NITGEN

NITGEN®

RS-232C serial protocol for Stand-Alone Fingerprint Recognition Device

Developer Guide

(Supported device: FIM01 Ver. 1.90,

FIM20xx Ver. 1.90, FIM30xx Ver 1.40,

FIM22xx Ver. 1.90, FIM32xx Ver 1.40)

Version 1.90

Serial Protocol

Date	Version	Description
2004-02-11	1.4	Release
2004-07-01	1.53	Add new device (FIM01) command
2004-08-02	1.54	Updated functions of FIM01-HV firmware ver1.13
2004-10-26	1.55	Updated functions of CMD_INSTANT_MATCHING and CMD_GET_MINUTIAE in FIM10.
2004-12-28	1.56	Correct misprint concerning with CMD_REGISTER_FP in Appendix G
2005-01-12	1.57	Updated functions of CMD_REGISTER_FP and CMD_CHANGE_FP to enroll different fingerprint. Default value of brightness is changed from 40 to 45 in FIM01-HV.

2005-02-14	1.60	Add new command:
		    CMD_CHG_NUM_OF_TEMP
		Add new result of acknowledge packet:
		    RESULT_DB_ISNOT_EMPTY,
		    RESULT_WRONG_TEMP_MODE,
		    RESULT_INVALID_DATASIZE,
		    RESULT_INVALID_DATA
		New SI_TYPTE supported in CMD_GET_SYSINFO:
		    SI_NUM_OF_TEMP
		Support 1 ID, 2 fingers, 4 templates mode
		Change terminology
		    minutiae -> template
		Change command name
		    CMD_GET_MINUTIAE->CMD_GET_TEMPLATE

2005-10-25	1.65	CMD_DELETE_ALL_LOG supported in FIM10 series New device type added in CMD_GET_DEVICE_INFO FIM1030, FIM2030, FIM2040 Auto-generation ID and Different finger mode supported in FIM10 series in CMD_REGISTER_FP Do not support FDA12 device any more.

2006-01-24	1.70	Add Commands CMD_SET_DEFAULT_SYSINFO, CMD_GET_IMAGE_QUALITY
2006-02-24	1.72	Add new device (FIM30xx)
2006-04-20	1.73	Correct typographical errors
2006-10-17	1.75	Change Commands CMD_VERIFY_FP, CMD_IDENTIFY_FP, CMD_INSTANT_VERIFY, CMD_INSTANT_IDENTIFY Command name changed and modified CMD_SET_CAPTURE_OPTION, CMD_GET_CAPTURE_OPTION CMD_CTL_IO command is supported in FIM30.
2006-12-19	1.76	Add new result of acknowledge packet: RESULT_EXTRACT_FAIL
2007-09-28	1.78	Add Command CMD_IDENTIFY_RID_FP
2008-04-14	1.80	Change Command CMD_INSTANT_MATCHING Add new device(FIM32) System Default values are changed SI_ADAPTIVE_CAPTURE SI_USING_LATENT
2008-12-22	1.81	Change Command CMD_IDENTFIY_FP Add New Command CMD_AUTO_IDENTIFY CMD_AUTO_IDETNIFY_RESULT
2009-08-03	1.86	Change Command CMD_GET_TEMPLATE CMD_INSTANT_MATCHING CMD_ADD_FP CMD_GET_FP
	1.90	Add new SI_TYPE SI_FP_FULL_ROTATION FIM30 devices supports the following commands

		CMD_CHANG_FP
		CMD_SET_SYSINFO
		CMD_GET_SYSINFO
		CMD_SAVE_SYSINFO
		CMD_SET_DEFAULT_SYSINFO
	Change Command	
		CMD_REGISTER_FP
		CMD_CHANGE_FP
		CMD_GET_TEMPLATE
		CMD_INSTANT_MATCHING
		CMD_ADD_FP
		CMD_GET_FP

Contents

1. SERVICE CATEGORIES

Category	Command
Initialization	Request Connection
	Set Baud Rate[1]
	Get Firmware Version[1]
	Get Firmware Version2
	Get Device Information
Matching	Verification / Identification/RID Identification/Auto Identification
	Instant Matching
	Get Template
	Cancel
	Instant Verification / Instant Identification[2]
Database Management	Enroll FP[1] / Delete FP / Delete All FP
	Set/Reset Master
	Enter[1]/Leave Master Mode
	Set/Delete Master Password
	Get FP List / Get Master List[1]
	Read Log Data[1]
	Read/Write User Data, Erase User Data Block
	Enter Master Mode2
	Get FP List2 / Get Master List2
	Read Log Data2
	Register FP / Change FP[2] / Add FP[2] / Get FP[2]
	Delete All Log[2]
Configuration	Set/Get OPP Option[1]
	Set/Get Security Level[1]
	Set/Get Capture Option[1]
	Set/Get Log Option[1]
	Set/Get Capture Period[1]
	Set/Get System Information[2], Save System Information[2], Set Default System Information[2]
	Change Template mode[2]

Serial Protocol

System Management	Get FP Image[1]
	Status Check
	Get FP Image2
	Upgrade Fimrware2
	Set/Get Device Time[2]
	I/O Control[2]
	Get Image Quality[3]

1) These commands are only supported in FIM10, FIM30, and FIM32.

2) These commands are only supported in FIM01 and FIM20.

3) These commands are only supported in FIM01, FIM20, FIM30 and FIM32.

Serial Protocol

2. COMMAND DESCRIPTION

■ INITIALIZATION

Service Types	Description
Request Connection	Request communication connection with pre-defined Baud rate.
Set Baud Rate[1]	Set new Baud rate.
Get Firmware Version[1]	Request current firmware version information from the device. This protocol command will be obsolete. Use "Get Firmware Version2" command.
Get Firmware Version2	Request current firmware Version information from the device.
Get Device Information	Request target device information such as board type, and so on.

1) These commands are only supported in FIM10, FIM30, and FIM32

NITGEN _____ **Pages 12**

■ **MATCHING**

Service Types	Description
Verification	This command is used to verify user with the ID number. If the host requests user verification with the ID number, the device checks if the ID number exists in user DB. If the ID number exists in user DB, the device scans fingerprint image through the sensor module. After internal processing, matching results is returned to the host.
Identification	This command is used to identify user without an ID number. If the host requests user identification without an ID number, the device scans fingerprint image through sensor module. The device searches DB for user matched with input fingerprint. If there exists the matched user, the device returns that user ID number to the host. Otherwise, the device returns failed result.
RID Identification	This command is used to identify user with a limited ID. If the host requests user identification with a limited ID, the device scans fingerprint image through sensor module. This command operates the same method as identification except that the number of DB for identification can be less than normal identification. This command can reduce identification time.
Auto Identification	This command changes operation mode between auto-identify mode and normal mode. In Auto-identify mode, module captures fingerprint image continuously and run identification if finger is detected. Other commands except auto-identification are ignored.
Instant Matching	This command is used to match template data with input fingerprint. If the host requests instant matching with template data, the device matches those with fingerprint scanned through sensor module, and returns result to the host.
Get Template	The device returns template data get from the image scanned through sensor.
Cancel	The device cancels current processing task such as verification, identification and so on, and returns result caused by cancel to a host.
Instant Verification[2]	This command is used to verify user with the ID and the fingerprint data. It is similar to **Verification** except that **Instant Verification** gets fingerprint data from host instead of the sensor module.
Instant Identification[2]	This command is used to identify user with the fingerprint data. It is similar to **Identification** except that **Instant Identification** gets fingerprint data from host instead of the sensor module.

2) These commands are only supported in FIM01 and FIM20 series.

■ **DATABASE MANAGEMENT**

Service Type	Description
Enroll FP[1]	This command is used to add new user. The host requests enrollment of user with the ID number. The device checks if the ID number exists in DB. If the same ID number does not exist, the device gets the first fingerprint image through sensor module and returns the success of the first step. Then, the host requests another image capture. A device gets the second fingerprint image, save the new user to DB, and returns the success of the second step. This command is available only in 'Master Mode'. This command will be obsolete, Instead, use 'Register FP' command.
Delete FP	This command is used to delete user. The host requests the deletion of user with the ID number. The device checks if the ID number exists in DB. And if the same ID number exists, the device deletes the user from DB, and returns results to the host. This command is available only in 'Master Mode'.
Delete All FP	This command is used to delete all users. If the host requests the deletion of all users, the device deletes users according to options. This command has three options – All User, All Master User, and All Normal User. This command is available only in 'Master Mode'.
Set/Reset Master	This command is used to give/remove master privilege to a specific user. If the host requests setting or resetting master with the ID number, the device changes the master privilege of the user that has the same ID number. This command is available only in 'Master Mode'.
Enter Master Mode[1]	This command is used to change execution mode from 'Normal Mode' to 'Master Mode'. If the host requests entering master mode, the device authenticates master using fingerprint or password, then changes to 'Master Mode'. The device supports two fingerprint-authentication methods such as verification and template verification. If there is no master in DB, no master authentication is needed in changing to 'Master Mode'. This command will be obsolete. Instead, use "Enter Master Mode 2" command.
Leave Master Mode	This command is used to change execution mode from 'Master Mode' to 'Normal Mode'. After reset, 'Normal Mode' is default. And it's recommended that the device should be changed to 'Normal Mode' after all operations are completed in 'Master Mode' for the security

Set Master Password	This command is used to set or change the device password. The device password cannot be read from the device. This command is available only in 'Master Mode'.
Delete Master Password	This command is used to delete the device password. This command is available only in 'Master Mode'.
Get FP List[1)]	This command is used to get the list of normal users. The device returns the number and the list of normal users. This command is available only in 'Master Mode'. This command will be obsolete. Instead, use "Get FP List 2" command
Get Master List[1)]	This command is used to get the list of master users. The device returns the number and the list of master users. This command is available only in 'Master Mode'. This command will be obsolete. Instead, use "Get Master List2" command.
Read Log Data	This command is used to read log data from the device. This command is available only in 'Master Mode'. This command will be obsolete. Instead (of this), use "Read Log Data2" command.
Read/Write User Data	This command is used to read/write user data from/to flash ROM in the device. This command is available only in 'Master Mode'.
Erase User Data Block	This command is used to erase user data block of flash ROM in the device. This command is available only in 'Master Mode'
Enter Master Mode2	This command is the new of "Enter Master Mode" command. It is recommended this command to be used instead of "Enter Master Mode" command.
Get FP List2	This command is the new of "Get FP List" command. It is recommended this command to be used instead of "Get FP List" command.
Get Master List2	This command is the new of "Get Master List" command. It is recommended this command to be used instead of "Get Master List" command.
Read Log Data2	This command is the new of "Read Log Data" command. . It is recommended this command to be used instead of "Read Log Data" command.
Register FP	This command is the new of "Enroll FP" command. It is recommended this command to be used instead of "Enroll FP" command.
Change FP[2)]	This command is used to change the information of registered user. This command is available only in 'Master Mode'.
Add FP[2)]	This command is used to add new user using the information sent from host. This command is available only in 'Master Mode'.

Get FP[2)]	This command is used to get user information from the device. This command is available only in 'Master Mode'.
Delete All Log[2)]	This command is used to delete all logs in device. This command is available only in 'Master Mode'.

1) These commands are only supported in FIM10, FIM30 and FIM32..

2) These commands are only supported in FIM01 and FIM20.

■ CONFIGURATION

Service Types	Description

Set/Get OPP Option[1]	This command is used to set/get image control values such as gain, brightness, and contrast for sensor module. This command is available only in 'Master Mode'.
	• OPP02MM1 sensor module
	      Gain : 1~63 Brightness : 0~100 Contrast : 0~100
	• OPP01MM2, OPP03, OPP04 sensor module
	      Gain : 1, 2, 4, 8 Brightness : 0~100 Contrast : 0~100
	• Capacitor sensor module
	      Gain : 1, 2 Brightness: 0 ~ 50 Contrast : 0 ~ 100

Set/Get Security Level[1]	This command is used to set/reset/get security levels for verification and identification. Verification level can be set from 1 to 9, and identification level form 6 to 9 according to user's need. This command is available only in 'Master Mode'.
Set/Get Capture Option[1]	This command is used to set/reset/get the option for latent fingerprint image check and adaptive capture. This command is available only in 'Master Mode'.
Set/Get DB Init Option[1]	This command is used to set/reset/get option for the initialization of fingerprint DB. This command is available only in 'Master Mode'.
Set/Get Log Option[1]	This command is used to set/reset/get option for log write enable mode. This command is available only in 'Master Mode'.
Set/Get Capture Period[1]	This command is used to set/get capture period waiting time. This command is available only in 'Master Mode'.
Set/Get System Information	This command is used to set/get system information. This command is available only in 'Master Mode'.
Save System Information	This command is used to save current system information to Flash ROM. This command is only available in 'Master Mode'.
Set Default System Information	This command is used to set default system information. This command is not save the information to Flash ROM. Baudrate and the number of template is not changed.
Change template mode[2]	This command is used to select 2 or 4 templates mode. This command is only available in 'Master Mode'.

1) These commands are only supported in FIM10, FIM30 and FIM32.

2) These commands are only supported in FIM01 and FIM20.

■ SYSTEM MANAGEMENT

Service Types	Description
Get FP Image[1]	This command is used to get the raw image of fingerprint from the device. The device divides raw image into several blocks of data, and sends each block separately.
Status Check	This command is used to check the device operation status. The device returns current status such as idle or operating a task to the host.
Get FP Image2	This command is the new of "Get FP Image" command. It is recommended this command to be used instead of "Get FP Image" command.
Upgrade Firmware2	This command is used to upgrade firmware program of FIM10, FIM30, FIM32, FIM01 or FIM20xx series. Firmware Format: binary
Set Device Time[2]	This command is used to set the reference time of target device.
Get Device Time[2]	This command is used to read the reference time of target device.
I/O Control[2]	This command is used to set/clear the device I/Os such as Sensor LED and so on.
Get Image Quality[2]	This command is used to get the quality of fingerprint image.

1) These commands are only supported in FIM10, FIM30 and FIM32.

2) These commands are only supported in FIM01 and FIM20.

