



Serial Protocol

NITGEN®

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

Developer Guide

(Supported device: FIM10 Ver. 1.18, FIM01 Ver. 1.58,
FIM20xx Ver. 1.58, FIM30xx Ver 1.10)

Version 1.75



Serial Protocol

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Serial Number:

Specifications can be changed without notice.

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Revision Information

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_TYPTTE 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.

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2006-01-24	1.70	Command added 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	Command changed 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.

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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 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⁾

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System Management	Get FP Image ¹⁾ Status Check Get FP Image2 Upgrade Firmware2 Set/Get Device Time ²⁾ I/O Control ²⁾ Get Image Quality ³⁾
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1) These commands are only supported in FIM10 and FIM30.

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

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

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2. COMMAND DESCRIPTION

■ INITIALIZATION

Service Types	Description
Request Connection	Request communication connection with pre-defined Baud rate.
Set Baud Rate¹⁾	Set new Baud rate.
Get Firmware Version¹⁾	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 and FIM30.

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■ 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.
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 Verification²⁾	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 Identification²⁾	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.

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■ DATABASE MANAGEMENT

Service Type	Description
Enroll FP¹⁾	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 Mode¹⁾	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

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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 List¹⁾	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 List¹⁾	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 FP²⁾	This command is used to change the information of registered user. This command is available only in 'Master Mode'.
Add FP²⁾	This command is used to add new user using the information sent from host. This command is available only in 'Master Mode'.
Get FP²⁾	This command is used to get user information from the device. This command is available only in 'Master Mode'.

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Delete All Log²⁾	This command is used to delete all logs in device. This command is available only in 'Master Mode'.
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- 1) These commands are only supported in FIM10.
- 2) These commands are only supported in FIM01 and FIM20.

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■ CONFIGURATION

Service Types	Description
Set/Get OPP Option¹⁾	<p>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'.</p> <ul style="list-style-type: none"> • 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
Set/Get Security Level¹⁾	<p>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'.</p>
Set/Get Capture Option¹⁾	<p>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'.</p>
Set/Get DB Init Option¹⁾	<p>This command is used to set/reset/get option for the initialization of fingerprint DB. This command is available only in 'Master Mode'.</p>
Set/Get Log Option¹⁾	<p>This command is used to set/reset/get option for log write enable mode. This command is available only in 'Master Mode'.</p>
Set/Get Capture Period¹⁾	<p>This command is used to set/get capture period waiting time. This command is available only in 'Master Mode'.</p>
Set/Get System Information	<p>This command is used to set/get system information. This command is available only in 'Master Mode'.</p>
Save System Information	<p>This command is used to save current system information to Flash ROM. This command is only available in 'Master Mode'.</p>
Set Default System Information	<p>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.</p>
Change template mode²⁾	<p>This command is used to select 2 or 4 templates mode. This command is only available in 'Master Mode'.</p>

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

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

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■ SYSTEM MANAGEMENT

Service Types	Description
Get FP Image¹⁾	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, FIM01 or FIM20xx series. Firmware Format: binary
Set Device Time²⁾	This command is used to set the reference time of target device.
Get Device Time²⁾	This command is used to read the reference time of target device.
I/O Control²⁾	This command is used to set/clear the device I/Os such as Sensor LED and so on.
Get Image Quality²⁾	This command is used to get the quality of fingerprint image.

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

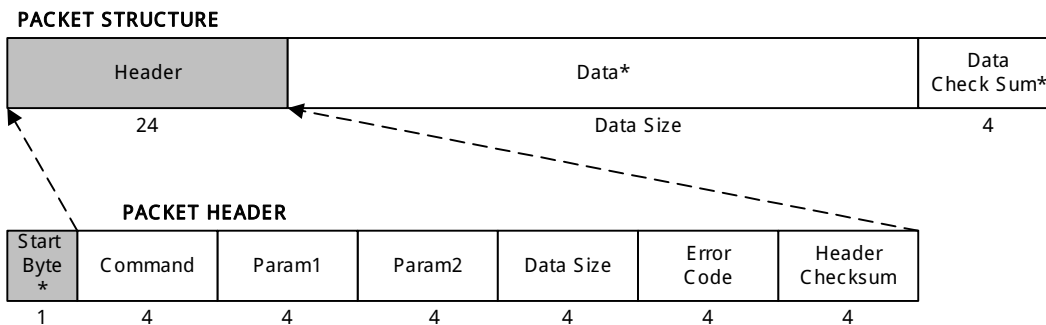
2) These commands are only supported in FIM01 and FIM20.

