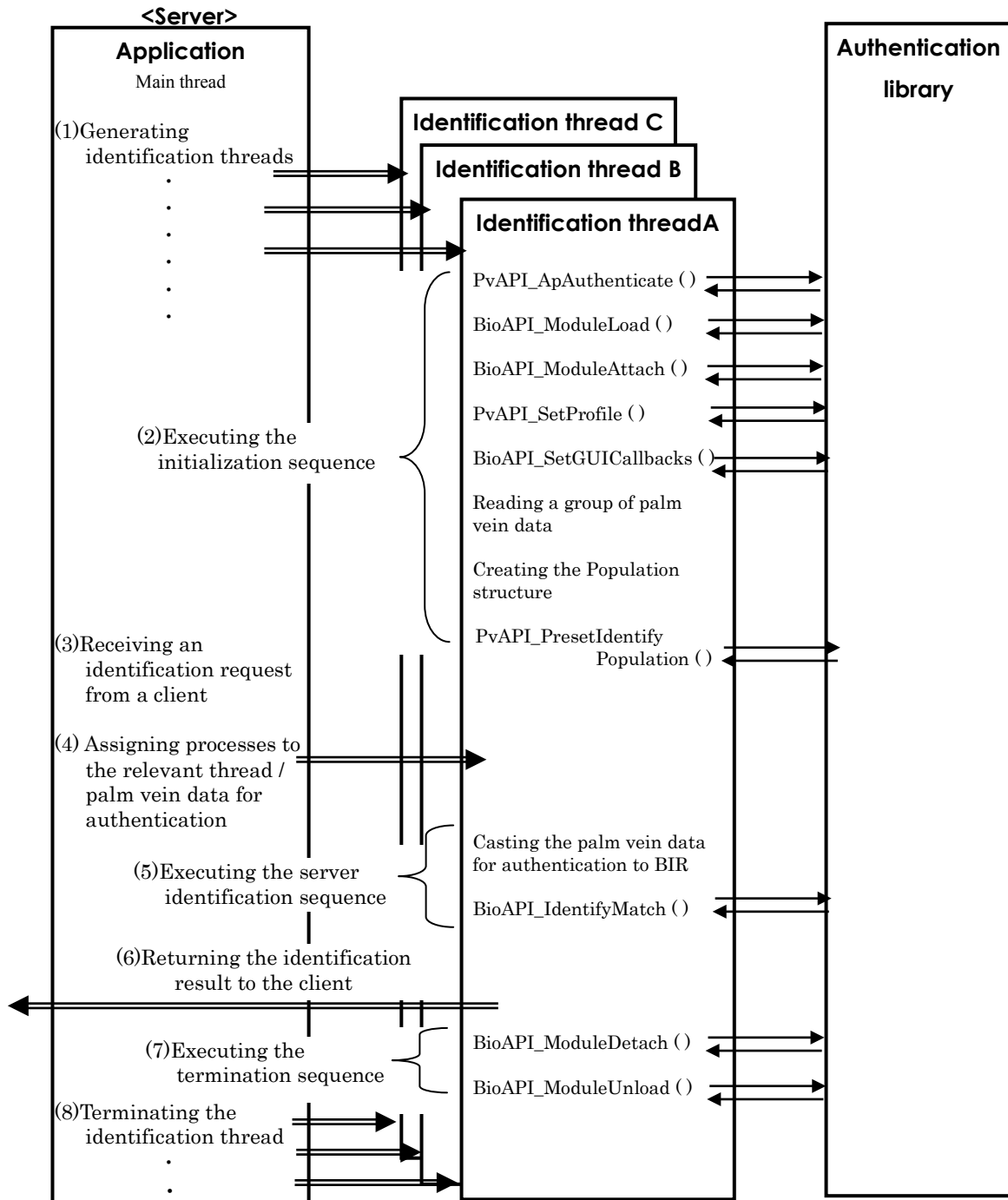


>See> For information on the initialization sequence, refer to “3.3.1 Initialization Sequence”.

>See> For information on the termination sequence, refer to “3.3.2 Termination Sequence”.

3.3.9 Multi-threaded Identification Sequence (for the Enterprise Edition)

The following diagram indicates the basic multi-threaded identification sequence for the Enterprise Edition.

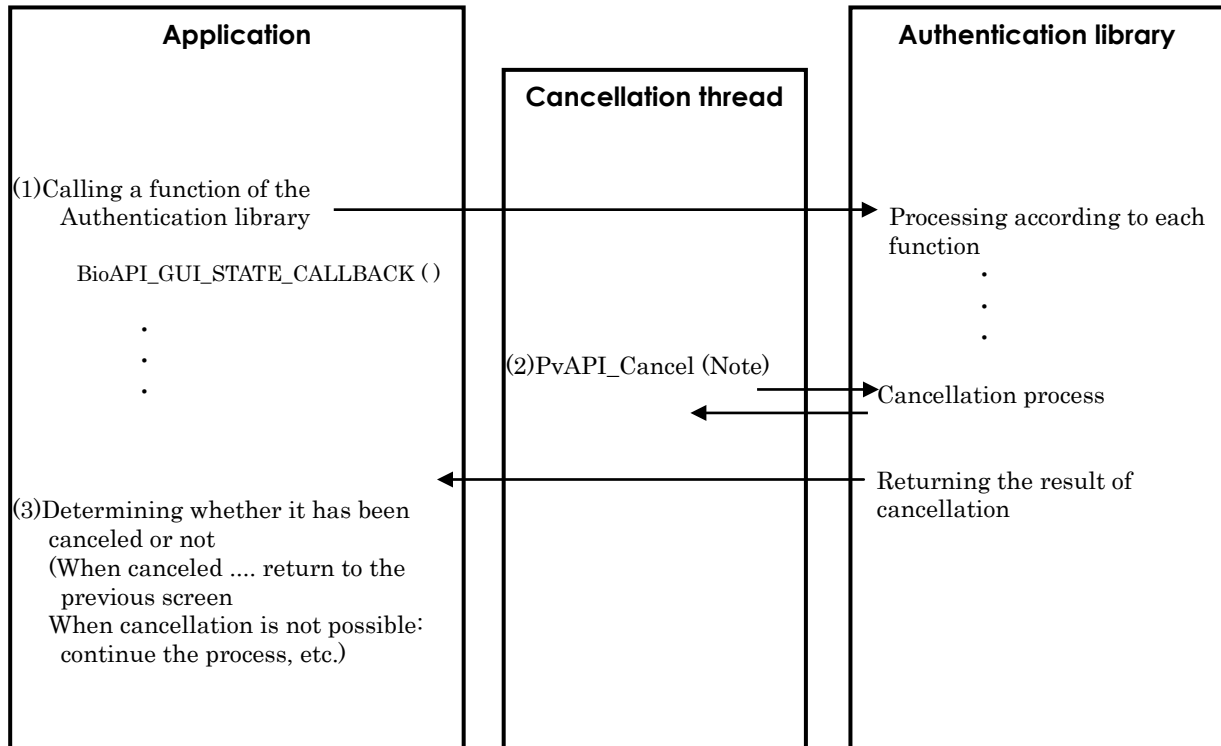


>See> For information on the initialization sequence, refer to “3.3.1 Initialization Sequence”.

>See> For information on the termination sequence, refer to “3.3.2 Termination Sequence”.

3.3.10 Cancellation Sequence

The following diagram indicates the basic cancellation sequence.



Note) `PvAPI_Cancel` operates asynchronously from other functions in the Authentication library.

>See> For information on functions which can be subject to a cancellation process, refer to "3.4.20 `PvAPI_Cancel`".

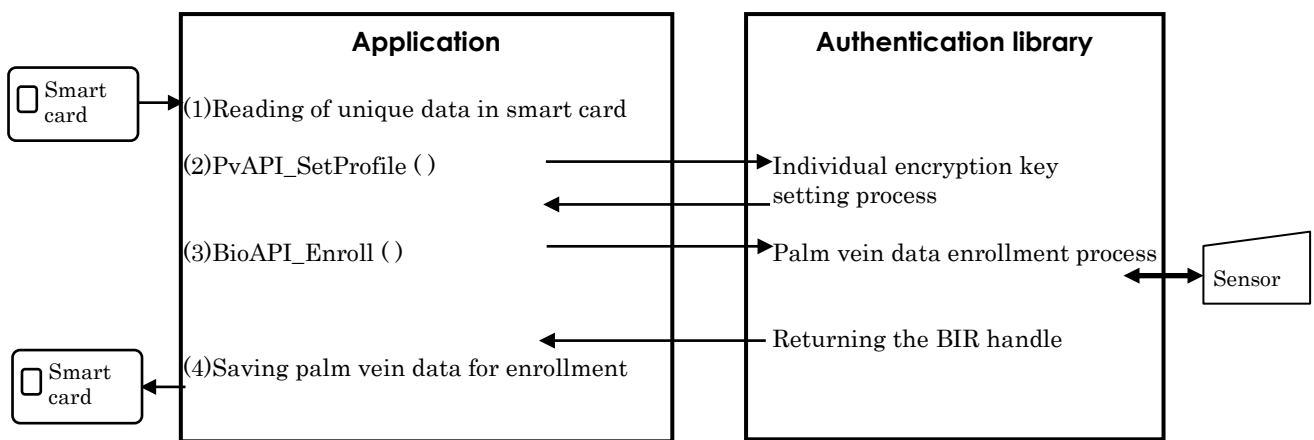
3.3.11 Individual Encryption Key Setting Sequence

The following diagram indicates the individual encryption key setting sequence.

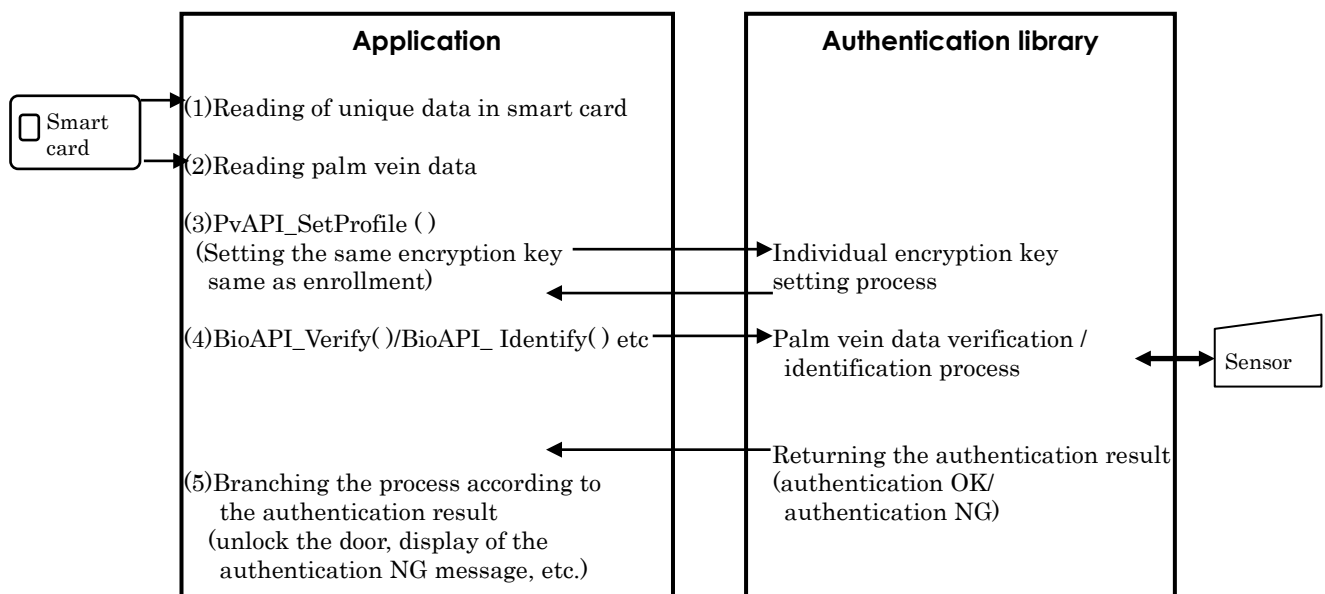
The following sequence is an example where different encryption keys are used for each smart card to encrypt palm vein data.

Also, the following describes only processes specific to the individual encryption key setting sequence and the basic sequence is omitted.

◆ Palm Vein Data Enrollment Sequence



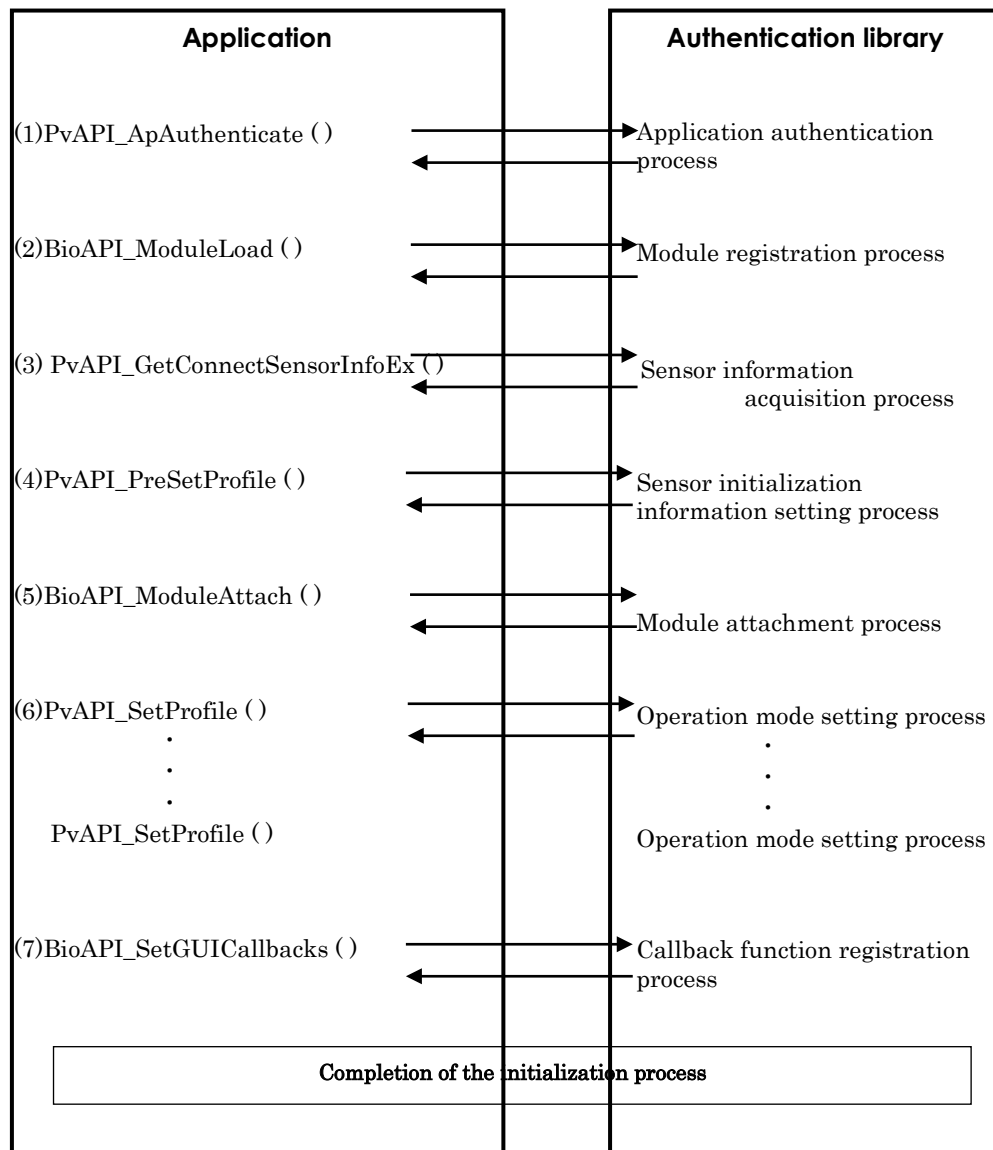
◆ Palm Vein Data Verification/Identification Sequence



★Tip In the case of the individual encryption key does not set,
Same encryption key will be set by authentication library.

3.3.12 Sensor Switching Sequence

The following diagram indicates the Sensor switching sequence when multiple Sensors are connected to a single item of target hardware.



★Tip When switching the Sensor again

Carry out the termination sequence of the Authentication library and repeat the above Sensor switching sequence.

>See>

For information on the termination sequence, refer to "3.3.2 Termination Sequence".

3.4 Interface

3.4.1 BioAPI_ModuleLoad

[Function outline]

This function registers Authentication library modules.

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_ModuleLoad
(
    const BioAPI_UUID      *ModuleGuid,
    uint32                  Reserved,
    BioAPI_ModuleEventHandler AppNotifyCallback,
    void                    *AppNotifyCallbackCtx
);
```

[Parameters]

Member Name	Type	Description
ModuleGuid	input	Specify the Authentication library UUID "0xe1,0x9a,0x69,0x01, 0xb8,0xc2,0x49,0x80, 0x87,0x7e,0x11,0xd4, 0xd8,0xf1,0xbe,0x79" in 16 bytes.
Reserved	input	Reserved Specify "0".
AppNotifyCallback	input/ optional	Unused Specify "0".
AppNotifyCallbackCtx	input/ optional	Unused Specify NULL.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★**Tip** **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling `PvAPI_GetErrorInfo`.

➤**See** For information on `PvAPI_GetErrorInfo`, refer to "3.4.18
`PvAPI_GetErrorInfo`".

[Caution]

This function must be called for each thread when performing the multi-threaded authentication process using the Enterprise Edition.

3.4.2 BioAPI_ModuleUnload

[Function outline]

This function unloads Authentication library modules.

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_ModuleUnload
(
    const BioAPI_UUID          *ModuleGuid,
    BioAPI_ModuleEventHandler AppNotifyCallback,
    void                       *AppNotifyCallbackCtx
);
```

[Parameters]

Member Name	Type	Description
ModuleGuid	input	Specify the UUID which was used at the module registration.
AppNotifyCallback	input/ optional	Unused Specify "0".
AppNotifyCallbackCtx	input/ optional	Unused Specify NULL.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★**Tip** **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling `PvAPI_GetErrorInfo`.

>**See**> For information on `PvAPI_GetErrorInfo`, refer to "3.4.18 `PvAPI_GetErrorInfo`".

[Caution1]

If you have previously called `BioAPI_ModuleLoad`, be sure to call this function before terminating the application.

[Caution2]

This function must be called for each thread when performing the multi-threaded authentication process using the Enterprise Edition.

3.4.3 BioAPI_ModuleAttach

[Function outline]

This function attaches Authentication library modules.

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_ModuleAttach
(
    const BioAPI_UUID      *ModuleGuid,
    const BioAPI_VERSION   *Version,
    const BioAPI_MEMORY_FUNCS *MemoryFuncs,
    uint32                  DeviceID,
    uint32                  Reserved1,
    uint32                  Reserved2,
    uint32                  Reserved3,
    BioAPI_FUNC_NAME_ADDR  *FunctionTable,
    uint32                  NumFunctionTable,
    const void              *Reserved4,
    BioAPI_HANDLE_PTR      NewModuleHandle
);
```

[Parameters]

Member Name	Type	Description
ModuleGuid	input	Specify the UUID which was used at the module registration.
Version	input	Unused Specify NULL.
MemoryFuncs	input	Unused Specify NULL.
DeviceID	input	Unused Specify "0".
Reserved1	input	Unused Specify "0".
Reserved2	input	Unused Specify "0".
Reserved3	input	Unused Specify "0".
FunctionTable	input/ output/ optional	Unused Specify NULL.
NumFunctionTable	input	Unused Specify "0".
Reserved4	input	Unused Specify NULL.
NewModuleHandle	output	Returns the handle of the attached module.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★**Tip** **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling PvAPI_GetErrorInfo.

>**See**> For information on PvAPI_GetErrorInfo, refer to "3.4.18 PvAPI_GetErrorInfo".

[Caution]

This function must be called for each thread when performing the multi-threaded authentication process using the Enterprise Edition. Also, the module handle acquired by this function cannot be used in any other threads.

[Remark]

A firmware update process for the Sensor unit is performed in this function before the start sequence of the Sensor if necessary.

>**See**> For information on how to update the firmware, refer to "Appendix C Authentication Library Firmware Update Function (Basic Edition Only)".

3.4.4 BioAPI_ModuleDetach

[Function outline]

This function detaches Authentication library modules.

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_ModuleDetach
(
    BioAPI_HANDLE ModuleHandle
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★**Tip** **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling `PvAPI_GetErrorInfo`.

>See> For information on `PvAPI_GetErrorInfo`, refer to "3.4.18 `PvAPI_GetErrorInfo`".

[Caution1]

If you have previously called `BioAPI_ModuleAttach`, be sure to call this function and `BioAPI_ModuleUnload` before terminating the application.

[Caution2]

This function must be called for each thread when performing the multi-threaded authentication process using the Enterprise Edition.

3.4.5 BioAPI_FreeBIRHandle

[Function outline]

This function frees the BIR handle.

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_FreeBIRHandle
(
    BioAPI_HANDLE    ModuleHandle,
    BioAPI_BIR_HANDLE BIRHandle
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
BIRHandle	input	Specify the BIR handle to be freed.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★**Tip** **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling [PvAPI_GetErrorInfo](#).

>**See**> For information on [PvAPI_GetErrorInfo](#), refer to "3.4.18 [PvAPI_GetErrorInfo](#)".

[Caution]

Free all the BIR handles returned by BioAPI_Enroll, BioAPI_Capture, or BioAPI_Process before calling BioAPI_ModuleDetach.

If BioAPI_ModuleDetach is called without freeing BIR handles returned by BioAPI_Enroll, BioAPI_Capture, or BioAPI_Process these handles cannot be freed afterwards.

Don't specify the handle except above 3 functions.

3.4.6 BioAPI_GetBIRFromHandle

[Function outline]

This function retrieves the BIR associated with a BIR handle.

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_GetBIRFromHandle
(
    BioAPI_HANDLE    ModuleHandle,
    BioAPI_BIR_HANDLE BIRHandle,
    BioAPI_BIR_PTR    *BIR
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
BIRHandle	input	Specify the BIR handle.
BIR	output	Returns the pointer of the BIR.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★**Tip** **Acquiring error information when the function has terminated with an error**
 Error information can be acquired by calling `PvAPI_GetErrorInfo`.

➤**See** For information on `PvAPI_GetErrorInfo`, refer to "3.4.18 `PvAPI_GetErrorInfo`".

[Caution]

When using x64 version, cast the notified BIR (`BioAPI_BIR_PTR`) to BIR (`PvAPI_BIR_PTR`) for x64 version.

BIR (`PvAPI_BIR_PTR`) for x64 version can also be used in the x86 version.

The following is an example of a call in the x64 version.

