## **Datasheet**

Ver. 1.0



## **Revision History**

Rev No.	Issued date	Description
1.0	SEP 30, 2014	Initial Release

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## Overview

The Suprema Fingerprint Module(SFM) are stand-alone fingerprint systems ideal for embedded system applications where biometric security is needed. The modules are designed for manufacturers searching for an inexpensive, reliable and easy-to-integrate biometric system. The SFM provide complete fingerprint solutions by incorporating fingerprint sensor interface and embedded fingerprint recognition algorithm into a half business card sized module.

The SFM5500 series is the latest module equipped with world's leading fingerprint authentication algorithm (ranked No. 1 in FVC2004, FVC2006 and FVC-on-going ) and powerful DSP technology. Also, it supports wide range of fingerprint sensor interoperability giving you a freedom to select suitable sensor that most fits to your application. Furthermore, the fingerprint data for enrollment and verification are compatible among different sensors, even if they are based on different technologies. This feature of unification presents application manufacturers and system integrators with much more flexibility than ever before.

In addition to these features, the miniature sized SFM has a state-of-theart low power design making it a perfect match in a wide range of applications from battery operated mobile equipments to network based security systems. The SFM stands ready to meet your requirements and adapt to your applications.

## 1. SFM5500 Series

Table 1 SFM5500 Series combinations

Model name	Supported sensors	Main board	
SFM5520-OP5	Suprema Optical Sensor OP5	CEMEE 20	
SFM5530-OC4	Suprema Optical Sensor OC4	SFM5520	
SFM5550-TC1	UPEK TouchChip TCS1C	CEMEEEO	
SFM5550-TC2	UPEK TouchChip TCS2C	SFM5550	

## 2. Features

- · World's most reliable fingerprint algorithm
- · Powerful 533MHz DSP
- · High speed fingerprint enrollment and authentication speed
- Compact size
- Low power consumption
- · Fast power on time
- Various communication interfaces
- · 256-bit AES fingerprint data encryption
- Various fingerprint sensor options
- · Configurable I/O signals
- Operates with a single 5.0VDC power supply
- Supports various fingerprint output image including RAW, GRAY(4-bit and 8-bit gray) and WSQ compressed image (certified by FBI)

## 3. Fingerprint Authentication Specifications

## 3.1. Fingerprint Authentication Performance

EER*	<0.1%
Enrollment time	<0.55 sec
Verification time(1:1)	<0.55 sec
Identification time(1:1000)**	<0.70 sec

<sup>\*</sup>EER is dependent on databases

### 3.2. Fingerprint Sensor Specifications

Manufacturer	Suprema Inc.		
Device Name	OP5		
Sensor technology	Optical		
Sensing area	16.0mm x 19.0mm		
Image size(pixels)	272x320		
Image resolution	500 dpi		

### 3.3. Data storage

Template capacity	9,000 at 4M Flash ( 19,000 at 8M )
LOG capacity	12,800 event
User memory	256 Bytes

## 4. Hardware Specifications

## 4.1. Operating range

Parameter	Symbol	Min	Тур	Max	Unit
Supply voltage	$V_{DD}$	4.5	5.0	5.5	٧
Operating temperature	T <sub>OP</sub>	-15		50	°C

<sup>\*\*</sup> Average 1:1000 genuine identification time including feature extraction time

## 4.2. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units
Power supply voltage	$V_{DD}$	-0.3	6	V
Input voltage on signal pins	$V_{IN}$	-0.3	6	V

## 4.3. Electrical DC characteristics @ $(V_{DD} = 5.0 \text{Vdc}, T_{OP} = 25^{\circ}\text{C})$

Parameter	Symbol	Min.	Тур.	Max.	Units
Supply current (idle)	$I_{DD1}$		155		mA
Supply current (scanning)	$I_{DD2}$	170		240	mA
Supply current (identifying)	$I_{DD3}$	170		240	mA
High level input voltage	$V_{\mathrm{IH}}$	2.0		5.5	V
Low level input voltage	V <sub>IL</sub>	-0.3		0.6	V

## 4.4. Interface

Туре	Description
Host communication	RS-232C or RS422/485 level
	Baud rates up to 115.2kbps (factory default:
	115.2kbps)
Aux communication	RS-232C or CMOS(0~5V) level
	Baud rates up to 115.2kbps (factory default:
	115.2kbps)
Digital I/O	CMOS(0~5V) level
	3 CMOS input, 3 CMOS output pins
LED driver	3 LED drivers. Common anode. Active low
	outputs.
Wiegand	CMOS(0~5V) level
	Input and output ports supported

## 4.5. Connector Specifications

Connector	Usage
J1	LED output port
J2	Digital I/O port. CMOS(0~5V), 3 Inputs, 3 Outputs
J3	Wiegand I/O port.

]4	Aux interface port
J5	Host interface port
J6	Battery connector for time keeping
J7	Internal use only
Ј8	Sensor interface port

- 1. Connectors J1  $\sim$  J6 are Molex 53261-0890 compatible board-to-wire connectors.
- 2. Power can be supplied by one of J2, J3, J4 or J5 connectors.