Serial Protocol

3. SERIAL COMMUNICATION COMMANDS

■ Packet Structure

The following figure shows the organization of a packet. The packet consists of start byte, header, data (optional), and data checksum (optional). Data and data checksum block is sent only if needed.

PACKET STRUCTURE

Header	Data*	Data Check Sum*
24	Data Size	4

PACKET HEADER

Start Byte *	Command	Param1	Param2	Data Size	Error Code	Header Checksum
1	4	4	4	4	4	4
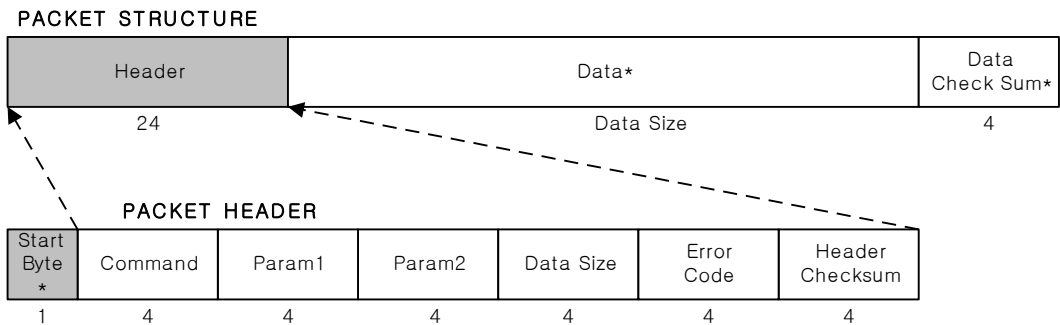
* If data size is zero, then data and data check sum is not used.

* Start byte: 0x7E

The maximum size of a packet is 64Kbyte.

Size (Start Byte) + Size (Header)   + Size (Data)   + Size (Data Checksum) $\leq 65,536$

If data size is so large that the host/device cannot carry data in a single packet, the host/device divides data into small data blocks and sends them over several subsequent packets. And the packet index has the value from 0 to 255. The maximum data size that can be sent is calculated as the following.

Max Data block = 256 x 65,507 = 16,769,792 [byte]

Packet index is transferred by the parameter of the header. The following explains the format of packet index.

(Packet index (0~N) << 8) + (Max Packet Index N)

For example, if single packet is sent, packet index is 0x0000.

If two packets are sent, the first packet index is 0x0001, and the second packet index is 0x0101.

If three packets are sent, packet indexes are sequentially 0x0002, 0x0102, and 0x0202.

Warning: The total data size of multiple packets is dependent on the target devices.

   The multi-packet is executed after last packet is transferred.

■ Error Code

If the host sends the command packet, the device returns the acknowledge packet with the packet error code. If Error code is not "ERR_NONE", the previously sent command packet is ignored in the device. The host needs to check the returned error code, and then retry or does something.

ERROR CODE LIST		
ERR_NONE	The command packet successfully executed	0x0
ERR_CHECKSUM_ERROR	There exists checksum error in header or data block.	0x2
ERR_INVALID_CMD	The command sent to the device is invalid.	0x5
ERR_UNSUPPORTED_CMD	The command sent to the device is not supported.	0x6

■ How to Make the Header Checksum & the Data Checksum

Checksum data can be calculated by adding all byte data.

For example, in order to create the header checksum, 20 bytes are added.

4. LOG DATA BLOCK

The log data block consists of index, type, event, and information, and the size of a log data block is 28 bytes. The following table shows the organization of a log data block. The max number of log data to be supported is different according to devices. The FIM10 supports 2048 log data. And The FIM01and FIM20xx support 8196 log data.

■ Log Data Format

Index (4)	Type (1)	Event (1)	Information (22)		
			ID (10)	Result (2)	Reserved (10)
0 ~ (0xFFFFFFFF – 1)	Command = 0	Enroll = 0	FPID (10)	RESULT (2)	X
		Delete = 1	FPID (10)	RESULT (2)	X
		Verify = 2	FPID (10)	RESULT (2)	X
		Identify = 3	FPID (10)	RESULT (2)	X
		Instant Match = 6	X	RESULT (2)	X
		Enter Master Mode = 7	FPID (10)	RESULT (2)	X
		Set Master = 8	X	RESULT (2)	X
		Reset Master = 9	X	RESULT (2)	X
		Delete All = 10	X	RESULT (2)	X
	Error = 1	Error String			
	Type (1)	**Event (1)**	**Information (22)**		
			Result (2)	Time (8)	ID (12)
	Command = 2[1]	Enroll = 0	RESULT (2)	TIME (8)	FPID (12)
		Delete = 1	RESULT (2)	TIME (8)	FPID (12)
		Verify = 2	RESULT (2)	TIME (8)	FPID (12)
		Identify = 3	RESULT (2)	TIME (8)	FPID (12)
		Instant Match = 6	RESULT (2)	TIME (8)	FPID (12)
		Enter Master Mode = 7	RESULT (2)	TIME (8)	FPID (12)
		Set Master = 8	RESULT (2)	TIME (8)	FPID (12)
		Reset Master = 9	RESULT (2)	TIME (8)	FPID (12)
		Delete All[)] = 10	RESULT (2)	TIME (8)	FPID (12)
		Change FP = 11	RESULT (2)	TIME (8)	FPID (12)

		Change Password = 12	RESULT (2)	TIME (8)	FPID (12)
		Add FP = 13	RESULT (2)	TIME (8)	FPID (12)
		Instant Verify = 14	RESULT (2)	TIME (8)	FPID (12)
		Instant Identify = 15	RESULT (2)	TIME (8)	FPID (12)

1) These type is supported in FIM01 and FIM20

Appendix A. COMMAND LIST

CONNECTION	
CMD_REQUEST_CONNECTION	0x01
CMD_SET_BAUDRATE	0x02
CMD_GET_FIRMWARE_VERSION	0x03
CMD_GET_FIRMWARE_VERSION2	0x04
CMD_GET_DEVICE_INFO	0x05

MATCHING	
CMD_VERIFY_FP	0x11
CMD_IDENTIFY_FP	0x12
CMD_IDETNIFY_RID_FP	0x13
CMD_INSTANT_MATCHING	0x15
CMD_GET_TEMPLATE	0x16
CMD_CANCEL	0x17
CMD_INSTANT_VERIFY	0x18
CMD_INSTANT_IDENTIFY	0x19
CMD_AUTO_IDENTIFY	0x1A
CMD_AUTO_IDENTIFY_RESULT	0x1B

DATABASE MANAGEMENT	
CMD_ENROLL_FP_STEP1	0x20
CMD_ENROLL_FP_STEP2	0x21
CMD_DELETE_FP	0x22
CMD_DELETE_ALL_FP	0x23
CMD_SET_MASTER	0x24
CMD_ENTER_MASTER_MODE	0x25
CMD_LEAVE_MASTER_MODE	0x26
CMD_SET_MASTER_PASSWORD	0x27
CMD_GET_FP_LIST	0x28

CMD_GET_MASTER_LIST	0x29
CMD_READ_LOG_DATA	0x2A
CMD_READ_USER_DATA	0x2B
CMD_WRITE_USER_DATA	0x2C
CMD_ERASE_USER_DATA_BLOCK	0x2D
CMD_DELETE_MASTER_PASSWORD	0x2E
CMD_ENTER_MASTER_MODE2	0x2F
CMD_GET_FP_LIST2	0x30
CMD_GET_MASTER_LIST2	0x31
CMD_READ_LOG_DATA2	0x32
CMD_REGISTER_FP	0x33
CMD_CHANGE_FP	0x34
CMD_ADD_FP	0x35
CMD_GET_FP	0x36
CMD_DELETE_ALL_LOG	0x37

CONFIGURATION	
CMD_SET_OPP_OPTION	0x40
CMD_GET_OPP_OPTION	0x41
CMD_SET_SECURITY_LEVEL	0x42
CMD_GET_SECURITY_LEVEL	0x43
CMD_SET_CAPTURE_OPTION	0x44
CMD_GET_CAPTURE_OPTION	0x45
CMD_SET_DB_INIT_OPTION	0x46
CMD_GET_DB_INIT_OPTION	0x47
CMD_SET_LOG_OPTION	0x48
CMD_GET_LOG_OPTION	0x49
CMD_SET_CAPTURE_PERIOD	0x4A
CMD_GET_CAPUTRE_PERIOD	0x4B
CMD_SET_SYSINFO	0x4C
CMD_GET_SYSINFO	0x4D
CMD_GET_SYSINFO	0x4E

CMD_CHG_NUM_OF_TEMP	0x4F
CMD_SET_DEFAULT_SYSINFO	0x50

SYSTEM MANAGEMENT	
CMD_GET_FP_IMAGE	0x60
CMD_STATUS_CHECK	0x62
CMD_GET_FP_IMAGE2	0x63
CMD_UPGRADE_FIRMWARE2	0x64
CMD_SET_TIME	0x65
CMD_GET_TIME	0x66
CMD_CTL_IO	0x67
CMD_GET_IMAGE_QAULITY	0x68

Appendix B. COMMAND LIST SUPPORTED IN DEVICES

FIM10 Series

CONNECTION	CMD_REQUEST_CONNECTION (0x01)
	CMD_SET_BAUDRATE (0x02)
	CMD_GET_WARE_VERSION (0x03)
	CMD_GET_FIRMWARE_VERSION2 (0x04)
	CMD_GET_DEVICE_INFO (0x05)
MATCHING	CMD_VERIFY_FP (0x11)
	CMD_IDENTIFY_FP (0x12)
	CMD_INSTANT_MATCHING (0x15)
	CMD_GET_TEMPLATE (0x16)
	CMD_CANCEL (0x17)
DATABASE MANAGEMENT	CMD_ENROLL_FP_STEP1 (0x20)
	CMD_ENROLL_FP_STEP2 (0x21)
	CMD_DELETE_FP (0x22)
	CMD_DELETE_ALL_FP (0x23)
	CMD_SET_MASTER (0x24)
	CMD_ENTER_MASTER_MODE (0x25)
	CMD_LEAVE_MASTER_MODE (0x26)
	CMD_SET_MASTER_PASSWORD (0x27)
	CMD_GET_FP_LIST (0x28)
	CMD_GET_MASTER_LIST (0x29)
	CMD_READ_LOG_DATA (0x2A)
	CMD_READ_USER_DATA (0x2B)
	CMD_WRITE_USER_DATA (0x2C)
	CMD_ERASE_USER_DATA_BLOCK (0x2D)
	CMD_DELETE_MASTER_PASSWORD (0x2E)
	CMD_ENTER_MASTER_MODE2 (0x2F)
	CMD_GET_FP_LIST2 (0x30)
	CMD_GET_MASTER_LIST2 (0x31)
	CMD_READ_LOG_DATA2 (0x32)
	CMD_REGISTER_FP (0x33)

	CMD_DELETE_ALL_LOG (0x37)
CONFIGURATION	CMD_SET_OPP_OPTION (0x40)
	CMD_GET_OPP_OPTION (0x41)
	CMD_SET_SECURITY_LEVEL (0x42)
	CMD_GET_SECURITY_LEVEL (0x43)
	CMD_SET_CAPTURE_OPTION (0x44)
	CMD_GET_CAPTURE_OPTION (0x45)
	CMD_SET_LOG_OPTION (0x48)
	CMD_GET_LOG_OPTION (0x49)
	CMD_SET_CAPTURE_PERIOD (0x4A)
	CMD_GET_CAPTURE_PERIOD (0x4B)
SYSTEM MANAGEMENT	CMD_GET_FP_IMAGE (0x60)
	CMD_STATUS_CHECK (0x62)
	CMD_GET_FP_IMAGE2 (0x63)
	CMD_UPGRADE_FIRMWARE2 (0x64)

FIM01 and FIM20 Series

CONNECTION	CMD_REQUEST_CONNECTION (0x01)
	CMD_GET_FIRMWARE_VERSION2 (0x04)
	CMD_GET_DEVICE_INFO (0x05)
MATCHING	CMD_VERIFY_FP (0x11)
	CMD_IDENTIFY_FP (0x12)
	CMD_IDENTIFY_RID_FP(0x13)
	CMD_INSTANT_MATCHING (0x15)
	CMD_GET_TEMPLATE (0x16)
	CMD_CANCEL (0x17)
	CMD_INSTNAT_VERIFY (0x18)
	CMD_INSTNAT_IDENTIFY (0x19)
DATABASE MANAGEMENT	CMD_DELETE_FP (0x22)
	CMD_DELETE_ALL_FP (0x23)
	CMD_SET_MASTER (0x24)
	CMD_LEAVE_MASTER_MODE (0x26)
	CMD_SET_MASTER_PASSWORD (0x27)
	CMD_READ_USER_DATA (0x2B)
	CMD_WRITE_USER_DATA (0x2C)
	CMD_ERASE_USER_DATA_BLOCK (0x2D)
	CMD_DELETE_MASTER_PASSWORD (0x2E)
	CMD_ENTER_MASTER_MODE2 (0x2F)
	CMD_GET_FP_LIST2 (0x30)
	CMD_GET_MASTER_LIST2 (0x31)
	CMD_READ_LOG_DATA 2(0x32)
	CMD_REGISTER_FP (0x33)
	CMD_CHANGE_FP (0x34)
	CMD_ADD_FP (0x35)
	CMD_GET_FP (0x36)
	CMD_DELETE_ALL_LOG (0x37)
CONFIGURATION	CMD_SET_SYSINFO (0x4C)
	CMD_GET_SYSINFO (0x4D)

	CMD_SAVE_SYSINFO (0x4E)
	CMD_CHG_NUM_OF_TEMP (0x4F)
	CMD_SET_DEFAULT_SYSINFO (0x50)
SYSTEM MANAGEMENT	CMD_STATUS_CHECK (0x62)
	CMD_GET_FP_IMAGE2 (0x63)
	CMD_UPGRADE_FIRMWARE2 (0x64)
	CMD_SET_TIME (0x65)
	CMD_GET_TIME (0x66)
	CMD_CTL_IO (0x67)
	CMD_GET_IMAGE_QUALITY (0x68)