```
PvAPI_BIR_PTR pBIR;
bioRet = GetBIRFromHandle(
    ModuleHandle,
    BIRHandle,
    (BioAPI_BIR_PTR*)&pBIR
);
```

➤**See** For information on BIR, refer to "3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication".

3.4.7 BioAPI_GetHeaderFromHandle

[Function outline]

This function retrieves the BIR header from the BIR handle.

This function is generally not necessary for this Authentication library.

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_GetHeaderFromHandle
(
    BioAPI_HANDLE      ModuleHandle,
    BioAPI_BIR_HANDLE  BIRHandle,
    BioAPI_BIR_HEADER_PTR Header
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
BIRHandle	input	Specify the BIR handle.
Header	output	Returns the BIR header.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★**Tip** **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling [PvAPI_GetErrorInfo](#).

>**See**> For information on [PvAPI_GetErrorInfo](#), refer to "3.4.18 [PvAPI_GetErrorInfo](#)".

3.4.8 BioAPI_SetGUICallbacks

[Function outline]

This function registers the status notification callback function and the guidance image notification callback function.

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_SetGUICallbacks
(
    BioAPI_HANDLE          ModuleHandle,
    BioAPI_GUI_STREAMING_CALLBACK GuiStreamingCallback,
    void                   *GuiStreamingCallbackCtx,
    BioAPI_GUI_STATE_CALLBACK GuiStateCallback,
    void                   *GuiStateCallbackCtx
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
GuiStreamingCallback	input	Specify the pointer to BioAPI_GUI_STREAMING_CALLBACK when displaying the guidance image to instruct the palm position in the application. Specify NULL when not displaying the guidance image.
GuiStreamingCallbackCtx	input	Specify the pointer to the context which is passed to BioAPI_GUI_STREAMING_CALLBACK when displaying the guidance image to instruct the palm position in the application. Specify NULL when not displaying the guidance image.
GuiStateCallback	input	Specify the pointer to BioAPI_GUI_STATE_CALLBACK.
GuiStateCallbackCtx	input	Specify the pointer to the context which is passed to BioAPI_GUI_STATE_CALLBACK.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★**Tip** **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling PvAPI_GetErrorInfo.

➤**See** For information on PvAPI_GetErrorInfo, refer to "3.4.18 PvAPI_GetErrorInfo".

[Caution]

This function must be called for each thread when performing the multi-threaded authentication process using the Enterprise Edition.

[Remark1]

BioAPI_GUI_STATE_CALLBACK should have been created by an application and registered using this function in advance in order for the application to control the guidance for correctly positioning the palm while capturing the palm veins, or to use the captured palm silhouette images.

➤**See** For information on BioAPI_GUI_STATE_CALLBACK, refer to "3.5.1 BioAPI_GUI_STATE_CALLBACK".

[Remark2]

When displaying the guidance image to instruct the palm position, set the detailed information notification function for the guidance image display "CBGUIMessage Detail" to "1" (Use) in the operational environment setting file in advance.

Also, in order for the application to use the guidance image to instruct the palm position while capturing the palm veins, BioAPI_GUI_STREAMING_CALLBACK must be created by the application and registered using this function.

➤**See** For information on an operational environment setting file, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

➤**See** For information on BioAPI_GUI_STREAMING_CALLBACK, refer to "3.5.2 BioAPI_GUI_STREAMING_CALLBACK".

[Remark3]

The context specified by this function is the area which can be used in the callback which the application can use freely. Be sure to specify the context corresponding to the given callback function when registering a callback function.

3.4.9 BioAPI_Capture

[Function outline]

This function captures the palm veins on a single hand and returns the palm vein data for authentication.

>See For information on the structure of palm vein data for authentication, refer to "3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication".

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_Capture
(
    BioAPI_HANDLE      ModuleHandle,
    BioAPI_BIR_PURPOSE Purpose,
    BioAPI_BIR_HANDLE_PTR CapturedBIR,
    sint32              Timeout,
    BioAPI_BIR_HANDLE_PTR AuditData
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
Purpose	input	Specify the setting value for verification (BioAPI_PURPOSE_VERIFY).
CapturedBIR	output	Returns the BIR handle of palm vein data for authentication.
Timeout	input	Specify the timeout duration in millisecond. However, specify "0" (no timeout) at present.
AuditData	output/ optional	Unused Specify NULL.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★Tip **Acquiring error information when the function has terminated with an error**
 Error information can be acquired by calling PvAPI_GetErrorInfo.

>See For information on PvAPI_GetErrorInfo, refer to "3.4.18 PvAPI_GetErrorInfo".

[Caution1]

BIR handle specified by this function should be freed by calling BioAPI_FreeBIR Handle.

[Caution2]

The time required for the capturing process is slightly longer if the image compression function is used.

>See> For information on image compression function, refer to the "System development guide" and "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

[Remark1]

When this function is called, the guidance for correctly positioning the palm and other information are returned from the Authentication library using BioAPI_GUI_STATE_CALLBACK.

If the guidance image notification callback function has been registered using BioAPI_SetGUICallbacks, the guidance image to instruct the palm position is returned from the Authentication library by BioAPI_GUI_STREAMING_CALLBACK.

>See> For information on BioAPI_GUI_STATE_CALLBACK, refer to "3.5.1 BioAPI_GUI_STATE_CALLBACK".

>See> For information on BioAPI_SetGUICallbacks, refer to "3.4.8 BioAPI_SetGUICallbacks".

>See> For information on BioAPI_GUI_STREAMING_CALLBACK, refer to "3.5.2 BioAPI_GUI_STREAMING_CALLBACK".

[Remark2]

Only palm vein data for enrollment can be compressed when compressed format is specified for the enrollment format. Palm vein data for authentication is not compressed.

>See> For information on enrollment format of palm vein data, refer to the "System development guide" and "3.4.17 PvAPI_SetProfile".

3.4.10 BioAPI_Process

[Function outline]

This function generates the "processed BIR" by processing palm vein data for authentication returned by BioAPI_Capture.

In addition, the palm vein data for authentication returned by BioAPI_Capture is already the "processed BIR"; therefore, this function is normally not necessary in this library.

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_Process
(
    BioAPI_HANDLE          ModuleHandle,
    const BioAPI_INPUT_BIR *CapturedBIR,
    BioAPI_BIR_HANDLE_PTR  ProcessedBIR
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
CapturedBIR	input	Specify palm vein data for authentication (BioAPI_INPUT_BIR structure). >See> For information on the BioAPI_INPUT_BIR structure, refer to "A.1 BioAPI_INPUT_BIR Structure".
ProcessedBIR	output	Returns the processed BIR handle.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★Tip **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling PvAPI_GetErrorInfo.

>See> For information on PvAPI_GetErrorInfo, refer to "3.4.18 PvAPI_GetErrorInfo".

[Caution]

BIR Handle specified by this function should be freed by calling BioAPI_FreeBIR Handle.

3.4.11 BioAPI_VerifyMatch

[Function outline]

This function performs a verification process between the captured palm vein data for authentication and the enrolled palm vein data with the corresponding user identification information such as the ID, and returns the authentication result.

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_VerifyMatch
(
    BioAPI_HANDLE          ModuleHandle,
    const BioAPI_FAR        *MaxFARRequested,
    const BioAPI_FRR        *MaxFRRRequested,
    const BioAPI_BOOL        *FARPrecedence,
    const BioAPI_INPUT_BIR  *ProcessedBIR,
    const BioAPI_INPUT_BIR  *StoredTemplate,
    BioAPI_BIR_HANDLE       *AdaptedBIR,
    BioAPI_BOOL             *Result,
    BioAPI_FAR_PTR          FARAchieved,
    BioAPI_FRR_PTR          FRRAchieved,
    BioAPI_DATA_PTR         *Payload
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
MaxFARRequested	input	Unused Specify NULL.
MaxFRRRequested	input/ optional	Specify the matching level. <ul style="list-style-type: none"> • PvAPI_MATCHING_LEVEL_HIGHEST (Highest) • PvAPI_MATCHING_LEVEL_HIGH (High) • PvAPI_MATCHING_LEVEL_NORMAL (Normal) • PvAPI_MATCHING_LEVEL_LOW (Low) • PvAPI_MATCHING_LEVEL_LOWEST (Lowest)
FARPrecedence	input	Fixed to BioAPI_FALSE

Member Name	Type	Description
ProcessedBIR	input	Specify the captured palm vein data for authentication (BioAPI_INPUT_BIR structure). Only BioAPI_FULLBIR_INPUT can be specified to Form in the BioAPI_INPUT_BIR structure. >See> For information on the BioAPI_INPUT_BIR structure, refer to "A.1 BioAPI_INPUT_BIR Structure".
StoredTemplate	input	Specify palm vein data for enrollment to be verified with (BioAPI_INPUT_BIR structure). Only BioAPI_FULLBIR_INPUT can be specified to Form in the BioAPI_INPUT_BIR structure. >See> For information on the BioAPI_INPUT_BIR structure, refer to "A.1 BioAPI_INPUT_BIR Structure".
AdaptedBIR	output/ optional	Unused Specify NULL.
Result	output	Returns the authentication result. • BioAPI_TRUE (Authentication OK) • BioAPI_FALSE (Authentication NG)
FARAchieved	output	<p>■ When not using the authentication result score notification function Returns the matching result.</p> <ul style="list-style-type: none"> • 0 (Matching OK) • 0xffffffff (Matching NG) <p>However, the application does not need to be concerned about this value.</p> <p>■ When using the authentication result score notification function <When the authentication is OK> Returns the score value against the enrolled palm vein data between 1,000 and 10,000 in 1,000 units. The larger the value, the more the similarity. <When the authentication is NG> Returns 0.</p> <p>>See> For information on the authentication result score notification function, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information" or "3.4.17 PvAPI_SetProfile".</p>
FRRAchieved	output/ optional	Unused Specify NULL.
Payload	output/ optional	Unused Specify NULL.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★Tip **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling PvAPI_GetErrorInfo.

>See> For information on PvAPI_GetErrorInfo, refer to "3.4.18 PvAPI_GetErrorInfo".

[Remark1]

When this function is called, the verification starting guidance and other information are returned from the Authentication library using BioAPI_GUI_STATE_CALLBACK.

>See> For information on BioAPI_GUI_STATE_CALLBACK, refer to "3.5.1 BioAPI_GUI_STATE_CALLBACK".

[Remark2]

Where palm vein data of both hands are enrolled for one user, it is called 1 to 2 authentication. In such a case, call this function twice.

3.4.12 BioAPI_IdentifyMatch

[Function outline]

This function performs an identification process by searching through the entire enrolled palm vein data for one which is similar to the captured palm vein data for authentication, and returns the similar palm vein data items as the candidates.

!Caution Authentication with identification

Identification has higher risks of false acceptance compared to verification.

Therefore, when deploying the identification mode for authentication, carefully consider measures against false acceptance when designing an application.

>See>

For information on measures against false acceptance when authenticating with the identification mode, refer to the "System development guide".

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_IdentifyMatch
(
    BioAPI_HANDLE                ModuleHandle,
    const BioAPI_FAR              *MaxFARRequested,
    const BioAPI_FRR              *MaxFRRRequested,
    const BioAPI_BOOL             *FARPrecedence,
    const BioAPI_INPUT_BIR        *ProcessedBIR,
    const BioAPI_IDENTIFY_POPULATION *Population,
    BioAPI_BOOL                   Binning,
    uint32                         MaxNumberOfResults,
    uint32                         *NumberOfResults,
    BioAPI_CANDIDATE_ARRAY_PTR     *Candidates,
    sint32                         Timeout
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
MaxFARRequested	input	Unused Specify NULL.

Member Name	Type	Description
MaxFRRRequested	input/ optional	Specify the matching level. <ul style="list-style-type: none"> • PvAPI_MATCHING_LEVEL_HIGHEST (Highest) • PvAPI_MATCHING_LEVEL_HIGH (High) • PvAPI_MATCHING_LEVEL_NORMAL (Normal) • PvAPI_MATCHING_LEVEL_LOW (Low) • PvAPI_MATCHING_LEVEL_LOWEST (Lowest)
FARPrecedence	input	Fixed to BioAPI_FALSE
ProcessedBIR	input	Specify the captured palm vein data for authentication (BioAPI_INPUT_BIR structure). Only BioAPI_FULLBIR_INPUT can be specified to Form in the BioAPI_INPUT_BIR structure. >See> For information on the BioAPI_INPUT_BIR structure, refer to "A.1 BioAPI_INPUT_BIR Structure".
Population	input	Specify the palm vein data group subject to identification (Population structure). Keep the number of hands in a palm vein data group to be stored in a Population structure within 1,000 hands. Specify one of the following to Type in the Population structure. <ul style="list-style-type: none"> • BioAPI_ARRAY_TYPE (when the palm vein data group is not loaded in memory in advance) • PvAPI_PRESET_ARRAY_TYPE (when the palm vein data group is loaded in memory in advance) >See> For information on the Population structure, refer to "A.2 Population Structure".
Binning	input	Fixed to BioAPI_FALSE
MaxNumberOfResults	input	Specify how many items of palm vein data (as the candidates) which are similar to the captured palm vein data for authentication should be returned in the range from 1 to 30.
NumberOfResults	output	Returns the number of palm vein data items which are returned in Candidates.

Member Name	Type	Description
Candidates	output	<p>Returns palm vein data items (as the candidates) which are similar to the captured palm vein data for authentication in the Candidates structure in the order of their similarity.</p> <p>If the authentication result score notification function is used, the score values for those similar palm vein data items (candidates) are also returned.</p> <p>The application should prepare an array with the specified maximum number of elements using MaxNumberOfResults in order to store the returned palm vein data.</p> <p>>See> For information on the Candidates structure, refer to "A.3 Candidates Structure".</p> <p>>See> For information on the authentication result score notification function, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information" or "3.4.17 PvAPI_SetProfile".</p>
Timeout	input	<p>Specify the timeout duration in millisecond. However, specify "0" (no timeout) at present.</p>

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★**Tip** **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling PvAPI_GetErrorInfo.

>See> For information on PvAPI_GetErrorInfo, refer to "3.4.18 PvAPI_GetErrorInfo".

[Caution1]

This function can be called only when palm vein data satisfies the following conditions.

- Enrollment format of palm vein data is non-compressed format
- Internal format of palm vein data is I-format
- Index type is F27-Index

>See> For information on enrollment format of palm vein data, refer to the "System development guide" and "3.4.17 PvAPI_SetProfile".

>See> For information on internal format of palm vein data and the index type, refer to the "System development guide" and "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

[Caution2]

The time required for the identification process is slightly longer if the image compression function is used.

>See> For information on image compression function, refer to the "System development guide" and "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

[Remark1]

When this function is called, the identification starting guidance and other information are returned from the Authentication library using BioAPI_GUI_STATE_CALLBACK.

>See> For information on BioAPI_GUI_STATE_CALLBACK, refer to "3.5.1 BioAPI_GUI_STATE_CALLBACK".

[Remark2]

Use PvAPI_PresetIdentifyPopulation in the initialization process if you want to load the palm vein data group subject to the identification in memory in advance.

>See> For information on PvAPI_PresetIdentifyPopulation, refer to "3.4.22 PvAPI_PresetIdentifyPopulation".

3.4.13 BioAPI_Enroll

[Function outline]

This function captures the palm veins on a single hand and returns the palm vein data for enrollment.

>See For information on the structure of palm vein data for enrollment, refer to "3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication".

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_Enroll
(
    BioAPI_HANDLE          ModuleHandle,
    BioAPI_BIR_PURPOSE      Purpose,
    const BioAPI_INPUT_BIR *StoredTemplate,
    BioAPI_BIR_HANDLE_PTR   NewTemplate,
    const BioAPI_DATA       *Payload,
    sint32                  Timeout,
    BioAPI_BIR_HANDLE_PTR   AuditData
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
Purpose	input	Specify the setting value for verification (BioAPI_PURPOSE_VERIFY).
StoredTemplate	input/ optional	Unused Specify NULL.
NewTemplate	output/ optional	Returns the BIR handle of palm vein data for enrollment.
Payload	input/ optional	Unused Specify NULL.
Timeout	input	Specify the timeout duration in millisecond. However, specify "0" (no timeout) at present.
AuditData	output/ optional	Unused Specify NULL.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★Tip **Acquiring error information when the function has terminated with an error**
 Error information can be acquired by calling PvAPI_GetErrorInfo.

>See For information on PvAPI_GetErrorInfo, refer to "3.4.18 PvAPI_GetErrorInfo".

[Caution]

BIR handle specified by this function should be freed by calling BioAPI_FreeBIR Handle.

[Remark]

When this function is called, the guidance for correctly positioning the palm and other information are returned from the Authentication library using BioAPI_GUI_STATE_CALLBACK.

If the guidance image notification callback function has been registered using BioAPI_SetGUICallbacks, the guidance image to instruct the palm position is returned from the Authentication library by BioAPI_GUI_STREAMING_CALLBACK.

When using the enrolled data score notification function, the quality of palm vein data at the enrollment is also notified as the score value.

- >See> For information on BioAPI_GUI_STATE_CALLBACK, refer to "3.5.1 BioAPI_GUI_STATE_CALLBACK".
- >See> For information on BioAPI_SetGUICallbacks, refer to "3.4.8 BioAPI_SetGUICallbacks".
- >See> For information on BioAPI_GUI_STREAMING_CALLBACK, refer to "3.5.2 BioAPI_GUI_STREAMING_CALLBACK".
- >See> For information on the enrolled data score notification function, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

3.4.14 BioAPI_Verify

[Function outline]

This function captures palm veins, performs a verification process between the captured palm veins and the enrolled palm vein data with the corresponding user identification information such as the ID, and returns the authentication result.

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_Verify
(
    BioAPI_HANDLE          ModuleHandle,
    const BioAPI_FAR        *MaxFARRequested,
    const BioAPI_FRR        *MaxFRRRequested,
    const BioAPI_BOOL        *FARPrecedence,
    const BioAPI_INPUT_BIR  *StoredTemplate,
    BioAPI_BIR_HANDLE_PTR   AdaptedBIR,
    BioAPI_BOOL             *Result,
    BioAPI_FAR_PTR          FARAchieved,
    BioAPI_FRR_PTR          FRRAchieved,
    BioAPI_DATA_PTR         *Payload,
    sint32                  Timeout,
    BioAPI_BIR_HANDLE_PTR   AuditData
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
MaxFARRequested	input	Unused Specify NULL.
MaxFRRRequested	input/ optional	Specify the matching level. <ul style="list-style-type: none"> • PvAPI_MATCHING_LEVEL_HIGHEST (Highest) • PvAPI_MATCHING_LEVEL_HIGH (High) • PvAPI_MATCHING_LEVEL_NORMAL (Normal) • PvAPI_MATCHING_LEVEL_LOW (Low) • PvAPI_MATCHING_LEVEL_LOWEST (Lowest)
FARPrecedence	input	Fixed to BioAPI_FALSE

Member Name	Type	Description
StoredTemplate	input	Specify palm vein data for enrollment to be verified with (BioAPI_INPUT_BIR structure). Only BioAPI_FULLBIR_INPUT can be specified to Form in the BioAPI_INPUT_BIR structure. >See> For information on the BioAPI_INPUT_BIR structure, refer to "A.1 BioAPI_INPUT_BIR Structure".
AdaptedBIR	output/ optional	Unused Specify NULL.
Result	output	Returns the authentication result. • BioAPI_TRUE (Authentication OK) • BioAPI_FALSE (Authentication NG)
FARAchieved	output	<p>■ When not using the authentication result score notification function Returns the matching result.</p> <ul style="list-style-type: none"> • 0 (Matching OK) • 0x7fffffff (Matching NG) <p>However, the application does not need to be concerned about this value.</p> <p>■ When using the authentication result score notification function <When the authentication is OK> Returns the score value against the enrolled palm vein data between 1,000 and 10,000 in 1,000 units. The larger the value, the more the similarity. <When the authentication is NG> Returns 0.</p> <p>>See> For information on the authentication result score notification function, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information" or "3.4.17 PvAPI_SetProfile".</p>
FRRAchieved	output/ optional	Unused Specify NULL.
Payload	output/ optional	Unused Specify NULL.
Timeout	input	Specify the timeout duration in millisecond. However, specify "0" (no timeout) at present.
AuditData	output/ optional	Unused Specify NULL.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★**Tip** **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling PvAPI_GetErrorInfo.

➤**See** For information on PvAPI_GetErrorInfo, refer to "3.4.18 PvAPI_GetErrorInfo".

[Caution]

The time required for the capturing process is slightly longer if the image compression function is used.

➤**See** For information on image compression function, refer to the "System development guide" and "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

[Remark1]

When this function is called, the guidance for correctly positioning the palm and other information are returned from the Authentication library using BioAPI_GUI_STATE_CALLBACK.

If the guidance image notification callback function has been registered using BioAPI_SetGUICallbacks, the guidance image to instruct the palm position is returned from the Authentication library by BioAPI_GUI_STREAMING_CALLBACK.

➤**See** For information on BioAPI_GUI_STATE_CALLBACK, refer to "3.5.1 BioAPI_GUI_STATE_CALLBACK".

➤**See** For information on BioAPI_SetGUICallbacks, refer to "3.4.8 BioAPI_SetGUICallbacks".

➤**See** For information on BioAPI_GUI_STREAMING_CALLBACK, refer to "3.5.2 BioAPI_GUI_STREAMING_CALLBACK".

[Remark2]

Where palm vein data of both hands are enrolled for one user, it is called 1 to 2 authentication. In such a case, capture palm vein data for authentication using BioAPI_Capture and then call BioAPI_VerifyMatch twice.

➤**See** For information on BioAPI_Capture, refer to "3.4.9 BioAPI_Capture".

➤**See** For information on BioAPI_VerifyMatch, refer to "3.4.11 BioAPI_VerifyMatch".

3.4.15 BioAPI_Identify

[Function outline]

This function captures palm veins, performs an identification process by searching through the entire enrolled palm vein data for one which is similar to the captured palm veins, and returns the similar palm vein data items as the candidates.

!Caution Authentication with identification

Identification has higher risks of false acceptance compared to verification.

Therefore, when deploying the identification mode for authentication, carefully consider measures against false acceptance when designing an application.

>See>

For information on measures against false acceptance when authenticating with the identification mode, refer to the "System development guide".

[Coding syntax]

```
BioAPI_RETURN BioAPI BioAPI_Identify
(
    BioAPI_HANDLE                ModuleHandle,
    const BioAPI_FAR              *MaxFARRequested,
    const BioAPI_FRR              *MaxFRRRequested,
    const BioAPI_BOOL             *FARPrecedence,
    const BioAPI_IDENTIFY_POPULATION *Population,
    BioAPI_BOOL                   Binning,
    uint32                        MaxNumberOfResults,
    uint32                        *NumberOfResults,
    BioAPI_CANDIDATE_ARRAY_PTR     *Candidates,
    sint32                        Timeout,
    BioAPI_BIR_HANDLE_PTR          AuditData
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
MaxFARRequested	input	Unused Specify NULL.

Member Name	Type	Description
MaxFRRRequested	input/ optional	Specify the matching level. <ul style="list-style-type: none"> • PvAPI_MATCHING_LEVEL_HIGHEST (Highest) • PvAPI_MATCHING_LEVEL_HIGH (High) • PvAPI_MATCHING_LEVEL_NORMAL (Normal) • PvAPI_MATCHING_LEVEL_LOW (Low) • PvAPI_MATCHING_LEVEL_LOWEST (Lowest)
FARPrecedence	input	Fixed to BioAPI_FALSE
Population	input	Specify the palm vein data group subject to identification (Population structure). Keep the number of hands in a palm vein data group to be stored in a Population structure within 1,000 hands. Specify one of the following to Type in the Population structure. <ul style="list-style-type: none"> • BioAPI_ARRAY_TYPE (when the palm vein data group is not loaded in memory in advance) • PvAPI_PRESET_ARRAY_TYPE (when the palm vein data group is loaded in memory in advance) >See> For information on the Population structure, refer to "A.2 Population Structure".
Binning	input	Fixed to BioAPI_FALSE
MaxNumberOfResults	input	Specify how many items of palm vein data (as the candidates) which are similar to the captured palm veins should be returned in the range from 1 to 30.
NumberOfResults	output	Returns the number of palm vein data items which are returned in Candidates.

Member Name	Type	Description
Candidates	output	<p>Returns palm vein data items (as the candidates) which are similar to the captured palm veins in the Candidates structure in the order of their similarity.</p> <p>If the authentication result score notification function is used, the score values for those similar palm vein data items (candidates) are also returned.</p> <p>The application should prepare an array with the specified maximum number of elements using MaxNumberOfResults in order to store the returned palm vein data.</p> <p>>See> For information on the Candidates structure, refer to "A.3 Candidates Structure".</p> <p>>See> For information on the authentication result score notification function, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information" or "3.4.17 PvAPI_SetProfile".</p>
Timeout	input	Specify the timeout duration in millisecond. However, specify "0" (no timeout) at present.
AuditData	output/ optional	Unused Specify NULL.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★**Tip** **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling PvAPI_GetErrorInfo.

>See> For information on PvAPI_GetErrorInfo, refer to "3.4.18 PvAPI_GetErrorInfo".

[Caution1]

This function can be called only when palm vein data satisfies the following conditions.

- Enrollment format of palm vein data is non-compressed format
- Internal format of palm vein data is I-format
- Index type is F27-Index

>See> For information on enrollment format of palm vein data, refer to the "System development guide" and "3.4.17 PvAPI_SetProfile".

>See> For information on internal format of palm vein data and the index type, refer to the "System development guide" and "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

[Caution2]

The time required for the identification process is slightly longer if the image compression function is used.

>See> For information on image compression function, refer to the "System development guide" and "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

[Remark1]

When this function is called, the guidance for correctly positioning the palm and other information are returned from the Authentication library using BioAPI_GUI_STATE_CALLBACK.

If the guidance image notification callback function has been registered using BioAPI_SetGUICallbacks, the guidance image to instruct the palm position is returned from the Authentication library by BioAPI_GUI_STREAMING_CALLBACK.

>See> For information on BioAPI_GUI_STATE_CALLBACK, refer to "3.5.1 BioAPI_GUI_STATE_CALLBACK".

>See> For information on BioAPI_SetGUICallbacks, refer to "3.4.8 BioAPI_SetGUICallbacks".

>See> For information on BioAPI_GUI_STREAMING_CALLBACK, refer to "3.5.2 BioAPI_GUI_STREAMING_CALLBACK".

[Remark2]

Use PvAPI_PresetIdentifyPopulation in the initialization process if you want to load the palm vein data group subject to the identification in memory in advance.

>See> For information on PvAPI_PresetIdentifyPopulation, refer to "3.4.22 PvAPI_PresetIdentifyPopulation".

3.4.16 PvAPI_ApAuthenticate

[Function outline]

This function authenticates the application using the specified key.

[Coding syntax]

```
BioAPI_RETURN BioAPI PvAPI_ApAuthenticate
(
    uint8 *Key
);
```

[Parameters]

Member Name	Type	Description
Key	input	Specify the application key which is described in the "License agreement".

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★**Tip** **Acquiring error information when the function has terminated with an error**
Error information can be acquired by calling PvAPI_GetErrorInfo.

>See> For information on PvAPI_GetErrorInfo, refer to "3.4.18
PvAPI_GetErrorInfo".

[Caution1]

Do not call any subsequent functions until this function completes successfully.

[Caution2]

This function must be called for each thread by specifying the same application key on all threads when performing the multi-threaded authentication process using the Enterprise Edition.

There is no need to call this function for a cancellation thread which calls PvAPI_Cancel only.

3.4.17 PvAPI_SetProfile

[Function outline]

This function sets the operation mode of the Authentication library.

[Coding syntax]

[x86 version]

```
BioAPI_RETURN BioAPI PvAPI_SetProfile
(
    BioAPI_HANDLE ModuleHandle,
    DWORD          dwFlag,
    DWORD          dwParam1,
    DWORD          dwParam2,
    DWORD          dwReserve
);
```

[x64 version]

```
BioAPI_RETURN BioAPI PvAPI_SetProfile
(
    BioAPI_HANDLE ModuleHandle,
    uint64         dwFlag,
    uint64         dwParam1,
    uint64         dwParam2,
    uint64         dwReserve
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
dwFlag	input	Specify the flag for the operation mode to be set.
dwParam1	input	Specify the value to be set for the flag.
dwParam2	input	Unused Specify "0".
dwReserve	input	Unused Specify "0".

[Definition]**[Flag and setting values]**

Setting Item	Flag	Setting Value
Enrollment format of palm vein data (Basic Edition Only)	PvAPI_PROFILE _REGIST_DATA_ TYPE	<p>Specify enrollment format of palm vein data.</p> <p>PvAPI_PROFILE_REGIST_DATA_TYPE_NO_COMPRESS_2 : Non-compressed format (default)</p> <p>PvAPI_PROFILE_REGIST_DATA_TYPE_COMPRESS_2 : Compressed format (Note1) (Note2)</p> <p>Note1) The following functions for identification are not available when "Compressed format" is specified.</p> <ul style="list-style-type: none"> • BioAPI_IdentifyMatch • BioAPI_Identify • PvAPI_PresetIdentifyPopulation <p>The following function is also not available.</p> <ul style="list-style-type: none"> • Authentication result score notification function <p>Note2) Only palm vein data for enrollment can be compressed when compressed format is specified for the enrollment format. Palm vein data for authentication is not compressed.</p> <p>>See> For information on enrollment format of palm vein data, refer to the "System development guide".</p>
Encryption method of palm vein data	PvAPI_PROFILE _CR_INFO	<p>Specify the encryption method of palm vein data for enrollment and palm vein data for authentication.</p> <p>PvAPI_PROFILE_CR_KIND_2 : AES128 (Default)</p> <p>PvAPI_PROFILE_CR_KIND_3 : AES256</p> <p>>See> For information on the encryption method of palm vein data, refer to the "System development guide".</p>

Setting Item	Flag	Setting Value
Guide mode (Basic Edition Only)	PvAPI_PROFILE_GUIDE_MODE	<p>Specify the guide mode for capturing palm veins.</p> <p>PvAPI_PROFILE_GUIDE_MODE_GUIDE : With guide mode</p> <p>PvAPI_PROFILE_GUIDE_MODE_NO_GUIDE : Without guide mode (default) (Note)</p> <p>Note) Be sure to specify “without guide mode” for the following cases.</p> <ul style="list-style-type: none"> • When connecting a mouse type Sensor (sold separately) <p>>See> For information on guide mode, refer to the "System development guide".</p> <p>There are several issues which should be considered when using guide mode.</p> <p>>See> For notes on using guide mode, refer to "Appendix F Guide Mode (Basic Edition Only)".</p>
Capturing angle (Basic Edition Only)	PvAPI_PROFILE_SENSOR_DIRECTION	<p>Specify the capturing angles of palm veins in placing on the hand above the Sensor.</p> <p>PvAPI_PROFILE_SENSOR_DIRECTION_0 : 0 degree (default) (Note)</p> <p>PvAPI_PROFILE_SENSOR_DIRECTION_90 : 90 degrees</p> <p>PvAPI_PROFILE_SENSOR_DIRECTION_180 : 180 degrees</p> <p>PvAPI_PROFILE_SENSOR_DIRECTION_270 : 270 degrees</p> <p>Note) Be sure to specify “0 degree” for the following cases.</p> <ul style="list-style-type: none"> • When using "Without guide mode" <p>>See> For information on the capturing angle, refer to the "System development guide".</p>

Setting Item	Flag	Setting Value
Individual encryption key	PvAPI_PROFILE_CARD_INFO	<p>Specify an individual encryption key in a 16 byte string (Note 1) (Note 2) when different keys are used for each item of palm vein data at enrollment. (Specify an individual encryption key, for example, in cases where palm vein data for enrollment is encrypted with a smart card with a unique encryption key.)</p> <p>Note 1) Do not include a NULL in the 16 byte string.</p> <p>Note 2) If the string length exceeds 16 bytes, the first 16 bytes only are effective.</p> <p>When authenticating with palm vein data encrypted with individual encryption keys, the same individual key as the one used at the enrollment must be specified to decrypt the item of palm vein data.</p> <p>Also, specify the casted address of the area where the character string is stored since dwParam1 is the DWORD type (x86 version) or the uint64 type (x64 version).</p> <p>>See> For information on the basic sequence for using individual encryption keys, refer to “3.3.11 Individual Encryption Key Setting Sequence”.</p>
Authentication result score notification function	PvAPI_PROFILE_SCORE_NOTIFICATIONS	<p>Specify whether to use the authentication result score notification function.</p> <p>PvAPI_PROFILE_SCORE_NOTIFICATIONS_OFF : Do not use (default)</p> <p>PvAPI_PROFILE_SCORE_NOTIFICATIONS_ON : Use (Note)</p> <p>Note) Palm vein data must satisfy the following conditions when “Use” is specified.</p> <ul style="list-style-type: none"> Enrollment format of palm vein data is non-compressed format <p>>See> For information on the authentication result score notification function, refer to the "System development guide".</p> <p>The time required for verification is slightly longer if this function is used in verification processes.</p>

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★Tip **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling PvAPI_GetErrorInfo.

>See> For information on PvAPI_GetErrorInfo, refer to "3.4.18 PvAPI_GetErrorInfo".

[Caution1]

This function must be called after calling BioAPI_ModuleAttach and before calling functions for capturing, enrolling, verifying or identifying palm vein data.

>See> For information on BioAPI_ModuleAttach, refer to "3.4.3 BioAPI_ModuleAttach".

[Caution2]

The specified operation mode is effective only within the thread which called this function in the Enterprise Edition. Therefore, this function must be called for each thread when the operation mode needs changing in the Enterprise Edition.

[Remark1]

This function must be called for each setting item. If the same item is set multiple times, the final value becomes effective.

[Remark2]

The following item which is specified in this function can also be specified in the operational environment setting file.

- Guide mode
- Authentication result score notification function

When there item is set by an operational environment setting file and this function, the setting value by this function is effective.

>See> For information on operational environment setting file, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

3.4.18 PvAPI_GetErrorInfo

[Function outline]

This function acquires error information.

[Coding syntax]

```
void BioAPI PvAPI_GetErrorInfo
(
    PvAPI_ErrorInfo *pErrorInfo
);
```

[Parameters]

Member Name	Type	Description
pErrorInfo	output	Returns the error information structure.

[Definition]

[Error information structure]

```
typedef struct t_PvAPI_ErrorInfo
{
    uint32 ErrorLevel;      Error level (0: Normal, 1: Cancellation,
                           2: Recoverable, 3: Not recoverable)
    uint32 ErrorCode;      Error type (1: Device, 2: Resource,
                                    3: application, 4: Others)
    uint32 ErrorDetail;     Error details
    uint32 ErrorModule;     Error detected module (1: Interface section,
                                                2: Authentication library)
    uint32 ErrorOptional1; Internal information 1
    uint32 ErrorOptional2; Internal information 2
    uint32 APIInfo[4];      Interface section information
    uint32 ErrorInfo1;      Error information 1
                           notified in the Authentication library
    uint32 ErrorInfo2;      Error information 2
                           notified in the Authentication library
    uint32 ErrorInfo3[4];   Error information 3
                           notified in the Authentication library
}PvAPI_ErrorInfo;
```

★Tip **About "Internal information 1" - "Error information 3 notified in the Authentication library"**
 There is no need for applications to be aware of these values since they are internal information.

>See> For information on error details, refer to "Chapter4 Error Information".

[Caution1]

Call this function immediately after the function where the error occurred to acquire error information. The content of error information is not guaranteed if this function is called at any other time.

[Caution2]

Error information is maintained on a thread basis in the Enterprise Edition. Therefore, only the error information for the thread which called this function can be acquired.

3.4.19 PvAPI_Sense

[Function outline]

This function detects if a hand is positioned over the Sensor.

[Coding syntax]

```
BioAPI_RETURN BioAPI PvAPI_Sense
(
    BioAPI_HANDLE ModuleHandle,
    uint32         Timeout,
    uint32         Interval,
    uint32         CheckRetryInterval,
    uint32         CheckRetryCount
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
Timeout	input	Specify the timeout duration in millisecond. A range from 0 to 3600,000 (Note1) can be specified. The recommended value is 10,000 or more. Specify 0 for not timing out. Note1) If the specified value is under 10,000, this function may return with a timeout before detecting a hand even if a hand is placed.
Interval	input	Specify sensing interval before hand detections in milliseconds. (Note2) A range from 50 to 1,000 can be specified. The recommended value is 100.
CheckRetryInterval	input	Specify the interval between the first detection and retry in milliseconds. (Note2) A range from 50 to 1,000 can be specified. The recommended value is 50.
CheckRetryCount	input	Specify the number of times to perform re-detections after the first detection of a hand. A range from 0 to 15 can be specified. The recommended value is 3. The Sensor assumes that a hand is positioned only when it detected the hand for the number of specified times consecutively.