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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.



* 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.

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

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.

$$\text{Max Data block} = 256 \times 65,507 = 16,769,792 \text{ [byte]}$$

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

$$(\text{Packet index } (0\sim N) \ll 8) + (\text{Max Packet Index } N)$$

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.

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■ 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.

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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 FIM01 and 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 ¹⁾ = 10		RESULT (2)	TIME (8)	FPID (12)	
	Change FP = 11		RESULT (2)	TIME (8)	FPID (12)	

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		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

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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_INSTANT_MATCHING	0x15
CMD_GET_TEMPLATE	0x16
CMD_CANCEL	0x17
CMD_INSTANT_VERIFY	0x18
CMD_INSTANT_IDENTIFY	0x19

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

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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_CAPTURE_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

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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

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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)

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	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)

Serial Protocol

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_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)

Serial Protocol

	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)

Serial Protocol

FIM30 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)
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)

Serial Protocol

	CMD_GET_LOG_OPTION (0x49) CMD_SET_CAPTURE_PERIOD (0x4A) CMD_GET_CAPTURE_PERIOD (0x4B)
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

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.

- 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.

Serial Protocol

- 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.

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_IDENTIFY ¹⁾	0x0F

1) These log events are only supported in FIM01 and FIM20xx series.

Serial Protocol

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.

Serial Protocol

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

Serial Protocol

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

Serial Protocol

- 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
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.

Serial Protocol

CMD_IDENTIFY_FP

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x12	Command	0x12
Param1	<p>0 – User ID only request</p> <p>1 – User ID and Template index request (FIM01 & FIM20 only)</p>	Param1	<p>RESULT_SUCCEEDED</p> <p>RESULT_FAILED</p> <p>RESULT_INVALID_PARAM</p> <p>RESULT_NOT_IN_TIME</p> <p>RESULT_IDENTIFY_TIMEOUT (FIM01 & FIM20xx only)</p> <p>RESULT_CANCELED</p>
Param2	X	Param2	<p>(Packet Index (0~N) << 8)</p> <p>+ (Max Packet Index N)</p>
Data Size	0	Data Size	<p>IF (Param1 == Succeeded)</p> <p> IF (Command Param1 = 0)</p> <p> Size of FPID (various between devices)</p> <p> ELSE IF (Command Param1 = 1)</p> <p> Size of (FPID + Template Index)</p> <p> ELSE</p> <p> 0</p> <p>ELSE</p> <p> 0</p>
Error Code	X	Error Code	Error Code
Data	-	Data	<p>IF (Param1 == Succeeded)</p> <p> IF (Command Param1 = 0)</p> <p> FPID</p> <p> ELSE IF (Command Param1 = 1)</p> <p> (FPID + Template Index)</p> <p> ELSE</p> <p> 0</p> <p>ELSE</p> <p> 0</p>

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

Serial Protocol

CMD_INSTANT_MATCHING

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x15	Command	0x15
Param1	0 - Default 1 - FDA01 compatible style (FIM10 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
Param2	(Packet Index (0~N) << 8) + (Max Packet Index N)	Param2	X
Data Size	Size (A fraction of Template)	Data Size	0
Error Code	X	Error Code	Error Code
Data	A fraction of Template	Data	-

The value '1' of param1 is supported in FIM10 firmware ver1.10 or later.

CMD_GET_TEMPLATE

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x16	Command	0x16
Param1	0 - Default 1 - FDA01 compatible style (FIM10 only)	Param1	RESULT_SUCCEEDED RESULT_FAILED RESULT_NOT_IN_TIME RESULT_CANCELED
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

Serial Protocol

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 FIM10 firmware ver1.10 or later.

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_CANCEL 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

Serial Protocol

			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 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

Serial Protocol

Data	A fraction of Template	Data	<pre> IF (Param1 == Succeeded) IF (Command Param1 = 0) FPID ELSE IF (Command Param1 = 1) (FPID + Template Index) ELSE 0 ELSE 0 </pre>
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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.