FIM30 and FIM32 Series

CONNECTION	CMD_REQUEST_CONNECTION (0x01)
	CMD_SET_BAUDRATE (0x02)
	CMD_GET_FIRMWARE_VERSION2 (0x04)
	CMD_GET_DEVICE_INFO (0x05)
MATCHING	CMD_VERIFY_FP (0x11)
	CMD_IDENTIFY_FP (0x12)
	CMD_INSTANT_MATCHING (0x15)
	CMD_GET_TEMPLATE (0x16)
	CMD_CANCEL (0x17)
	CMD_AUTO_IDENTIFY (0x1A)
	CMD_AUTO_IDENTIFY_RESULT (0x1B)
DATABASE MANAGEMENT	CMD_DELETE_FP (0x22)
	CMD_DELETE_ALL_FP (0x23)
	CMD_SET_MASTER (0x24)
	CMD_LEAVE_MASTER_MODE (0x26)
	CMD_SET_MASTER_PASSWORD (0x27)
	CMD_READ_USER_DATA (0x2B)
	CMD_WRITE_USER_DATA (0x2C)
	CMD_ERASE_USER_DATA_BLOCK (0x2D)
	CMD_DELETE_MASTER_PASSWORD (0x2E)
	CMD_ENTER_MASTER_MODE2 (0x2F)
	CMD_GET_FP_LIST2 (0x30)
	CMD_GET_MASTER_LIST2 (0x31)
	CMD_READ_LOG_DATA2 (0x32)
	CMD_REGISTER_FP (0x33)
	CMD_DELETE_ALL_LOG (0x37)
CONFIGURATION	CMD_SET_OPP_OPTION (0x40)
	CMD_GET_OPP_OPTION (0x41)
	CMD_SET_SECURITY_LEVEL (0x42)
	CMD_GET_SECURITY_LEVEL (0x43)
	CMD_SET_CAPTURE_OPTION (0x44)

	CMD_GET_CAPTURE_OPTION (0x45)
	CMD_SET_LOG_OPTION (0x48)
	CMD_GET_LOG_OPTION (0x49)
	CMD_SET_CAPTURE_PERIOD (0x4A)
	CMD_GET_CAPTURE_PERIOD (0x4B)
	CMD_SET_SYSINFO (0x4C)
	CMD_GET_SYSINFO (0x4D)
	CMD_SAVE_SYSINFO (0x4E)
	CMD_SET_DEFAULT_SYSINFO (0x50)
SYSTEM MANAGEMENT	CMD_STATUS_CHECK (0x62)
	CMD_GET_FP_IMAGE2 (0x63)
	CMD_UPGRADE_FIRMWARE2 (0x64)
	CMD_CTL_IO (0x67)
	CMD_GET_IMAGE_QUALITY (0x68)

Appendix C. PACKET RESULT LIST

PACKET RESULT LIST	
RESULT_SUCCEEDED	0x01
RESULT_FAILED	0x02
RESULT_NOT_MASTER_MODE	0x03
RESULT_USED_ID	0x04
RESULT_INVALID_ID	0x05
RESULT_DB_IS_FULL	0x06
RESULT_NOT_IN_TIME	0x07
RESULT_INVALID_PARAM	0x09
RESULT_EXCEEDED_MASTER_CNT	0x0A
RESULT_OPP_INIT_FAILED	0x0C
RESULT_CANCELED	0x0D
RESULT_ANOTHER_FINGER	0x0E
RESULT_IDLE_STATUS	0x10
RESULT_TOO_LARGE_DATA[1]	0x11
RESULT_IDENTIFY_TIMEOUT[2]	0x12
RESULT_DB_ISNOT_EMPTY[3]	0x13
RESULT_WRONG_TEMP_MODE[3]	0x14
RESULT_INVALID_DATASIZE[3]	0x15
RESULT_INVALID_DATA[3]	0x16
RESULT_EXTRACT_FAIL[4]	0x17

1) These results are only supported in FIM01-HV, FIM2030 and FIM2040.

2) In FIM01-HV, FIM2030 and FIM2040, this result is supported in firmware version 1.13 or later.

3) In FIM01-HV, FIM2030 and FIM2040, this result is supported in firmware version 1.30 or later.

3) In FIM01-HV, FIM2030 and FIM2040, this result is supported in firmware version 1.61 or later.

- RESULT_SUCCEEDED: This value is returned if the command is executed successfully.

- RESULT_FAILED: This value is returned if the command cannot be executed for known reason.

- RESULT_NOT_MASTER_MODE: This value is returned if the command that requires the master privilege is executed in normal mode.

- RESULT_USED_ID: This value is returned if the ID in adding or changing command already exists.

- RESULT_INVALID_ID: This value is returned if the ID in command packet is invalid.

- RESULT_DB_IS_FULL: This value is returned if there is no room for new user.

- RESULT_NOT_IN_TIME: This value is returned if the fingerprint image can not be captured in pre-defined time.

- RESULT_INVALID_PARAM: This value is returned if parameters of the command packet are invalid.

- RESULT_EXCEEDED_MASTER_CNT: This value is returned if the number of master is greater than a pre-defined value.

- RESULT_OPP_INIT_FAILED: This value is returned if the initialization of the sensor is failed.

- RESULT_CANCELED: This value is returned if the cancel command is transferred during executing a previous command.

- RESULT_ANOTHER_FINGER: This value is returned if the first inputted finger of a new user is not equal to the second one.

- RESULT_IDLE_STATUS: This value is returned if there is no executed command for the cancel command.

- RESULT_TOO_LARGE_DATA: This value is returned if the size of data is greater than the size of pre-defined data structure.

- RESULT_IDENTIFY_TIMEOUT: This value is returned if the identification process (1:N matching) can't be finished until pre-defined time.

- RESULT_DB_ISNOT_EMPTY: This value is returned if the command requires empty DB, but there exists user or users.

- RESULT_WRONG_TEMP_MODE: This value is returned if the template mode that required by command is different from the current template mode.

- RESULT_INVALID_DATASIZE: This value is returned if the size of data needed is different from the size of data sent.

- RESULT_INVALID_DATA: This value is returned if the data cannot be comprehended.

- RESULT_EXTRACT_FAIL: This value is returned if module cannot extract template data from image.

Appendix D. LOG EVENT LIST

LOG EVENT LIST	
LOGEVT_ENROLL	0x00
LOGEVT_DELETE	0x01
LOGEVT_VERIFY	0x02
LOGEVT_IDENTIFY	0x03
LOGEVT_INSTANT_MATCH	0x06
LOGEVT_ENTER_MASTERMODE	0x07
LOGEVT_SET_MASTER	0x08
LOGEVT_RESET_MASTER	0x09
LOGEVT_DELETE_ALL	0x0A
LOGEVT_CHANGE_FP[1]	0x0B
LOGEVT_CHANGE_PASSWD[1]	0x0C
LOGEVT_ADD[1]	0x0D
LOGEVT_INSTANT_VERIFY[1]	0x0E
LOGEVT_INSTANT_IDNETIFY[1]	0x0F

1) These log events are only supported in FIM01and FIM20xx series.

Appendix E. COMMAND DESCRIPTION

● Initialization

CMD_REQUEST_CONNECTION

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x01	Command	0x01
Param1	X	Param1	RESULT_SUCCEEDED
Param2	X	Param2	Fingerprint Count
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

This command can be used for connection test.

CMD_SET_BAUDRATE

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x02	Command	0x02
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_PARAM RESULT_CANCELED
Param2	Baud rate (0 ~ 4) 0 – 115,200 bps 1 – 57,600 bps 2 – 38,400 bps 3 – 19,200 bps 4 – 9,600 bps 5 – 14,400 bps	Param2	Baud rate (0 ~ 4) 0 – 115,200 bps 1 – 57,600 bps 2 – 38,400 bps 3 – 19,200 bps 4 – 9,600 bps 5 – 14,,400 bps
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

The device to which the host is now being connected sends packet with the same baud rate as the host's. New baud rate is applied from the next packet.

This command is only supported in FIM10, FIM30 and FIM32.

CMD_GET_FIRMWARE_VERSION

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x03	Command	0x03
Param1	X	Param1	Version information
Param2	X	Param2	X
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

The version is calculated by dividing Param1, which is BCD value, by 100.

This command will be obsolete in future. Instead, use **CMD_GET_FIRMWARE_VERION2** command.

This command is only supported in FIM10.

CMD_GET_FIRMWARE_VERSION2

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x04	Command	0x04
Param1	X	Param1	RESULT_SUCCEEDED RESULT_CANCELED
Param2	X	Param2	Version Information
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

The version is calculated by dividing Param2, which is BCD value, by 100.

CMD_GET_DEVICE_INFO

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x05	Command	0x05
Param1	X	Param1	RESULT_SUCCEEDED RESULT_CANCELED
Param2	X	Param2	Device Name 0x00 – Reserved for old device 0x01 – Reserved for old device 0x02 – FIM10_HV 0x03 – FIM10_LV 0x04 – FIM01_HV

			0x13 – FIM1030
			0x33 – FIM2030
			0x34 – FIM2040
			0x3030 – FIM3030
			0x3040 – FIM3040
			0x3200 – FIM3200
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

● MATCHING

CMD_VERIFY_FP

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x11	Command	0x11
Param1[1]	0 – FP verification 1 – Password	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_DATASIZE RESULT_INVALID_DATA RESULT_INVALID_ID RESULT_INVALID_PARAM RESULT_NOT_IN_TIME RESULT_CANCELED RESULT_EXTRACT_FAIL

Param2	(Packet Index (0~N) << 8)
	
	+ (Max Packet Index N)
		Param2	**IF** (Param1 == Succeeded)
			
			    IF (Command Param1 = 0)
			
			      Template Index Number
			
			    ELSE
			
			      0
			
			ELSE
			
			    0

Data Size	**IF** FP verification
	
	    Size (a fraction of FPID)
	
	ELSE IF password
	
	    Size (a fraction of FPID + password)
	
	ELSE
	
	    0
		Data Size	0

Error Code	X	Error Code	Error Code

Data	**IF** (Param1 == 0)
	
	    A fraction of FPID
	
	ELSE IF (Param1 == 1)
	
	    A fraction of FPID + password
	
	ELSE
	
	    -
		Data	-

Template index number is only supported in FIM01 and FIM20 only.

CMD_IDENTIFY_FP

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x12	Command	0x12

Param1	0x00 – User ID only request
	
	0x01 – User ID and Template index
	
	      request
	
	0x02 – User ID and user type request
	
	      (FIM30 Only)
		Param1	RESULT_SUCCEEDED
			
			RESULT_FAILED
			
			RESULT_INVALID_PARAM
			
			RESULT_NOT_IN_TIME
			
			RESULT_IDENTIFY_TIMEOUT (FIM01 &
			
			FIM20xx only)
			
			RESULT_CANCELED
			
			RESULT_EXTRACT_FAIL

Param2	X	Param2	(Packet Index (0~N) << 8) + (Max Packet Index N)

Data Size	0	Data Size	**IF** (Param1 == Succeeded)
			
			    IF (Command Param1 = 0x00)
			
			   Size of FPID (various between devices)
			
			    ELSE IF (Command Param1 = 0x01)
			
			   Size of (FPID + Template Index)
			
			    ELSE IF (Command Param1 = 0x02)
			
			   Size of(FPID + User Type)
			
			    ELSE
			
			   0
			
			ELSE
			
			   0

Error Code	X	Error Code	Error Code

Data	-	Data	**IF** (Param1 == Succeeded)
			
			    IF (Command Param1 = 0)
			
			   FPID
			
			    ELSE IF (Command Param1 = 1)
			
			   (FPID + Template Index)
			
			    ELSE

			0
			ELSE
			0

ID + User type is only supported in FIM30 only.

CMD_IDENTIFY_RID_FP

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x13	Command	0x13
Param1	0x00 - User ID only request 0x01 - User ID and Template index request	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_PARAM RESULT_NOT_IN_TIME RESULT_IDENTIFY_TIMEOUT (FIM01 & FIM20xx only) RESULT_CANCELED
Param2	(Packet Index (0~N) << 8) + (Max Packet Index N)	Param2	(Packet Index (0~N) << 8) + (Max Packet Index N)

Data Size	Size (FPID)	Data Size	**IF** (Param1 == Succeeded)
			  IF (Command Param1 == 0x00)
			    Size of FPID
			  ELSE IF(Command Param1 == 0x01)
			    Size of (FPID + Template Index)
			  ELSE
			    0
			ELSE
			  0

Error Code	X	Error Code	Error Code

Data	A fraction of FPID	Data	**IF** (Param1 == Succeeded)
			    IF (Command Param1 == 0x00)
			     FPID
			    ELSE IF (Command Param1 == 0x01)
			     (FPID + Template Index)
			    ELSE

			0
			ELSE
			0

This command is only supported in FIM01 and FIM20 only.

When you want to reduced ID matching, you must send ID having '*' (0x2A) that matching one unknown digit.

For example, If you want to identify with ID starting with "12" and ID requires 4 digits, you must send reduced ID such as "12**".

CMD_INSTANT_MATCHING

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x15	Command	0x15

Param1	**(Template Mode << 8) + Aux Info**
	
	Template Mode
	
	0 – single template
	
	1 – Multi Template (FIM30 Only)
	
	2 – ISO 19794-2 Template (FIM30 Only)
	
	3 – ANSI 378 Template (FIM30 Only)
	
	In Template Mode == 0 (single-template)
	
	    0 - Default
	
	    1 - FDA01 compatible style
	
	      (FIM30 only)
	
	In Template Mode == 1 (Multi-template)
	
	    1~10 – the number of templates
	
	      (NITGEN Format Only)
		Param1	RESULT_SUCCEEDED
			
			RESULT_FAILED
			
			RESULT_INVALID_DATASIZE
			
			RESULT_INVALID_DATA
			
			RESULT_NOT_IN_TIME
			
			RESULT_INVALID_PARAM
			
			RESULT_TOO_LARGE_DATA
			
			RESULT_CANCELED
			
			RESULT_EXTRACT_FAIL

Param2	(Packet Index (0~N) << 8) + (Max Packet Index N)	Param2	X
Data Size	Size (A fraction of TEMPLATE_INFO) the number of template	Data Size	0
Error Code	X	Error Code	Error Code
Data	A fraction of TEMPLATE_INFO	Data	-

The FDA compatible style is supported in FIM30 firmware ver1.10 or later.