Note2) When the hand detection time in the Sensor exceeds the duration specified in Interval or CheckRetryInterval, the next detection process starts after the hand detection process completes in the Sensor.

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★Tip **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling PvAPI_GetErrorInfo.

>See> For information on PvAPI_GetErrorInfo, refer to "3.4.18 PvAPI_GetErrorInfo".

[Process description]

The following processes are performed for the hand detection.

- While a hand is not detected, hand detections take place at the specified interval.
- Once a hand is detected, re-detections take place for the specified number of times at the specified interval.
- After a hand is detected by all the consecutive re-detections for the specified times, the function determines that the hand has been positioned and returns.

[Remark]

This function is used when you are calling BioAPI_Identify or BioAPI_Capture as a hand is placed.(This function is not necessary if you are calling BioAPI_Identify or BioAPI_Capture by other triggers such as pressing a button.)

3.4.20 PvAPI_Cancel

[Function outline]

This function cancels a process.

[Coding syntax]

```
BioAPI_RETURN BioAPI PvAPI_Cancel
(
    BioAPI_HANDLE    ModuleHandle,
    PvAPI_ErrorInfo *pErrorInfo
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
pErrorInfo	output	Returns the error information structure.

[Definition]

[Error information structure]

>See> Refer to "Definition" under "3.4.18 PvAPI_GetErrorInfo".

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★Tip Acquiring error information when the function has terminated with an error

Error information can be referred from the error information structure specified by the argument "ErrorInfo". (Calling PvAPI_GetErrorInfo is not required.)

>See> For information on error information, refer to "Chapter4 Error Information".

[Caution1]

The target function is canceled when its status becomes cancellable, then terminates abnormally. In such a case, do not use any output data even if some information is written since output data from the canceled function is not guaranteed.

[Caution2]

Cancel error or Sequence error will occur when PvAPI_Cancel issued under the process of cancellation.

[Remark]

The following functions can be subject to cancellation.

- BioAPI_Capture
- BioAPI_VerifyMatch
- BioAPI_IdentifyMatch
- BioAPI_Enroll
- BioAPI_Verify
- BioAPI_Identify
- PvAPI_Sense
- PvAPI_PresetIdentifyPopulation

3.4.21 PvAPI_PreSetProfile

[Function outline]

This function sets information for the Sensor initialization.

[Coding syntax]

```
BioAPI_RETURN BioAPI PvAPI_PreSetProfile
(
    uint32    uiFlag,
    void*     lpvParamData,
    uint32    uiParamDataSize,
    void*     lpvReserve
);
```

[Parameters]

Member Name	Type	Description
uiFlag	input	Specify the flag of the information which is set for the Sensor initialization.
lpvParamData	input	Specify the value to be set for the flag.
uiParamDataSize	input	Specify the size of the value to be set for the flag.
lpvReserve	input	Unused Specify NULL

[Definition]

[Flag, setting value and size of the setting value]

Setting Item	Flag	Setting Value and Size of the Setting Value
Sensor information	PvAPI_PRE_PROFILE_IDENTIFYSENSOR	Specify the Sensor information when connecting multiple Sensors. Specify the following values for the setting value and the size of the setting value. <ul style="list-style-type: none"> Setting value Specify the address of the Sensor information structure. Size of the setting value Specify the size of the Sensor information structure "sizeof(PvAPI_SensorInfo)" (fixed).

[Sensor information structure]

```
typedef struct {
    uint32 uiSerialNo;    Serial number
    sint8  szUnitNo[128]; Model
    uint32 uiSensor;      Reserved
    void*  lpvReserve2;   Reserved
} PvAPI_SensorInfo;
```

[Information to be set to the Sensor information structure]

Member Name	Type	Description
uiSerialNo	input	Specify the serial number of the connected Sensor.
szUnitNo[128]	input	Specify the model of the connected Sensor.
uiSensor	input	Unused Specify "0".
lpvReserve2	input	Unused Specify NULL.

★Tip Sensor serial number and model

The serial number and model of the Sensor can be confirmed using the Sensor maintenance tool.

>See> For information on the Sensor maintenance tool, refer to the "Sensor maintenance tool operation guide".

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★Tip Acquiring error information when the function has terminated with an error

Error information can be acquired by calling PvAPI_GetErrorInfo.

>See> For information on PvAPI_GetErrorInfo, refer to "3.4.18 PvAPI_GetErrorInfo".

[Caution1]

Settings for switching the encryption method to a Sensor are no longer required from the Authentication library V31.

The Authentication library V31 and later are automatically configured as follows.

- Encryption method to a Sensor: AES256 method

[Caution2]

When connecting multiple Sensors, keep the following points in minds.

- There are a few issues to be considered when designing and developing applications with multiple Sensors.
 - >See> For information on the application design with multiple Sensors, refer to the "System development guide".
 - >See> For information on the application development with multiple Sensors, refer to "Appendix B Connecting Multiple Sensors (Windows Basic Edition Only)".
- When connecting multiple Sensors, this function must be called after calling BioAPI_ModuleLoad and before calling BioAPI_ModuleAttach. Also, this function must be called before calling BioAPI_ModuleAttach again if BioAPI_ModuleDetach or BioAPI_ModuleUnload has been called for an error process, etc. The subsequent operations are not guaranteed if this function is not called.
- Sensor information set by this function is effective until BioAPI_ModuleDetach is called.
- If Sensor information is set multiple times by this function, the latter setting becomes effective.
- Operations are not guaranteed if the same Sensor information is set by this function from multiple applications.
- Operations are not guaranteed if multiple Sensors are connected without setting Sensor information by this function.

3.4.22 PvAPI_PresetIdentifyPopulation

[Function outline]

This function loads the palm vein data group subject to the identification in memory in advance when identifying.

[Coding syntax]

```
BioAPI_RETURN BioAPI PvAPI_PresetIdentifyPopulation
(
    BioAPI_HANDLE ModuleHandle,
    const BioAPI_IDENTIFY_POPULATION *Population
);
```

[Parameters]

Member Name	Type	Description
ModuleHandle	input	Specify the handle of the attached module.
Population	input	Specify the palm vein data group subject to identification (Population structure). Keep the number of hands in a palm vein data group to be stored in a Population structure within 1,000 hands. Specify BioAPI_ARRAY_TYPE to Type in the Population structure. >See> For information on the Population structure, refer to "A.2 Population Structure".

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★Tip **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling [PvAPI_GetErrorInfo](#).

>See> For information on [PvAPI_GetErrorInfo](#), refer to "3.4.18 [PvAPI_GetErrorInfo](#)".

[Caution1]

This function can be called only when palm vein data satisfies the following conditions.

- Enrollment format of palm vein data is non-compressed format
- Internal format of palm vein data is I-format
- Index type is F27-Index

- >See> For information on enrollment format of palm vein data, refer to the "System development guide" and "3.4.17 PvAPI_SetProfile".
- >See> For information on internal format of palm vein data and the index type, refer to the "System development guide" and "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

[Caution2]

This function must be called after calling `BioAPI_ModuleAttach` and before calling `BioAPI_ModuleDetach`.

The palm vein data group loaded in advance is available until `BioAPI_ModuleDetach` is called.

[Caution3]

Call this function with system security measures since this function results in the retention of the decoded palm vein data for enrollment in memory for a long duration of time.

[Caution4]

Do not release the loaded palm vein data group in memory until the application is terminated. This is because the palm vein data subject to identification is associated with the information returned in `Candidates` as a result of `BioAPI_Identify` and `BioAPI_IdentifyMatch` which are called later.

Release the loaded palm vein data group before calling this function again after some processes such as enrolling additional palm vein data items.

[Caution5]

The palm vein data group loaded in advance is available only within the thread which called this function in the Enterprise Edition. Therefore, this function must be called for each thread when a palm vein data group needs loading in advance in the Enterprise Edition.

[Remark]

This function reduces the duration required for the identification process.

This function is effective when identifying in an environment where a large number of palm vein data items is enrolled and re-enrollment of palm vein data is rare.

3.4.23 PvAPI_GetConnectSensorInfoEx

[Function outline]

This function searches Sensors connected to the target hardware to acquire Sensor information and returns the information as a list.

Use this function to obtain setting information to switch Sensors when you are connecting multiple Sensors to the target hardware and switching between them.

>See> For information on how to switch between Sensors, refer to "3.3.12 Sensor Switching Sequence".

[Coding syntax]

```
BioAPI_RETURN BioAPI PvAPI_GetConnectSensorInfoEx
(
    uint32          *lpuiSensorNum,
    PvAPI_SensorInfoEx *lpSensorInfo
);
```

[Parameters]

Member Name	Type	Description
lpuiSensorNum	output	Returns the number of connected Sensors between 0 and 8.
lpSensorInfo	output	Returns the address of the sensor information structure. The application should prepare an array with the maximum number of returned items specified in PvAPI_GET_SENSOR_INFO_MAX in order to store the returned Sensor information.

[Definition]

[Maximum number of returned Sensor information items]

PvAPI_GET_SENSOR_INFO_MAX; Maximum number of returned items (8)

[Sensor information structure] (Note1)

```
typedef struct t_PvAPI_SensorInfoEx{
    uint32 uiSerialNo;           Serial number
    sint8  szUnitNo[128];       Model
    uint32 uiSensor;            Sensor type (Note2)
    uint32 uiFwVersion;         Firmware version
    uint32 uiFwLevel;           Firmware level
    sint8  szReserve[112];      Reserved
} PvAPI_SensorInfoEx, *PvAPI_SensorInfoEx_PTR;
```

Note1) Sensor information is not returned when a Sensor is not connected.

(Returns NULL)

Note2) The following value is returned as the Sensor type.

PvAPI_INFO_SENSOR_TYPE_2 : PalmSecure Sensor

or PalmSecure Sensor V2

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★**Tip** **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling PvAPI_GetErrorInfo.

➤**See**➤ For information on PvAPI_GetErrorInfo, refer to "3.4.18 PvAPI_GetErrorInfo".

[Caution1]

This function must be called after calling BioAPI_ModuleLoad and before calling BioAPI_ModuleAttach.

[Caution2]

Sensor information is not returned in the following cases.

- The Sensor driver for the connected Sensor is not installed.
- The connected Sensor is being used by another process.

[Caution3]

Although this function can return Sensor information for up to 8 Sensors, do not connect more than 3 Sensors. Operations are not guaranteed if 4 or more Sensors are connected.

Please verify the operations carefully at the user's own risk if connecting 4 or more Sensors.

3.4.24 PvAPI_GetLibraryInfo

[Function outline]

This function acquires the file version of the Authentication library.

If a Sensor is connected, the Sensor information is also acquired.

[Coding syntax]

```
BioAPI_RETURN BioAPI PvAPI_GetLibraryInfo
(
    PvAPI_LBINFO_PTR    lptLBInfo
);
```

[Parameters]

Member Name	Type	Description
lptLBInfo	output	Returns the address of the version information structure.

[Definition]

[Version information structure]

```
typedef struct t_PvAPI_LBInfo {
    uint32 uiLibVersion;      Authentication library version    (Note1)
    uint32 uiLibLevel;        Authentication library level      (Note1)
    uint32 uiLibSubCounter;    Authentication library version counter (Note1)
    sint8  szDrvVersion[16];   Sensor driver component version
    uint32 uiFwVersion;        Firmware version
    uint32 uiFwLevel;          Firmware level
    uint32 uiSensorKind;        Sensor type 1 (Note2)
    uint32 uiSensorExtKind;     Sensor type 2 (Note3)
    uint32 uiSerialNo;          Serial number
    sint8  szUnitNo[16];        Model
    uint32 uiLoopMode;          Whether the continuous capture function
                                is used (Note4)
    uint32 uiCompressMode;      Whether the image compression function
                                is used (Note5)
    sint8  szReserve[504];      Reserved
} PvAPI_LBINFO, *PvAPI_LBINFO_PTR;
```

Note1) The value returned in the Authentication library file version is the value displayed by property -> version information -> file version by PvFw.dll or F3BC4BIOSV.DLL.

Please note the information is different from the Authentication library version information (displayed by pvfwvl.txt or pvfwvlSV.txt).

Note2) The following value is returned as the Sensor type 1.

PvAPI_INFO_SENSOR_TYPE_2: PalmSecure Sensor
or PalmSecure Sensor V2

Note3) The following value is returned as the Sensor type 2.

PvAPI_INFO_SENSOR_MODE_COMPATIBLE: PalmSecure Sensor
PvAPI_INFO_SENSOR_MODE_EXTEND : PalmSecure Sensor V2

Note4) The following value is returned as Whether the continuous capture function is used.

PvAPI_INFO_LOOP_MODE_OFF: Do not use (capture once)
PvAPI_INFO_LOOP_MODE_ON : Use (capture 2 to 5 times)

Note5) The following value is returned as Whether the image compression function is used.

PvAPI_INFO_COMPRESS_MODE_OFF: Do not use
PvAPI_INFO_COMPRESS_MODE_ON : Use

[Return value]

BioAPI_OK	Successful
BioAPI_ERRCODE_FUNCTION_FAILED	Error

★**Tip** **Acquiring error information when the function has terminated with an error**

Error information can be acquired by calling PvAPI_GetErrorInfo.

>See> For information on PvAPI_GetErrorInfo, refer to "3.4.18 PvAPI_GetErrorInfo".

[Caution]

This function must be called after calling BioAPI_ModuleAttach and before calling BioAPI_ModuleDetach.

Only the Authentication library file version is returned if this function is called before calling BioAPI_ModuleAttach, after calling BioAPI_ModuleDetach, or when a Sensor is not connected.

3.5 Callback Function Interface

3.5.1 BioAPI_GUI_STATE_CALLBACK

[Function outline]

This function returns the guidance for correct palm positioning and the silhouette image of the captured palm from the Authentication library.

Also, this function returns detailed information to display the guidance image to instruct the palm position when using the detailed information notification function for the guidance image display.

In addition, the quality of palm vein data at the enrollment is also notified as the score value when using the enrolled data score notification function.

>See> For information on the detailed information notification function for the guidance image display and the enrolled data score notification function, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

[Coding syntax]

```
typedef BioAPI_RETURN (BioAPI *BioAPI_GUI_STATE_CALLBACK)
(
    void                *GuiStateCallbackCtx,
    BioAPI_GUI_STATE     GuiState,
    BioAPI_GUI_RESPONSE  Response,
    BioAPI_GUI_MESSAGE   Message,
    BioAPI_GUI_PROGRESS  Progress,
    BioAPI_GUI_BITMAP_PTR SampleBuffer
);
```

[Parameters]

Member Name	Type	Description
GuiStateCallbackCtx	input	Returns the pointer to the context specified by BioAPI_SetGUICallbacks.
GuiState	input	Returns the notification type. <ul style="list-style-type: none"> • Silhouette image notification • Guidance notification • Guidance image notification
Response	output	Unused Specify "0".
Message	input/ optional	Returns the message ID when the notification type is guidance notification.
Progress	input/ optional	Unused Specify "0".
SampleBuffer	input/ optional	Returns the silhouette image when the notification type is silhouette image notification.

[Definition]**[Notification type] (Note 1)**

```
typedef uint32 BioAPI_GUI_STATE:
    #define BioAPI_SAMPLE_AVAILABLE (0x0001)  Silhouette image notification
    #define BioAPI_MESSAGE_PROVIDED (0x0002)  Guidance notification
    #define PvAPI_APPEND_STREAMING (0x0008)  Guidance image notification (Note 2)
```

Note 1) The notification type is specified by bits.

Note 2) The guidance image notification returns the guidance image corresponding to the message ID specified by the guidance notification as a callback notification. When bits in the guidance image notification (0x0008) are on, its in the guidance notification (0x0002) will also be on; therefore, a value "0x000A" will be notified.

>See> For information on the call back notification for guidance images, refer to "3.5.2 BioAPI_GUI_STREAMING_CALLBACK".

[Message ID]

```
typedef uint32 BioAPI_GUI_MESSAGE, *BioAPI_GUI_MESSAGE_PTR;
```

[Silhouette image]

```
typedef struct bioapi_gui_bitmap {
    uint32 Width;                Width of the image
    uint32 Height;              Height of the image
    BioAPI_DATA_PTR Bitmap;      Bitmap data
} BioAPI_GUI_BITMAP, *BioAPI_GUI_BITMAP_PTR;
```

[Return value]**[When not using the detailed information notification function for the guidance image display]**

BioAPI_OK	Successful (fixed)
-----------	--------------------

[When using the detailed information notification function for the guidance image display]

BioAPI_OK	Return from the function(Note)
PvAPI_WAIT	Repeat the status notification callback(Note)

>See> For information on the detailed information notification function for the guidance image display, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

Note) BioAPI_OK and PvAPI_WAIT can be specified when the notification type is guidance notification and the process completion type "PvAPI_NOTIFY_API_END" (0x030002XX) is returned in the message ID.

Specify PvAPI_WAIT to wait for returning from the function while the guidance image is displayed in the application.

However, always specify BioAPI_OK if the value of the process completion type "PvAPI_NOTIFY_API_END" is "Canceled" (0x03000210) or "Error" (0x03000220).

[Caution1]

The status notification callbacks are notified in short intervals. For example, when a hand is not positioned over the Sensor, a guidance message "Please place your hand above the Sensor." is notified continuously until a hand is positioned. In such a case, the application should take appropriate actions such as to ignore or interleave the same guidance messages.

However, if the application completely ignores the guidance notification, a problem may occur such as confusing the user positioning his/her hand; therefore, the application must be aware of the latest guidance notification.

[Caution2]

Perform minimum necessary processes within the status notification callback and return swiftly.

[Caution3]

Do not modify control mode of the floating point within status notification callbacks. Operations are not guaranteed if control mode for the floating point is modified.

[Remark1]

This function should have been created by an application and registered using BioAPI_SetGUICallbacks in advance in order for the application to control the guidance for correctly positioning the palm while capturing the palm veins, or to use the captured palm silhouette images.

>See> For information on BioAPI_SetGUICallbacks, refer to "3.4.8 BioAPI_SetGUICallbacks".

[Remark2]

The following table describes message IDs returned when the notification type is guidance notification, and whether messages are returned when the different guide mode.

○: Notified ×: Not notified

Message ID		Description (1st row: Meaning and status 2nd row: Message example)	Guide mode	
Value	Definition		With guide mode	Without guide mode
0x020300MN (Note1) (Note2)	PvAPI_NOTIFY_CAP_GUID_START	Starting the capturing guidance	○	○
0x02030200	PvAPI_NOTIFY_CAP_GUID_BADIMAGE	Capturing guidance in progress: Hand is still on the Sensor Please move your hand away from the Sensor.	○	○
0x02030201	PvAPI_NOTIFY_CAP_GUID_NO_HANDS	Capturing guidance in progress: Hand is not placed Place your hand.	○	○
0x02030203	PvAPI_NOTIFY_CAP_GUID_MOVING	Capturing guidance in progress: Hand is in motion Don't move your hand.	○	○
0x02030204	PvAPI_NOTIFY_CAP_GUID_LESSINFO	Capturing guidance in progress: Shape of hand is not recognized. With your fingers spread, place your hand at the correct position again.	○	○
0x02030205	PvAPI_NOTIFY_CAP_GUID_RIGHT	Capturing guidance in progress: Hand is placed too far to the right Move your hand slightly to the left.	×	○
0x02030206	PvAPI_NOTIFY_CAP_GUID_LEFT	Capturing guidance in progress: Hand is placed too far to the left Move your hand slightly to the right.	×	○
0x02030207	PvAPI_NOTIFY_CAP_GUID_DOWN	Capturing guidance in progress: Hand is placed too inward Move your hand slightly away from you.	×	○
0x02030208	PvAPI_NOTIFY_CAP_GUID_UP	Capturing guidance in progress: Hand is placed too forward Move your hand slightly toward you.	×	○
0x02030209	PvAPI_NOTIFY_CAP_GUID_FAR	Capturing guidance in progress: Hand is placed too far away Your hand is too far from the Sensor.	○	○
0x0203020A	PvAPI_NOTIFY_CAP_GUID_NEAR	Capturing guidance in progress: Hand is placed too close (Capturing distance between a hand and the Sensor is under approximately 40mm.) Place your hand slightly further from the Sensor.	○	○
0x0203020B	PvAPI_NOTIFY_CAP_GUID_CAPTURING	Capturing guidance in progress: Capturing Now saving...Please don't move your hand.	○	○

Message ID		Description (1st row: Meaning and status 2nd row: Message example)	Guide mode	
Value	Definition		With guide mode	Without guide mode
0x02030210	PvAPI_NOTIFY_CAP_GUID_PITCH_DOWN	Capturing guidance in progress: Fingers are placed downward Lay your hand flat.	×	○
0x02030211	PvAPI_NOTIFY_CAP_GUID_PITCH_UP	Capturing guidance in progress: Fingers are placed upward Lay your hand flat.	×	○
0x02030212	PvAPI_NOTIFY_CAP_GUID_ROLL_RIGHT	Capturing guidance in progress: Right side of hand is downward. Lay your hand flat.	×	○
0x02030213	PvAPI_NOTIFY_CAP_GUID_ROLL_LEFT	Capturing guidance in progress: Left side of hand is downward. Lay your hand flat.	×	○
0x02030214	PvAPI_NOTIFY_CAP_GUID_YAW_RIGHT	Capturing guidance in progress: Fingers are pointing to the right Place your hand parallel to the Sensor.	×	○
0x02030215	PvAPI_NOTIFY_CAP_GUID_YAW_LEFT	Capturing guidance in progress: Fingers are pointing to the left Place your hand parallel to the Sensor.	×	○
0x02030217	PvAPI_NOTIFY_CAP_GUID_ROUND	Capturing guidance in progress: Hand is not open Please flatten the hand, and bring it closer to the Sensor a little.	○	○
0x02030220	PvAPI_NOTIFY_CAP_GUID_ADJUST_LIGHT	Capturing guidance in progress: Re-capturing with another capturing condition Trying to capture again. Please don't move your hand.	○	○
0x02030221	PvAPI_NOTIFY_CAP_GUID_ADJUST_NG	Capturing guidance in progress: Hand will be captured again because capturing conditions exceeded the tolerance. Trying to capture again. Please don't move your hand.	○	○
0x02030300	PvAPI_NOTIFY_CAP_GUID_PHASE_END	Capturing phase complete. However, starting the verification is notified when it is BioAPI_VerifyMatch or BioAPI_IdentifyMatch. Now authenticating...	○	○

Message ID		Description (1st row: Meaning and status 2nd row: Message example)	Guide mode	
Value	Definition		With guide mode	Without guide mode
0x02030222	PvAPI_NOTIFY_CAP_GUID_CAPTURE_IMAGE	Capturing guidance in progress: The guidance image is returned after returning this message ID	(Returned when using the detailed information notification function for the guidance image display.)	
0x030001XX (Note 3)	PvAPI_NOTIFY_API_KIND	The process type is returned. <ul style="list-style-type: none"> • PvAPI_NOTIFY_API_KIND + 0x01 : BioAPI_Capture • PvAPI_NOTIFY_API_KIND + 0x02 : BioAPI_VerifyMatch • PvAPI_NOTIFY_API_KIND + 0x03 : BioAPI_IdentifyMatch • PvAPI_NOTIFY_API_KIND + 0x04 : BioAPI_Enroll • PvAPI_NOTIFY_API_KIND + 0x05 : BioAPI_Verify • PvAPI_NOTIFY_API_KIND + 0x06 : BioAPI_Identify 		
0x030002XX (Note 4)	PvAPI_NOTIFY_API_END	The process completion type is returned. <ul style="list-style-type: none"> • PvAPI_NOTIFY_API_END : Successful • PvAPI_NOTIFY_API_END + 0x10 : Cancel • PvAPI_NOTIFY_API_END + 0x20 : Error When this message ID is returned, specify the return value (BioAPI_OK or PvAPI_WAIT) according to the application control.		
0x04XXXXXX (Note 5)	PvAPI_NOTIFY_MATCH_RESULT	The authentication result is returned. <Verification> <ul style="list-style-type: none"> • PvAPI_NOTIFY_MATCH_RESULT : Authentication NG • PvAPI_NOTIFY_MATCH_RESULT + 0x000001: Authentication OK <Identification> <ul style="list-style-type: none"> • PvAPI_NOTIFY_MATCH_RESULT : No similar palm vein data • PvAPI_NOTIFY_MATCH_RESULT + 0xXXXXXX : Similar palm vein data found (0xXXXXXX indicates the enrollment number of the most similar palm vein data item) 		

Message ID		Description (1st row: Meaning and status 2nd row: Message example)	Guide mode	
Value	Definition		With guide mode	Without guide mode
0x05XXXXXX (Note 6)	PvAPI_NOTIFY_REGIST_SCORE	<p>The quality of palm vein data at the enrollment is returned as the score value.</p> <ul style="list-style-type: none"> • PvAPI_REGIST_SCORE_QUALITY_1 : Quality level 1 (The quality of palm vein data is good) • PvAPI_REGIST_SCORE_QUALITY_2 : Quality level 2 (The quality of palm vein data is acceptable) • PvAPI_REGIST_SCORE_QUALITY_3 : Quality level 3 (The quality of palm vein data is deficient) 	(Returned when using the enrolled data score notification function)	

Note 1) PvAPI_NOTIFY_CAP_GUID_START (0x020300MN) is defined by the value of "0x02030000". "MN" is "11" in the case of authenticating and is "2N"(N means the capturing number that starts from 1) in the case of palm vein data enrollment.

Note 2) The Authentication library may automatically repeat capturing instructions for the first capture "PvAPI_NOTIFY_CAP_GUID_START (0x02030021)" when palm veins could not be captured properly during palm vein data enrollment.

Therefore, applications should be designed to be able to process multiple notifications of capturing instruction "PvAPI_NOTIFY_CAP_GUID_START (0x02030021 or 0x02030022)".

Note 3) PvAPI_NOTIFY_API_KIND (0x030001XX) is defined as a value "0x03000100".

Note 4) PvAPI_NOTIFY_API_END (0x030002XX) is defined as a value "0x03000200".

Note 5) PvAPI_NOTIFY_MATCH_RESULT (0x04XXXXXX) is defined as a value "0x04000000".

Note 6) PvAPI_NOTIFY_REGIST_SCORE (0x05XXXXXX) is defined as a value "0x05000000".

The value of "0x05XXXXXX" is one of the following depending on the score value.

- PvAPI_REGIST_SCORE_QUALITY_1 : 0x05000001
- PvAPI_REGIST_SCORE_QUALITY_2 : 0x05000002
- PvAPI_REGIST_SCORE_QUALITY_3 : 0x05000003

- >See> For information on guide mode (with guide mode/without guide mode), refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information" or "3.4.17 PvAPI_SetProfile".
- >See> For information on the detailed information notification function for the guidance image display and the enrolled data score notification function, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

[Remark3]

The following describes items returned when the notification type is silhouette image notification.

- Width of the image : 640
- Height of the image : 480
- Bitmap data : Bitmap file format, monochrome, 256 gradations

The silhouette image is notified only when the initial capturing has completed during palm vein data enrollment.

Contents of the silhouette image are not guaranteed after returning from this callback function. Store the image in another area within this callback function if you are using the image after returning from this function.

[Remark4]

The guidance image is returned when the detailed information notification function for the guidance image display "CBGUIMessageDetail" is set to "1" (Use) in the operational environment setting file and the guidance image notification callback is registered using BioAPI_SetGUICallbacks.

The guidance image to instruct the palm position is returned from BioAPI_GUI_STREAMING_CALLBACK when the notification type is guidance image notification.

- >See> For information on an operational environment setting file, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".
- >See> For information on BioAPI_SetGUICallbacks, refer to "3.4.8 BioAPI_SetGUICallbacks".
- >See> For information on BioAPI_GUI_STREAMING_CALLBACK, refer to "3.5.2 BioAPI_GUI_STREAMING_CALLBACK".

3.5.2 BioAPI_GUI_STREAMING_CALLBACK

[Function outline]

This function returns the guidance image to instruct the palm position from the Authentication library.

[Coding syntax]