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

Serial Protocol

			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 RESULT_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

Serial Protocol

Error Code	X	Error Code	Error Code
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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 RESULT_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	<u>Master authentication type</u> Verification = 0	Param2	<u>Master authentication type</u> Verification = 0

Serial Protocol

	Password = 2 Null = 3		Password = 2 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

Serial Protocol

			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)

Serial Protocol

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

Serial Protocol

			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	<u>Master authentication type</u> Master FP = 0	Param1	RESULT_SUCCEEDED RESULT_FAILED

Serial Protocol

	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
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 FPID + Template	Data	-

Serial Protocol

	ELSE IF null		
	-		

The Command Packet with Param1=5 is supported in FIM10 firmware version 1.10 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

Serial Protocol

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 Nth log	Param2	IF (Param1 == RESULT_SUCCEEDED) (Packet Index (0~N) << 8)

Serial Protocol

	ELSE IF Param1 == 3 Index(0~N) ELSE IF Param1 == 4 Index (0~N) ELSE 0		+ (Max Packet Index N) ELSE -
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 1 – Master Otherwise – 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_ANOTHER_FINGER RESULT_CANCELED
Param2	Packet index	Param2	IF (Param1 == RESULT_SUCCEEDED)

Serial Protocol

	<p>0x00 – Extract 1st Template from sensor with ID and password</p> <p>0x10 – Extract 1st Template from sensor with auto-generated ID</p> <p>0x01 – Extract 2nd Template from sensor & Save</p> <p>0x02 – Extract 2nd Template from sensor & Save with different finger</p> <p>0x03 – Extract 3rd Template from sensor (FIM01 & FIM20xx only)</p> <p>0x04 – Extract 4th Template form sensor & save (FIM01 & FIM20xx only)</p> <p>0x05 – Extract 4th Template from sensor & save with different finger (FIM01 & FIM20xx only)</p>		<pre> && (((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 </pre>
Data Size	<p>IF (Packet index == 0)</p> <p>Size of (FPID + Password)</p> <p>ELSE</p> <p>0</p>	Data Size	0
Error Code	X	Error Code	Error Code
Data	<p>IF (Packet index == 0)</p> <p>FPID + password</p> <p>ELSE</p> <p>0</p>	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

Serial Protocol

Param1	<p>0x01 – Change Master Privilege & Save</p> <p>0x02 – Change Password & Save</p> <p>0x10 – Change 1st template from host</p> <p>0x11 – Change 2nd template from host Save</p> <p>0x12 – Change 2nd template from host with different finger from 1st template Save</p> <p>0x13 – Change 3rd template from host</p> <p>0x14 – Change 4th template from host Save in 4 templates mode</p> <p>0x15 – Change 4th template from host with different finger from 3rd template Save in 4 templates mode</p> <p>0x20 – Change 1st template from sensor</p> <p>0x21 – Change 2nd template form sensor Save in 2 templates mode</p> <p>0x22 – Change 2nd template form sensor with different finger from 1st template Save in 2 templates mode</p> <p>0x23 – Change 3rd template form sensor</p> <p>0x24 – Change 4th template from sensor Save in 4 templates mode</p> <p>0x25 – Change 4th template form sensor with different finger from 3rd template Save in 4 templates mode</p> <p>Others – reserved</p>	Param1	<p>RESULT_SUCCEEDED</p> <p>RESULT_FAILED</p> <p>RESULT_INVALID_DATASIZE</p> <p>RESULT_INVALID_DATA</p> <p>RESULT_NOT_IN_TIME</p> <p>RESULT_INVALID_PARAM</p> <p>RESULT_INVALID_ID</p> <p>RESULT_NOT_MASTER_MODE</p> <p>RESULT_CANCELED</p>
Param2	<p>IF (Param1 == 0x01)</p> <p>0 – set to normal user</p>	Param2	X

Serial Protocol

	1 – set to master ELSE Reserved		
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 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 or 0x15) FPID + Template ELSE IF (Param2 == 0x01 or 0x20 or 0x21 or 0x22 or 0x23 or 0x24 or 0x25) FPID ELSE 0	Data	-

The structure of data is explained in Appendix F.

This command is only supported in FIM01 and FIM20xx.

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

Serial Protocol

CMD_ADD_FP

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
Command	0x35	Command	0x35
Param1	DB structure version 1 – 2 templates data structure 2 – 4 templates data structure 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.

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

Serial Protocol

			RESULT_CANCELED
Param2	The version of DB structure 1- 2 templates data structure 2- 4 templates data structure Others – reserved	Param2	0
Data Size	IF (Param1 == 0) Size of FPID ELSE 0	Data Size	IF (Param1 == RESULT_SUCCEEDED) Size of DB structure ELSE 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 and FIM30.