Serial Protocol

CMD_GET_TEMPLATE

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x16	Command	0x16
Param1	0 - Default 1 - FDA01 compatible (FIM10 only) 2- ISO 19794-2 Format 3- ANSI 378 Format	Param1	RESULT_SUCCEEDED RESULT_FAILELD RESULT_NOT_IN_TIME RESULT_CANCELED RESULT_EXTRACT_FAIL
Param2	X	Param2	(Packet Index (0~N) << 8) + (Max Packet Index N)

Data Size	0	Data Size	**IF** (Param1 == Succeeded)
			
			    Size (A fraction of Template)
			
			ELSE
			
			    0

Error Code	X	Error Code	Error Code

Data	-	Data	**IF** (Param1 == Succeeded)
			
			    A fraction of Template
			
			ELSE
			
			    -

The value '1' of param1 is supported in FIM30 firmware ver1.10 or later.

The structure of TEMPLATE_INFO is explained in Appendix F.

CMD_CANCEL

COMMAND PACKET		ACKNOWLEDGEMENT PACKET[1]	
Command	0x17	Command	0x17
Param1	X	Param1	RESULT_IDLE_STATUS
Param2	X	Param2	X
Data Size	0	Data Size	0
Error Code	X	Error Code	Error Code

If the device received the CMD_CANCEL command packet in idle, the device returns the CMD_CANCEL acknowledge packet with RETURN_CANCLE in paramter1. Otherwise, it returns the currently executing command acknowledge packet.

CMD_INSTANT_VERIFY

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x18	Command	0x18
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_DATASIZE RESULT_INVALID_DATA RESULT_NOT_IN_TIME RESULT_INVALID_PARAM RESULT_INVALID_ID RESULT_TOO_LARGE_DATA RESULT_CANCELED

Param2	(Packet Index (0~N) << 8)
	
	+ (Max Packet Index N)
		Param2	**IF** (Param1 == Succeeded)
			
			    Template Index Number
			
			ELSE
			
			    0

Data Size	Size (A fraction of FPID + Template)	Data Size	0
Error Code	X	Error Code	Error Code
Data	A fraction of FPID + Template	Data	-

The structure of data is explained in Appendix F.

This command is only supported in FIM01 and FIM20xx.

Template index number is only supported in FIM01 and FIM20 only.

CMD_INSTANT_IDENTIFY

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x19	Command	0x19
Param1	0 – User ID only request 1 – User ID and Template index request (FIM01 & FIM20 only)	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_DATASIZE RESULT_INVALID_DATA RESULT_NOT_IN_TIME RESULT_IDENTIFY_TIMEOUT

Serial Protocol

			RESULT_INVALID_PARAM
			RESULT_TOO_LARGE_DATA
			RESULT_CANCELED
Param2	(Packet Index (0~N) << 8) + (Max Packet Index N)	Param2	X

Data Size	Size (A fraction of Template)	Data Size	**IF** (Param1 == Succeeded)
			    IF (Command Param1 = 0)
			 Size of FPID (various between devices)
			   ELSE IF (Command Param1 = 1)
			 Size of (FPID + Template Index)
			   ELSE
			 0
			 ELSE
			   0

Error Code	X	Error Code	Error Code

Data	A fraction of Template	Data	**IF** (Param1 == Succeeded)
			    IF (Command Param1 = 0)
			 FPID
			   ELSE IF (Command Param1 = 1)
			 (FPID + Template Index)
			   ELSE
			 0
			 ELSE
			   0

The structure of data is explained in Appendix F.

This command is only supported in FIM01 and FIM20xx.

Template index number is only supported in FIM01 and FIM20 only.

CMD_AUTO_IDENTIFY

COMMAND PACKET		ACKNOWLEDGEMENT PACKET[1]	
Command	0x1A	Command	0x1A
Param1	Selection of Operation 0x00 – Stop Auto Identification	Param1	RESULT_SUCCEEDED RESULT_FAILED

	0x01 – Start Auto Identification		RESULT_INVALID_PARAM
Param2	X	Param2	0
Data Size	0	Data Size	0
Error Code	X	Error Code	Error Code

By using this command, you can change the mode of module to auto-identify mode. In auto-identify mode, module ignores other command except CMD_AUTO_IDENTIFY.

CMD_AUTO_IDENTIFY_RESULT

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command		Command	0x1B
Param1		Param1	RESULT_SUCCEEDED RESULT_FAILED
Param2		Param2	0

Data Size		Data Size	**IF** (Param1 == Succeeded)
			    Size of (FPID + Template Index)
			ELSE
			    0

Error Code		Error Code	Error Code

Data		Data	**IF** (Param1 == Succeeded)
			    FPID
			ELSE
			    0

This command is used only for acknowledge packet. In auto-identify mode, module returns the result of identification.

Serial Protocol

● DATABASE MANAGEMENT

CMD_ENROLL_FP_STEP1

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x20	Command	0x20
Param1	0 – User 1 – Master Others – reserved	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_DATASIZE RESULT_INVALID_DATA RESULT_NOT_IN_TIME RESULT_INVALID_PARAM RESULT_USED_ID RESULT_DB_IS_FULL RESULT_NOT_MASTER_MODE RESULT_CANCELED
Param2	(Packet Index (0~N) << 8) + (Max Packet Index N)	Param2	X
Data Size	Size (A fraction of FPID)	Data Size	0
Error Code	X	Error Code	Error Code
Data	A fraction of FPID	Data	-

This command is only supported in FIM10. In FIM01 or FIM20xx, instead of this command, use CMD_REGISTER_FP.

CMD_ENROLL_FP_STEP2

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x21	Command	0x21
Param1	0 – User 1 – Master Others – reserved	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_IN_TIME RESULT_NOT_MASTER_MODE RESULT_ANOTHER_FINGER RESULT_CANCELED
Param2	X	Param2	**IF** (Param1 == Succeeded) Registered FP Count **ELSE**

			0
Data Size	0	Data Size	0
Error Code	X	Error Code	Error Code

This command is only supported in FIM10. In FIM01 or FIM20xx, instead of this command, use CMD_REGISTER_FP.

CMD_DELETE_FP

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x22	Command	0x22
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_DATASIZE RESULT_INVALID_DATA REAULT_INVALID_ID RESULT_NOT_MASTER_MODE
Param2	(Packet Index (0~N) << 8) + (Max Packet Index N)	Param2	**IF** (Param1 == Succeeded) Registered FP Count **ELSE** 0
Data Size	Size (A fraction of FPID)	Data Size	0
Error Code	X	Error Code	Error Code
Data	A fraction of FPID	Data	-

CMD_DELETE_ALL_FP

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x23	Command	0x23
Param1	0 – Delete all FP 1 – Delete all user (except Master) 2 – Delete all Master	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_PARAM RESULT_NOT_MASTER_MODE RESULT_CANCELED
Param2	X	Param2	Registered FP count
Data Size	0	Data Size	0

Error Code	X	Error Code	Error Code

CMD_SET_MASTER

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x24	Command	0x24
Param1	0 – Clear Master Flag 1 – Set Master Flag	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_DATASIZE RESULT_INVALID_DATA RESULT_INVALID_PARAM REAULT_INVALID_ID RESULT_NOT_MASTER_MODE RESULT_EXCEEDED_MASTER_CNT
Param2	(Packet Index (0~N) << 8) + (Max Packet Index N)	Param2	Master Count
Data Size	Size (A fraction of FPID)	Data Size	0
Error Code	X	Error Code	Error Code
Data	A fraction of FPID	Data	-

CMD_ENTER_MASTER_MODE

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x25	Command	0x25
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_DATASIZE RESULT_INVALID_DATA RESULT_NOT_IN_TIME RESULT_INVALID_PARAM RESULT_INVALID_ID RESULT_CANCELED

Param2	Master authentication type
	
	   Verification = 0
		Param2	Master authentication type
			
			   Verification = 0

	Password = 2		Password = 2
	Null = 3		Null = 3

Data Size	**IF** verification
	
	    Data size = size of FPID
	
	ELSE IF password
	
	    Data size = size of password
	
	ELSE IF null
	
	    Data size = 0
		Data Size	0

Error Code	X	Error Code	Error code

Data	**IF** verification
	
	    FPID
	
	ELSE IF password
	
	    Password
		Data	-

This command will be obsolete in future. Instead, use CMD_ENTER_MASTER_MODE2 packet.

This command is only supported in FIM10.

CMD_LEAVE_MASTER_MODE

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x26	Command	0x26
Param1	X	Param1	RESULT_SUCCEEDED RESULT_NOT_MASTER_MODE
Param2	X	Param2	X
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

CMD_SET_MASTER_PASSWORD

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x27	Command	0x27
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_DATASIZE RESULT_INVALID_DATA

			RESULT_NOT_MASTER_MODE
Param2	(Packet Index (0~N) << 8) + (Max Packet Index N)	Param2	X
Data Size	Size (A fraction of Password)	Data Size	0
Error Code	X	Error Code	Error code
Data	A fraction of Password	Data	-

CMD_GET_FP_LIST

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x28	Command	0x28
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE
Param2	X	Param2	**IF** (Param1 == RESULT_SUCCEEDED) Registered FP count **ELSE** X
Data Size	0	Data Size	**IF** (Param1 == RESULT_SUCCEEDED) Size of FPID x FP count **ELSE** 0
Error Code	X	Error Code	Error code
Data	-	Data	**IF** (Param1 == RESULT_SUCCEEDED) FP list block **ELSE** 0

The FIM10 or FIM01 (or FIM20xx) has each different format for FP list block. Before using CMD_GET_FP_LIST packet,

check device information with CMD_GET_DEVICE_INFO

This command will be obsolete in future. Instead, use CMD_GET_FP_LIST2 packet.

This command is only supported in FIM10.

Serial Protocol

CMD_GET_MASTER_LIST

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x29	Command	0x29
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE
Param2	X	Param2	**IF** (Param1 == RESULT_SUCCEEDED) Registered Master count **ELSE** X
Data Size	0	Data Size	**IF** (Param1 == RESULT_SUCCEEDED) Size of FPID x master count **ELSE** 0
Error Code	X	Error Code	Error code
Data	-	Data	**IF** (Param1 == RESULT_SUCCEEDED) Master list block **ELSE** 0

The FIM10 or FIM01 (or FIM20xx) has each different format for master list block. Before using CMD_GET_FP_LIST packet, check device information using CMD_GET_DEVICE_INFO.

This command will be obsolete in future. Instead, use CMD_GET_MASTER_LIST2 packet.

This command is only supported in FIM10.

CMD_READ_LOG_DATA

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x2A	Command	0x2A
Param1	Packet number = 0, 1, 2, 3, …	Param1	Packet number = 0, 1, 2, 3, … If last packet Packet number = 0xffff
Param2	X	Param2	Log data count = 256 Log data count <= 256 (last packet)

Data Size	0	Data Size	Log data size (28) x log data count
Error Code	X	Error Code	Error code
Data	-	Data	Log data

This command will be obsolete in future. Instead, use CMD_READ_LOG_DATA2 packet.

This command is only supported in FIM10.

CMD_READ_USER_DATA

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x2B	Command	0x2B
Param1	Address	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_PARAM RESULT_NOT_MASTER_MODE
Param2	User data length (byte)	Param2	**IF** (Param1 == RESULT_SUCCEEDED) User data length (byte) **ELSE** 0
Data Size	0	Data Size	**IF** (Param1 == RESULT_SUCCEEDED) User data length (byte) **ELSE** 0
Error Code	X	Error Code	Error code
Data	-	Data	**IF** (Param1 == RESULT_SUCCEEDED) User data **ELSE** -

CMD_WRITE_USER_DATA

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x2C	Command	0x2C
Param1	Address	Param1	RESULT_SUCCEEDED RESULT_FAILED

			RESULT_INVALID_PARAM RESULT_NOT_MASTER_MODE
Param2	User data length (byte)	Param2	X
Data Size	User data length	Data Size	0
Error Code	X	Error Code	Error code
Data	User Data	Data	-

CMD_ERASE_USER_DATA_BLOCK

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x2D	Command	0x2D
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE
Param2	X	Param2	X
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

CMD_DELETE_MASTER_PASSWORD

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x2E	Command	0x2E
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE
Param2	X	Param2	X
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

CMD_ENTER_MASTER_MODE2

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x2F	Command	0x2F
Param1	Master authentication type Master FP = 0	Param1	RESULT_SUCCEEDED RESULT_FAILED

	Master password = 1 FDA board password = 2 Null = 3 Master FP from host = 4 Master FP from host (FDA01 style) = 5 (FIM10 only)		RESULT_INVALID_DATASIZE RESULT_INVALID_DATA RESULT_NOT_IN_TIME RESULT_INVALID_PARAM RESULT_INVALID_ID RESULT_CANCELED RESULT_EXTRACT_FAIL

Param2	(Packet Index (0~N) << 8)
	
	    + (Max Packet Index N)
		Param2	<u>Master authentication type</u>
			
			    Master FP = 0
			
			    Master password = 1
			
			    FDA board password = 2
			
			    Null = 3
			
			    Master FP from host = 4
			
			    Master FP from host (FDA01 style) = 5
			
			    (FIM10 only)

Data Size	**IF** Master FP
	    Size (A fraction of FPID)
	ELSE IF master password
	    Size (A fraction of FPID + Password)
	ELSE IF device board password
	    Size (A fraction of password)
	ELSE IF Master FP from host
	    Size (A fraction of FPID + Template)
	ELSE IF null
	    0
		Data Size	0

Error Code	X	Error Code	Error code

Data	**IF** Master FP
	    A fraction of FPID
	ELSE IF master password
	    A fraction of FPID + Password
	ELSE IF device board password
	    A fraction of Password
	ELSE IF Master FP from host
		Data	-

	FPID + Template
	ELSE IF null
	-

The Command Packet with Param1=5 is supported in FIM10 firmware version1.10 or later

CMD_GET_FP_LIST2

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x30	Command	0x30
Param1	List data selection 0 = User count, ID list 1 = User count	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE RESULT_INVALID_PARAM RESULT_CANCELED
Param2	Packet Index (0~N)	Param2	**IF** (Param1 == RESULT_SUCCEEDED) (Packet Index (0~N) << 8) + (Max Packet Index N) **ELSE** -
Data Size	0	Data Size	**IF** (Param1 == RESULT_SUCCEEDED) Size of (a piece of FP list block) **ELSE** 0
Error Code	X	Error Code	Error code
Data	-	Data	A piece of FP list block

The FP list block may be different according to devices. Before using CMD_GET_FP_LIST2 packet, check device information using CMD_GET_DEVICE_INFO

FP list block consists of the number of user, the size of FPID, and user list if **Param1** of command packet is '0', or the number of user if **Param1** of command packet is '1'.