```
BioAPI_RETURN (BioAPI *BioAPI_GUI_STREAMING_CALLBACK)
(
    void *GuiStreamingCallbackCtx,
    BioAPI_GUI_BITMAP_PTR Bitmap
);
```

[Parameters]

Member Name	Type	Description
GuiStreamingCallbackCtx	input	Returns the pointer to the context specified by BioAPI_SetGUICallbacks.
Bitmap	input/ optional	Returns the guidance image.

[Definition]

[Guidance image]

```
typedef struct bioapi_gui_bitmap {
    uint32 Width;           Width of the guidance image
    uint32 Height;          Height of the guidance image
    BioAPI_DATA_PTR Bitmap; Bitmap data
} BioAPI_GUI_BITMAP, *BioAPI_GUI_BITMAP_PTR;
```

[Return value]

BioAPI_OK	Successful (fixed)
-----------	--------------------

[Caution]

Perform minimum necessary processes within the guidance image notification callback and return swiftly.

[Remark1]

This function should have been created by an application and registered using BioAPI_SetGUICallbacks in advance in order to use the guidance image to instruct the palm position while capturing the palm veins in the application.

>See> For information on BioAPI_SetGUICallbacks, refer to "3.4.8 BioAPI_SetGUICallbacks".

[Remark2]

The following describes items returned with the guidance image.

- Width of the guidance image :640
- Height of the guidance image :480
- Bitmap data :Bitmap file format, monochrome, 256 gradations

Contents of the guidance image are not guaranteed after returning from this callback function. Store the image in another area within this callback function if you are using the image after returning from this function.

Chapter4 Error Information

4.1 List of Error Information

4.2 Error Notifications for Each Function

4.1 List of Error Information

This section lists error information which is notified to the error information structure.

>See> For information on the error information structure, refer to "3.4.18 PvAPI_GetErrorInfo" or "3.4.20 PvAPI_Cancel".

[Legends]

<Error level>

0: Normal, 1: Cancellation, 2: Recoverable, 3: Not recoverable

<Error type>

1: Device, 2: Resource, 3: Application, 4: Others

Error Level	Error Type	Error Detail	Description
0			Normal end. No measures are required.
1			The process has been cancelled. No measures are required.
2	1	Hex.: 0x02010001 Dec.: 33619969 (Abnormal temperature)	The internal temperature of the Sensor unit has exceeded the threshold. If the temperature of the surrounding atmosphere is 60°C or higher, adjust the external temperature to less than 60°C. However, it indicates the Sensor's internal error if the temperature of the surrounding atmosphere is less than 60°C. Replace the Sensor unit.
		Hex.: 0x02010002 Dec.: 33619970 (Sensor disconnected)	An error has occurred in the Sensor. Take the following measures. (1) Check if the Sensor is connected. (2) When (1) is OK and multiple Sensors are connected, check if Sensor information set in PvAPI_PreSetProfile is correct, and if the correct version level of the Sensor driver is used. (3) When (2) is OK, it may indicate an error in the Sensor unit, cable or receptacle. Check the Sensor status using the Sensor maintenance tool and replace the Sensor unit, cable or receptacle.
		Hex.: 0x02010003 Dec.: 33619971 (Sensor not found)	A function which requires a Sensor connection has been issued while a Sensor is not connected. Check if the settings in the operational environment setting file is correct and if there are any problems in the application.
	3	Hex.: 0x02030001 Dec.: 33751041 (Parameter error)	A parameter error has occurred. Take the following measures according to the value of error information 3 "ErrorInfo3[0]". <ul style="list-style-type: none"> When the value of "ErrorInfo3[0]" is "0x314E0102" in hexadecimal ("827195650" in decimal). Over 4,000 hands are contained in the vein data group as the subject for identification. Keep the number of hands within 4,000 in the vein data group as the subject for identification.
(To be continued)			

Error Level	Error Type	Error Detail	Description
2	3		(Continued)
		Hex.:0x02030001 Dec.: 33751041 (Parameter error)	<ul style="list-style-type: none"> Other than the above <p>An error in the parameter. Check if the parameters are correct. If the parameters are correct, it may indicate a data error. Check the value and the pointer set in the BioAPI_INPUT_BIR structure.</p>
		Hex.:0x02030002 Dec.: 33751042 (Sequence error)	<p>An error in the function sequence. Check if the sequence of the issued functions is correct.</p>
		Hex.:0x02030003 Dec.: 33751043 (Authentication error)	<p>The application is not authenticated. Check if the sequence of the issued PvAPI_ApAuthenticate is correct, and if the application key specified in PvAPI_ApAuthenticate is correct.</p>
		Hex.:0x02030004 Dec.: 33751044 (Incorrect UUID)	<p>The UUID is incorrect. Check if the UUID specified in BioAPI_ModuleLoad, BioAPI_ModuleUnload or BioAPI_ModuleAttach is correct.</p>
		Hex.:0x02030005 Dec.: 33751045 (Incorrect handle)	<p>The handle is incorrect. Check if the handle acquired by BioAPI_ModuleAttach is specified correctly.</p>
		Hex.:0x02030006 Dec.: 33751046 (Callback not set)	<p>The callback function is not set. Set the callback function.</p>
		Hex.:0x02030007 Dec.: 33751047 (Exceeded maximum acquisition number)	<p>The maximum number of acquisitions has been exceeded. Check if BioAPI_ModuleAttach has been issued multiple times.</p>
		Hex.:0x02030008 Dec.: 33751048 (Multiple issues)	<p>A multiple issues error has occurred. Take the following measures according to the value of error information 3 "ErrorInfo3[0]".</p> <ul style="list-style-type: none"> When the value of "ErrorInfo3[0]" is "0x00000000" in hexadecimal ("0" in decimal) <ul style="list-style-type: none"> (a) Functions have been issued from multiple threads in the Enterprise Edition without the license file. Acquire a license file for the Enterprise Edition when operating in a multi-threaded environment in the Enterprise Edition. (b) Multiple functions have been issued. Check the sequence of the issued functions. When the value of "ErrorInfo3[0]" is "0x00000001" in hexadecimal ("1" in decimal) <p>Functions have been issued from more than 512 threads excluding cancellation threads in the Enterprise Edition. Keep the number of threads within the range 1 to 512 when operating in a multi-threaded environment in the Enterprise Edition.</p>
		Hex.:0x02030009 Dec.: 33751049 (Incorrect BIR)	<p>The BIR is incorrect. Check if the BIR is correct.</p>

Error Level	Error Type	Error Detail	Description
2	3	Hex.:0x0203000A Dec.: 33751050 (Incorrect data)	<p>The data is incorrect. Take the following measures according to the value of error information 3 "ErrorInfo3[0]" and "ErrorInfo3[1]."</p> <ul style="list-style-type: none"> When the value of "ErrorInfo3[0]" is "0x0000B002" in hexadecimal ("45058" in decimal) and "ErrorInfo3[1]" is "0x00000010" in hexadecimal ("16" in decimal) or "0x00000011" in hexadecimal ("17" in decimal) An error was detected in the CRC check on palm vein data for enrollment. The palm vein data may be corrupted. Check the palm vein data. When the value of "ErrorInfo3[0]" is "0x0000B002" in hexadecimal ("45058" in decimal) and "ErrorInfo3[1]" is "0x00000020" in hexadecimal ("32" in decimal) An error was detected in the format check on palm vein data for enrollment. The palm vein data may be corrupted. Check the palm vein data. When the value of "ErrorInfo3[0]" is "0x0000B002" in hexadecimal ("45058" in decimal) and "ErrorInfo3[1]" is "0x00000030" in hexadecimal ("48" in decimal) <ul style="list-style-type: none"> (a) Compressed format and non-compressed format are mixed in palm vein data for enrollment. Use one format only. (b) Verification or identification has been attempted in a guide mode which is different from the guide mode of palm vein data for enrollment. Verify or identify in the same guide mode as the palm vein data for enrollment. (c) Verification or identification has been attempted in without guide mode using palm vein data created by the Authentication library V21 or earlier. Recreate palm vein data for enrollment in without guide mode when performing verification or identification in without guide mode. Or, perform verification of identification in with guide mode when using palm vein data for enrollment created by the Authentication library V21 or earlier. <p>(To be continued)</p>

Error Level	Error Type	Error Detail	Description
2	3	Hex.:0x0203000A Dec.: 33751050 (Incorrect data)	<p>(Continued)</p> <ul style="list-style-type: none"> When the value of "ErrorInfo3[0]" is "0x0000B002" in hexadecimal ("45058" in decimal) and "ErrorInfo3[1]" is "0x00000040" in hexadecimal ("64" in decimal) Internal format of palm vein data for enrollment and for authentication are different. Create palm vein data for enrollment again. When the value of "ErrorInfo3[0]" is "0x0000B002" in hexadecimal ("45058" in decimal) and "ErrorInfo3[1]" is "0x00000050" in hexadecimal ("80" in decimal) Palm vein data for enrollment is specified as palm vein data for authentication. Specify palm vein data for authentication. When the value of "ErrorInfo3[0]" is "0x0000B002" in hexadecimal ("45058" in decimal) and "ErrorInfo3[1]" is "0x00000051" in hexadecimal ("81" in decimal) Palm vein data for authentication is specified as palm vein data for enrollment. Specify palm vein data for enrollment. When the value of "ErrorInfo3[0]" is "0x000B002" in hexadecimal ("45058" in decimal) and "ErrorInfo3[1]" is one of the following values. <ul style="list-style-type: none"> Between "0x00000100" in hexadecimal ("256" in decimal) and "0x00000103" in hexadecimal ("259" in decimal) "0x00000105" in hexadecimal ("261" in decimal) "0x00000106" in hexadecimal ("262" in decimal) BIR header information of palm vein data for enrollment or palm vein data for authentication is incorrect. Check if the pointer to the palm vein data's BIR is specified correctly. When the value of "ErrorInfo3[0]" is "0x314E0203" in hexadecimal ("827195907" in decimal) Identification is requested with palm vein data for enrollment in compressed format. Recreate palm vein data for enrollment in non-compressed format when performing identification. Perform verification when using palm vein data for enrollment in compressed format. <p>(To be continued)</p>

Error Level	Error Type	Error Detail	Description
2	3	Hex.:0x0203000A Dec.: 33751050 (Incorrect data)	<p>(Continued)</p> <ul style="list-style-type: none"> When the value of "ErrorInfo3[0]" is "0x314E0204" in hexadecimal ("827195908" in decimal) <ul style="list-style-type: none"> (a) The specified palm vein data for enrollment is in a format which cannot be used for identification. Check the format of palm vein data for enrollment supported by identification. >See> For the viability of authentication (compatibility) using enrolled palm vein data with the Authentication library V31, refer to "Appendix G Compatibility of Palm Vein Data". (b) The format of the specified palm vein data is not supported by PvAPI_PresetIdentifyPopulation. Check the format supported by PvAPI_PresetIdentifyPopulation and review the specified format of the palm vein data. Other than the above Data passed from the application is incorrect. Check the data. If there are no problems with the data, make a query through the SDK support Web site with the attached error information details and trace file.
		Hex.:0x02040001 Dec.: 33816577 (Timeout)	A timeout has occurred. No measures are required.
		Hex.:0x02040002 Dec.: 33816578 (Cancellation not possible)	No process is running to cancel. No measures are required.
		Hex.:0x02040003 Dec.: 33816579 (Environment setting error)	An environment setting error has occurred. (Currently not used)
3	1	Hex.:0x03010001 Dec.: 50397185 (Sensor error)	<p>An error has occurred in the Sensor. Take the following measures.</p> <ol style="list-style-type: none"> Check if the Sensor is connected. When (1) is OK, check if the Sensor driver is installed. When (2) is OK and multiple Sensors are connected, check if Sensor information set in PvAPI_PreSetProfile is correct, and if the correct version level of the Sensor driver is used. When (3) is OK, it may indicate an error in the Sensor unit, cable or receptacle. Check the Sensor status using the Sensor maintenance tool and replace the Sensor unit, cable or receptacle.
		Hex.:0x03010002 Dec.: 50397186 (Sensor error alarm)	<p>An error has been detected by the Sensor self-diagnosis. Take the following measures.</p> <ol style="list-style-type: none"> This error may occur when the Sensor is installed at a place exposed to direct sunlight. Check the lighting environment of the Sensor installation place. >See> For information on the lighting environment for Sensors, refer to the "Sensor instruction manual". When (1) is OK, check the Sensor status using the Sensor maintenance tool and replace the Sensor unit.

Error Level	Error Type	Error Detail	Description
3	2	Hex.:0x03020001 Dec.: 50462721 (Memory acquisition error)	Failed to acquire memory. Check if there are any problems in memory.
		Hex.:0x03020002 Dec.: 50462722 (Resource acquisition error)	Failed to acquire internal resources. Check if there are any problems in internal resources.
		Hex.:0x03020003 Dec.: 50462723 (Resource operation error)	Failed to operate on internal resources. Check if there are any problems in the application. If there are no problems with the application, make a query through the SDK support Web site with the attached error information details and trace file.
	3	Hex.:0x03030001 Dec.: 50528257 (Incorrect area)	An error has occurred in memory. Check if there are any problems in the application. If there are no problems with the application, make a query through the SDK support Web site with the attached error information details and trace file.
		Hex.:0x03030002 Dec.: 50528258 (Callback)	An error has occurred in callback. Check if there are any problems in the application.
	4	Hex.:0x03040001 Dec.: 50593793 (Internal error)	An internal error has occurred. Make a query through the SDK support Web site with the attached error information details and trace file.
		Hex.:0x03040002 Dec.: 50593794 (Environment setting error)	An environment setting error has occurred. Take the following measures according to the value of error information 3 "ErrorInfo3[0]". <ul style="list-style-type: none"> When the value of "ErrorInfo3[0]" is "0x0000A002" in hexadecimal ("40962" in decimal) Either "F3BC4BSP.DAT" or "F3BC4BSPSV.DAT" does not exist or the file contents are corrupted. Restore "F3BC4BSP.DAT" or "F3BC4BSPSV.DAT" in the Authentication library installation folder. When the value of "ErrorInfo3[0]" is "0x0000A006" in hexadecimal ("40966" in decimal) The previous version of the Sensor driver is being in use in a Windows environment. Install the latest version of the Sensor driver. This error information is not notified in a Linux environment. When the value of "ErrorInfo3[0]" is "0x0000A007" in hexadecimal ("40967" in decimal) The previous version of the firmware is being used. Update the firmware to the latest version. When the value of "ErrorInfo3[0]" is "0x0000A008" in hexadecimal ("40968" in decimal) or "0x0000A013" in hexadecimal ("40979" in decimal) G-format is specified as the internal format of palm vein data. The Authentication library V31 does not support G-format. Create palm vein data for enrollment or palm vein data for authentication again. (To be continued)

Error Level	Error Type	Error Detail	Description
3	4	Hex.:0x03040002 Dec.: 50593794 (Environment setting error)	<p>(Continued)</p> <ul style="list-style-type: none"> When the value of "ErrorInfo3[0]" is "0x0000A00A" in hexadecimal ("40970" in decimal) "Connect a Sensor" is specified in the operational environment setting file for the Enterprise Edition. Do not specify whether a Sensor is connected or not in the operational environment setting file for the Enterprise Edition. When the value of "ErrorInfo3[0]" is "0x0000A00D" in hexadecimal ("40973" in decimal) F-method is specified as the identification mode of palm vein data. The Authentication library V30 does not support the F-method. Specify the F27-method as the identification mode of palm vein data. When the value of "ErrorInfo3[0]" is "0x46570000" in hexadecimal ("1180106752" in decimal). An error occurred during the Authentication library firmware update process. Take the following measures. <ol style="list-style-type: none"> (1) Check if the Sensor is connected. (2) When (1) is OK, check if the procedure for firmware update using the Authentication library was correct. (3) When (2) is OK, make a query through the SDK support Web site with the attached error information details and trace file. <p>>See> For information on how to update firmware using the Authentication library, refer to "Appendix C Authentication Library Firmware Update Function (Basic Edition Only)".</p>

4.2 Error Notifications for Each Function

The following lists whether error information is notified or not for each function.

[Legends]

<Error level>

0: Normal, 1: Cancellation, 2: Recoverable, 3: Not recoverable

<Error type>

1: Device, 2: Resource, 3: Application, 4: Others

<Symbols>

○: With a notification, △: Not notified for server start up, ×: No notification

Error Level	Error Type	Error Detail	PvAPI_GetLibraryInfo	PvAPI_GetConnectSensorInfoEx	PvAPI_PresetIdentifyPopulation	PvAPI_PresetProfile	PvAPI_Cancel	PvAPI_Sense	PvAPI_SetProfile	PvAPI_ApAuthenticate	BioAPI_IdentifyMatch	BioAPI_VerifyMatch	BioAPI_Process	BioAPI_Capture	BioAPI_SetGUILocalbacks	BioAPI_Identify	BioAPI_Verify	BioAPI_Enroll	BioAPI_GetHeaderFromHandle	BioAPI_GetBIRFromHandle	BioAPI_FreeBIRHandle	BioAPI_ModuleDetach	BioAPI_ModuleAttach	BioAPI_ModuleUnload	BioAPI_ModuleLoad
0			○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
1			×	×	○	×	×	○	×	×	○	○	×	○	×	○	○	○	○	×	×	×	×	×	×
2	1	Hex.: 0x02010001 Dec.: 33619969 (Abnormal temperature)	×	×	×	×	×	×	×	×	×	×	×	△	×	×	△	△	△	×	×	×	×	×	×
		Hex.: 0x02010002 Dec.: 33619970 (Sensor disconnected)	×	×	×	×	×	△	×	×	×	×	×	△	×	×	△	△	△	×	×	×	×	×	×
		Hex.: 0x02010003 Dec.: 33619971 (Sensor not found)	×	×	×	×	×	○	×	×	×	×	×	○	×	×	○	○	○	×	×	×	×	×	×

	PvAPI_GetLibraryInfo	PvAPI_GetConnectSensorInfoEx	PvAPI_PresetIdentifyPopulation	PvAPI_PresetProfile	PvAPI_Cancel	PvAPI_Sense	PvAPI_SetProfile	PvAPI_ApAuthenticate	BioAPI_IdentifyMatch	BioAPI_VerifyMatch	BioAPI_Process	BioAPI_Capture	BioAPI_SetGUICallbacks	BioAPI_Identify	BioAPI_Verify	BioAPI_Enroll	BioAPI_GetHeaderFromHandle	BioAPI_GetBIRFromHandle	BioAPI_FreeBIRHandle	BioAPI_ModuleDetach	BioAPI_ModuleAttach	BioAPI_ModuleUnload	BioAPI_ModuleLoad	Error Detail	Error Type	Error Level
2		O	x	O	x	O	O	O	O	O	O	O	O	O	O	O	O	O	x	O	O	O	O	Hex.:0x02030001 Dec.: 33751041 (Parameter error)	3	
		O	O	x	O	O	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	O	Hex.:0x02030002 Dec.: 33751042 (Sequence error)			
		O	O	O	x	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	Hex.:0x02030003 Dec.: 33751043 (Authentication error)			
		x	x	x	x	O	O	x	x	x	x	x	x	x	x	x	x	x	x	x	x	O	Hex.:0x02030004 Dec.: 33751044 (Incorrect UUID)			
		x	x	O	x	O	O	x	O	O	O	O	O	O	O	O	O	O	O	O	O	x	Hex.:0x02030005 Dec.: 33751045 (Incorrect handle)			
		x	x	x	x	x	x	x	x	O	O	x	O	x	O	O	O	x	x	x	x	x	Hex.:0x02030006 Dec.: 33751046 (Callback not set)			
		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Hex.:0x02030007 Dec.: 33751047 (Exceeded maximum acquisition number)			
		O	O	O	O	x	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	Hex.:0x02030008 Dec.: 33751048 (Multiple issues)			
		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Hex.:0x02030009 Dec.: 33751049 (Incorrect BIR)			
		x	x	O	x	x	x	x	x	O	O	x	x	x	O	O	O	x	x	x	x	x	Hex.:0x0203000A Dec.: 33751050 (Incorrect data)			
		x	x	x	x	x	O	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Hex.:0x02040001 Dec.: 33816577 (Timeout)	4		
		x	x	x	x	O	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Hex.:0x02040002 Dec.: 33816578 (Cancellation not possible)			
		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Hex.:0x02040003 Dec.: 33816579 (Environment setting error)			

Appendix

Appendix A Structures

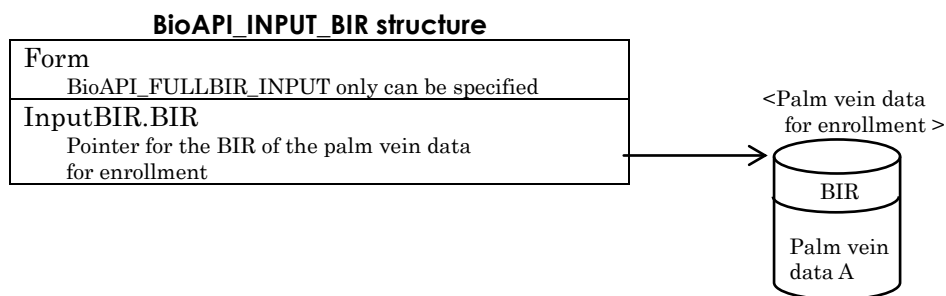
A.1 BioAPI_INPUT_BIR Structure

When calling BioAPI_Verify or BioAPI_VerifyMatch, the BioAPI_INPUT_BIR structure must be created in the application to pass the BIR of the palm vein data for enrollment as the subject for verification, to the Authentication library.

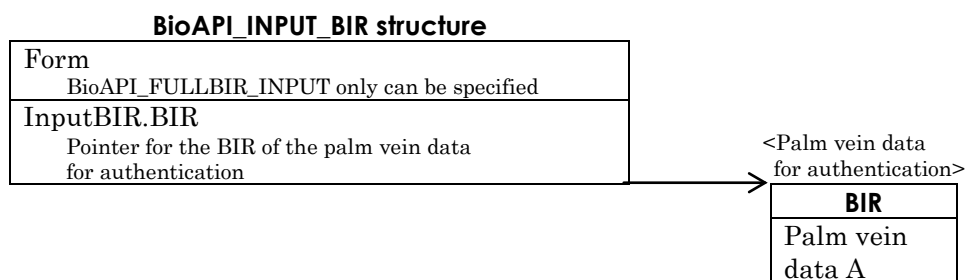
Also, when calling BioAPI_VerifyMatch or BioAPI_IdentifyMatch, the BioAPI_INPUT_BIR structure must be created in the application to pass the BIR of the captured palm vein data for authentication, to the Authentication library.

The following describes the BioAPI_INPUT_BIR structure.

<Palm vein data for enrollment to be verified>



< Captured palm vein data for authentication>



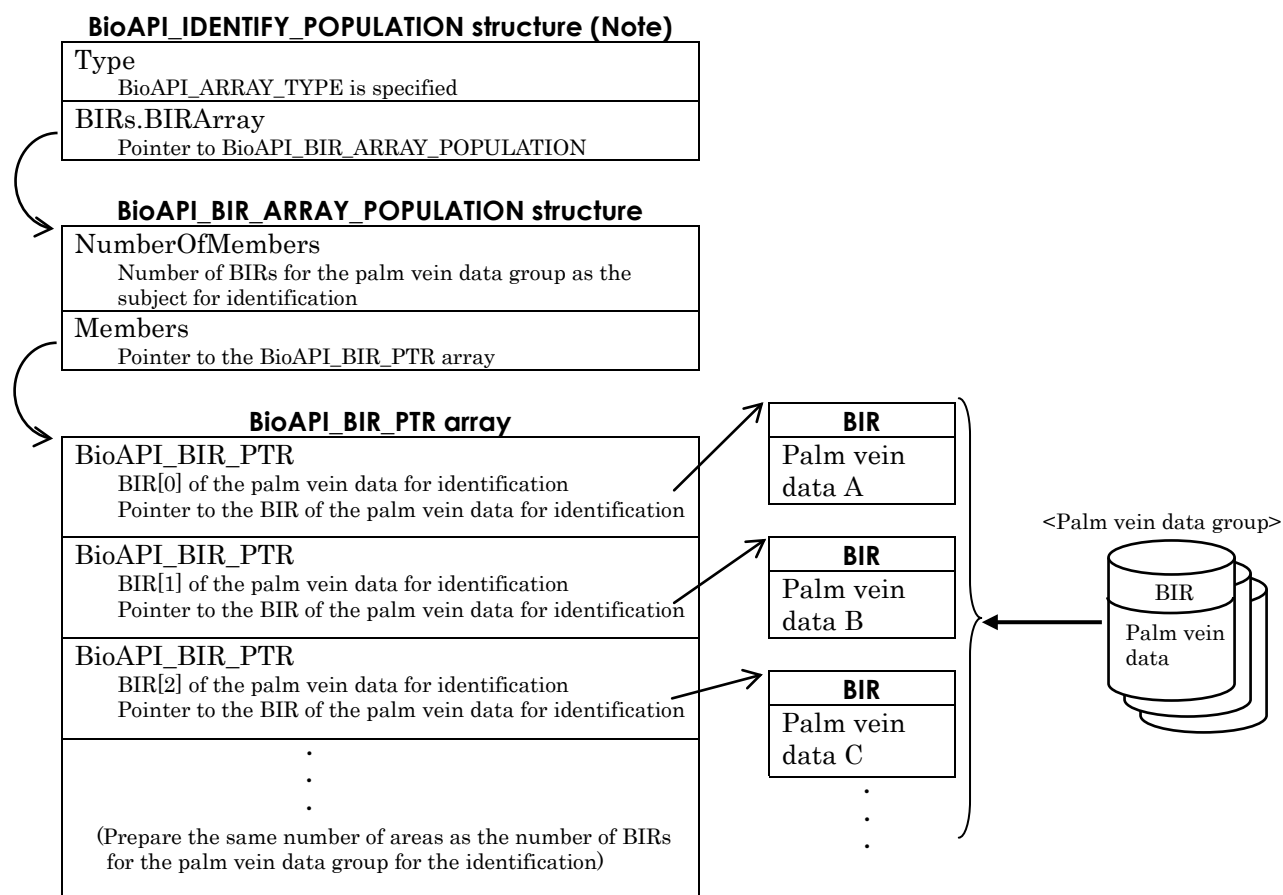
!Caution BIR structure for the x64 version

Use the PvAPI_BIR structure for BIR.
Also, when setting BIR to InputBIR.BIR, cast to BioAPI_BIR_PTR.
The PvAPI_BIR structure can also be used in the x86 version.

A.2 Population Structure

When calling BioAPI_Identify, BioAPI_IdentifyMatch, or PvAPI_PresetIdentify Population the Population structure must be created in the application to pass the BIRs of the palm vein data group as the subject for identification, to the Authentication library.

The following describes the Population structure.



Note) Specify the following values to "Type" and "BIRs.BIRArray" of BioAPI_IDENTIFY_POPULATION structure when palm vein data group subject to identification is loaded in memory in advance by PvAPI_PresetIdentify Population and identifying by calling BioAPI_Identify or BioAPI_Identify Match.

BioAPI_IDENTIFY_POPULATION structure

Type
Specify PvAPI_PRESET_ARRAY_TYPE
BIRs.BIRArray
Specify NULL

!Caution BIR structure for the x64 version

Use the PvAPI_BIR structure for BIR.

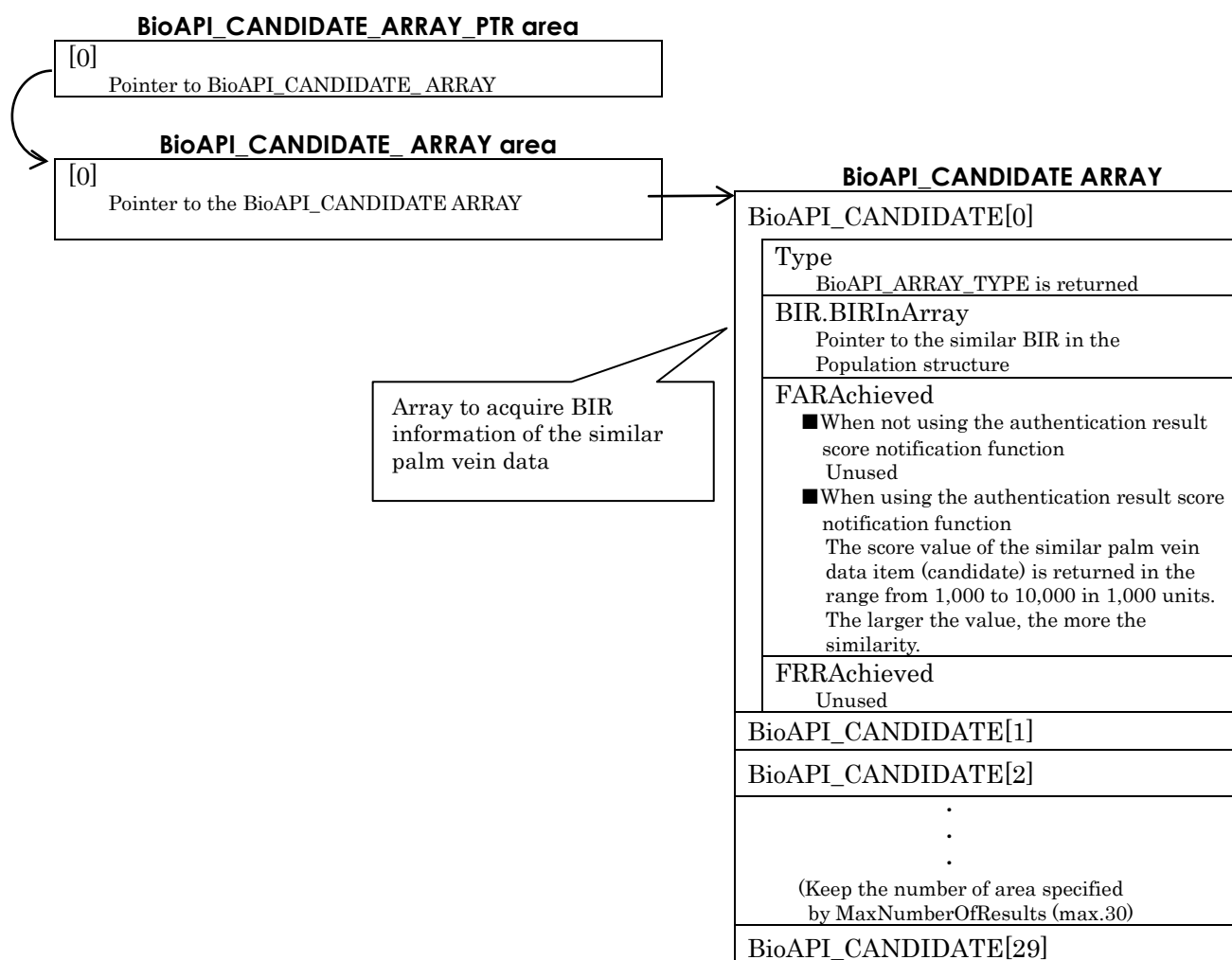
Also, when setting BIR to each element in the BioAPI_BIR_PTR array, cast to BioAPI_BIR_PTR.

The PvAPI_BIR structure can also be used in the x86 version.

A.3 Candidates Structure

When BioAPI_Identify or BioAPI_IdentifyMatch is complete, the Authentication library returns the similar palm vein data items from the palm vein data group which was the subject for identification, to the Candidates structure.

The following describes the Candidates structure.



>See> For information on the authentication result score notification function, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information" and "3.4.17 PvAPI_SetProfile".

!Caution BIR structure for the x64 version

Use the PvAPI_BIR structure for BIR.
Also, when referencing BIR in BIR.BIRInArray, cast to PvAPI_BIR_PTR.
The PvAPI_BIR structure can also be used in the x86 version.

Appendix B Connecting Multiple Sensors (Windows Basic Edition Only)

Multiple Sensors (up to eight Sensors) can be connected since the Authentication library V21.

◆ Procedure for Connecting Multiple Sensors

The following describes how to connect multiple Sensors.

Operation

Step1 Check the ID number of the Sensor (serial number/model) using the Sensor maintenance tool.

>See> For information on the Sensor maintenance tool, refer to the "Sensor maintenance tool operation guide".

Step2 Create an application.
Set the connected Sensor ID number (serial number/model) in the parameters for PvAPI_PreSetProfile.
PvAPI_PreSetProfile must be called after calling BioAPI_ModuleLoad and before calling BioAPI_ModuleAttach.

!Caution Setting the Sensor ID number (serial number/model)
Take Sensor replacements into consideration and design the application to allow changes of the Sensor ID number (serial number/model) easily.

>See> For information on PvAPI_PreSetProfile, BioAPI_Module Load, and BioAPI_ModuleAttach, refer to "Chapter 3 Authentication Library Interface".

◆ Notes on Connecting Multiple Sensors

There are several considerations which should be given when connecting multiple Sensors.

- **Notes on application design**

There are a few issues to be considered when designing applications with multiple Sensors.

>See> For information on the application design with multiple Sensors, refer to the "System development guide".

- **Sensor connection**

Generally connect Sensors to the root hub when connecting multiple Sensors.

- **Power options in Windows**

Pay attention to settings for power options in Windows when connecting multiple Sensors.

>See> For information on power options in Windows, refer to the "System development guide".

Appendix C Authentication Library Firmware Update Function (Basic Edition Only)

The firmware is stored in the Sensor unit.

In addition to publishing information on the SDK support Web site, we will send you update information by e-mail when the firmware is updated.

Check the version level information of the current firmware and update to the latest version by downloading it from the SDK support Web site as necessary.

!Caution Application to update the firmware

The firmware can be updated by an application with Authentication library and which uses the Sensor.

★Tip

Appropriate update of the firmware on the Sensor unit

The firmware update function of the Authentication library compares the version level of the firmware downloaded from the SDK support Web site and the version level of the firmware in the Sensor unit. It updates the firmware in the Sensor unit only when the versions are the same and the level on the Sensor unit is older.

Therefore, the firmware in the Sensor unit is not updated if one of the following cases is applicable.

- The version of the firmware in the Sensor unit is different.
 - The version of the firmware in the Sensor unit is the same and the level is newer.
 - The version of the firmware in the Sensor unit is the same and the level is also the same.
-

!Caution Updating the firmware

Always follow the procedure below.

The Sensor may develop a fault if the procedure below is not followed.

★Tip**Duration required for the firmware update process**

The firmware update process takes approximately 10 seconds.

!Caution Updating the firmware on multiple Sensors

Only one Sensor can be updated by the following procedure.

Repeat the following procedure for each Sensor when updating the firmware on multiple Sensors.

The following describes how to update the firmware in the Sensor unit.

👉Operation**Step1 Check the firmware version level (firmware version) on the Sensor unit using the Sensor maintenance tool.**

>See>

For information on the Sensor maintenance tool, refer to the "Sensor maintenance tool operation guide".

Step2 Compare the version level of the firmware in the SDK support Web site and the version level of the firmware in the Sensor unit. If the versions are the same and the level on the Sensor unit is older, download the firmware from the SDK support Web site.**Step3 Store the firmware downloaded from the SDK support Web site in any folder on the target hardware.****Step4 Create an operational environment setting file "F3BC4FRM.INI" (in a Windows environment) or "f3bc4frm.ini" (in a Linux environment) under the Authentication library installation folder to update the firmware and set the firmware update information.**
The following lists setting items in the operational environment setting file.**!Caution Note on setting items**

Each setting item in the operational environment setting file must be up to 256 single byte characters and must be terminated with a carriage return.

<For Windows environment>