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 and FIM30.

Serial Protocol

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 and FIM30.

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 and FIM30.

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 or 0x02) 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 and FIM30.

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)

Serial Protocol

			<p style="color: red;">Max number of capture in adaptive</p> <p style="color: red;">ELSE</p> <p style="color: red;">-</p> <p style="color: red;">ELSE</p> <p style="color: red;">-</p>
Data Size	0	Data Size	0
Error Code	X	Error Code	Error code

This command is only supported in FIM10 and FIM30.

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 and FIM30.

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 -

Serial Protocol

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

This command is only supported in FIM10 and FIM30.

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 and FIM30.

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 and FIM30.

CMD_SET_SYSINFO

COMMAND PACKET		ACKNOWLEDGEMENT PACKET	
----------------	--	------------------------	--

Serial Protocol

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

Serial Protocol

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.

Serial Protocol

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.

Serial Protocol

- 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

Serial Protocol

			isn't ready to communicate
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

Serial Protocol

			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

Serial Protocol

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
----------------	------------------------

Serial Protocol

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 and FIM30xx.

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'.

Serial Protocol

Appendix F. DATA STRUCTURE

(FIM10, FIM01, FIM20xx, FIM30xx)

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

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

FIM10

```
LENGTH_OF_FPID = 10
LENGTH_OF_PASSWD = 16
LENGTH_OF_TEMPLATE = 400
```

FIM01 or FIM20xx

```
LENGTH_OF_FPID = 11
LENGTH_OF_PASSWD = 16
LENGTH_OF_TEMPLATE = 404
```

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];
}
```

2. The structure of a password

```
Structure {
    UINT8 FPPassword[LENGTH_OF_PASSWD];
}
```

3. The structure of a "FPID + Password"

```
Structure {
    UINT8 FPID[LENGTH_OF_FPID];
    UINT8 FPPassword[LENGTH_OF_PASSWD];
}
```

Serial Protocol

4. The structure of a "FPID + Template"

```
Structure {  
  
    UINT8 FPID[LENGTH_OF_FPID];  
    UINT8 Template[LENGTH_OF_TEMPLATE];  
  
}
```

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

```
Structure {  
  
    UINT8 FPID[LENGTH_OF_FPID];  
    UINT8 Template_Index;  
  
}
```

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

```
Structure {  
  
    UINT8 FPID_1[LENGTH_OF_FPID];  
    UINT8 FPID_2[LENGTH_OF_FPID];  
    ...  
    UINT8 FPID_N[LENGTH_OF_FPID];  
  
}
```

7. 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];  
  
}
```

8. 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
```

Serial Protocol

```

        UINT8 FPID_1[LENGTH_OF_FPID];
        UINT8 FPID_2[LENGTH_OF_FPID];
        ...
        UINT8 FPID_N[LENGTH_OF_FPID];
    }
else if Param1 == 1
    Structure {
        UINT16 User_Number;           // for example, N
    }

```

9. 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];
}

```

10. 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
}

```

11. 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
}

```

Serial Protocol

```

        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.

12. 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)	100ms tick
0x18	SI_RELAY_TIME	0 or 1~100	10	100ms ticks
0x19	SI_CAPTURE_TIMEOUT	More than 10	50	100ms ticks
0x20	SI_IMAGE_BRIGHTNESS	0~100	40 (FIM10) 45(FIM01 or FIM20xx)	100 - brightest
0x21	SI_IMAGE_GAIN	1,2,4,8	2	
0x22	SI_IMAGE_CONTRAST	0~100	20	
0x28	SI_ADAPTIVE_CAPTURE	True/False	True	
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	

Serial Protocol

0x38	SI_USING_LATENT	True/False	True	
0x40	SI_ENABLE_CHANNEL1	True/False	False	
0x48	SI_CHANNEL0_BAUDRATE	0 – 115200 1 – 57600 2 – 38400 3 – 19200 4 – 9600	4	
0x49	SI_CHANNEL1_BAUDRATE	“	4	
0x4A	SI_CURR_CHANNEL_BAUDRATE	“		
0x50	SI_MAX_USER			

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

SI_MAX_USER is only supported in command CMD_GET_SYSINFO.

13. DB structure used in CMD_SET_SYSINFO and CMD_GET_SYSINFO

```

Structure {
    UINT32 SI_TYPE;
    UINT32 SI_VALUE
} SI_INFO

```

14. DB structure used in CMD_ADD_FP