The structure of data is explained in Appendix F.

CMD_GET_MASTER_LIST2

COMMAND PACKET	ACKNOWLEDGEMENT PACKET

Command	0x31	Command	0x31
Param1	List data selection 0 = Master count, ID list 1 = Master count	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE RESULT_INVALID_PARAM RESULT_CANCELED
Param2	Packet index (0~N)	Param2	**IF** (Param1 == RESULT_SUCCEEDED) (Packet Index (0~N) << 8) + (Max Packet Index N) **ELSE** -
Data Size	0	Data Size	**IF** (Param1 == RESULT_SUCCEEDED) Size of (a piece of master list block) **ELSE** 0
Error Code	X	Error Code	Error code
Data	-	Data	A piece of master list block

The Master list block may be different according to devices. Before using CMD_GET_MASTER_LIST2 packet, check device information using CMD_GET_DEVICE_INFO

Master list block consists of the number of master, the size of FPID, and master list if **Param1** of command packet is '0', or the number of master if **Param1** of command packet is '1'.

The structure of data is explained in Appendix F.

CMD_READ_LOG_DATA2

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x32	Command	0x32
Param1	Log request mode 0 = **Param2** previous log read 1 = oldest unread log 2 = last written log 3 = All log 4 = from oldest unread to last	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE RESULT_INVALID_PARAM RESULT_CANCELED

Param2	IF Param1 == 0	Param2	IF (Param1 == RESULT_SUCCEEDED)
	Nth log		(Packet Index (0~N) << 8)
	ELSE IF Param1 == 3		+ (Max Packet Index N)
	Index(0~N)		ELSE
	ELSE IF Param1 == 4		-
	Index (0~N)		
	ELSE		
	0		
Data Size	0	Data Size	IF (Param1 == RESULT_SUCCEEDED)
			Size of a piece of Log data block
			ELSE
			0
Error Code	X	Error Code	Error code
Data	-	Data	IF (Param1 == RESULT_SUCCEEDED)
			Size of a piece of Log data block
			ELSE
			0

Log data block consists of the number of returned log, the size of log, and log data

Log data block = Log data count (2) + Log data size (2) + Log data size (28) x log data count

CMD_REGISTER_FP

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x33	Command	0x33
Param1	0 – User	Param1	RESULT_SUCCEEDED
	1 – Master		RESULT_FAILED
	Otherwise – Reserved		RESULT_INVALID_DATASIZE
			RESULT_INVALID_DATA
			RESULT_NOT_IN_TIME
			RESULT_INVALID_PARAM
			RESULT_USED_ID
			RESULT_DB_IS FULL
			RESULT_NOT_MASTER_MODE
			RESULT_ANOTHER_FINGER

			RESULT_CANCELED
			RESULT_EXTRACT_FAIL
Param2	Packet index 0x00 – Extract 1st Template from sensor with ID and password 0x10 – Extract 1st Template from sensor with auto-generated ID 0x01 – Extract 2nd Template from sensor & Save 0x02 – Extract 2nd Template from sensor & Save with different finger 0x03 – Extract 3rd Template from sensor (FIM01 & FIM20xx only) 0x04 – Extract 4th Template form sensor & save (FIM01 & FIM20xx only) 0x05 – Extract 4th Template from sensor & save with different finger (FIM01 & FIM20xx only)	Param2	**IF** (Param1 == RESULT_SUCCEEDED) && (((Packet index == 0x01 or 0x02) && (2 templates mode)) || ((Packet index == 0x11 or 0x12) && (4 templates mode))) 　　　Registered FP Count 　　　(Only valid if succeed) **ELSE** 　　0
Data Size	**IF** (Packet index == 0) 　　Size of (FPID + Password) **ELSE** 　　0	Data Size	0
Error Code	X	Error Code	Error Code
Data	**IF** (Packet index == 0) 　FPID + password **ELSE** 　　0	Data	-

The DB of user is saved only after executing command packet with Param2 value such as 0x01 or 0x02 in 2 templates mode, or 0x04 or 0x05 in 4 templates mode.

The function of enrolling user with different finger is supported In FIM01 & FIM20xx firmware version 1.20 or later and FIM10 firmware version 1.14 or later,

The 4 templates mode is supported in FIM01 and FIM20xx firmware version 1.30 or later.

CMD_CHANGE_FP

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x34	Command	0x34
Param1	0x01 – Change Master Privilege & Save 0x02 – Change Password & Save 0x03 – Change Verification Security Level & Save 0x10 – Change 1st template from host 0x11 – Change 2nd template from host Save 0x12 – Change 2nd template from host with different finger from 1st template Save 0x13 – Change 3rd template from host (FIM01/20 only) 0x14 – Change 4th template from host Save in 4 templates mode (FIM01/20 only) 0x15 – Change 4th template from host with different finger from 3rd template Save in 4 templates mode (FIM01/20 only) 0x20 – Change 1st template from sensor 0x21 – Change 2nd template form sensor Save in 2 templates mode 0x22 – Change 2nd template form sensor with different finger from 1st template Save in 2 templates mode 0x23 – Change 3rd template form sensor (FIM01/20 Only)	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_DATASIZE RESULT_INVALID_DATA RESULT_NOT_IN_TIME RESULT_INVALID_PARAM RESULT_INVALID_ID RESULT_NOT_MASTER_MODE RESULT_CANCELED RESULT_ANOTHER_FINGER RESULT_EXTRACT_FAIL

	0x24 – Change 4th template from sensor Save in 4 templates mode (FIM01/20 Only) 0x25 – Change 4th template form sensor with different finger from 3rd template Save in 4 templates mode (FIM01/20 Only) Others – reserved		
Param2	**IF** (Param1 == 0x01) 0 – set to normal user 1 – set to master **ELSE IF**(Param1 == 0x03) Verification Security Level (1~9) **ELSE** 0	Param2	X
Data Size	**IF** (Param2 == 0x02) Size of (FPID + Password) **ELSE IF** (Param2 == 0x10 or 0x11 or 0x12 or 0x13 or 0x14 or 0x15) Size of (FPID + Template) **ELSE IF** (Param2 == 0x01 or 0x03 or 0x20 or 0x21 or 0x22 or 0x23 or 0x24 or 0x25) Size of FPID **ELSE** 0	Data Size	0
Error Code	X	Error Code	Error Code
Data	**IF** (Param1 == 0x02) FPID + password **ELSE IF** (Param1 == 0x10 or 0x11 or 0x12 or 0x13 or 0x14	Data	-

or 0x15)	
FPID + Template	
ELSE IF (Param2 == 0x01 or 0x03	
or 0x20 or 0x21 or 0x22	
or 0x23 or 0x24 or 0x25)	
FPID	
ELSE	
0	

The structure of data is explained in Appendix F.

The function of one ID-different fingerprint change is supported In FIM01 and FIM20xx firmware version 1.20 or later,

The 4 templates mode is supported in firmware version 1.30 or later, and Values from 0x13 to 0x15 and from 0x23 to

0x25 in **Param1** are only valid in 4 templates mode

This command is supported in FIM30/32 firmware version 1.40 or later.

CMD_ADD_FP

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x35	Command	0x35

Param1	DB structure version
	
	0x01 – FIM_OLD_DB2 data structure
	
	0x02 – FIM_OLD_DB4 data structure
	
	0x11 – FIM_DB2 data structure
	     (NITGEN, ISO 19794-2, and
	      ANSI 378 format)
	
	0x12 – FIM_DB4 data structure
	     (NITGEN, ISO 19794-2, and
	      ANSI 378 format)
	
	Others – reserved
		Param1	RESULT_SUCCEEDED
			
			RESULT_FAILED
			
			RESULT_INVALID_DATASIZE
			
			RESULT_INVALID_DATA
			
			RESULT_INVALID_PARAM
			
			RESULT_USED_ID
			
			RESULT_DB_IS_FULL
			
			RESULT_NOT_MASTER_MODE
			
			RESULT_CANCELED
			
			RESULT_WRONG_TEMP_MODE

Param2	(Packet index (0~N) << 8) + (Max Packet Index N)	Param2	X
Data Size	Size (a piece of DB structure)	Data Size	0
Error Code	X	Error Code	Error Code
Data	A piece of DB structure	Data	-

The structure of data is explained in Appendix F.

Serial Protocol

This command is only supported in FIM01 and FIM20xx.

The value 2 in **Param1** is supported in firmware version 1.30 or later.

CMD_GET_FP

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x36	Command	0x36
Param1	Get operation 0 – FPID DB 1 – First DB 2 – Next DB Others – reserved	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_DATASIZE RESULT_INVALID_DATA RESULT_INVALID_PARAM RESULT_INVALID_ID RESULT_NOT_MASTER_MODE RESULT_CANCELED

Param2	DB structure version
	
	0x01 – FIM_OLD_DB2 data structure
	
	0x02 – FIM_OLD_DB4 data structure
	
	0x11 – FIM_DB2 data structure
	      (Template:-NITGEN format)
	
	0x12 – FIM_DB4 data structure
	      (Template:-NITGEN format)
	
	0x13 – FIM_DB2 data structure
	      (Template: ISO 19794-2 format)
	
	0x14 – FIM_DB2 data structure
	      (Template: ISO 19794-2 format)
	
	0x15 – FIM_DB2 data structure
	      (Template: ANSI 378 format)
	
	0x16 – FIM_DB2 data structure
	      (Template: ANSI 378 format)
	
	Others – reserved
		Param2	0

Data Size	**IF** (Param1 == 0)
	    Size of FPID
	ELSE
		Data Size	**IF** (Param1 == RESULT_SUCCEEDED)
			    Size of DB structure
			ELSE

	0		0
Error Code	X	Error Code	Error Code

Data	**IF** (Param1 == 0)
	
	    FPID
	
	ELSE
	
	    -
		Data	**IF** (Param1 == RESULT_SUCCEEDED)
			
			    DB structure
			
			ELSE
			
			    0

The structure of DB is explained in Appendix F.

This command is only supported in FIM01 and FIM20xx.

The value 2 in **Param2** (4 templates mode) is supported in firmware version 1.30 or later.

CMD_DELETE_ALL_LOG

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x37	Command	0x37
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE RESULT_CANCELED
Param2	X	Param2	X
Data Size	0	Data Size	0
Error Code	X	Error Code	Error Code

Serial Protocol

● CONFIGURATION

CMD_SET_OPP_OPTION

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x40	Command	0x40
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_PARAM RESULT_NOT_MASTER_MODE
Param2	Option value bit[23..16] = gain bit[15..8] = brightness bit[7..0] = contrast	Param2	Option value bit[23..16] = gain bit[15..8] = brightness bit[7..0] = contrast
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

This command is only supported in FIM10, FIM30 and FIM32.

CMD_GET_OPP_OPTION

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x41	Command	0x41
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE
Param2	X	Param2	**IF** (Param1 == RESULT_SUCCEEDED) Option value bit[23..16] = gain bit[15..8] = brightness bit[7..0] = contrast **ELSE** -
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

This command is only supported in FIM10, FIM30 and FIM32.

CMD_SET_SECURITY_LEVEL

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x42	Command	0x42
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_PARAM RESULT_NOT_MASTER_MODE
Param2	Verification security level bit[31..16] Identification security level Bit[15..0]	Param2	Verification security level bit[31..16] Identification security level Bit[15..0]
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

This command is only supported in FIM10, FIM30 and FIM32.

CMD_GET_SECURITY_LEVEL

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x43	Command	0x43
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE
Param2	X	Param2	**IF** (Param1 == RESULT_SUCCEEDED) Verification security level bit[31..16] Identification security level bit[15..0] **ELSE** -
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

This command is only supported in FIM10, FIM30 and FIM32.

Serial Protocol

CMD_SET_CAPTURE_OPTION

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x44	Command	0x44
Param1	0x00 -> Latent & Adaptive 0x01 -> Latent 0x02 -> Adaptive 0x08 -> Max number of Capture in Adaptive	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_FAILED RESULT_INVALID_PARAM RESULT_NOT_MASTER_MODE

Param2	**IF** (Param1 == 0x0 or 0x01 or0x02)
	
	    Turn Off = 0 / Turn On = 1
	Else IF (Param1 == 0x08)
	
	    Max number of capture in Adaptive
	ELSE
	
	    -
		Param2	**IF** (Command Param1 == 0x00 or
			
			    0x01 or 0x02)
			
			    Turn Off = 0 / Turn On = 1
			ELSE IF (Command Param1 == 0x08)
			
			    Max number of Capture in Adaptive
			ELSE
			
			    -

Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

This command is only supported in FIM10, FIM30 and FIM32.

The range of Max Number of Capture is from 0 to 255.

CMD_GET_CAPTURE_OPTION

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x45	Command	0x45
Param1	0x00 -> Reserved 0x01 -> Latent 0x02 -> Adaptive 0x08 -> Max number of Capture in Adaptive	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE

Param2	X	Param2	**IF** (Param1 == RESULT_SUCCEEDED)
			    IF (Command Param1 == 0x00 or
			      0x01 or 0x02)
			      Turn Off = 0 / Turn On = 1

			ELSE IF (Command Param1==0x08) Max number of capture in adaptive **ELSE** - **ELSE** -
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

This command is only supported in FIM10, FIM30 and FIM32.