```

[FirmwareFile]
Path=C:\abc\def\ghi\      . . . . . (1)
Name=yyyymmdd_xxxx_FirmWare_bin.arc . . . . (2)
Name2=yyyymmdd_xxxx_FirmWare_bin.arc . . . . (2)
Name3=FirmWare_V2_VxxLxxx.arc . . . . . (2)

[Progress]
Message=1      . . . . . (3)

[LogFile]
LogPath=C:\abc\def\ghi\ . . . . . (4)

```

<For Linux environment>

```

[FirmwareFile]
Path=/abc/def/ghi/      . . . . . (1)
Name=yyyymmdd_xxxx_FirmWare_bin.arc . . . . (2)
Name2=yyyymmdd_xxxx_FirmWare_bin.arc . . . . (2)
Name3=FirmWare_V2_VxxLxxx.arc . . . . . (2)

[Progress]
Message=1      . . . . . (3)

[LogFile]
LogPath=/abc/def/ghi/ . . . . . (4)

```

Setting Item		Description	Default
(1)	Path	<p>Specify the absolute path of the folder on the target hardware where the firmware downloaded from the SDK support Web site has been stored.</p> <p>Each folder must be delimited by “\” (one “\” character) and “/” (one “/” character) must be added at the end in Windows environments. Also in Linux environment each folder must be delimited by “/” (one “/” character) and “/” (one “/” character) must be added at the end.</p> <p>Note) The previous version specified “\\” (two “\” characters). Although “\\” (two “\” characters) can still work, it is recommended to use “\” (one “\” character).</p> <p>Do not use full-width characters in folder names.</p> <p>This item is mandatory.</p>	-

Setting Item		Description	Default
(2)	Name	Specify the file name of the firmware including its extension ".arc" stored in a folder on the target hardware. Do not use full-width characters in file names. This item is mandatory.	-
	Name2 Name3	Specify these items when multiple items of firmware are stored in the folder on the target hardware. (Up to 3 items can be specified including "Name".) Do not use full-width characters in file names.	-
(3)	Message	<p><For Windows environment> Specify whether or not to display messages with a dialog box while updating the firmware. 1: Display a message to indicate the update is in progress only 2: Display confirmation messages for starting and finishing the update only. (The [OK] button needs clicking at the confirmation messages for starting and finishing the firmware update.) 3: Display confirmation messages for starting and finishing the update, and a message to indicate that the update is in progress. (The [OK] button needs clicking at the confirmation messages for starting and finishing the firmware update.)</p> <p>Omit this item for not displaying messages. Messages are not displayed if any value other than the above is specified.</p> <p>Specify "1: Display a message to indicate the update is in progress only" or omit this item if you prefer to update the firmware automatically without operations of clicking the [OK] button at confirmation messages for starting and finishing the update.</p>	(No message display)
		<p><For Linux environment> Specify whether or not to display messages while updating the firmware. 1: Display a message to indicate the update is in progress only</p> <p>Omit this item for not displaying messages. Messages are not displayed if any value other than the above is specified.</p>	

Setting Item		Description	Default
(4)	LogPath	<p>Specify the absolute path (Note 1) of the folder to output the log file of the firmware update process result "f3bc4frm.log".</p> <p>Note 1) The path must be 247 characters or less in Windows environments. Each folder must be delimited by "\" (one \" character) and \" (one \" character) must be added at the end in Windows environments. Also in Linux environment each folder must be delimited by / (one / character) and / (one / character) must be added at the end.</p> <p>Note 2) The previous version specified \" (two \" characters). Although \" (two \" characters) can still work, it is recommended to use \" (one \" character).</p> <p>Do not use full-width characters in folder names.</p> <p>The log file "f3bc4frm.log" is not output if the specified folder does not exist.</p>	(Authentica tion library installation folder)

Step5 Connect the Sensor to the target hardware and start the application in order to update the firmware in the Sensor unit.

!Caution Application to update the firmware

The firmware can be updated by an application with Authentication library and which uses the Sensor.

★Tip

Timing for starting the firmware update process

The firmware update process starts before the start sequence of the Sensor in the first BioAPI_ModuleAttach called by the application.

>See>

For information on BioAPI_ModuleAttach, refer to "3.4.3 BioAPI_ModuleAttach".

Subsequent operations are described with examples of confirmation messages for starting and finishing the update, and a message to indicate that the update is in progress displayed in a dialog box in a Windows environment.

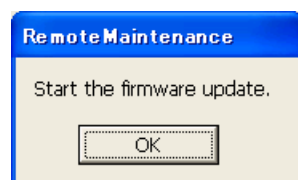
★Tip**Cases where the firmware is not updated**

The Firmware update function of the Authentication library compares the version level of the firmware stored in the folder on the target hardware and the version level of the firmware in the Sensor. It does not update the firmware in the Sensor unit if one of the following cases is applicable.

- The version of the firmware in the Sensor unit is different.
- The version of the firmware in the Sensor unit is the same and the level is newer.
- The version of the firmware in the Sensor unit is the same and the level is also the same.

In the above cases an entry to state the firmware update process is not required is logged into the log file for the firmware update process.

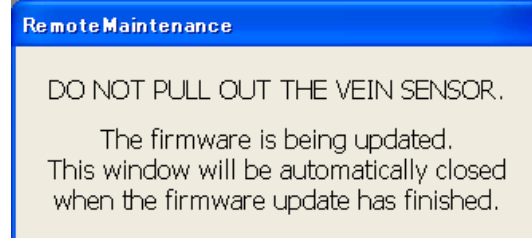
As the firmware update process starts, the confirmation message for starting the update is displayed in a dialog box. This confirmation message is not displayed in a Linux environment.



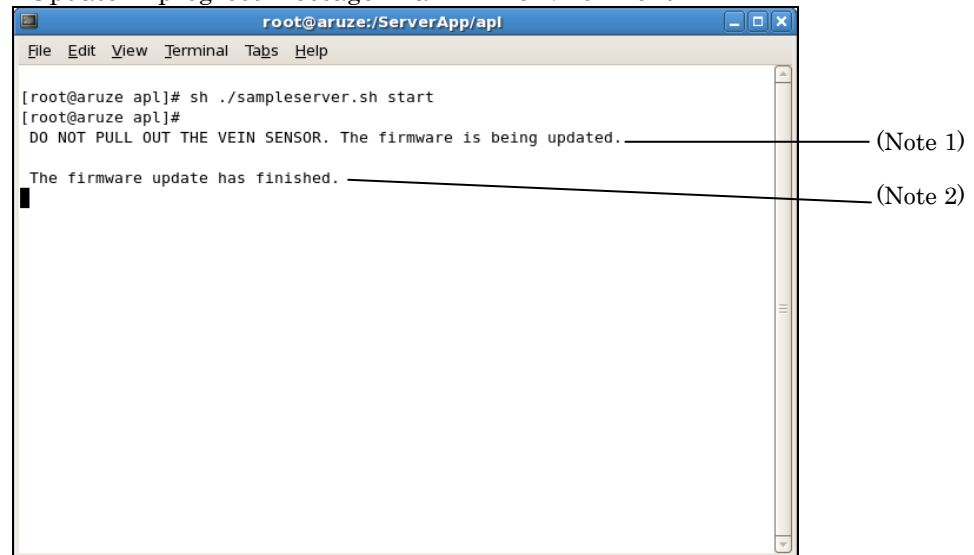
Step6 Click the [OK] button below the confirmation message for starting the update.

A dialog box is displayed to indicate that the update is in progress, and the firmware update process starts.

<Update in progress message in a Windows environment >



<Update in progress message in a Linux environment>



Note 1) This message is displayed when the firmware update process is started.

Note 2) This message is displayed when the firmware update process is complete.

!Caution While updating the firmware

Never operate any other applications.

Also note, the following events must not occur.

- Removing and re-inserting of the USB receptacle and cable
- Resetting the system
- Rebooting the OS
- Shutting down
- Power cut

The Sensor may develop a fault if the above events occur.

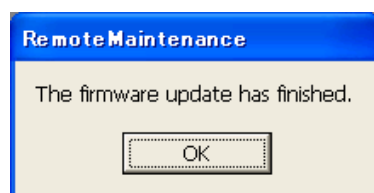
If one of the above events occurs, check the Sensor status using the Sensor maintenance tool.

>See>

For information on the Sensor maintenance tool, refer to the "Sensor maintenance tool operation guide".

When the firmware update process is complete, the confirmation message for finishing the update is displayed in a dialog box regardless if the process has been successful or not.

This confirmation message is not displayed in a Linux environment.

**Step7 Click the [OK] button below the confirmation message for finishing the update.**

The confirmation message for finishing the update disappears.

The firmware stored in a folder on the target hardware and the operational environment setting file created in step 4 are automatically deleted.

★Tip**When the firmware update process has finished with an error**

BioAPI_ModuleAttach will return an error (error detail "0x03040002 (Environment setting error)").

>See>

For information on error details, refer to "4.1 List of Error Information".

Step8 Check version level information of the firmware in the Sensor unit to confirm that the firmware has been updated.

It can also be checked by referencing the contents of the log file "f3bc4frm.log" which has been created in the log output folder specified in step 4 (4).

>See> For information on how to check the version level information of the firmware, refer to the "Sensor maintenance tool operation guide".

The following shows an example of the log file .

(1)	(2)	(3)	(4)	(5)
[2013/01/20 12:34:35 12:34:45],	OK,	0000000001,	yyymmdd_xxxxx_FirmWare_bin. arc,	V00Lxxx
[2013/01/20 12:44:35 12:44:45],	NG,	0000000002,	yyymmdd_xxxxx_FirmWare_bin. arc,	XXXXXXXX
[2013/01/20 12:54:35 12:54:45],	--,	0000000003,	FirmWare_V2_VxxLxxx. arc,	V00Lxxx
.

Item		Description
(1)	Update process date and time	The date and time (start date and time and end date and time) of the firmware update process. (For example, if the process is started at 12:34:35 on Jan 20, 2013 and finished at 12:34:45, "[2013/01/20 12:34:35 12:34:45]" is output.
(2)	Result	The result of the firmware update process. <ul style="list-style-type: none"> • OK: Firmware update successful • NG: Firmware update failed • -- : Firmware update not required
(3)	Serial number of the Sensor	The serial number of the updated Sensor in decimal.

Item		Description
(4)	Firmware file name	<When the result is "OK"> Among the firmware items stored in the folder on the target hardware, the file name of the one used for the update is output.
		<When the result is "NG"> The file name of the firmware which caused a read error, or which caused an update process error is output.
		<When the result is "--"> The file names of the firmware specified in "Name", "Name2", and "Name3" in Step 4 (2) are output. (For example, "a.arc/b.arc/c.arc" is output when Name=a.arc, Name2=b.arc, and Name3=c.arc are specified.)
(5)	Version information of the firmware in the Sensor unit	<When the result is "OK" or "--"> Version level information of the firmware of the updated Sensor unit is output.
		<When the result is "NG"> Error location information is output. The following describes the error location information, its meaning and countermeasures. <ul style="list-style-type: none"> 00010001 An error has occurred in the Sensor. Take the following measures. (1) Check if the Sensor is connected. (2) When (1) is OK, check if the Sensor driver is installed. (3) When (2) is OK and multiple Sensors are connected, check if Sensor information set in PvAPI_PreSetProfile is correct, and if the correct version level of the Sensor driver is used. (4) When (3) is OK, it may indicate an error in the Sensor unit, cable or receptacle. Check the Sensor status using the Sensor maintenance tool and replace the Sensor unit, cable or receptacle. 00020001 The firmware is not stored in the firmware storage folder specified in step 4 (1). Check the folder where you have stored the firmware, and the firmware file name. Other than the above Terminate the application and check if the firmware update procedure was followed without problems. If there is no problem with the procedure, make a query through the SDK support Web site attaching this log file.

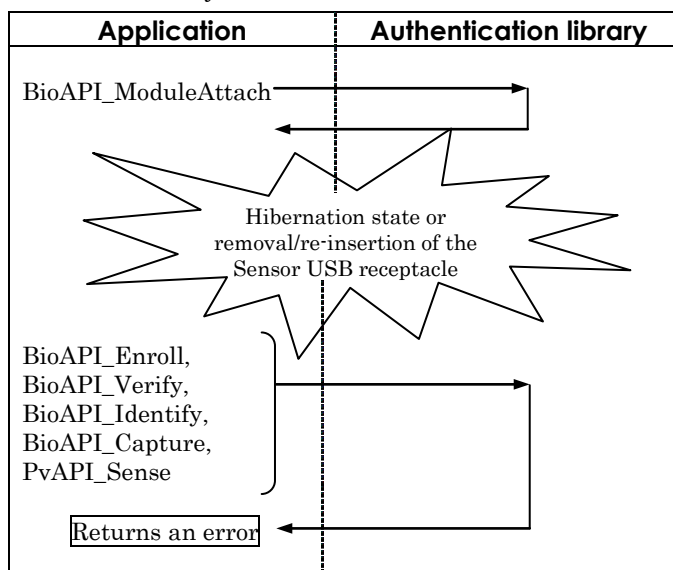
Appendix D Auto-recovery Function from the Hibernation State and Removal/Re-insertion of the Sensor USB Receptacle (Windows Basic Edition Only)

The auto-recovery function from the hibernation state and removal/insertion of the Sensor USB receptacle has been added since the Authentication library V21.

◆ Differences between Enabling and Disabling the Auto-recovery Function

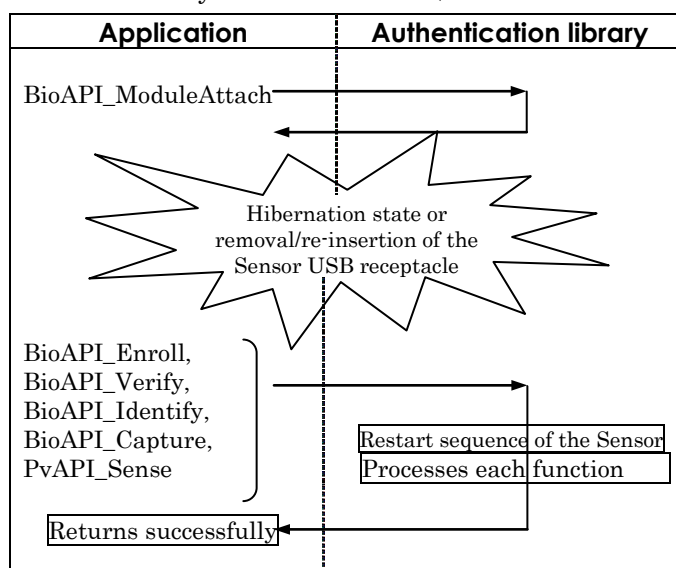
The following describes the difference in operations between enabling and disabling the auto-recovery function.

< Auto-recovery function disabled (before the Authentication library V21) >



If the hibernation state or removal/re-insertion of the Sensor USB receptacle occurs after calling BioAPI_Module Attach, any subsequent functions which use the Sensor such as BioAPI_Enroll will return an error. In such a case, the application must be restarted.

<Auto-recovery function enabled (the Authentication library V21 and later) (Note) >



Even if the hibernation state or removal/re-insertion of the Sensor USB receptacle occurs after calling BioAPI_Module Attach, any subsequent functions which use the Sensor such as BioAPI_Enroll will return successfully. Because the restart sequence of the Sensor is performed in the Authentication library when a function which uses the Sensor such as BioAPI_Enroll is called.

Note) The auto-recovery function is disabled if multiple sensors are connected or a sensor is connected via a USB hub even with the Authentication library V21 or later.

>See> For information on multiple Sensor connections, refer to the "System development guide" and "Appendix B Connecting Multiple Sensors (Windows Basic Edition Only)".

>See> For information on considerations on using USB hubs, refer to the "System development guide".

◆ Notes on Using the Auto-recovery Function

There are several issues which should be considered when using the auto-recovery function.

- **Calling BioAPI_ModuleAttach and BioAPI_ModuleDetach**

It is recommended to limit calling BioAPI_ModuleAttach and BioAPI_ModuleDetach only at starting and terminating of the application in general except for an error.

!Caution Applications which call BioAPI_ModuleAttach and BioAPI_ModuleDetach each time for functions which use the Sensor such as BioAPI_Enroll

Applications had to call BioAPI_ModuleAttach and BioAPI_ModuleDetach each time they issue a function to use the Sensor such as BioAPI_Enroll up to the Authentication library V12 since the auto-recovery function was not available; however, such processes are no longer necessary since the Authentication library V21. Eliminating such processes reduces the duration required for the start sequence of the Sensor and improves the processing speed.

>See> For information on the duration required for the Sensor's start sequence, refer to "Appendix E Duration Required for the Start Sequence of the Sensor (Basic Edition Only)".

- **The hibernation state or removal/re-insertion of the Sensor USB receptacle while calling function which use the Sensor such as BioAPI_Enroll**

If the hibernation state or removal/re-insertion of the Sensor USB receptacle occurs while calling functions which use the Sensor such as BioAPI_Enroll, the function returns an error. In such a case, it may be recovered by calling BioAPI_ModuleDetach and BioAPI_ModuleAttach. However, if it does not recover, the application must be restarted.

- **Removal/re-insertion of the USB receptacle immediately after the hibernation state**

Even when functions which use the Sensor such as BioAPI_Enroll is not being called, if removal/re-insertion of the Sensor occurs immediately after recovering from the hibernation state and a function which uses the Sensor such as BioAPI_Enroll or BioAPI_ModuleDetach is called instantaneously, the function may return an error or does not respond.

If an error is returned, it may be recovered by calling BioAPI_ModuleDetach and BioAPI_ModuleAttach. However, if it does not recover, the application must be restarted.

Also, in the case of no response, it may be recovered by repeating removal/re-insertion of the Sensor again. However, if it does not recover, the application must be restarted.

- **Sensor replacement at removal/re-insertion of the Sensor USB receptacle**

The auto-recovery function is disabled and returns an error if the Sensor is replaced with another Sensor at the time of removal or insertion of the Sensor USB receptacle. In such a case, the application must be restarted.

Appendix E Duration Required for the Start Sequence of the Sensor (Basic Edition Only)

The following list the duration required for the start sequence of the Sensor.

These durations were measured using Intel® Core i5 680 3.60GHz and USB2.0.

Version of the Authentication library	Authentication library V30	
Sensor driver type	Conventional	For extended function
Firmware version	V00L203	V50L223
Duration required for the Sensor connection process (Note1)	0.3 sec.	0.5 sec.
Duration required for the start sequence (Note2)	0.4 sec.	02 sec.
Total	0.7 sec.	0.7 sec.

Note1) The duration required for the Sensor connection process is from the moment the Sensor is switched on until the Sensor becomes connected after the Sensor's USB receptacle is inserted or recovering from the hibernation state.

Note2) The duration required for the start sequence is from the moment BioAPI_ModuleAttach is called while the Sensor is connected until the function is complete.

Appendix F Guide Mode (Basic Edition Only)

The guide mode function has been added since the Authentication library V24. Guide mode can be specified as one of two; with guide mode or without guide mode, and the default is without guide mode.

Previous modes up to the Authentication library V21 are equivalent of the with guide mode.

◆ How to Set Guide Mode

Guide mode can be specified in the operational environment setting file or `PvAPI_SetProfile`.

The following describes how to specify the guide mode for both modes.

- **With guide mode**

With guide mode can be specified in the operational environment setting file.

With Guide mode can also be specified in `PvAPI_SetProfile`.

- **Without guide mode**

The default guide mode is without guide mode.

Therefore, there is no need to specify without guide mode in the operational environment setting file or `PvAPI_SetProfile`.

>See> For information on the operational environment setting file, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

>See> For information on `PvAPI_SetProfile`, refer to "3.4.17 `PvAPI_SetProfile`".

◆ Notes on Using Guide Mode

There are several issues which should be considered when using guide mode.

- **Notes on application design**

There are a few issues to be considered when designing applications with guide mode.

It is especially important to determine the guide mode suitable to the operational environment.

>See> For information on the application design with guide mode, refer to the "System development guide".

- **Capturing angle**

Always make the capturing angle "0°" when using without guide mode.

>See> For information on the capturing angle, refer to the "System development guide" and "3.4.17 PvAPI_SetProfile".

- **Detailed guidance notifications**