```

Structure {
    UINT8 Right; // Normal User:0 Master: 1
    UINT8 UserID[LENGTH_OF_FPID]; // user ID
    UINT8 Passwd[LENGTH_OF_PASSWD]; // Password
    UINT8 Template1[LENGTH_OF_TEMPLATE]; // 1st Template
    UINT8 Template2[LENGTH_OF_TEMPLATE]; // 2nd Template
    TIME_INFO Time; // Time Information
} 2 Template structure

```

```

Structure {
    UINT8 Right; // Normal User:0 Master: 1
    UINT8 UserID[LENGTH_OF_FPID]; // user ID

```

Serial Protocol

```
UINT8  Passwd[LENGTH_OF_PASSWD]; // Password
UINT8  Template1[LENGTH_OF_TEMPLATE]; // 1st Template
UINT8  Template2[LENGTH_OF_TEMPLATE]; // 2nd Template
UINT8  Template3[LENGTH_OF_TEMPLATE]; // 3rd Template
UINT8  Template4[LENGTH_OF_TEMPLATE]; // 4th Template
TIME_INFO Time; // Time Information
} 4 Template structure
```

Serial Protocol

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.

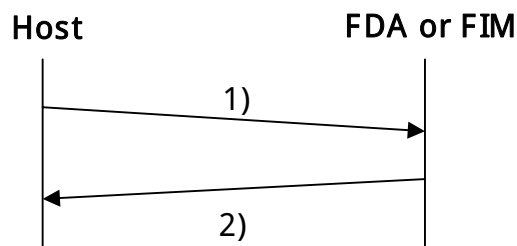


Figure E.1 The sequence of Request Connection

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

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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_ENROLL_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'.

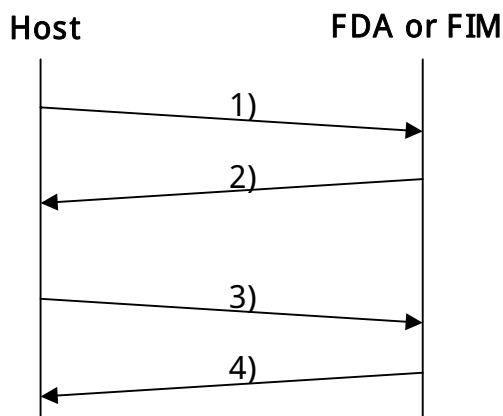


그림 E.2 The sequence of enrollment

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

Serial Protocol

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									

Serial Protocol

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

Serial Protocol

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 00 35 36 37 38 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
----	-------------	-------------	-------------	-------------	-------------	-------------

Serial Protocol

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'.

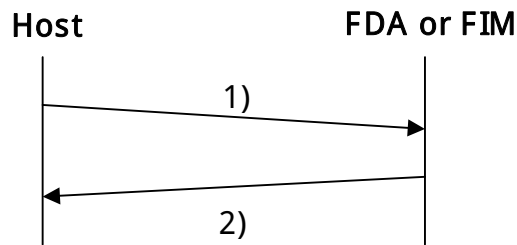


Figure E.3 The sequence of deletion

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

Serial Protocol

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'.

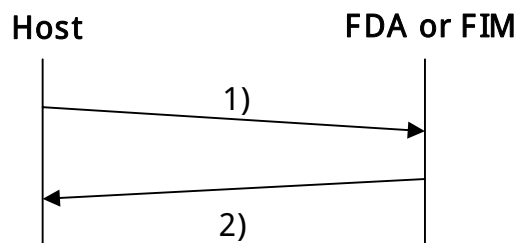


Figure E.4 The sequence of verification

1) The structure of CMD_VERIFY_FP command packet

Serial Protocol

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									
---------	------------	--	--	--	--	--	--	--	--	--

Serial Protocol

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.

Serial Protocol

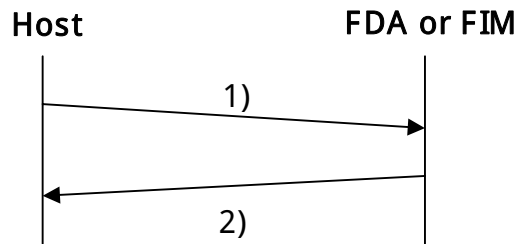


Figure E.5 The sequence of Identification

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
----	-------------	-------------	-------------	-------------	-------------	-------------

Serial Protocol

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

Serial Protocol

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

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