CMD_SET_LOG_OPTION

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x48	Command	0x48
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_PARAM RESULT_NOT_MASTER_MODE
Param2	Disable = 0 / Enable = 1	Param2	Disable = 0 / Enable = 1
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

This command is only supported in FIM10, FIM30 and FIM32.

CMD_GET_LOG_OPTION

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x49	Command	0x49
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE
Param2	X	Param2	**IF** (Param1 == RESULT_SUCCEEDED) Disable = 0 / Enable = 1 **ELSE**

			-
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

This command is only supported in FIM10, FIM30 and FIM32.

CMD_SET_CAPTURE_PERIOD

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x4A	Command	0x4A
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_PARAM RESULT_NOT_MASTER_MODE
Param2	Capture period	Param2	Capture period (1 ~ 255)
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

This command is only supported in FIM10, FIM30 and FIM32.

CMD_GET_CAPTURE_PERIOD

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x4B	Command	0x4B
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE

Param2	X	Param2	**IF** (Param1 == RESULT_SUCCEEDED)
			
			    Capture period (1 ~ 255)
			ELSE
			
			    -

Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

This command is only supported in FIM10, FIM30 and FIM32.

Serial Protocol

CMD_SET_SYSINFO

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x4C	Command	0x4C
Param1	**SI_Type**	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_PARAM RESULT_NOT_MASTER_MODE
Param2	SI_Value	Param2	0

Data Size	0	Data Size	**IF** (Param1 == Succeeded)
			    Size (SI_INFO)
			ELSE
			    0

Error Code	X	Error Code	Error code

	-		**IF** (Param1 == Succeeded)
			    SI_INFO
			ELSE
			    -

SI_TYPE and **SI_INFO** is defined in Appendix F.

This command is only supported in FIM01 and FIM20xx.

Caution: Option value is changed temporary by this command. After power off, this value is changed to the previous value. If you want to keep new option value, send CMD_SAVE_SYSINFO command after changing option value.

CMD_GET_SYSINFO

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x4D	Command	0x4D
Param1	**SI_Type**	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_PARAM RESULT_NOT_MASTER_MODE
Param2	X	Param2	SI_Value
Data Size	0	Data Size	**IF** (Param1 == Succeeded) Size (SI_INFO)

		ELSE 0	
Error Code	X	Error Code	Error code
Data	-	Data	**IF** (Param1 == Succeeded) SI_INFO **ELSE** -

SI_TYPE and **SI_INFO** are defined in Appendix F.

This command is only supported in FIM01 and FIM20xx.

CMD_SAVE_SYSINFO

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x4E	Command	0x4E
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE
Param2	X	Param2	X
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

This command is only supported in FIM01 and FIM20xx.

CMD_CHG_NUM_OF_TEMP

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x4F	Command	0x4F
Param1	Number of Template (2 or 4)	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE RESULT_INVALID_PARAM RESULT_DB_ISNOT_EMPTY
Param2	X	Param2	X
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

After executing this command, option is saved by force.

This command is supported in FIM01 and FIM20xx firmware version 1.30 or later.

CMD_SET_DEFAULT_SYSINFO

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x50	Command	0x50
Param1	0	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_MASTER_MODE
Param2	0	Param2	0
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code
	-		-

This command is supported in FIM01 and FIM20xx firmware version 1.50 or later.

This command changes all options to default value except the following options.

SI_NUM_OF_TEMP

SI_CHANNEL0_BAUDRATE

SI_CHANNEL1_BAUDRATE

SI_ENABLE_CHANNEL1

Caution) This command does not save the changed option value. So to save options, use CMD_SAVE_SYSINFO.

● SYSTEM MANAGEMENT

CMD_GET_FP_IMAGE

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x60	Command	0x60
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_IN_TIME
Param2	Packet number = 0, 1, 2, …	Param2	Packet number
Data Size	0	Data Size	**IF** (Param1 == RESULT_SUCCEEDED) Size of image data block **ELSE** 0
Error Code	X	Error Code	Error code
Data	-	Data	**IF** (Param1 == RESULT_SUCCEEDED) Image data block **ELSE** -

This command will be obsolete in future. Instead, use CMD_GET_FP_IMAGE2 packet.

This command is only supported in FIM10.

CMD_STATUS_CHECK

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x62	Command	0x62
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED
Param2	X	Param2	STATUS = IDLE (0x00) BUSY (0x01) : Current executed command DB_UPLOADING (0x03) : During power-up operation, a device

			isn't ready to communicate AUTO_IDENTIFY_MODE (0x04) : Device is in Auto-Identify-mode.
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code
Data	-	Data	-

DB_UPLOADING in acknowledgement packet is only supported in FIM01 and FIM20xx.

CMD_GET_FP_IMAGE2

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x63	Command	0x63
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_IN_TIME RESULT_CANCELED
Param2	Packet index (0~N)	Param2	**IF** (Param1 == RESULT_SUCCEEDED) (Packet Index (0~N) << 8 + (Max Packet Index N) **ELSE** 0
Data Size	0	Data Size	**IF** (Param1 == RESULT_SUCCEEDED) Size of (a piece of image data block) **ELSE** 0
Error Code	X	Error Code	Error code
Data	-	Data	**IF** (Param1 == RESULT_SUCCEEDED) A piece of image data block **ELSE** -

CMD_UPGRADE_FIRMWARE2

COMMAND PACKET	ACKNOWLEDGEMENT PACKET

Command	0x64	Command	0x64
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_PARAM RESULT_CANCELED
Param2	(Packet Index (0~N) << 8) + (Max Packet Index N-1)	Param2	Command packet param2 value
Data Size	Size of (a fragment of Firmware data block)	Data Size	0
Error Code	X	Error Code	Error code
Data	Firmware data block	Data	-

Each firmware data block consists of the total size of firmware and a portion of firmware data. (Refer to Appendix F)

CMD_SET_TIME

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x65	Command	0x65
Param1	X	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_DATASIZE RESULT_INVALID_DATA RESULT_CANCELED
Param2	X	Param2	0
Data Size	Size of TIME_INFO	Data Size	0
Error Code	X	Error Code	Error code
Data	TIME_INFO	Data	-

TIME_INFO data structure is defined in Appendix F

This command is only supported in FIM01 and FIM20xx.

CMD_GET_TIME

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x66	Command	0x66
Param1	X	Param1	RESULT_SUCCEEDED

			RESULT_FAILED
			RESULT_CANCELED
Param2	X	Param2	0

Data Size	0	Data Size	**IF** (Param1 == RESULT_SUCCEEDED)
			
			    Size of TIME_INFO
			
			ELSE
			
			    0

Error Code	X	Error Code	Error code

Data	-	Data	**IF** (Param1 == RESULT_SUCCEEDED)
			
			    TIME_INFO
			
			ELSE
			
			    -

TIME_INFO data structure is defined in Appendix F

This command is only supported in FIM01 and FIM20xx.

CMD_CTL_IO

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x67	Command	0x67
Param1	Selection of GPIO 0x01 – Sensor LED 0x40 – Relay Channel 0 (FIM01 & FIM20 Only) 0x41 – Relay Channel 1 (FIM01 & FIM20 Only) Others – Reserved	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_INVALID_PARAM RESULT_CANCELED
Param2	Value 0 – Low/Off 1 – High/On	Param2	0
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code
Data	-	Data	-

CMD_GET_IMAGE_QUALITY

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x68	Command	0x68
Param1	0	Param1	RESULT_SUCCEEDED RESULT_FAILED
Param2	0	Param2	Quality Value
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code
	-		-

This command is only supported in FIM01 and FIM20xx firmware version 1.50 or later, FIM30 and FIM32.

This command returns image quality after using the following commands.

> CMD_VERIFY_FP
>
> CMD_IDENTIFY_FP
>
> CMD_INSTANT_MATCHING
>
> CMD_GET_TEMPLATE
>
> CMD_GET_FP_IMAGE2
>
> CMD_ENTER_MASTER_MODE2
>
> CMD_REGISTER_FP
>
> CMD_CHANGE_FP

For other commands, the value of image quality is invalid.

The quality range is from 0 (low quality) to 100 (high quality).

Notice

'X' means "don't care", so you can send any value. But for future compatibility, we recommend that you send '0'.

Appendix F. DATA STURCTURE

(FIM30, FIM32, FIM01, FIM20)

In this chapter, the structure of data block to be transmitted is explained.

According to the device, the variables are defined as the following.

> FIM30 or FIM32
>
>> LENGTH_OF_FPID = 10
>>
>> LENGTH_OF_PASSWD = 16
>>
>> LENGTH_OF_TEMPLATE_HEADER=0
>>
>> LENGTH_OF_TEMPLATE_DATA = 400
>
> FIM01 or FIM20xx
>
>> LENGTH_OF_FPID = 11
>>
>> LENGTH_OF_PASSWD = 16
>>
>> LENGTH_OF_TEMPLATE_HEADER=4
>>
>> LENGTH_OF_TEMPLATE_DATA = 400

Caution) FPID and Password are string. So the last byte is null (0x00). The available size of FPID is (LENGTH_OF_FPID – 1), and the available size of password is (LENGTH_OF_PASSWD – 1).

1. The structure of a FPID

> **Structure   {**
>
>> **UINT8 FPID[LENGTH_OF_FPID];**
>
>> **} ID_INFO**

2. The structure of a password

> **Structure   {**
>
>> **UINT8 FPPassword[LENGTH_OF_PASSWD];**
>
>> **} PASSWORD_INFO**

3. The structure of TEMPLATE_INFO

TEMPLATE_INFO consists of TEMPLATE Header and Template Data.

For NITGEN Format:

> **Structure   {**

UINT8 Header[LENGTH_OF_TEMPLATE_HEADER];

UINT8 Data[LENGTH_OF_TEMPLATE_DATA];

} TEMPLATE_INFO

For ISO 19794-2 Format or ANSI 378 Format:

Structure   {

UINT8 Header[LENGTH_OF_TEMPLATE_HEADER];

UINT8 Data[Length of data];

} TEMPLATE_INFO

"Length of data" varies according to the contents of ISO 19794-2 template data or ANSI 378 template data.

Template Header is defined as followings (For FIM01 or FIM20):

0x00 0x00 0x00 0x03 : NITGEN Data Format

0x00 0x00 0x01 0x00:   ISO 17974-2 Format

4. The structure of a "FPID + Password"

Structure   {

ID_INFO FPID;

PASSWORD_INFO FPPassword;

}

5. The structure of a "FPID + Template"

Structure   {

ID_INFO FPID;

TEMPLATE_INFO FPTemplate;

}

6. The structure of a "FPID + Template Index"

Structure   {

ID_INFO FPID;

UINT8 Template_Index;

}

7. The structure of a "FPID + User type"

> **Structure** **{**
>
>> **ID_INFO FPID;**
>>
>> **UINT8 Right;**   **// Normal User:0　Master: 1**
>
> **}**

8. The structure of a list block used in CMD_GET_FP_LIST, CMD_GET_MASTER_LIST

> **Structure** **{**
>
>> **ID_INFO FPID_1;**
>>
>> **ID_INFO FPID_2;**
>>
>>> **...**
>>
>> **ID_INFO FPID_N;**
>
> **}**

9. The structure of a log block used in CMD_READ_LOG_DATA

> **Structure** **{**
>
>> **UINT8 LogDB_1[28];**
>>
>> **UINT8 LogDB_2[28];**
>>
>>> **...**
>>
>> **UINT8 LogDB_N[28];**
>
> **}**

10. The structure of a list block used in CMD_GET_FP_LIST2, CMD_GET_MASTER_LIST2

if Param1 == 0

> **Structure** **{**
>
>> **UINT16 User_Number;**   **// for example, N**
>>
>> **UINT16 ID_Size;**   **// FIM10: 10　　FIM01 or FIM20xx: 11**
>>
>> **ID_INFO FPID_1;**
>>
>> **ID_INFO FPID_2;**
>>
>>> **...**
>>
>> **ID_INFO FPID_N;**
>
> **}**

else if Param1 == 1

      Structure   **{**

            UINT16 User_Number;   **// for example, N**

        }

11. The structure of a log block used in CMD_READ_LOG_DATA2

      Structure   **{**

            UINT16 Log_Number;   **// for example, N**

            UINT16 Log_Size;

            UINT8 LogDB_1[28];

            UINT8 LogDB_2[28];

               …

            UINT8 LogDB_N[28];

        }

12. The structure of a firmware block used in CMD_UPGRADE_FIRMWARE2
(Refer to Appendix H)

      Structure   **{**

            UINT32 Firmware_Size;   **// for example, N = M1+M2+ … + Mn**

            UINT8 Firmware[M*];   **// 1 ≤ M* ≤ 32768**

        }

13. The structure of a TIME_INFO used in CMD_SET_TIME and CMD_GET_TIME

      Structure   **{**

            UINT8 HundredthYear;   **// hundredth Year**

            UINT8 Year;   **// Remain Year**

            UINT8 Month;   **// Month: from 1 to 12**

            UINT8 Date;   **// Date: from 1 to 31**

            UINT8 Hour;   **// Hour: form 0 to 23**

            UINT8 Minute;   **// Minute: form 0 to 59**

            UINT8 Second;   **// Second: form 0 to 59**

            UINT8 Reserved;   **//**

        } TIME_INFO

All data is BCD code.