Always specify "Detailed notification" for CBMessageDetail when using without guide mode.

Settings for the detailed guidance notification are no longer required from the Authentication library V31. ("Detailed notification" is automatically specified.)

>See> For information on the detailed guidance notifications, refer to "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

- **Guide mode for enrolling palm vein data and for authentication**

Always use the same guide mode for enrollment and authentication of palm vein data.

>See> For the viability of authentication (compatibility) using enrolled palm vein data with the Authentication library V31, refer to "Appendix G Compatibility of Palm Vein Data".

- **Migrating previous products to the Authentication library V31**

There are a few issues to be considered when migrating to the Authentication library V31.

>See> For information on issues in migrating to the Authentication library V31, refer to the "System development guide"

Appendix G Compatibility of Palm Vein Data

The following describes viability of authentication (compatibility) using enrolled palm vein data with the Authentication library V31.

- >See> For information on enrollment format of palm vein data (non-compressed format / compressed format), refer to the "System development guide" and "3.4.17 PvAPI_SetProfile".
- >See> For information on internal format of palm vein data (G-format / I-format), refer to the "System development guide" and "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".
- >See> For information on the index type (F27-Index / F-Index), refer to the "System development guide" and "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".
- >See> For information on guide mode (with guide mode / without guide mode), refer to the "System development guide", "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information" and "3.4.17 PvAPI_SetProfile".
- >See> For information on authentication method (verification / identification), refer to the "System development guide", "3.4.11 BioAPI_VerifyMatch", "3.4.12 BioAPI_IdentifyMatch", "3.4.14 BioAPI_Verify", and "3.4.15 BioAPI_Identify".
- >See> For information on identification mode of palm vein data (F27-method), refer to the "System development guide" and "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

G.1 Palm Vein Data Enrolled by the Authentication Library V31

◆ Enrollment Format of Palm Vein Data is Non-compressed Format

Enrolled Palm Vein Data				Authentication library V31			
				Verification		Identification (F27-method)	
				Without guide mode	With guide mode	Without guide mode	With guide mode
Internal format of palm vein data	Authentication library V31	G-format					
		F27-Index	Without guide mode	○	×	○ [1,000]	×
			With guide mode	×	○	×	○ [1,000]
		F-Index	Without guide mode				
			With guide mode				

○ : Usable × : Unusable(error)

[] indicates the maximum number of data items in the palm vein data group subject to identification.

[Notes on compatibility]

<Enrolled palm vein data>

- Enrollment in G-format is not available with the Authentication library V31.
- Enrollment in F-index is not available with the Authentication library V31.

<Authentication method>

- Authentication is not possible with a guide mode which is different from the guide mode used to enroll palm vein data with the Authentication library V31.

◆ Enrollment Format of Palm Vein Data is Compressed Format

Enrolled palm vein data				Authentication library V31			
				Verification		Identification (F27-method)	
				Without guide mode	With guide mode	Without guide mode	With guide mode
Internal format of palm vein data	Authentication library V31	G-format					
		I-format	Without guide mode	○	×		
			With guide mode	×	○		

○ : Usable × : Unusable(error)

[Notes on compatibility]

<Enrolled palm vein data>

- Enrollment in G-format is not available with the Authentication library V31.

<Authentication method>

- Authentication is not possible with a guide mode which is different from the guide mode used to enroll palm vein data with the Authentication library V31.
- Palm vein data enrolled in compressed format cannot be used for identification with F27-method in the Authentication library V31.

G.2 Palm Vein Data Enrolled before the Authentication Library V31

◆ Enrollment Format of Palm Vein Data is non-compressed Format

!Caution Palm vein data enrolled before the Authentication library V30

It is strongly recommended to re-enroll palm vein data when migrating to the Authentication library V31.

Enrolled palm vein data			Authentication library V31			
			Verification		Identification (F27-method)	
			Without guide mode	With guide mode	Without guide mode	With guide mode
Internal format of palm vein data	Authentication library V10	G-format	×	×	×	×
	Authentication library V12	G-format	×	×	×	×
		I-format (F-Index)	×	○	×	×
	Authentication library V21	G-format	×	×	×	×
		I-format (F-Index)	×	○	×	▲ [200]
	Authentication library V24	G-format	×	×	×	×
		I-format (F-Index)	Without guide mode	○	×	▲ [40]
			With guide mode	×	○	×
	Authentication library V30	I-format (F27-Index)	Without guide mode	×	○	×
			With guide mode	×	○	○ [1,000]

○ : Usable ▲ : Data conversion available × : Unusable(error)

[] indicates the maximum number of data items in the palm vein data group subject to identification.

[Notes on compatibility]

<Enrolled palm vein data>

- Palm vein data enrolled before the Authentication library V24 and enrolled in G-format with the Authentication library V24 is equivalent to the data enrolled in with guide mode.
- Palm vein data enrolled before the Authentication library V30 is equivalent to the data enrolled in with F-Index.

<Authentication method>

- The Authentication library V31 cannot authenticate using palm vein data enrolled in G-format.
- Authentication is not possible with a guide mode which is different from the guide mode used to enroll palm vein data with the Authentication library V31.
- The Authentication library V31 cannot use palm vein data enrolled with any previous versions of the Authentication library V30 for identification with F27-method.

<Others>

Palm vein data (palm vein data indicated with ▲ in the above table) can be converted to a format which can be identified by the Authentication library V30 or later using the enrolled data conversion library if the following conditions are satisfied.

- The palm vein data which was enrolled by the Authentication library V21 or V24
- Enrollment format of palm vein data is non-compressed format
- Internal format of palm vein data is I-format

>See> For information on the enrolled data conversion library, refer to "Appendix H Enrolled Data Conversion Library".

◆ Enrollment Format of Palm Vein Data is Compressed Format

!Caution Palm vein data enrolled before the Authentication library V30

It is strongly recommended to re-enroll palm vein data when migrating to the Authentication library V31.

Enrolled palm vein data			Authentication library V31			
			Verification		Identification (F27-method)	
			Without guide mode	With guide mode	Without guide mode	With guide mode
Internal format of palm vein data	Authentication library V10	G-format	×	×		
	Authentication library V12	G-format	×	×		
		I-format	×	○		
	Authentication library V21	G-format	×	×		
		I-format	×	○		
	Authentication library V24	G-format	×	×		
		I-format	Without guide mode			
			With guide mode	×	○	
	Authentication library V30	I-format	Without guide mode	○	×	
			With guide mode	×	○	

○ : Usable × : Unusable(error)

[Notes on compatibility]

<Enrolled palm vein data>

- Palm vein data enrolled before the Authentication library V24 and enrolled in G-format with the Authentication library V24 is equivalent to the data enrolled in with guide mode.

<Authentication method>

- The Authentication library V31 cannot authenticate using palm vein data enrolled in G-format.
- Authentication is not possible with a guide mode which is different from the guide mode used to enroll palm vein data with the Authentication library V31.
- Palm vein data enrolled in compressed format cannot be used for identification with F27-method in the Authentication library V31.

Appendix H Enrolled Data Conversion Library

H.1 Overview of the Enrolled Data Conversion Library

The enrolled data conversion library converts palm vein data enrolled by the Authentication library V21 or V24 (Note) to be able to be identified by the Authentication library V30 or later.

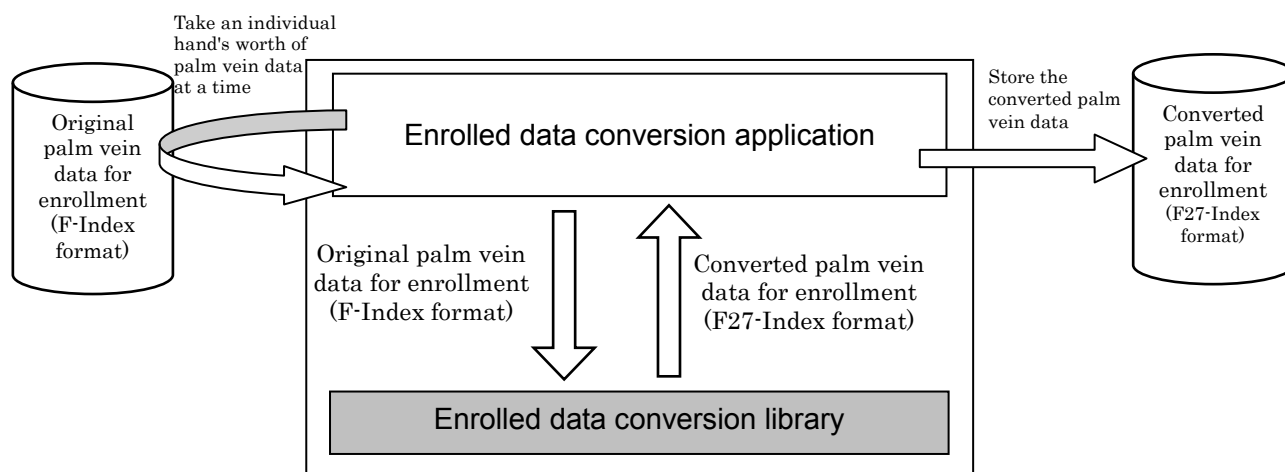
Note) Palm vein data must satisfy the following conditions to be converted.

- The palm vein data which was enrolled by the Authentication library V21 or V24
- Enrollment format of palm vein data is non-compressed format
- Internal format of palm vein data is I-format

The enrolled data conversion library for the Basic Edition "F3BC4TIC.DLL" / "libf3bc4tic.so" supports calls from single threads only.

However, the enrolled data conversion library for the Enterprise Edition "F3BC4TICSV.DLL" / "libf3bc4ticsv.so" supports calls from multiple threads.

The following illustrates the overview of the enrolled data conversion library.



* Repeated until all the palm vein data for enrollment is converted.

!Caution Palm vein data which can be converted

The enrolled data conversion library can convert palm vein data for enrollment.

Palm vein data for authentication cannot be converted.

★Tip **The application to convert palm vein data to be used for identification in the Authentication library V30 or later**
You must create a data conversion application in order to convert enrolled palm vein data to be able to be identified by the Authentication library V30 or later.

>See> For information on the sample program for the enrolled data conversion application, refer to SDK support Web site.

!Caution **Header files to be included**
The header files need to be included in the following order for source programs which use the functions in the enrolled data conversion library.

- bioapi_type.h
- bioapi_api.h
- bioapi_err.h
- pvapi_type.h
- pvapi_api.h
- pvapi_err.h
- f3bc4tic.h

!Caution **When building a source code**
The following library should be specified in advance.

<For the Windows(x86) Basic Edition>

- F3BC4TIC.lib

<For the Windows(x64) Enterprise Edition>

- F3BC4TICSV.lib

<For the Windows(x64) Basic Edition>

- F3BC4TIC.lib

<Linux(x86) Basic Edition>

- libf3bc4tic.so

<Linux(x86) Enterprise Edition>

- libf3bc4ticsv.so

<Linux(x64) Enterprise Edition>

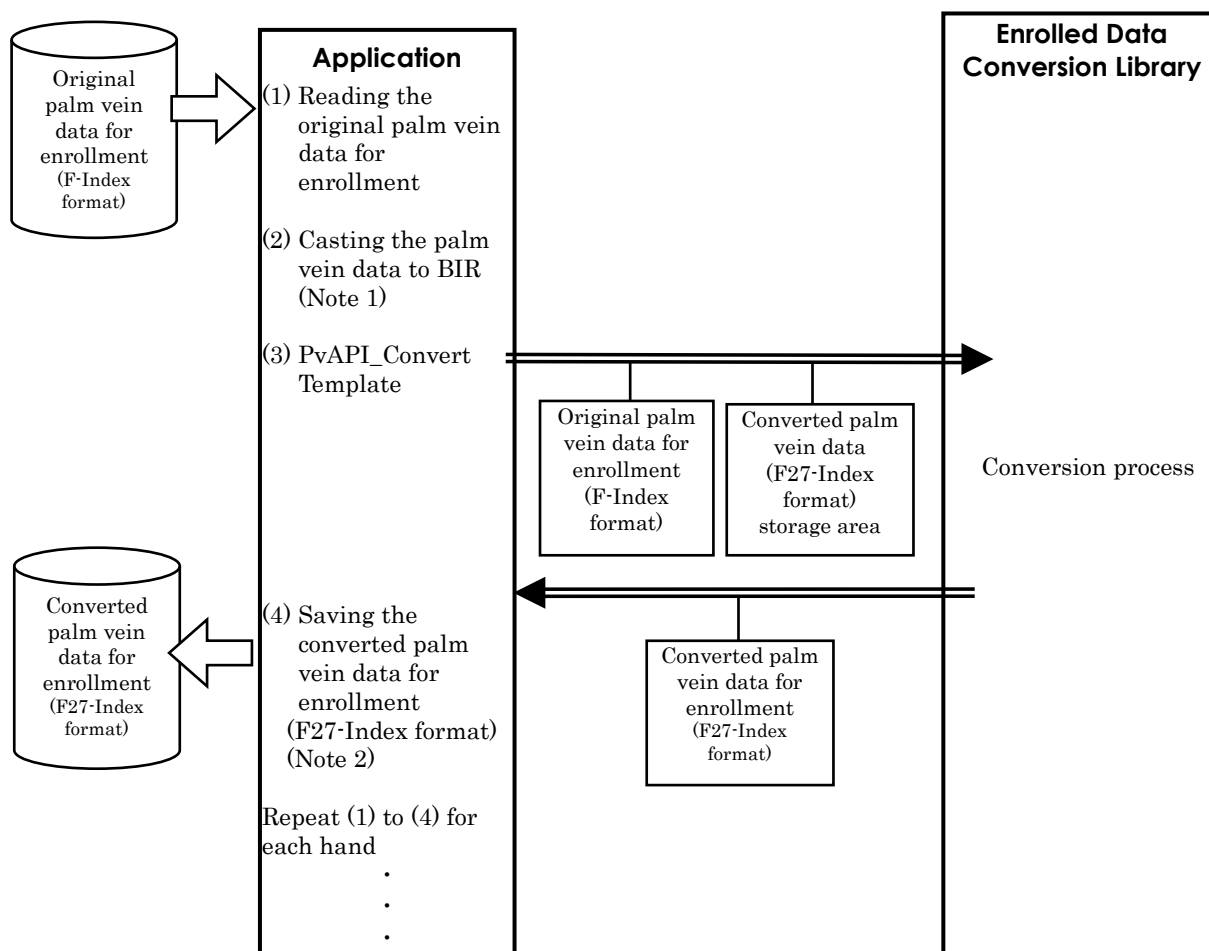
- libf3bc4ticsv.so

!Caution **Size of palm vein data after conversion**
Note that the size of an item of palm vein data can be up to 3072 bytes after conversion.

!Caution **After converting palm vein data**
Be sure to test authentication and confirm the authentication accuracy before commencing operations using the converted palm vein data.
If you have any problems in authenticating a particular user, re-enroll the user's palm vein data. If the authentication problem persists, re-enroll all users' palm vein data.

H.2 Palm Vein Data for Enrollment Conversion Sequence

The following diagram indicates the palm data for enrollment conversion sequence.



Note1) Cast palm vein data to BIR and reset the data address.

>See> For information on the BIR, refer to "3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication".

Note2) When saving converted palm vein data for enrollment, save it as a complete set with its BIR.

Note that the size set in Length in the BIR header does not include the size of the data address (4 bytes) and of the signature (4 bytes).

>See> For information on the palm vein data for enrollment,, refer to "3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication".

★Tip

Initialization and termination processes

There is no need to carry out the initialization process of the Authentication library when converting palm vein data for enrollment. Also, there is no need to carry out the termination process of the Authentication library after converting palm vein data for enrollment.

➤See➤

For information on the initialization process, refer to "3.3.1 Initialization Sequence".

➤See➤

For information on the termination process, refer to "3.3.2 Termination Sequence".

H.3 Enrolled Data Conversion Library Interface

◆ PvAPI_ConvertTemplate

[Function outline]

This function converts palm vein data enrolled by the Authentication library V21 or V24 to be able to be identified by the Authentication library V30 or later.

[Coding syntax]

```
BioAPI_RETURN BioAPI
PvAPI_ConvertTemplate(
    const BioAPI_BIR_PTR    Template,
    uint8*                   ApplicationKey,
    uint32                   EncryptionKind,
    uint8*                   EncryptionKey,
    uint32                   ConvertType,
    BioAPI_BIR_PTR          NewTemplate
);
```

[Parameters]

Member Name	Type	Description
Template	input	Specify the palm vein data for enrollment (Note) to be converted. Note) Palm vein data must satisfy the following conditions to be converted. <ul style="list-style-type: none"> • Palm vein data enrolled by the Authentication library V21 or V24 • Enrollment format of palm vein data is non-compressed format • Internal format of palm vein data is I-format
ApplicationKey	input	Specify the application key which was used to create the palm vein data for enrollment to be converted. >See> For information on the application key, refer to "3.4.16 PvAPI_ApAuthenticate".

Member Name	Type	Description
EncryptionKind	input	<p>Specify the encryption method which was used to create the palm vein data for enrollment to be converted.</p> <p>PvAPI_PROFILE_CR_KIND_2 : AES128</p> <p>PvAPI_PROFILE_CR_KIND_3 : AES256</p> <p>The default (AES128) applies if a value other than the above is specified.</p> <p>The converted palm vein data for enrollment is encrypted according to the encryption method specified by this parameter.</p> <p>>See> For information on the encryption method, refer to "3.4.17 PvAPI_SetProfile".</p>
EncryptionKey	input/ optional	<p>Specify an individual encryption key which was used to create the palm vein data for enrollment to be converted.</p> <p>Specify NULL when the individual encryption key has not been used.</p> <p>>See> For information on the individual encryption key, refer to "3.4.17 PvAPI_SetProfile".</p>
ConvertType	input	<p>Unused</p> <p>Specify "0".</p>
NewTemplate	output	<p>Returns the converted palm vein data for enrollment (F27-Index).</p> <p>The application must prepare a storage area with the size of PvAPI_MAX_SIZE_TEMPLATE (defined in f3bc4tic.h) in order to store the returned palm vein data.</p>

[Return value]

Return value		Meaning	Description
Value	Definition		
0x00000000	PVAPI_CVTTPPL_ERROR_NORMAL	Successful	Normal end. No measures are required.
0x00010001	PVAPI_CVTTPPL_ERROR_PRM_SRCTEMPLATE	Parameter error	The template is not specified correctly. Check if the parameters are correct.
0x00010002	PVAPI_CVTTPPL_ERROR_PRM_APLKEY	Parameter error	The application key is not specified correctly. Check if the parameters are correct.
0x00010006	PVAPI_CVTTPPL_ERROR_PRM_DSTTEMPLATE	Parameter error	The new template is not specified correctly. Check if the parameters are correct.
0x00020001	PVAPI_CVTTPPL_ERROR_CHK_BIR_VERSION	Incorrect data	BIR header information of the template is incorrect. Check the data.
0x00020002	PVAPI_CVTTPPL_ERROR_CHK_BIR_TYPE		
0x00020003	PVAPI_CVTTPPL_ERROR_CHK_BIR_FORMAT		
0x00020004	PVAPI_CVTTPPL_ERROR_CHK_BIR_FACTOR		
0x00020005	PVAPI_CVTTPPL_ERROR_CHK_BIR_LENGTH	Incorrect data	The BIR header size of the template is incorrect. Check the data.
0x00020006	PVAPI_CVTTPPL_ERROR_CHK_DATA_COMPRESS	Incorrect data	Palm vein data for enrollment specified in the template is compressed format. Specify palm vein data for enrollment in non-compressed format.
0x00020007	PVAPI_CVTTPPL_ERROR_CHK_DATA_UNCOMPRESS1	Incorrect data	Palm vein data for enrollment specified in the template is unsupported format. Specify palm vein data for enrollment in non-compressed format.
0x00020008	PVAPI_CVTTPPL_ERROR_CHK_DATA_G	Incorrect data	Palm vein data for enrollment specified in the template is in G-format. Specify palm vein data for enrollment in I-format.
0x00020009	PVAPI_CVTTPPL_ERROR_CHK_SENSOR_TYPE	Incorrect data	Palm vein data for enrollment specified in the template was captured by an unsupported Sensor. Specify the palm vein data for enrollment captured by a prescribed Sensor.

Return value		Meaning	Description
Value	Definition		
0x0002000A	PVAPI_CVTTPL_ERROR_CHK_LIB_VER	Incorrect data	Palm vein data for enrollment specified in the template was created by the Authentication library prior to V21. Specify the palm vein data for enrollment created by the Authentication library V21 or V24.
0x0002000B	PVAPI_CVTTPL_ERROR_CHK_CRC1	Incorrect data	An error was detected in the CRC check on the template. The data may be corrupted. Check the data.
0x0002000C	PVAPI_CVTTPL_ERROR_CHK_CRC2	Incorrect data	Failed to decode the template. Check if the application key or encryption key used for creating the palm vein data for enrollment is specified correctly in the parameter.
0x0002000E	PVAPI_CVTTPL_ERROR_CHK_CRYPTKIND	Incorrect data	An error was detected in the data check on the template. The data may be corrupted. Check the data.
0x0002000F	PVAPI_CVTTPL_ERROR_CHK_DATA_FORMAT	Incorrect data	Palm vein data for authentication is specified in the template. Specify palm vein data for enrollment.
0x0003XXXX (Note)	PVAPI_CVTTPL_ERROR_RESOURCE	Resource acquisition error	Failed to acquire internal resources. Check if there are any problems in internal resources.
0x0004XXXX (Note)	PVAPI_CVTTPL_ERROR_OTHER	Internal error	An internal error has occurred. Make a query through the SDK support Web site with the attached return value information.

Note) Internal information is output to XXXX.

[Caution]

When using x64 version, cast palm vein data for enrollment before conversion (BioAPI_BIR_PTR) to BIR (PvAPI_BIR_PTR) for x64 version.

BIR (PvAPI_BIR_PTR) for x64 version can also be used in the x86 version.

The following is an example of a call in the x64 version.