14. SI_TYPE used in CMD_SET_SYSINFO and CMD_GET_SYSINFO

Code	System Information	Value Range	Default Value	
0x01	SI_USING_RELAY†	True/False	False	
0x02	SI_USING_LOG	True/False	True	
0x03	SI_NUM_OF_TEMP†	2, 4	2	
0x10	SI_WIEGAND_FORMAT†	0 – No Out 1 – 26 bits 2 – 34 bits	0	
0x11	SI_WIEGAND_SITECODE†		0x0000	
0x17	SI_IDENTIFY_TIMEOUT	255 or 10 ~ 250	255 (Unlimited)	
0x18	SI_RELAY_TIME†	0 or 1~100	10	100ms ticks
0x19	SI_CAPTURE_TIMEOUT	$\geq$ 10	50	100ms ticks (FIM01/20)
		$\geq$ 1	255	1s ticks (FIM30/32)
0x20	SI_IMAGE_BRIGHTNESS	0~100	45	100 - brightest
0x21	SI_IMAGE_GAIN	1,2,4,8	2	
0x22	SI_IMAGE_CONTRAST	0~100	20	
0x28	SI_ADAPTIVE_CAPTURE	True/False	False	
0x30	SI_VERIFY_SECURITY_LEVEL	1~9	5	
0x31	SI_IDENTIFY_SECURITY_LEVEL	6~9	8	
0x32	SI_REGISTER_QUALITY	30~100	40	
0x33	SI_VERIFY_QUALITY	10~100	30	
0x38	SI_USING_LATENT	True/False	False	
0x40	SI_ENABLE_CHANNEL1†	True/False	False	
0x48	SI_CHANNEL0_BAUDRATE†	0 – 115200 1 – 57600	4	

		2 – 38400		
		3 – 19200		
		4 – 9600		
0x49	SI_CHANNEL1_BAUDRATE†	"	4	
0x4A	SI_CURR_CHANNEL_BAUDRATE†	"		
0x50	SI_MAX_USER†			
0x51	SI_FP_FULL_ROTATION	True/False	False	

$^{†:}$ FIM01 & FIM20 Only options

"**True**" means '1' and "**False**" means '0'.

SI_MAX_USER is only supported in command CMD_GET_SYSINFO.

SI_USING_RELAY is option for relay control. When this option is true, relay signals are come out.

SI_USING_LOG is option for the function of saving log. When this option is true, log is saved.

SI_NUM_OF_TEMP is option for current template mode.
When this option is 2, 1-ID 2-template mode is selected. When this option is 4, 1-ID 4-template mode is selected. Other values are not permitted.
To change SI_NUM_OF_TEMP, use CMD_CHG_NUM_OF_TEMP (0x4F).

SI_WIEGAND_FORMAT is option for wiegand data format.

SI_WIEGAND_SITECODE is option for wiegand site code for wiegand output.

SI_IDENTIFY_TIMEOUT is option for identification timeout. By setting this value, you can shorten the time for unregistered user. The default value is 255 that means un-limited timeout.

SI_RELAY_TIME is option for active pulse width of relay.

SI_CAPTURE_TIMEOUT is option for capture period.

SI_IMAGE_BRIGHTNESS, SI_IMAGE_GAIN, and SI_IMAGE_CONTRAST are options for

image option.

SI_ADAPTIVE_CAPTURE is option for enhanced image. If this option is true, module tries to get better image, but takes more capture time.

SI_VERIFY_SECURITY_LEVEL is option for security level for verification.

SI_IDENTIFY_SECURITY_LEVEL is option for security level for identification. Normally identification requires more security level than verification.

SI_REGISTER_QUALILY is option for the required area quality of image when user is registered.

SI_VERIFY_QUALITY is option for the required area quality of image when user tries to identify or verify.

SI_USING_LATENT is option for latent detective mode. If this option is true, module tries to check latent image, but takes more capture time.

SI_ENABLE_CHANNEL1 is option for the operation mode of auxiliary UART port when module supports more than one UART ports.

SI_CHANNEL0_BAUDRATE is option for the speed of default UART port.

SI_CHANNEL1_BAUDRATE is option for the speed of auxiliary UART port.

SI_MAX_USER is option for the max user capacity of module.

SI_FP_FULL_ROTATION is option for fingerprint rotation mode. If this option is false, module tries to match fingers within $\pm45°$. But if this option is true, module tires to match fingers in full-rotation mode.

15. DB structure used in CMD_SET_SYSINFO and CMD_GET_SYSINFO

```
Structure    {

            UINT32   SI_TYPE;

            UINT32   SI_VALUE

      } SI_INFO
```

16. DB structure used in CMD_ADD_FP

Old Format:

```
Structure    {

            UINT8   Right;                          // Normal User:0   Master: 1

            ID_INFO FIID;                           // user ID

            PASSWOR_DINFO   FPPasswd;               // Password

            TEMPLATE_INFO FPTemplate1;              // 1st Template

            TEMPALTE_INFO FPTemplate2;              // 2nd Template

            TIME_INFO Time;                         // Time Information

      } FIM_OLD_DB2
```

```
Structure    {

            UINT8   Right;                          // Normal User:0   Master: 1

            ID_INFO   FPID;                         // user ID

            PASSWORD_INFO FPPasswd;                 // Password

            TEMPLATE_INFO FPTemplate1;              // 1st Template

            TEMPLATE_INFO FPTemplate2;              // 2nd Template

            TEMPLATE_INFO FPTemplate3;              // 3rd Template

            TEMPLATE_INFO FPTemplate4;              //4th Template

            TIME_INFO Time;                         // Time Information

      } FIM_OLD_DB4
```

New Format:

```
Structure    {

            UINT8 Header[4];                        // Data Header

            UINT8   Right;                          // Normal User:0   Master: 1

            ID_INFO FIID;                           // user ID
```

PASSWOR_DINFO FPPasswd;	// Password
UINT8 SecuLevelInfo;	// 0xFC: Using user security Level
	// Others: reserved
UINT8 UserSecuLevel;	// User Verification security Level
UINT8 Reserved[6];	// Reserved area for future use
TIME_INFO Time;	// Time Information
SIZE_INFO FPSize1;	// size of FPTemplate1
SIZE_INFO FPSize2;	// size of FPTemplate2
TEMPLATE_INFO FPTemplate1;	// 1st Template
TEMPALTE_INFO FPTemplate2;	// 2nd Template

} FIM_DB2

Reserved area must be set full 0xFF.

Structure   {

UINT8 Header[4];	// Data Header
UINT8 Right;	// Normal User:0 Master: 1
ID_INFO FPID;	// user ID
PASSWORD_INFO FPPasswd;	// Password
UINT8 SecuLevelInfo;	// 0xFC: Using user security Level
	// Others: reserved
UINT8 UserSecuLevel;	// User Verification security Level
UINT8 Reserved[6]	// Reserved area for future use
TIME_INFO Time;	// Time Information
SIZE_INFO FPSzie1;	// size of FPTempalte1
SIZE_INFO FPSize2;	// size of FPTemplate2
SIZE_INFO FPSize3;	// size of FPTemplate3
SIZE_INFO FPSize4;	// size of FPTemplate4
TEMPLATE_INFO FPTemplate1;	// 1st Template
TEMPLATE_INFO FPTemplate2;	// 2nd Template
TEMPLATE_INFO FPTemplate3;	// 3rd Template
TEMPLATE_INFO FPTemplate4;	//4th Template

} FIM_DB4

Reserved area must be set full 0xFF.

```
Structure    {

              UINT8   Size_H;                    // MSB 8 bits

              UINT8   Size_L;                    // LSB 8 bits

        } SIZE_INFO
```

Size = (**Size_H** x 256) + **Size_L**

Header has the following values

"**0xC1 0x00 0x00 0x00**" – FIM_DB2 with NITGEN format data

"**0xC1 0x01 0x00 0x00**" – FIM_DB2 with ISO 19794-2 format data

"**0xC1 0x02 0x00 0x00**" – FIM_DB2 with ANSI 378 format data

"**0xC2 0x00 0x00 0x00**" – FIM_DB4 with NITGEN format data

"**0xC2 0x01 0x00 0x00**" – FIM_DB4 with ISO 19794-2 format data

"**0xC2 0x02 0x00 0x00**" – FIM_DB4 with ANSI 378 format data

In ISO 91794-2 format, the maximum number of minutiae supported in FIM is 80.

Appendix G. EXAMPLES

In this chapter, communication method is explained with examples. These examples are made for FIM10. For FIM01 case, you should consider the difference of LENGTH_OF_FPID.

1. Request Connection

For checking serial connection, use "Request Connection" command. For explanation on real packet data, assume that the device has 10 users in DB. The following figure shows the sequence of packets, and the contents of packets.
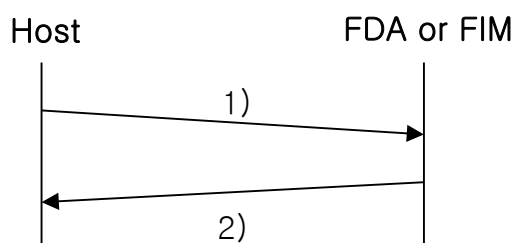
Figure E.1 The sequence of Request Connection

1) The structure of CMD_REQUEST_CONNECTION command packet

The following table shows the command packet made in the host. (Refer to Appendix D)

Command	0x00000001
Param1	0x00000000
Param2	0x00000000
Data Size	0x00000000
Error Code	0x00000000
Header Checksum	0x00000001

The following table shows the sequence of data to be transmitted to the device.

7E	00 00 00 01	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 01

2) Acknowledgement packet

In response to CMD_REQUEST_CONNECTION packet from host, the device sends acknowledgement packet meaning a success as the following. (Refer to Appendix D)

Command	0x00000001
Param1	0x00000001

Param2	0x0000000A
Data Size	0x00000000
Error Code	0x00000000
Header Checksum	0x0000000C

If the host gets the following packet, it means that the communication was successfully done.

7E	00 00 00 01	00 00 00 01	00 00 00 0A	00 00 00 00	00 00 00 00	00 00 00 0C

2. User Enrollment

There are two methods in registering user. The first method is the use of CMD_ENTROLL_FP_STEP1 and CM_ENROLL_FP_STEP2. And the second method is the use of CMD_REGISTER_FP. The second is only supported in FIM10, FIM01 and FIM20xx. The CMD_REGISTER_FP is recommended because CMD_ENROLL_FP_SETP1 and CMD_ENROLL_FP_STEP2 are to be obsolete. In FIM01 and FIM20xx, CMD_REGISTER_FP_STEP1 and CMD_REGISTER_FP_STEP2 is not supported.

2.1 Using CMD_ENROLL_FP_STEP1 & CMD_ENROLL_FP_STEP2

2.1.1 Enrolling normal user

Assume that a device has 10 users in DB. The following figure shows the sequence of enrolling user with the ID '1234'.
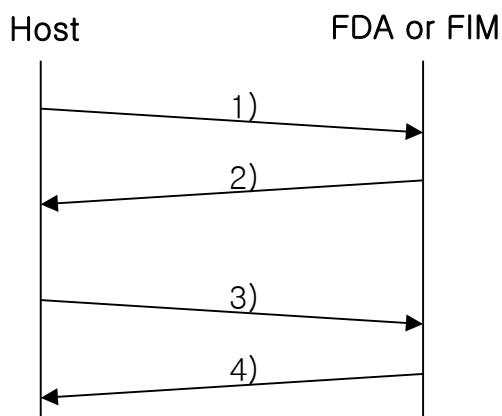
그림 E.2 The sequence of enrollment

1) The structure of CMD_ENROLL_FP_STEP1 command packet

The following table shows the command packet made in the host. (Refer to Appendix D)

Serial Protocol

Command	0x00000020								
Param1	0x00000000								
Param2	0x00000000								
Data Size	0x0000000A								
Error Code	0x00000000								
Header Checksum	0x0000002A								
Data	0x31	0x32	0x33	0x34	0x00	0x00	0x00	0x00	0x00	0x00
Data Checksum	0x000000CA								

As sending a packet to the device, data should be sent in big endian sequence after the start byte (0x7E).

7E	00 00 00 20	00 00 00 00	00 00 00 00	00 00 00 0A	00 00 00 00	00 00 00 2A

31 32 33 34 00 00 00 00 00 00	00 00 00 CA

2) Acknowledgement packet

In response to CMD_ENROLL_FP_STEP1 packet from host, the device sends acknowledgement packet meaning a success as the following. (Refer to Appendix D)

Command	0x00000020
Param1	0x00000001
Param2	0x00000000
Data Size	0x00000000
Error Code	0x00000000
Header Checksum	0x00000021

If the host gets the following packet, it means that the communication was successfully done.

7E	00 00 00 20	00 00 00 01	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 21

3) The structure of CMD_ENROLL_FP_STEP2 command packet

If the acknowledgement packet to the CMD_ENROLL_FP_STEP1 is returned successfully, the host sends CMD_ENROLL_FP_STEP2 command packet as the following. (Refer to Appendix D)

7E	00 00 00 21	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 21

4) Acknowledgement packet

In response to CMD_ENROLL_FP_STEP2 packet from host, the device sends acknowledgement packet as the

following meaning a success. (Refer to Appendix D)

7E	00 00 00 21	00 00 00 01	00 00 00 0B	00 00 00 00	00 00 00 00	00 00 00 2D

2.1.2 Enrolling Master (Supported in FIM10 series)

Assume that a device has 10 users in DB. The following description explains the sequence of enrolling master with the ID '1234'.

1) The structure of CMD_ENROLL_FP_STEP1 command packet

The following table shows the command packet made in the host. (Refer to Appendix D)

Command	0x00000020								
Param1	0x00000001								
Param2	0x00000000								
Data Size	0x0000000A								
Error Code	0x00000000								
Header Checksum	0x0000002B								
Data	0x31	0x32	0x33	0x34	0x00	0x00	0x00	0x00	0x00	0x00
Data Checksum	0x000000CA								

The following table shows the sequence of data to be transmitted to the device.

7E	00 00 00 20	00 00 00 01	00 00 00 00	00 00 00 0A	00 00 00 00	00 00 00 2B

31 32 33 34 00 00 00 00 00 00	00 00 00 CA

2) Acknowledgement packet

In response to CMD_ENROLL_FP_STEP1 packet from host, the device sends acknowledgement packet meaning a success as the following. (Refer to Appendix D)

Command	0x00000020
Param1	0x00000001
Param2	0x00000000
Data Size	0x00000000
Error Code	0x00000000
Header Checksum	0x00000021

If the host gets the following packet, it means that the communication was successfully done.

7E	00 00 00 20	00 00 00 01	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 21

3) The structure of CMD_ENROLL_FP_STEP2 command packet

If the acknowledgement packet to the CMD_ENROLL_FP_STEP1 is returned successfully, the host sends CMD_ENROLL_FP_STEP2 command packet as the following. (Refer to Appendix D)

7E	00 00 00 21	00 00 00 01	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 22

4) Acknowledgement packet

In response to CMD_ENROLL_FP_STEP2 packet from host, the device sends acknowledgement packet as the following meaning a success. (Refer to Appendix D)

7E	00 00 00 21	00 00 00 01	00 00 00 0B	00 00 00 00	00 00 00 00	00 00 00 2D

2.2 Using CMD_REGISTER_FP (Supported in FIM10 , FIM01 or FIM20xx series)

Using this single command, The FIM10, FIM01 and FIM20xx support fingerprint, password, and master privilege setting in registration.

Caution: This example is for FIM10.

2.2.1 Enrolling Normal User

Assume that a device has 10 users in DB. The following description explains the sequence of registering normal user with the ID '1234' and the password "5678".

1) The structure of CMD_REGISTER_FP command packet

The following table shows the command packet made in the host. (Refer to Appendix D)

Command	0x00000033
Param1	0x00000000
Param2	0x00000000
Data Size	0x0000001A
Error Code	0x00000000
Header Checksum	0x0000004D

Data	0x31	0x32	0x33	0x34	0x00	0x00	0x00	0x00	0x00	0x00
	0x35	0x36	0x37	0x38	0x00	0x00	0x00	0x00	0x00	0x00
	0x00	0x00	0x00	0x00	0x00	0x00				
Data Checksum	0x000001A4									

The following table shows the sequence of data to be transmitted to the device.

7E	00 00 00 33	00 00 00 00	00 00 00 00	00 00 00 1A	00 00 00 00	00 00 00 4D

31 32 33 34 00 00 00 00 00 00 35 36 37 38 00 00 00 00 00 00 00 00 00 00 00 00	00 00 01 A4

2) Acknowledgement packet

In response to CMD_REGISTER_FP packet from host, the device sends acknowledgement packet meaning a success as the following. (Refer to Appendix D)

Command	0x00000033
Param1	0x00000001
Param2	0x00000000
Data Size	0x00000000
Error Code	0x00000000
Header Checksum	0x00000034

If the host gets the following packet, it means that the communication was successfully done.

7E	00 00 00 33	00 00 00 01	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 34

3) The structure of CMD_REGISTER_FP command packet

If the acknowledgement packet to the first CMD_REGISTER_FP is returned successfully, the host sends the second CMD_REGISTER_FP command packet as the following. (Refer to Appendix D)

7E	00 00 00 33	00 00 00 00	00 00 00 01	00 00 00 00	00 00 00 00	00 00 00 34

4) Acknowledgement packet

In response to CMD_REGISTER_FP packet from host, the device sends acknowledgement packet as the following meaning a success. (Refer to Appendix D)

7E	00 00 00 33	00 00 00 01	00 00 00 0B	00 00 00 00	00 00 00 00	00 00 00 3F

2.2.2 Registering Master

Assume that a device has 10 users in DB. The following description explains the sequence of registering master with the ID '1234' and the password "5678".

1) The structure of CMD_REGISTER_FP command packet

The following table shows the command packet made in a host. (Refer to Appendix D)

Command	0x00000033									
Param1	0x00000001									
Param2	0x00000000									
Data Size	0x0000001A									
Error Code	0x00000000									
Header Checksum	0x0000004E									
Data	0x31	0x32	0x33	0x34	0x00	0x00	0x00	0x00	0x00	0x00
	0x35	0x36	0x37	0x38	0x00	0x00	0x00	0x00	0x00	0x00
	0x00	0x00	0x00	0x00	0x00	0x00				
Data Checksum	0x000001A4									

The following table shows the sequence of data to be transmitted to the device.

7E	00 00 00 33	00 00 00 01	00 00 00 00	00 00 00 1A	00 00 00 00	00 00 00 4E

31 32 33 34 00 00 00 00 00 00 35 36 37 38 00 00 00 00 00 00 00 00 00 00 00 00	00 00 01 A4

2) Acknowledgement packet

In response to CMD_REGISTER_FP packet from host, the device sends acknowledgement packet meaning a success as the following. (Refer to Appendix D)

Command	0x00000033
Param1	0x00000001
Param2	0x00000000
Data Size	0x00000000
Error Code	0x00000000
Header Checksum	0x00000034

If the host gets the following packet, it means that the communication was successfully done.

7E	00 00 00 33	00 00 00 01	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 34

3) The structure of CMD_REGISTER_FP command packet

If the acknowledgement packet to the first CMD_REGISTER_FP is returned successfully, the host sends the second CMD_REGISTER_FP command packet as the following. (Refer to Appendix D)

7E	00 00 00 33	00 00 00 01	00 00 00 01	00 00 00 00	00 00 00 00	00 00 00 35

4) Acknowledgement packet

In response to CMD_REGISTER_FP packet from host, the device sends acknowledgement packet as the following meaning a success. (Refer to Appendix D)

7E	00 00 00 33	00 00 00 01	00 00 00 0B	00 00 00 00	00 00 00 00	00 00 00 3F

2.2.3 Enrolling Normal User with different finger

Assume that a device has 10 users in DB. The following description explains the sequence of registering normal user with the different finger and the ID '1234' and the password "5678".

The function is supported In FIM01 and FIM20xx firmware version 1.20 or later

1) The structure of CMD_REGISTER_FP command packet

This step is the same process with enrolling normal user

7E	00 00 00 33	00 00 00 00	00 00 00 00	00 00 00 1A	00 00 00 00	00 00 00 4D

31 32 33 34 00 00 00 00 00 00 35 36 37 38 00 00 00 00 00 00 00 00 00 00 00 00	00 00 01 A4

2) Acknowledgement packet

If the host gets the following packet, it means that the communication was successfully done.

7E	00 00 00 33	00 00 00 01	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 34

3) The structure of CMD_REGISTER_FP command packet

If the acknowledgement packet to the first CMD_REGISTER_FP is returned successfully, the host sends the second CMD_REGISTER_FP command packet as the following.

In order to enroll different finger with same ID, param2 of command packet have to be set in 2.

7E	00 00 00 33	00 00 00 00	**00 00 00 02**	00 00 00 00	00 00 00 00	00 00 00 35

4) Acknowledgement packet

In response to CMD_REGISTER_FP packet from host, the device sends acknowledgement packet as the following meaning a success. (Refer to Appendix D)

7E	00 00 00 33	00 00 00 01	00 00 00 0B	00 00 00 00	00 00 00 00	00 00 00 3F

3. User Deletion

Two deletion commands such as CMD_DELETE_FP for deleting a single user and CMD_DELETE_ALL_FP for deleting all users are supported. For example, assume that a device has 10 users in DB. The following description shows the sequence of deleting user that has the ID '1234'.
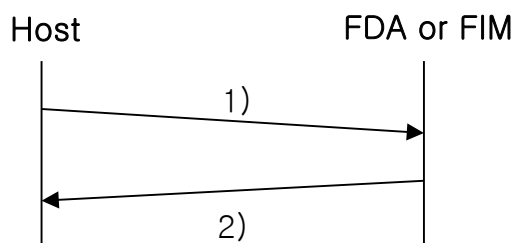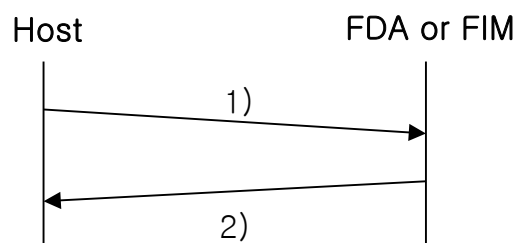

Figure E.3 The sequence of deletion

1) The structure of CMD_DELETE_FP command packet

The following table shows the command packet made in the host. (Refer to Appendix D)

Command	0x00000022									
Param1	0x00000000									
Param2	0x00000000									
Data Size	0x0000000A									
Error Code	0x00000000									
Header Checksum	0x0000002C									
Data	0x31	0x32	0x33	0x34	0x00	0x00	0x00	0x00	0x00	0x00
Data Checksum	0x000000CA									

The following table shows the sequence of data to be transmitted to the device.

7E	00 00 00 22	00 00 00 00	00 00 00 00	00 00 00 0A	00 00 00 00	00 00 00 2C

31 32 33 34 00 00 00 00 00 00	00 00 00 CA

2) Acknowledgement packet

In response to CMD_DELETE_FP packet from host, the device sends acknowledgement packet meaning a success as the following. (Refer to Appendix D)

Command	0x00000022
Param1	0x00000001
Param2	0x00000009
Data Size	0x00000000
Error Code	0x00000000
Header Checksum	0x0000002C

If the host gets the following packet, it means that the communication was successfully done.

7E	00 00 00 22	00 00 00 01	00 00 00 09	00 00 00 00	00 00 00 00	00 00 00 2C

4. Authentication

There are two methods for authentication – verification for 1:1 authentication and identification for 1:N authentication.

4.1 Verification (1:1 Authentication)

The device supports user verification with fingerprint or password. But password verification is only supported in FIM10 series.

4.1.1 Verification with fingerprint

The following description shows the sequence of verifying user that has the ID '1234'.

Figure E.4 The sequence of verification

1) The structure of CMD_VERIFY_FP command packet

The following table shows the command packet made in the host. (Refer to Appendix D)

Command	0x00000011									
Param1	0x00000000									
Param2	0x00000000									
Data Size	0x0000000A									
Error Code	0x00000000									
Header Checksum	0x0000001B									
Data	0x31	0x32	0x33	0x34	0x00	0x00	0x00	0x00	0x00	0x00
Data Checksum	0x000000CA									

The following table shows the sequence of data to be transmitted to the device.

7E	00 00 00 11	00 00 00 00	00 00 00 00	00 00 00 0A	00 00 00 00	00 00 00 1B

31 32 33 34 00 00 00 00 00 00	00 00 00 CA

2) Acknowledgement packet

In response to CMD_VERIFY_FP packet from host, the device sends acknowledgement packet meaning a success as the following. (Refer to Appendix D)

Command	0x00000011
Param1	0x00000001
Param2	0x00000000
Data Size	0x00000000
Error Code	0x00000000
Header Checksum	0x00000012

If the host gets the following packet, it means that the communication was successfully done.

7E	00 00 00 11	00 00 00 01	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 12

4.1.2 Verification with password

The following description shows the sequence of verifying user that has the ID '1234' and the password '5678'.

1) The structure of CMD_VERIFY_FP command packet

The following table shows the command packet made in the host. (Refer to Appendix D)

Command	0x00000011									
Param1	0x00000001									
Param2	0x00000000									
Data Size	0x00000010									
Error Code	0x00000000									
Header Checksum	0x00000022									
Data	0x35	0x36	0x37	0x38	0x00	0x00	0x00	0x00	0x00	0x00
	0x00	0x00	0x00	0x00	0x00	0x00				
Data Checksum	0x000000DA									

The following table shows the sequence of data to be transmitted to the device.

7E	00 00 00 11	00 00 00 01	00 00 00 00	00 00 00 10	00 00 00 00	00 00 00 22

35 36 37 38 00 00 00 00 00 00 00 00 00 00 00 00	00 00 00 DA

2) Acknowledgement packet

In response to CMD_VERIFY_FP packet from host, the device sends acknowledgement packet meaning a success as the following. (Refer to Appendix D)

Command	0x00000011
Param1	0x00000001
Param2	0x00000000
Data Size	0x00000000
Error Code	0x00000000
Header Checksum	0x00000012

If the host gets the following packet, it means that the communication was successfully done.

7E	00 00 00 11	00 00 00 01	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 12

4.2 Identification (1:N Authentication)

The device supports user verification only with fingerprint.

4.2.1 Identification with fingerprint

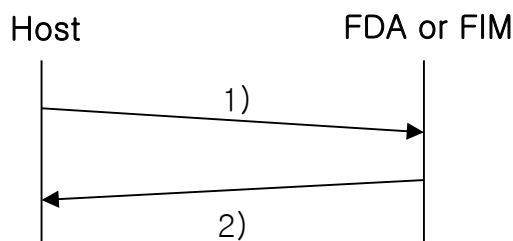The following description shows the sequence of Identification.

Figure E.5 The sequence of Identification

1) The structure of CMD_IDENTIFY_FP command packet

The following table shows the command packet made in the host. (Refer to Appendix D)

Command	0x00000012
Param1	0x00000000
Param2	0x00000000
Data Size	0x00000000
Error Code	0x00000000
Header Checksum	0x00000012

The following table shows the sequence of data to be transmitted to the device.

7E	00 00 00 12	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 12

2) Acknowledgement packet

In response to CMD_IDENTIFY_FP packet from host, the device sends acknowledgement packet meaning a success as the following. (Refer to Appendix D)

Command	0x00000012									
Param1	0x00000001									
Param2	0x00000000									
Data Size	0x0000000A									
Error Code	0x00000000									
Header Checksum	0x0000001D									
Data	0x31	0x32	0x33	0x34	0x00	0x00	0x00	0x00	0x00	0x00
Data Checksum	0x000000CA									

If the host gets the following packet, it means that the communication was successfully done.

7E	00 00 00 12	00 00 00 01	00 00 00 00	00 00 00 0A	00 00 00 00	00 00 00 1D

31 32 33 34 00 00 00 00 00 00	00 00 00 CA

Appendix H. THE EXAPMLE OF FIRMWARE UPGRADE

This chapter explains packet sequence for upgrading firmware with 'CMD_UPGRADE_FIRMWARE2' command.

In upgrading firmware, the data block of packet consists of size information and a portion of firmware. For example, assume that firmware size is "**S**", and firmware data consists of 10 blocks - **B0**, **B1**, … **B9** as the following table.

B0	B1	B2	B3	B4	B5	B6	B7	B8	B9

Using CMD_UPGRADE_FIRMWARE2 command, 10 packets are needed for carrying firmware. The following table shows all 10 packets.

Packet1 Data

Header	S	B0	Checksum

Packet2 Data

Header	S	B1	Checksum

.
.
.

Packet10 Data

Header	S	B9	Checksum

Appendix I. Support Information

NITGEN&COMPANY Co.,Ltd.

12th FL, Pax tower

Nonhyun-dong Gangnam-gu

Seoul, Korea (135-101)

Tel : +82-2-513-2140

Fax : +82-2-513-2191

E.mail : Customer@nitgen.com