```
PvAPI_BIR_PTR Template, NewTemplate;  
bioRet = PvAPI_ConvertTemplate(  
    (const BioAPI_BIR_PTR)Template,  
    ApplicationKey,  
    EncryptionKind,  
    EncryptionKey,  
    ConvertType,  
    (BioAPI_BIR_PTR)NewTemplate  
);
```

>See> For information on BIR, refer to "3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication".

Appendix I Using the x64 Version

There are several considerations which should be given when developing applications using the x64 version.

This section assumes that C language is used to develop the interface to call functions of the Authentication library.

◆ Arguments of PvAPI_SetProfile

Note that the types of arguments for PvAPI_SetProfile in the x64 version are different from the x86 version.

>See> For details, refer to "3.4.17 PvAPI_SetProfile".

◆ BIR Structure and BIR Data Address Settings

Note that the BIR structure for the x64 version is different from the x86 version. The x64 version uses the PvAPI_BIR structure. The PvAPI_BIR structure can also be used for the x86 version.

Also, always set 0 to the BIR data address and store palm vein data immediately after the signature in the x64 version.

>See> For details, refer to "Caution BIR structure for the x64 version" and "Caution Casting palm vein data to BIR and setting the data address" in "3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication".

◆ Passing Palm Vein Data to the Authentication Library

When developing applications with the x64 version, use variables of the `PvAPI_BIR` type since variables of the `BioAPI_BIR` type are not available for them. However, palm vein data can only be handled by variables of the `BioAPI_BIR` type in Authentication library functions. Therefore, applications developed using the x64 version must cast variables of the `PvAPI_BIR` type to `BioAPI_BIR` type before passing variables to the Authentication library.

The following functions require the casting.

- `BioAPI_GetBIRFromHandle`
- `BioAPI_VerifyMatch`
- `BioAPI_IdentifyMatch`
- `BioAPI_Verify`
- `BioAPI_Identify`
- `PvAPI_PresetIdentifyPopulation`
- `PvAPI_ConvertTemplate`

>See> For details, refer to “Chapter 3 Authentication Library Interface”, “Appendix A Structures”, and “H.3 Enrolled Data Conversion Library Interface”.

◆ Library Files in the Authentication Library

Note that the library file for x64 version in the Authentication library to build source programs is different from the one for x86 version.

>See> For details, refer to “1.2 List of Contents” and “Caution When building a source code” in “3.1 List of Functions”.

Appendix J Approximate Authentication Duration

The following describes the approximate authentication duration.

The capturing duration and authentication duration are measured separately from the Authentication library V31 using functions for the client server configuration.

!Caution Approximate authentication duration

The authentication duration below is an approximate indication only and does not guarantee the authentication duration at customers' environments.

Authentication duration depends on the operating environment. Customers are responsible for confirming authentication duration in their operating environment.

<Capturing duration> (Note 1)

Sensor type	Approximate capturing duration	Notes
PalmSecure Sensor	0.8 Sec.	The value on the left was measured by Fujitsu Ltd. in the following environment. <ul style="list-style-type: none"> • Intel® Core i5 3.60GHz • Conventional Sensor driver • Capture once
PalmSecure Sensor V2	0.8 Sec.	The value on the left was measured by Fujitsu Ltd. in the following environment. <ul style="list-style-type: none"> • Intel® Core i5 3.60GHz • Sensor driver for extended function • Capture once • Set the image compression function to "Do not use"
	1.0 Sec.	The value on the left was measured by Fujitsu Ltd. in the following environment. <ul style="list-style-type: none"> • Intel® Core i5 3.60GHz • Sensor driver for extended function • Capture once • Set the image compression function to "Use"
	1.35 Sec.	The value on the left was measured by Fujitsu Ltd. in the following environment. <ul style="list-style-type: none"> • Intel® Core i5 3.60GHz • Sensor driver for extended function • Set the continuous capture function to "Use", "Capture 2 times"

Note 1) Measured the duration from calling BioAPI_Capture until it is completed.

The capturing duration includes the guidance time.

Therefore, the function was called when the hand was already placed.

<Authentication duration> (Note 2)

Authentication method	Approximate authentication duration	Notes
Verification (1 to 1 authentication)	0.03 Sec.	The value on the left was measured by Fujitsu Ltd. in the following environment. <ul style="list-style-type: none"> • Intel® Core i5 3.60GHz • Specify "Do not use the authentication result score notification function" • Capture once
Identification (1 to many authentication)	0.9 Sec.	The value on the left was measured by Fujitsu Ltd. in the following environment. <ul style="list-style-type: none"> • Intel® Core i5 3.60GHz • F27-method N=1000hands (500people) • Capture once
	1.35 Sec.	The value on the left was measured by Fujitsu Ltd. in the following environment. <ul style="list-style-type: none"> • Intel® Core i5 3.60GHz • F27-method N=1000hands (500people) • Set the image compression function to "Use" • Capture once

Note 2) Measured the duration from calling BioAPI_VerifyMatch or

BioAPI_IdentifyMatch until it is completed.

- >See> For information on verification and identification, refer to the "System development guide", "3.4.11 BioAPI_VerifyMatch", "3.4.12 BioAPI_IdentifyMatch", "3.4.14 BioAPI_Verify", and "3.4.15 BioAPI_Identify".
- >See> For information on the authentication result score notification function, refer to the "System development guide", "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information" and "3.4.17 PvAPI_SetProfile"..
- >See> For information on continuous capture function and image compression function, refer to the "System development guide", "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information".

Appendix K Notes on Errors in Linux OSes

This chapter describes effects caused by errors in Linux OSes on the operations of the Authentication library (Linux version)

No.	OS error	Affected Linux	Description	Ref.
1	Kernel USB driver error	Kernel: 2.6.27 - 3.0.0	<p>There is a report that an error in kernel USB driver causes a communication timeout with devices.</p> <p>Due to this error, functions in the Authentication library Basic Edition return a Sensor error (Sensor disconnection error) in the Sensor initialization process or capturing process.</p> <p>This symptom is chipset dependent thus does not occur on some hardware.</p>	K.1
2	glibc error	Glibc: 2.12.1 or earlier	<p>There is a report that an error in the <code>qsort()</code> function of glibc causes SIGFPE by zero-division in multi-threaded processing of the <code>qsort()</code> function.</p> <p>Due to this error multi-threaded authentication processes may fail immediately after the application start-up in the Authentication library Enterprise Edition.</p> <p>However, this symptom does not occur after the <code>qsort()</code> function normally completes once or in a single-threaded authentication process.</p>	K.2

K.1 Effects of an Error in the Kernel USB Driver

This section describes effects caused by an error in the kernel USB driver included in Linux.

◆ Affected Linux

All variants of Linux from Kernel 2.6.27 to 3.0.0.

◆ Error Details

The following URL reports a problem in the EHCI process of the kernel USB driver.

<http://permalink.gmane.org/gmane.linux.kernel.stable/15679>

* The URL may be changed or deleted.

A timeout may occur in communications with devices depending on the chipset. This symptom does not occur with some chipsets.

◆ Effect on the Authentication Library

A sensor error may occur in the sensor initialization process and capturing process using the Authentication library Basic Edition for Linux depending on the type of the chipset. This symptom is rare.

◆ Measures

Consider the following measures if the symptom occurs.

- Use Linux with kernel 3.0.1 or later.
- Implement a retry procedure such as executing `BioAPI_ModuleDetach` once and recommence the process from `BioAPI_ModuleAttach` in the event of a sensor error.

K.2 Effects of an Error in Glibc

This section describes effects caused by an error in Glibc included in Linux.

◆ Affected Linux

All variants of Linux with Glibc 2.12.1 or earlier.

◆ Error Details

There is a report in the following URL that an error in the `qsort()` function of glibc. According to the report, this function is not thread-safe, and causes SIGFPE by zero-division in a process within glibc if the `qsort()` function is called from multiple threads.

http://sourceware.org/bugzilla/show_bug.cgi?id=11655

* The URL may be changed or deleted.

◆ Effect on the Authentication Library

The following effect is caused when carrying out multi-threaded authentication process using the Authentication library enterprise Edition for Linux.

The application may fail by SIGFPE if multiple threads request an authentication process almost simultaneously to the Authentication library in the first authentication process after starting the application. This symptom is very rare.

This symptom does not occur once an authentication process is successfully completed or using a single thread.

◆ Measures

Consider the following measures.

- Use Linux with glibc 2.12.2 or later.
- If you cannot use glibc 2.12.2 or later, consider improving process continuity such as restarting the application after a process failure.

◆ Previous Revision History

Revision	Issued Date	Revised Page	Modification Details
1st Rev.	Mar 2006	Entire document	Newly created
2nd Rev.	Jun 2006	Page 5	Error correction <ul style="list-style-type: none"> Addition of pvapi.api.h to Stored File of Linux
		Page 8	Change discription <ul style="list-style-type: none"> Note of CPU is changed to in case of CPU Identification with high-speed mode
		Page from 11 to 12, 14 to 15	Specification change <ul style="list-style-type: none"> Addition of Palm vein data internal format and identification method setting to operational environment setting file.
		Page 19	Expression improved <ul style="list-style-type: none"> Improved expression of caution about calling from multiple threads.
		Page 20	Position of description modified, Expression improved <ul style="list-style-type: none"> Modified position of explanation about the size of vein data and also improved expression of explanation.
		Page 21	Addition of expranation <ul style="list-style-type: none"> Addition of explanation about palm vein data internal format
		Page 22	Addition of explanation <ul style="list-style-type: none"> Addition of explanation about PvAPI SetProfile to note
		Page 23	Addition of explanation <ul style="list-style-type: none"> Addition of Tip about initialization sequence of authentication library
		Page 25	Expression modified <ul style="list-style-type: none"> Modified expression of Tip about saving palm vein data for enrollment.
		Page 27 Page 31	Description deleted <ul style="list-style-type: none"> Deleted explanation of casting palm vein data to BIR.
		Page 30 Page 32	Description deleted <ul style="list-style-type: none"> Deleted the picture of Smart card from diagram of sequence for client sever configuration.
		Page 32	Description modified <ul style="list-style-type: none"> Modified description of (4) in the diagram of palm vein data capture and identification sequence.
		Page 34	Description added <ul style="list-style-type: none"> Added the arrow under Returning the result of cancellation from authentication library in the diagram of cancellation sequence.

Revision	Issued Date	Revised Page	Modification Details
2nd Rev.	Jun 2006	Page 35	Addition of explanation <ul style="list-style-type: none"> Addition of assignment process sequence about encryption key for each smart card
		Page 42	Expression modified <ul style="list-style-type: none"> Modified expression of caution about the freeing BIR handle.
		Page 44	Description modified <ul style="list-style-type: none"> Modified the content of “Header” in the parameters of the function of getting header from handle.
		Page from 47 to 64	Description added <ul style="list-style-type: none"> Added explanation “Specify Null” in the description of parameters when output/optional is described in Member Name and when Unused is described in Description.
		Page 48 Page 49 Page 58 Page 77	Description added <ul style="list-style-type: none"> Added explanation “BIR Handle specified by this function should be freed by calling BioAPI_FreeBIRHandle.” as remark.
		Page from 52 , 61	Addition of explanation <ul style="list-style-type: none"> Addition of note about identification for 2 hand per a person
		Page from 53 to 56, 62 to 65	Addition of explanation <ul style="list-style-type: none"> Addition of explanation to identification sequence for mode changed
		Page from 67 to 70	Specification change <ul style="list-style-type: none"> Addition of setting items to PvAPI_SetProfile
		Page 74	Description added <ul style="list-style-type: none"> Added explanation when PvAPI_Cancel issued under the process of cancellation as caution.
		Page 75	Description added <ul style="list-style-type: none"> Added “BioAPI_VerifyMatch” function to the functions which can be subject to cancellation.
		Page 77	Description added <ul style="list-style-type: none"> Modified expression of remark about casting palm vein data to BIR.
		Page 78	Description added <ul style="list-style-type: none"> Added explanation “Specify Null” in the description of parameters when output/optional is described in Member Name and when Unused is described in Description.
		Page 82	Description modified <ul style="list-style-type: none"> Modified the symbol of “BioAPI_VerifyMatch” in the error level1 to “○”.

Revision	Issued Date	Revised Page	Modification Details
2nd Rev.	Jun 2006	Page 87	Description added <ul style="list-style-type: none"> Added explanation of arrangement number to Population Structure.
		Page 88	Specification change <ul style="list-style-type: none"> Structure change of candidates
3rd Rev.	Oct 2006	Page 9	Description added <ul style="list-style-type: none"> Added a note on the "Windows XP" OS.
4th Rev.	Jan 2007	Page 9	Description added <ul style="list-style-type: none"> Added a line for the kernel version "2.6.9-42.0.3.EL" under "Red Hat Linux V4".
		Page 10	Expression improved <ul style="list-style-type: none"> Improved the expression for the path setting procedure to the "dll" folder under (2) of Step 2.
		Page 83	Error correction <ul style="list-style-type: none"> Corrected the description of "△" for [Legends] under the table.
5th Rev.	Jun 2007	Entire document	Function added <ul style="list-style-type: none"> Added and modified descriptions for the operational guarantee on Windows Vista (x86) and the release of the Windows Vista (x64) version. <ol style="list-style-type: none"> Corrected the types of Authentication libraries in 1.2. Added a list of provided contents for Windows Vista (x64) in 1.3. Added descriptions concerning Windows Vista in 2.1. Modified "HDD space" in 2.1. Added descriptions concerning Windows Vista in 2.2.1. Added descriptions concerning Windows Vista in 3.1 "Caution When building a source code". Added descriptions concerning Windows Vista in 3.2. Added descriptions concerning Windows Vista in 3.3.4, 3.3.6 and 3.3.7. Added descriptions concerning Windows Vista in 3.4.6 and 3.4.17. Added descriptions concerning Windows Vista in Appendix A.

Revision	Issued Date	Revised Page	Modification Details
5th Rev.	Jun 2007	Entire document	<p>Function modified</p> <ul style="list-style-type: none"> Modified descriptions due to the change of the default value for the internal format of palm vein data. <ol style="list-style-type: none"> Corrected the default value for the internal format of palm vein data in 2.2.1. Corrected the default value for the internal format of palm vein data in 3.4.17.
		Entire document	<p>Function added</p> <ul style="list-style-type: none"> Modified descriptions due to the additional function to switch the encryption method during capture of palm vein data. <ol style="list-style-type: none"> Added the function "PvAPI_PreSetProfile" in 3.1. Added the function "PvAPI_PreSetProfile" in 3.3.1. Added the function "PvAPI_PreSetProfile" in 3.4.23. Added the function "PvAPI_PreSetProfile" in 4.2.
		Entire document	<p>Function added</p> <ul style="list-style-type: none"> Modified descriptions due to the additional function to connect multiple Sensors. <ol style="list-style-type: none"> Added descriptions on connecting multiple Sensors in 2.1. Added "Tip Trace file with multiple Sensor connections" in 2.2.1. Added the function "PvAPI_PreSetProfile" in 3.1. Added the function "PvAPI_PreSetProfile" in 3.3.1. Added the function "PvAPI_PreSetProfile" in 3.4.23. Added the function "PvAPI_PreSetProfile" in 4.2. Added "Appendix B Connecting Multiple Sensors (Windows Version Only)".
		Entire document	<p>Function added</p> <ul style="list-style-type: none"> Added descriptions due to the additional function to update the firmware. <ol style="list-style-type: none"> Added DLL files in 1.3.1. Added descriptions on firmware update as "Remark" in 3.4.3. Added "Appendix C Updating the Firmware in the Sensor Unit (Windows Version Only)".

Revision	Issued Date	Revised Page	Modification Details
5th Rev.	Jun 2007	Entire document	<p>Function added</p> <ul style="list-style-type: none"> Added and modified descriptions due to additional support for the hibernation state and removal/re-insertion of the Sensor USB receptacle. <p>1) Corrected the duration required for the start sequence of the Sensor in 3.3.1 "Tip Initialization sequence of Authentication library".</p> <p>2) Added "Appendix D Support for the Hibernation State and Removal/ Re-insertion of the Sensor USB Receptacle (Windows Version Only)" and "Appendix E Duration Required for the Start/ Restart Sequence of the Sensor".</p>
		Page 11 Page 13	<p>Description added</p> <ul style="list-style-type: none"> Added "Caution Note on setting items".
		Page from 13	<p>Expression improved</p> <ul style="list-style-type: none"> Improved the expression in descriptions on "TraceMode" and "TracePath".
		Page 15	<p>Description added</p> <ul style="list-style-type: none"> Added a description for operation Step 1 "Sensor driver" for running in a Linux environment.
		Page 40 Page 41	<p>Expression improved</p> <ul style="list-style-type: none"> Improved the expression in UUID descriptions.
		Page 71	<p>Expression improved</p> <ul style="list-style-type: none"> Improved the expression in descriptions for "Whether to connect a Sensor".
		Page 73	<p>Description added</p> <ul style="list-style-type: none"> Added descriptions to "Encryption key of each smart card".
		Page 74	<p>Description added</p> <ul style="list-style-type: none"> Added "Caution" in 3.4.17.
		Page from 92 to 94	<p>Description added</p> <ul style="list-style-type: none"> Added "4.1 List of Error Information".
		Page from 95 to 97	<p>Description added and modified</p> <ul style="list-style-type: none"> Added decimal notations in the list in 4.2. Reviewed ○× for "Sensor disconnected" and "Sensor error alarm" in 4.2.
6th Rev.	Mar. 2008	Front cover	<p>Change picture</p> <ul style="list-style-type: none"> Change the picture on the front page.

Revision	Issued Date	Revised Page	Modification Details
7th Rev.	Mar 2008	Entire document	Description deleted <ul style="list-style-type: none"> Deleted descriptions concerning Windows Vista (x64) and Linux all together in order to establish this manual for the Authentication library V24 (Windows 2000/XP/Server 2003/ Vista (x86) version).
		Page 2	Description added. <ul style="list-style-type: none"> Added "Caution When you are using previous versions" in "1.1 Overview".
		Page 4	Description modified <ul style="list-style-type: none"> Modified "Stored File" in "1.3 List of Contents".
		Page 6 to 7	Description modified <ul style="list-style-type: none"> Modified the following descriptions in "2.1 Required Hardware/Software". <ul style="list-style-type: none"> Modified descriptions for USB. Modified the HDD space. Modified descriptions on the Sensor.
		Page 8 to 15	Description modified <ul style="list-style-type: none"> Added and modified the following descriptions in "2.2 Preparing for Running Applications". <ul style="list-style-type: none"> Added the version of the Sensor driver in Step 1. Modified the name of the operational environment setting file, and added "GuideMode", "SensorInitMode", "CBMessageDetail" and "TraceNum" to Setting Item in Step 3. Added descriptions of the operation to update the firmware to the latest version in Step 4.
		Page 20	Description added <ul style="list-style-type: none"> Added and modified the following descriptions in "3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication". <ul style="list-style-type: none"> Added "Tip Palm vein data for enrollment and authentication". Modified descriptions in Note 1). Added Note 2).
		Page 23	Description modified <ul style="list-style-type: none"> Added setting items in Note 2) under "3.3.1 Initialization Sequence".

Revision	Issued Date	Revised Page	Modification Details
7th Rev.	Mar 2008	Page 25 to 32	Description deleted <ul style="list-style-type: none"> Deleted notes on the capturing guidance from between "3.3.3 Palm Vein Data Enrollment Sequence" and "3.3.7 Palm Vein Data Capture and Identification Sequence (for Client Server Configuration)".
		Page 46	Description added <ul style="list-style-type: none"> Added [Remark 2] in "3.4.9 BioAPI_Capture".
		Page 54	Description modified <ul style="list-style-type: none"> Added conditions for identification in high-speed mode in [Remark 1] under "3.4.12 BioAPI_IdentifyMatch".
		Page 63	Description modified <ul style="list-style-type: none"> Added conditions for identification in high speed mode in [Remark 2] under "3.4.15 BioAPI_Identify".
		Page 66 to 70	Description added <ul style="list-style-type: none"> Added the following description in "3.4.17 PvAPI_SetProfile" <ul style="list-style-type: none"> Added "Guide mode" to setting items Added the description of capturing angle when using "Without guide mode" to the setting item "Capturing angle". Added the explanation about the setting item "Encryption key of each smart card" to note.
		Page 80 to 81	Description added and modified <ul style="list-style-type: none"> Added and modified messages in [Remark 2] under "3.4.22 BioAPI_GUI_STATE_CALLBACK".
		Page 85	Description modified <ul style="list-style-type: none"> Modified descriptions on the firmware update in [Caution 1] under "3.4.23 PvAPI_PreSetProfile".
		Page 88 to 92	Description added and modified <ul style="list-style-type: none"> Added and modified the following descriptions in "4.1 List of Error Information". <ul style="list-style-type: none"> Modified the name of the operational environment setting file for "Sensor not found". Added and modified descriptions on "Incorrect data". Added and modified descriptions on "Environment setting error".

Revision	Issued Date	Revised Page	Modification Details
7th Rev.	Mar 2008	Page 96	Description modified <ul style="list-style-type: none"> Modified the mark on the "Environment setting error" at the "PvAPI_SetProfile" column to "O" in "4.2 Error Notifications for Each Function".
		Page 103 to 110	Description added and modified <ul style="list-style-type: none"> Added and modified descriptions in "Appendix C Authentication Library Firmware Update Function" due to the function improvement.
		Page 112 to 113	Description modified <ul style="list-style-type: none"> Modified descriptions on the firmware update in "Appendix D Support for the Hibernation State and Removal/Re-insertion of the Sensor USB Receptacle".
		Page 115 to 116	Description added <ul style="list-style-type: none"> Added descriptions on Sensor initialization mode in "Appendix E Duration Required for the Start/Restart Sequence of the Sensor".
		Page 117 to 118	Description added <ul style="list-style-type: none"> Added "Appendix F Guide Mode".
		Page 119 to 122	Description added <ul style="list-style-type: none"> Added "Appendix G Relationship between Enrolled Palm Vein Data and Authentication Method".
8th Rev.	Jul 2008	Page 6	Description modified <ul style="list-style-type: none"> Modified the following OS descriptions in "2.1 Required Hardware/Software". <ul style="list-style-type: none"> Modified "Windows Server 2003 SP1 or later" to "Windows Server 2003 SP2 or later". Modified "Windows Vista" to "Windows Vista SP1 or later".

Revision	Issued Date	Revised Page	Modification Details
8th Rev.	Jul 2008	Page 10 Page 54 Page 64 Page 69	<p>Description modified</p> <ul style="list-style-type: none"> Modified the following descriptions in line with supporting High-speed mode identification in Without Guide mode. <ul style="list-style-type: none"> Deleted descriptions on Guide mode from the description column of the Setting Item "IdentifyMode" in step 3 under "2.2 Preparing for Running Applications". Modified the following descriptions in [Remark 2] in "3.4.12 BioAPI_Identify Match" and [Remark 3] in "3.4.15 Bio API_Identify". <ul style="list-style-type: none"> Deleted description on Guide mode. Added descriptions that High-speed mode identification in With Guide mode is not available for palm vein data which was enrolled in Without Guide mode. Deleted a description on Guide mode from the Setting Value column of Setting Item "Identification mode of palm vein data" in "3.4.17 PvAPI_Set Profile".
		Page 12	<p>Description added</p> <ul style="list-style-type: none"> Added the description on specifying other than "No log output" to explanation of TraceMode in step3 under "2.2 Preparing for Running Applications".
		Page 52 Page 62	<p>Description added</p> <ul style="list-style-type: none"> Added the recommended number of hands for High-speed mode identification in Without Guide mode in Description columns of Member Name "Population" under "3.4.12 BioAPI_IdentifyMatch" and "3.4.15 BioAPI_Identify".
		Page 84	<p>Description added</p> <ul style="list-style-type: none"> Added "Note 2" in [Remark 2] under "3.4.22 BioAPI_GUI_STATE_CALLBACK".
		Page 91 to 93	<p>Description modified</p> <ul style="list-style-type: none"> Modified descriptions for "Incorrect data" under "4.1 List of Error Information".

Revision	Issued Date	Revised Page	Modification Details
8th Rev.	Jul 2008	Page 97 to 99	Description modified <ul style="list-style-type: none"> Reviewed notifications for "Sequence error", "Incorrect data" and "Environment setting error" under "4.2 Error Notifications for Each Function".
		Page 103	Description added <ul style="list-style-type: none"> Added the recommended number of items when performing High-speed mode identification in Without Guide mode in the BioAPI_BIR_PTR array under "A.2 Population Structure".
		Page 108	Expression improved <ul style="list-style-type: none"> Modified "Tip Updating the firmware on multiple Sensors" to "Caution Updating the firmware on multiple Sensors" under "Appendix C Authentication Library Firmware Update Function".
		Page 121 to 123	Description modified <ul style="list-style-type: none"> Modified the following descriptions in "Appendix F Guide Mode". <ul style="list-style-type: none"> Deleted description on authentication using Without Guide mode. Added "Capturing angle". Added "Guide mode for enrolling palm vein data and for authentication".
		Page 125 to 130	Description modified <ul style="list-style-type: none"> Reviewed viability of authentication in "Appendix G Relationship between Enrolled Palm Vein Data and Authentication Method".
9th Rev.	Aug 2008	Cover page	Manual name modified <ul style="list-style-type: none"> Modified the manual name to the "Authentication library V24 reference guide (Windows 2000/XP/Server 2003/ Vista(x86) Version / Linux Version)".
		Page 3	Description modified <ul style="list-style-type: none"> Modified the following descriptions in "1.2 Downloading the Authentication Library". <ul style="list-style-type: none"> Modified descriptions in step 1. Added "Caution Downloading the Authentication library". Added "Caution Using the downloaded Authentication library (V21 Windows Vista(x64) version)".
		Page 5	Description added <ul style="list-style-type: none"> Added "1.3.2 Linux Version" in "1.3 List of Contents".

Revision	Issued Date	Revised Page	Modification Details
9th Rev.	Aug 2008	Page 8 to 10	Description modified <ul style="list-style-type: none"> Modified the following descriptions in "2.1 Required Hardware/Software". <ul style="list-style-type: none"> Added "Red Hat Enterprise Linux V4" and "Red Hat Enterprise Linux V5" in the "OS" item. Added descriptions on Red Hat Enterprise Linux V5 in Note 3). Added "Caution Linux environment".
		Page 12 to 13	Terminology modified <ul style="list-style-type: none"> Modified the following terminologies concerning the internal format of palm vein data. <ul style="list-style-type: none"> Modified "indexed format" to "I-format". Modified "previous format" to "G-format". Modified the following terminologies concerning the identification mode of palm vein data. <ul style="list-style-type: none"> Modified "high-speed mode" to "F-method". Modified "previous mode" to "S-method".
		Page 72 to 73	
		Entire document	
		Page 19	Description added <ul style="list-style-type: none"> Added "2.2.2 Running on a Linux Environment" in "2.2 Preparing for Running Applications".
		Page 23	Description modified <ul style="list-style-type: none"> Modified descriptions in "Caution When building a source code" under "3.1 List of Functions".
		Page 78	Description added <ul style="list-style-type: none"> Added descriptions on specifying under 10000 to the parameter "Timeout" in "3.4.19 PvAPI_Sense".
		Page 85 to 88	Description added <ul style="list-style-type: none"> Added the following descriptions in "3.4.22 BioAPI_GUI_STATE_CALLBACK". <ul style="list-style-type: none"> Added "Caution 3". Added descriptions in "Remark 3" on the timing when the silhouette image is notified during palm vein data enrollment.

Revision	Issued Date	Revised Page	Modification Details
9th Rev.	Aug 2008	Page 99	Description modified <ul style="list-style-type: none"> Added descriptions in "When the value of "ErrorInfo3[0]" is "0x0000A006" in hexadecimal ("40966" in decimal)" under "4.1 List of Error Information" that this error is not notified in a Linux environment.
		Page 101	Description modified <ul style="list-style-type: none"> Reviewed notifications for "Sensor not found" under "4.2 Error Notifications for Each Function".
		Page 109 and entire document	Title modified <ul style="list-style-type: none"> Modified the title of Appendix B to "Connecting Multiple Sensors (Windows Environment Only)".
		Page 111 to 119	Description added <ul style="list-style-type: none"> Added descriptions on the Linux environment in "Appendix C Authentication Library Firmware Update Function".
		Page 120 and entire document	Title modified <ul style="list-style-type: none"> Modified the title of Appendix D to "Support for the Hibernation State and Removal/Re-insertion of the Sensor USB Receptacle (Windows Environment Only)".
		Page 126	Description added <ul style="list-style-type: none"> Added "(Windows environment only)" to "<Duration required for the restart sequence>" in "Appendix E Duration Required for the Start/Restart Sequence of the Sensor".
10th Rev.	May 2009	Page 11 Page 110 Page 121	Description modified <ul style="list-style-type: none"> Modified the VL of the Sensor driver.
		Page 12 to 15	Description added and modified <ul style="list-style-type: none"> Added and modified the following descriptions under "CBMessageDetail" of Step 3 in "2.2.1 Running on a Windows Environment". <ul style="list-style-type: none"> Added descriptions on where Without Guide mode is specified. Modified the default value.
		Page 128	Description added <ul style="list-style-type: none"> Added descriptions "Detailed guidance notifications" under "Notes on using guide mode" in "Appendix F Guide Mode".

Revision	Issued Date	Revised Page	Modification Details
11th Rev.	Oct 2009	Cover page	Manual name modified <ul style="list-style-type: none"> Modified the manual name to the "Authentication library V30 reference guide (Windows (x86) Version)."
		Entire document	Description deleted <ul style="list-style-type: none"> Deleted all Linux associated descriptions in order to make this manual the Authentication library V30 (Windows (x86) Version).
		Entire document	Description added, modified and deleted <ul style="list-style-type: none"> Added, modified and deleted descriptions due to withdrawal of Windows 2000 support and newly added Windows Server 2008 support.
		Entire document	Description modified and deleted <ul style="list-style-type: none"> Modified and deleted the following descriptions due to withdrawal of USB 1.1 support. <ul style="list-style-type: none"> Modified the USB for the Basic Edition to "USB 2.0 only" in 2.1. Deleted descriptions on USB from "Notes on Connecting Multiple Sensors" in Appendix B. Deleted descriptions on USB from "Notes on using guide mode" in Appendix F.

Revision	Issued Date	Revised Page	Modification Details
11th Rev.	Oct 2009	Entire document	<p>Function added</p> <ul style="list-style-type: none"> • Added and modified the following descriptions due to newly added support for the Enterprise Edition. <ul style="list-style-type: none"> • Added descriptions "Types of the Authentication library" in 1.1. • Described the list of contents separately for the Enterprise Edition and the Basic Edition in 1.3. • Described the required hardware and software separately for the Enterprise Edition and Basic Edition in 2.1. • Added descriptions on whether the setting items can be specified or not for the Enterprise Edition and Basic Edition under Step 3 in 2.2. • Added descriptions on the Enterprise Edition under the setting item "Sensor" under (3) of Step 3 in 2.2. • Added the default values for the Enterprise Edition for "Sensor" under (3) and "TraceFile" under (14) of Step 3 in 2.2. • Added descriptions whether the functions can be called or not by the Enterprise Edition and Basic Edition in the list of functions in 3.1. • Added the multi-threaded verification sequence in 3.3.8. • Added the multi-threaded identification sequence in 3.3.9. • Added [Caution] in 3.4.1 to 3.4.4 and 3.4.8. • Added [Caution 2] in 3.4.16. • Added descriptions on whether the setting items can be specified or not for the Enterprise Edition and Basic Edition, and [Caution 2] in 3.4.17. • Added [Caution 2] in 3.4.18.

Revision	Issued Date	Revised Page	Modification Details
11th Rev.	Oct 2009	Entire document	<p>Function added</p> <ul style="list-style-type: none"> Added and modified the following descriptions due to newly added support for a function "PvAPI_PresetIdentify Population". <ul style="list-style-type: none"> Added "PvAPI_PresetIdentify Population" to the list of functions in 3.1. Added (7) to (9) to the initialization sequence in 3.3.1. Added Note 1) in 3.3.5. Added Note 2) in 3.3.7. Modified descriptions for the member name "Population", and added [Remark 5] in 3.4.12 and 3.4.15. Added "PvAPI_PresetIdentify Population" under [Remark] in 3.4.20. Added "PvAPI_PresetIdentify Population" in 3.4.24. Added descriptions on whether "PvAPI_PresetIdentifyPopulation" is returned or not in 4.2. Modified descriptions on the "Population structure" in A.2.
		Entire document	<p>Function added</p> <ul style="list-style-type: none"> Added the following descriptions due to newly added support for the enrolled data conversion library. <ul style="list-style-type: none"> Added files for the enrolled data conversion library under "Stored File" in 1.3. Added "Tip Files for the enrolled data conversion library" in 3.1. Added "Appendix H Enrolled Data Conversion Library".
		Entire document	<p>Function added</p> <ul style="list-style-type: none"> Added and modified the following descriptions due to newly added support for identification with the F27-method and F27-Index. <ul style="list-style-type: none"> Added descriptions on the F27-method under (4) of Step 3 in 2.2. Added "(8) EnrollIndexMode" under Step 3 in 2.2. Added descriptions on index in 3.2. Added descriptions on the F27-method in 3.4.12 and 3.4.15. Added descriptions on the F27-method to "Identification mode of palm vein data" in 3.4.17. Added descriptions on "Index type of palm vein data in enrollment" in 3.4.17.

Revision	Issued Date	Revised Page	Modification Details
11th Rev.	Oct 2009	Entire document	<p>Function added</p> <ul style="list-style-type: none"> Added and modified the following descriptions due to newly added support for the authentication result score notification function. <ul style="list-style-type: none"> Added "(9) ScoreNotifications" under Step 3 in 2.2. Modified descriptions of the member name "Candidates", in 3.4.12 and 3.4.15. Added "Authentication result score notification function" in 3.4.17. Modified descriptions of the "FARAchieved", in the "Candidates structure" in A.3.
		Entire document	<p>Function added</p> <ul style="list-style-type: none"> Added and modified the following descriptions due to newly added support for the enrolled data score notification function. <ul style="list-style-type: none"> Added "(10) CBRegistDataScore" under Step 3 in 2.2. Added descriptions on when the enrolled data score notification function is in use under [Remark] in 3.4.13. Added descriptions on when the enrolled data score notification function is in use under [Function outline] and [Remark 2] in 3.4.22.
		Entire document	<p>Function modified</p> <ul style="list-style-type: none"> Added and modified the following descriptions due to added support for compressed format in Without Guide mode and change in Without Guide mode conditions when enrolling and authenticating palm vein data. <ul style="list-style-type: none"> Deleted the condition about Without Guide mode and added a reference to Appendix G in (5) of Step 3 in 2.2. Deleted descriptions on palm vein data enrolled in Without Guide mode from [Remark 3] in 3.4.12 and [Remark 3] in 3.4.15. Deleted the condition about Without Guide mode and added a reference to Appendix G in "GuideMode" in 3.4.17. Modified descriptions on Guide Mode in Appendix F.

Revision	Issued Date	Revised Page	Modification Details
11th Rev.	Oct 2009	Entire document	<p>Function modified</p> <ul style="list-style-type: none"> Modified and deleted the following descriptions due to withdrawal of support for the F-method. <ul style="list-style-type: none"> Modified "F-method" in Step 3 (4) to "not supported" and deleted descriptions on the F-method. Modified "F-method" under "Identification mode of palm vein data" in Step 3.4.17 to "not supported" and deleted descriptions on F-method conditions. Apart from the above, modified and deleted other descriptions on the F-method in general.
		Entire document	<p>Function modified</p> <ul style="list-style-type: none"> Added and modified the following descriptions due to withdrawal of support for the G-format. <ul style="list-style-type: none"> Modified "G-format" as "not supported" in (1) and (2) of Step 3 in 2.2. Added descriptions that the Authentication library V30 supports the I-format only in "Tip Internal format of the palm vein data" in 3.2. Modified "G-format" as "not supported" in "Internal format of palm vein data" in 3.4.17.
		Entire document	<p>Function modified</p> <ul style="list-style-type: none"> Modified and deleted the following descriptions due to withdrawal of support for setting items "Sender of the guidance" and "Whether to connect a Sensor". <ul style="list-style-type: none"> Deleted "Sender of the guidance" and "Whether to connect a Sensor" from the setting items in 3.4.17. Modified descriptions of [Remark 1] in 3.4.9, [Remark] in 3.4.13, [Remark 1] in 3.4.14, and [Remark 1] in 3.4.15. Added [Remark 1] in 3.4.11 and 3.4.12.
		Page 5	<p>Description modified</p> <ul style="list-style-type: none"> Modified descriptions of "Caution Downloading the Authentication library" and "Caution Downloading and using the previous versions of the Authentication library" under Step 1 in 1.2.

Revision	Issued Date	Revised Page	Modification Details
11th Rev.	Oct 2009	Page 20	Description added <ul style="list-style-type: none"> Added a figure to indicate how to specify the trace output mode under (11) of Step 3 in 2.2.
		Page 21	Description modified <ul style="list-style-type: none"> Modified the settable range of the number of trace generations under (15) of Step 3 in 2.2.
		Page 23	Description modified <ul style="list-style-type: none"> Modified descriptions in "Caution Firmware" under Step 4 in 2.2.
		Page 27	Description modified <ul style="list-style-type: none"> Modified descriptions of "Caution Header files to be included" and "Caution When building a source code" in 3.1.
			Description added <ul style="list-style-type: none"> Added "Caution When using the DllMain entry point" in 3.1.
		Page 34	Description modified <ul style="list-style-type: none"> Modified descriptions of "Tip Saving palm vein data for enrollment" in 3.3.3.
		Page 61 Page 67 Page 72 Page 78	Description modified <ul style="list-style-type: none"> Modified descriptions of [Remark 2] in 3.4.11, [Remark 4] in 3.4.12, [Remark 2] in 3.4.14, and [Remark 4] in 3.4.15.
		Page 87	Description added <ul style="list-style-type: none"> Added [Caution 1] in 3.4.18.
		Page from 96 to 98	Description added <ul style="list-style-type: none"> Added the following guidance notification messages in the message ID list in 3.4.22. <ul style="list-style-type: none"> A message for where a hand is not placed A message for where the hand is not open
		Page from 109 to 114	Description modified <ul style="list-style-type: none"> Modified the following descriptions in 4.1. <ul style="list-style-type: none"> Parameter error Multiple issues Incorrect data Environment setting error
		Page from 116 to 118	Function modified <ul style="list-style-type: none"> Reviewed whether error information is notified or not for each function in 4.2.

Revision	Issued Date	Revised Page	Modification Details
11th Rev.	Oct 2009	Page from 124 to 143	<p>Description modified</p> <ul style="list-style-type: none"> Modified the following titles of Appendices. <ul style="list-style-type: none"> Modified the title of Appendix B to "Connecting Multiple Sensors (Basic Edition Only)". Modified the title of Appendix C to "Authentication Library Firmware Update Function (Basic Edition Only)". Modified the title of Appendix D to "Support for the Hibernation State and Removal/Re-insertion of the Sensor USB Receptacle (Basic Edition Only)". Modified the title of Appendix E to "Duration Required for the Start/Restart Sequence of the Sensor (Basic Edition Only)". Modified the title of Appendix F to "Guide Mode (Basic Edition Only)".
		Page 140	<p>Description added</p> <ul style="list-style-type: none"> Added the duration required for the start sequence and the restart sequence of the Authentication library V30 in Appendix E.
		Page 142	<p>Description deleted</p> <ul style="list-style-type: none"> Deleted descriptions "Enabling Without Guide mode" from Appendix F.
		Page from 145 to 150	<p>Description modified</p> <ul style="list-style-type: none"> Reviewed viability of authentication in Appendix G.

Revision	Issued Date	Revised Page	Modification Details
12th Rev.	Nov 2009	Cover page	Manual name modified <ul style="list-style-type: none"> Modified the manual name to the "Authentication library V30 reference guide (Windows (x86) Version / Linux Version)".
		Entire document	Description added <ul style="list-style-type: none"> Added all Linux associated descriptions in order to make this manual the Authentication library V30 (Windows (x86) Version / Linux Version).
		Entire document	Function added <ul style="list-style-type: none"> Added and modified the following descriptions due to the addition of the detailed information notification function for the guidance image display and the guidance image notification callback function. <ul style="list-style-type: none"> Added "(11) CBGUIMessageDetail" under Step 3 in 2.2.1. Added "BioAPI_GUI_STREAMING_CALLBACK" in "List of Functions" in 3.1. Added "Displaying the Guidance Image" in 3.3.3 to 3.3.7. Added descriptions on registration of a callback function for guidance image notifications in 3.4.8. Modified descriptions under [Remark 1] in 3.4.9, 3.4.14, and 3.4.15. Modified descriptions under [Remark] in 3.4.13. Added descriptions on detailed information for the guidance image display in 3.4.22. Added 3.4.25.
		Page 5	Description modified <ul style="list-style-type: none"> Modified descriptions of "Caution Downloading the Authentication library" and "Caution Using the downloaded Authentication library (V21 Windows (x64) version) " under Step 1 in 1.2.
		Page 6 Page 8	Description added <ul style="list-style-type: none"> Added "Caution Using the Enterprise Edition" in 1.3.1 and 1.3.2.

Revision	Issued Date	Revised Page	Modification Details
12th Rev.	Nov 2009	Page 14	Description modified <ul style="list-style-type: none"> Modified descriptions of Note 2) under "Basic Edition" in 2.1.
		Page 113	Description deleted <ul style="list-style-type: none"> Deleted a message ID "0x02030216" from the table under [Remark 2] in "3.4.22 BioAPI_GUI_STATE_CALLBACK".
		Page 122 to 123	Description added <ul style="list-style-type: none"> Added [Remark 2] in "3.4.24 PvAPI_PresetIdentifyPopulation".
		Page 132	Description modified <ul style="list-style-type: none"> Modified descriptions of " When the value of "ErrorInfo3[0]" is "0x314E0204" in hexadecimal ("827195908" in decimal)" under "Incorrect data" in 4.1.
		Page 137	Description modified <ul style="list-style-type: none"> Reviewed notifications of error information under "Environment setting error" in 4.2.
		Page 144 Page 154	Title modified <ul style="list-style-type: none"> Modified the following appendix titles. <ul style="list-style-type: none"> Modified the title for Appendix B to "Connecting Multiple Sensors (Windows (x86) Basic Edition Only)". Modified the title for Appendix D to "Support for the Hibernation State and Removal/ Re-insertion of the Sensor USB Receptacle (Windows (x86) Basic Edition Only)".
		Page 172	Description modified <ul style="list-style-type: none"> Modified descriptions of "Caution Palm vein data which can be converted " in H.1.

Revision	Issued Date	Revised Page	Modification Details
13th Rev.	Jun. 2010	Cover page	Manual name modified <ul style="list-style-type: none"> Modified the manual name to the "Authentication library V30 reference guide".
		Entire document	Description added <ul style="list-style-type: none"> Added all descriptions concerning Windows (x64) in order to make the Authentication library V30 manual for Windows (x86), Windows (x64), and Linux.
		Entire document	Description added <ul style="list-style-type: none"> Added descriptions concerning Windows Server 2008 R2 to the following locations due to newly added support for Windows Server 2008 R2 (x64). <ul style="list-style-type: none"> “◆ Enterprise Edition” under “2.1 Required Hardware/Software”. “2.2.1 Running on a Windows Environment”.
		Entire document	Description added <ul style="list-style-type: none"> Added descriptions concerning Windows 7 to the following locations due to newly added support for Windows 7 (x86 and x64). <ul style="list-style-type: none"> “◆ Basic Edition” under “2.1 Required Hardware/Software”. “2.2.1 Running on a Windows Environment”. “Appendix B Connecting Multiple Sensors”. “Appendix D Support for the Hibernation State and Removal/ Re-insertion of the Sensor USB Receptacle”.

Revision	Issued Date	Revised Page	Modification Details
13th Rev.	Jun. 2010	Entire document	<p>Description added and modified</p> <ul style="list-style-type: none"> Added and modified the following descriptions due to newly added support for the authentication result score notification function in verification. Modified the descriptions of “(9) Score Notifications” under Step 3 in "2.2.1 Running on a Windows Environment". Added “Caution Authentication result score notification function” in Note 2) under "3.3.1 Initialization Sequence". Modified descriptions of the member name "FARAchieved", in “3.4.11 BioAPI_VerifyMatch” and “3.4.14 BioAPI_Verify”. Modified descriptions on the authentication result score notification function in “3.4.17 PvAPI_SetProfile”.
		Page 5	<p>Description deleted</p> <ul style="list-style-type: none"> Deleted “Caution Using the downloaded Authentication library (V21 Windows (x64) version)” from “1.2 Downloading the Authentication Library”.
		Page 14	<p>Description modified</p> <ul style="list-style-type: none"> Modified descriptions on the required memory under Note 3) of “◆ Enterprise Edition” in “2.1 Required Hardware/Software”.
		Page 20	<p>Description added and modified</p> <ul style="list-style-type: none"> Added and modified the following descriptions under Step 3 in "2.2.1 Running on a Windows Environment". Modified descriptions in "Caution Note on setting items". Added "Caution Comment notation". Added Note 2).
		Page 29	<p>Description modified</p> <ul style="list-style-type: none"> Modified the firmware version to “V00L203 or later” under Step 4 in "2.2.1 Running on a Windows Environment".
		Page 64	<p>Description added</p> <ul style="list-style-type: none"> Added [Caution 1] in “3.4.2 BioAPI_ModuleUnload”.
		Page 67	<p>Description added</p> <ul style="list-style-type: none"> Added [Caution 1] in “3.4.4 BioAPI_ModuleDetach”.

Revision	Issued Date	Revised Page	Modification Details
13th Rev.	Jun. 2010	Page 79 Page 90	Description modified <ul style="list-style-type: none"> Modified descriptions of [Remark 2] in “3.4.11 BioAPI_VerifyMatch” and “3.4.14 BioAPI_Verify”.
		Page 82 Page 93 Page 125	Description modified <ul style="list-style-type: none"> Modified descriptions on a group of palm vein data to be stored in the Population structure under the member name “Population” in “3.4.12 BioAPI_Identify Match”, “3.4.15 BioAPI_Identify”, and “3.4.24 PvAPI_PresetIdentifyPopulation”.
		Page 85 Page 96	Description deleted <ul style="list-style-type: none"> Deleted [Remark 4] (the case where palm vein data of both hands are enrolled for one user) in “3.4.12 BioAPI_Identify Match” and “3.4.15 BioAPI_Identify”.
		Page 134	Description modified <ul style="list-style-type: none"> Modified descriptions of (a) under “When the value of "ErrorInfo3[0]" is "0x314E0204" in hexadecimal ("827195908" in decimal)” in the “Incorrect data” column in “4.1 List of Error Information”.
		Page 143 to 144	Description deleted <ul style="list-style-type: none"> Deleted descriptions concerning the number of items in the palm vein data group subject to identification in “A.2 Population Structure”.
		Page 161 to 162	Description modified <ul style="list-style-type: none"> Modified the following descriptions in "Appendix E Duration Required for the Start/Restart Sequence of the Sensor". <ul style="list-style-type: none"> Modified the firmware version to “V00L203 or later” under the Authentication library V30 column in the table. Modified descriptions in Note 3).
		Page 165 to 171	Description modified <ul style="list-style-type: none"> Reviewed viability of authentication in "Appendix G Relationship Between Enrolled Vein Data and Authentication Method".

Revision	Issued Date	Revised Page	Modification Details
13th Rev.	Jun. 2010	Page 172 to 180	<p>Description added and modified</p> <ul style="list-style-type: none"> Added and modified the following descriptions in "Appendix H Enrolled Data Conversion Library". Added and modified the following descriptions in "H.1 Overview of the Enrolled Data Conversion Library". Modified the conditions for the palm vein data to be convertible. Added "Caution After converting palm vein data". Added the following descriptions in "H.2 Palm Vein Data for Enrollment Conversion Sequence". Added Note 1) and Note 2). Added "Caution Saving palm vein data for enrollment after conversion". Modified the conditions for the palm vein data for enrollment to be convertible under the member name "Template" in "H.3 Enrolled Data Conversion Library Interface".
14th Rev.	Jan 2011	Entire document	<p>Expression improved</p> <ul style="list-style-type: none"> Improved the overall expression.
		Page 2	<p>Description added</p> <ul style="list-style-type: none"> Added "Caution Authentication with identification" in "1.1 Overview".
		Page 5 to 10	<p>Description added</p> <ul style="list-style-type: none"> Added "F3BC4LICSVDAT" in the list of contents for the Enterprise Edition in "1.2 List of Contents".
		Page 12 to 13	<p>Description modified and deleted</p> <ul style="list-style-type: none"> Modified and deleted the following descriptions in "2.1 Hardware and Software Requirements". Modified descriptions on the CPU. Deleted descriptions concerning RHEL4.4.
		Page 18	<p>Description deleted</p> <ul style="list-style-type: none"> Deleted descriptions concerning RHEL4.4 from "2.2.2 Running on a Linux Environment".
		Page 16 to 26	<p>Structure changed</p> <ul style="list-style-type: none"> Separated the descriptions on the operational environment setting file in "2.2 Preparing for Running Applications" to form 2.2.3.

Revision	Issued Date	Revised Page	Modification Details
14th Rev.	Jan 2011	Page 19 to 26	<p>Description added, modified and deleted</p> <ul style="list-style-type: none"> Added, modified and deleted the following descriptions in “2.2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information”. <ul style="list-style-type: none"> Deleted “RegistExtractKind”, “Match ExtractKind”, and “EnrollIndexMode” settings. Modified the “S-method” in “Identify Mode” to “not supported”. Added conditions on palm vein data when “Use” is specified to “ScoreNotifications”. Added “Tip Specifying the internal format of palm vein data and index type”. Modified descriptions in “Tip Specifying operation mode of the Authentication library using PvAPI_SetProfile”. Modified the settable values to “Trace Mode”.
		Page 27 to 117	<p>Description deleted</p> <ul style="list-style-type: none"> Deleted descriptions on the “PvAPI_CreateHandleFromBiometricData” function from “Chapter 3 Authentication Library Interface” and “Chapter 4 Error Information”.
		Page 35	<p>Description modified</p> <ul style="list-style-type: none"> Modified descriptions of Note 2) in “3.3.1 Initialization Sequence”.
		Page 37 to 44	<p>Description deleted</p> <ul style="list-style-type: none"> Deleted the sequence to display the guidance image from “3.3.3 Palm Vein Data Enrollment Sequence” to “3.3.7 Palm Vein Data Capture and Identification Sequence (for Client Server Configuration)”.
		Page 65 Page 74	<p>Description added</p> <ul style="list-style-type: none"> Added “Caution Authentication with identification” in “3.4.12 BioAPI_Identify Match” and “3.4.15 BioAPI_Identify”.

Revision	Issued Date	Revised Page	Modification Details
14th Rev.	Jan 2011	Page 80 to 84	<p>Description added, modified and deleted</p> <ul style="list-style-type: none"> Added, modified and deleted the following descriptions in “3.4.17 PvAPI_SetProfile”. <ul style="list-style-type: none"> Added descriptions on functions unavailable when “compressed format” is specified to “Enrollment format of Palm vein data”. Deleted settings for “Internal format of palm vein data”, “Identification mode of palm vein data”, “Guide mode”, and “Index type”. Added conditions on palm vein data when specifying “Use” to “Authentication result score notification function”. Modified descriptions in [Remark 2].
		Page 93	<p>Description deleted</p> <ul style="list-style-type: none"> Deleted the following descriptions from [Caution1] in “3.4.21 PvAPI_PreSetProfile”. <ul style="list-style-type: none"> Descriptions on the firmware. Descriptions on the duration required for the Sensor connection process.
		Page 97 to 106	<p>Structure changed</p> <ul style="list-style-type: none"> Separated the descriptions on the callback function in “3.4 Interface” to form 3.5.
		Page 135	<p>Description deleted</p> <ul style="list-style-type: none"> Deleted descriptions on the firmware from “◆ Enabling the Auto-recovery Function” in “Appendix D Auto-recovery Function from the Hibernation State and Removal/Re-insertion of the Sensor USB Receptacle (Windows Basic Edition Only)”.
		Page 138	<p>Description deleted</p> <ul style="list-style-type: none"> Deleted descriptions concerning the Authentication library V24 from “Appendix E Duration Required for the Start/Restart Sequence of the Sensor (Basic Edition Only)”.
		Page 139	<p>Description deleted</p> <ul style="list-style-type: none"> Deleted descriptions concerning PvAPI_SetProfile from “Appendix F Guide Mode (Basic Edition Only)”.
		Page 141 to 148	<p>Description modified</p> <ul style="list-style-type: none"> Reviewed viability of authentication in “Appendix G Compatibility of Palm Vein Data”.
		Page 158 to 159	<p>Description added</p> <ul style="list-style-type: none"> Added “Appendix I Using the Windows (x64) Version”.

Revision	Issued Date	Revised Page	Modification Details
15th Rev.	Jul 2012	Cover page	Manual name modified <ul style="list-style-type: none"> Modified the manual name to the "Authentication library V31 reference guide (Windows (x86) Version / Windows (x64) Version)".
		Entire document	Description deleted <ul style="list-style-type: none"> Deleted all Linux associated descriptions in order to make this manual the Authentication library V31 (Windows (x86) Version / Windows (x64) Version).
		Page 5 to 7	Description modified <ul style="list-style-type: none"> Deleted the 1st hierarchy "English" from the folder structure in "1.2 List of Contents".
		Page 5	Description deleted <ul style="list-style-type: none"> Deleted files provided by the Enterprise Edition for Windows (x86) from "1.2 List of Contents".
		Page 10 to 11	Description modified <ul style="list-style-type: none"> Modified the following descriptions under "◆Basic Edition" in "2.1 Hardware and Software Requirements". <ul style="list-style-type: none"> Modified descriptions on CPU. Modified descriptions on the firmware on the Sensor unit. Modified descriptions on the Sensor driver.
		Page 12	Description modified <ul style="list-style-type: none"> Modified the following descriptions under "◆Enterprise Edition" in "2.1 Hardware and Software Requirements". <ul style="list-style-type: none"> Modified descriptions on memory. Modified descriptions on the OS.
		Page 13 to 14	Description modified and deleted <ul style="list-style-type: none"> Modified and deleted the following descriptions in "2.2 Preparation before Using the Authentication library". <ul style="list-style-type: none"> Deleted descriptions concerning Windows Server 2003 / 2008. Modified descriptions in "Caution Firmware". Modified descriptions on the firmware update in Step 4 (2).

Revision	Issued Date	Revised Page	Modification Details
15th Rev.	Jul 2012	Page 15 to 19	<p>Description added and deleted</p> <ul style="list-style-type: none"> • Added and deleted the following descriptions in "2.3 Setting Operation Mode for the Authentication Library and Trace Acquisition Information". • Deleted settings for the identification mode of palm vein data, Sensor initialization mode, and detailed guidance notifications. • Added descriptions on extended functions of the Sensor (continuous capture function and image compression function). • Added descriptions on items whose settings are no longer required from V31 in "Tip Settings for operation mode in the previous versions of Authentication library". • Added Guide mode in "Tip Specifying operation mode of the Authentication library using PvAPI_SetProfile".
		Page 24	<p>Description added</p> <ul style="list-style-type: none"> • Added the following functions in "3.1 List of Functions". • PvAPI_GetConnectSensorInfoEx • PvAPI_GetLibraryInfo
		Page 27	<p>Description added</p> <ul style="list-style-type: none"> • Added descriptions for the case where the extended functions of the Sensor (continuous capture function) is used under "Tip Size of the palm vein data storage area" in "3.2 Structures of Palm Vein Data for Enrollment and Palm Vein Data for Authentication".
		Page 31	<p>Description added and deleted</p> <ul style="list-style-type: none"> • Added and deleted the following descriptions in "3.3.1 Initialization Sequence". • Deleted descriptions concerning switching the encryption method to a Sensor from Note 1). • Added Guide mode in Note 2).
		Page 45	<p>Description added</p> <ul style="list-style-type: none"> • Added "3.3.12 Sensor Switching Sequence".

Revision	Issued Date	Revised Page	Modification Details
15th Rev.	Jul 2012	Page 56 to 74	Description added <ul style="list-style-type: none"> Added notes on using the extended functions of the Sensor (image compression function) in the following sections. <ul style="list-style-type: none"> "3.4.9 BioAPI_Capture" "3.4.12 BioAPI_IdentifyMatch" "3.4.14 BioAPI_Verify" "3.4.15 BioAPI_Identify"
		Page 62 to 74	Description deleted <ul style="list-style-type: none"> Deleted notes on using S-method as the identification mode for palm vein data. <ul style="list-style-type: none"> "3.4.12 BioAPI_IdentifyMatch" "3.4.15 BioAPI_Identify"
		Page 76 to 80	Description added <ul style="list-style-type: none"> Added descriptions concerning Guide mode in "3.4.17 PvAPI_SetProfile".
		Page 83	Description added and modified <ul style="list-style-type: none"> Added and modified the following descriptions in "3.4.19 PvAPI_Sense". <ul style="list-style-type: none"> Modified descriptions on the member name "CheckRetryInterval". Added (Note) to the member name "Interval" and "CheckRetryInterval".
		Page 87 to 89	Description added and deleted <ul style="list-style-type: none"> Added and deleted the following descriptions in "3.4.21 PvAPI_PreSet Profile". <ul style="list-style-type: none"> Deleted descriptions concerning switching the encryption method to a Sensor. Added descriptions that settings for the encryption method to a Sensor are no longer required from V31 in Caution. Deleted descriptions to call the given function for each setting item.
		Page 92 to 95	Description added <ul style="list-style-type: none"> Added the following sections. <ul style="list-style-type: none"> "3.4.23 PvAPI_GetConnectSensorInfo Ex" "3.4.24 PvAPI_GetLibraryInfo"
		Page 99 to 102	Description deleted <ul style="list-style-type: none"> Deleted descriptions concerning the detailed guidance notification from [Remark 2] in "3.5.1 BioAPI_GUI_STATE_CALLBACK".

Revision	Issued Date	Revised Page	Modification Details
15th Rev.	Jul 2012	Page 108 to 114	<p>Description modified</p> <ul style="list-style-type: none"> Modified the following descriptions in "4.1 List of Error Information". <ul style="list-style-type: none"> Modified descriptions in the error detail "Sensor error alarm". Modified the following descriptions in the error detail "Environment setting error". <ul style="list-style-type: none"> When the value of "ErrorInfo3[0]" is "0x0000A008" in hexadecimal ("40968" in decimal) or "0x0000A013" in hexadecimal ("40979" in decimal)
		Page 115 to 117	<p>Description added</p> <ul style="list-style-type: none"> Added the following functions in "4.2 Error Notifications for Each Function". <ul style="list-style-type: none"> PvAPI_GetConnectSensorInfoEx PvAPI_GetLibraryInfo
		Page 124 to 125	<p>Description deleted</p> <ul style="list-style-type: none"> Deleted the following descriptions from "Appendix B Connecting Multiple Sensors ". <ul style="list-style-type: none"> Deleted "Caution Checking the Sensor ID number (serial number/model) " from Step 1. Deleted "◆Enabling Multiple Sensor Connections".
		Page 126 to 133	<p>Description added and modified</p> <ul style="list-style-type: none"> Added and modified the following descriptions in "Appendix C Authentication Library Firmware Update Function". <ul style="list-style-type: none"> Modified descriptions in "Tip Appropriate update of the firmware on the Sensor unit". Modified descriptions in Step 2. Added "Name2" and "Name3" to the setting items for the operational environment setting file in Step 4. Deleted "DeleteFiles" from the setting items for the operational environment setting file in Step 4. Modified descriptions in "Tip Cases where the firmware is not updated". Modified descriptions on the log file in Step 8.

Revision	Issued Date	Revised Page	Modification Details
15th Rev.	Jul 2012	Page 135	Description deleted <ul style="list-style-type: none"> Deleted "◆ Enabling the Auto-recovery Function" from "Appendix D Auto-recovery Function from the Hibernation State and Removal/Re-insertion of the Sensor USB Receptacle".
		Page 137	Description modified and deleted <ul style="list-style-type: none"> Modified and deleted the following descriptions in "Appendix E Duration Required for the Start Sequence of the Sensor". Deleted descriptions concerning the restart sequence. Modified descriptions concerning the duration required for the Sensor to start.
		Page 138 to 139	Description added <ul style="list-style-type: none"> Added the following descriptions in "Appendix F Guide Mode". Added descriptions that Guide mode can also be set with PvAPI_SetProfile. Added description that the setting for the detailed guidance notification is no longer required from the Authentication library V31.
		Page 140 to 146	Description added and deleted <ul style="list-style-type: none"> Added and deleted the following descriptions in "Appendix G Compatibility of Palm Vein Data". Deleted descriptions on S-method and F-method. Added descriptions on the Authentication library V30 in "G.2 Palm Vein Data Enrolled before the Authentication Library V31".
		Page 156 to 157	Description added <ul style="list-style-type: none"> Added the following descriptions in "Appendix I Using the Windows (x64) Version". Added descriptions that development in C language is assumed. Added "◆Library Files in the Authentication Library".