#### 4.5.1. LED port (J1) pin assignment

Name	pin #	Туре	Functions
GND	1	Power	Power Ground
LED0	2	Output	Active low, Current sink up to 20mA
LED1	3	Output	Current limit resistors integrated (220
LED2	4	Output	Ohm)
VCC	5	Power	Power Supply for LEDs. 5VDC

#### 4.5.2. Digital I/O port (J2) pin assignment

Name	pin #	Туре	Functions
GND	1	Power	Power Ground
INO	2	Input	CMOS(0~5V), Active high input
IN1	3	Input	Internally pulled down with 47kOhm
IN2	4	Input	resistors
VCC	5	Power	Power Supply. 5VDC
OUT0	6	Output	
OUT1	7	Output	CMOS(0~5V), Active high output
OUT2	8	Output	
GND	9	Power	Power Ground

#### 4.5.3. Wiegand I/O port (J3) pin assignment

Name	pin #	Туре	Functions
GND	1	Power	Power Ground
WINO	2	Input	CMOS(0~5V), Wiegand input, DATA0
WIN1	3	Input	CMOS(0~5V), Wiegand input, DATA1

NC	4	No connect	Reserved for future use	
VCC	5	Power	Power Supply. 5VDC	
WOUT0	6	Output	CMOS(0~5V), Wiegand output, DATA0	
WOUT1	7	Output	CMOS(0~5V), Wiegand output, DATA1	
NC	8	No connect	Reserved for future use	
GND	9	Power	Power Ground	

## 4.5.4. Aux interface port (J4) pin assignment

Name	pin #	Туре	Functions
GND	1	Power	Power Ground
TX3	2	RS232C	Aux port transmit data
RX3	3	RS232C	Aux port receive data
VCC	4	Power	Power Supply. 5VDC
TX4C	5	CMOS	Aux port transmit data
RX4C	6	CMOS	Aux port receive data
GND	7	Power	Power Ground

## 4.5.5. Host interface port (J5) pin assignment

Name	pin #	Туре	Functions
GND	1	Power	Power Ground
TX1	2	RS232C	Host port transmit data
RX1	3	RS232C	Host port receive data
TX2P	4	RS422/485	Host port non inverting transmit data
VCC	5	Power	Power Supply. 5VDC
RX2P	6	RS422/485	Host port non inverting receive data
TX2N	7	RS422/485	Host port inverting transmit data
RX2N	8	RS422/485	Host port inverting receive data
GND	9	Power	Power Ground

## 4.5.6. Battery connector (J6) pin assignment

Name	pin #	Туре	Functions
GND	1	Power	Power Ground
VBATT	2	Power	RTC power supply. 3~3.6VDC
GND	3	Power	Power Ground

## 4.6. Physical Dimensions

Parameter	Values
Main board	63mm x 43mm x 10mm (LxWxH)
Sensor	20.5mm x 25mm x 52mm (LxWxH)

Figure 1: Main board dimensions

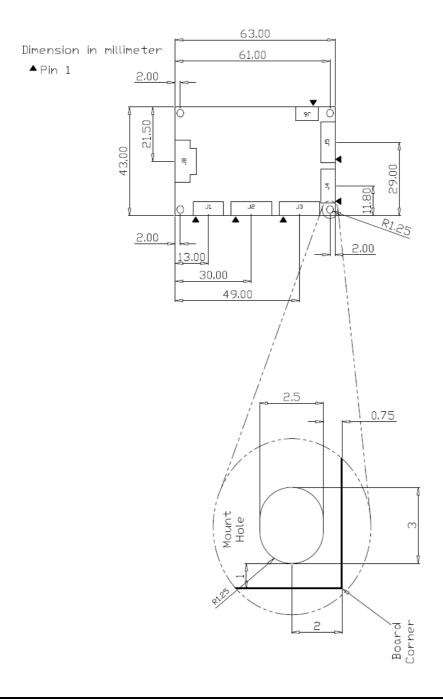
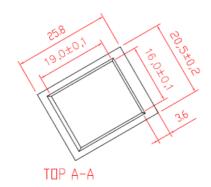
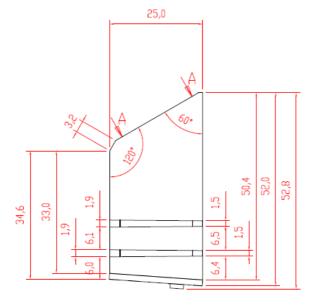
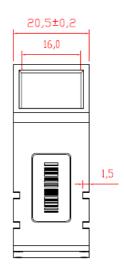


Figure 2: Sensor dimensions







Dimensions in millimeters

## 5. Communication Protocol Summary

The SFM provides a proprietary communication protocol for easy interface with most host systems. The protocol based on fixed sized packets. Only fingerprint image, template data, and user lists are transmitted as appended to the packet. Checksum functionality is supported to ensure consistency of transmitted data.

Please refer to SFM Protocol Manual for detailed information.

#### 5.1. Packet Structure

Start code	Command	Param	Size	Flag	Checksum	End code
1byte	1byte	4bytes	4bytes	1byte	1byte	1byte

#### 5.2. Command Summary

Command	Code	Description	
SW	0x01	Write system parameter	
SF	0x02	Save system parameter	
SR	0x03	Read system parameter	
CS	0x1A	Calibrate sensor	
SS	0x04	Check system status	
CA	0x60	Cancel	
ES	0x05	Enroll by scan	
ESA	0x70	ES with administrator verification	
EI	0x06	Enroll by image	
EIX	0x80	EI through data transfer protocol	
ET	0x07	Enroll by template	
EW	0x1C	Enroll by Wiegand ID	
EWA	0x71	EW with administrator verification	
VS	0x08	Verify by scan	
VI	0x09	Verify by image	
VIX	0x82	VI through data transfer protocol	
VT	0x10	Verify by template	
VW	0x1D	Verify by Wiegand ID	

VH			
II 0x12 Identify by image  IIX 0x81 II through data transfer protocol  IT 0x13 Identify by template  DA 0x17 Delete all templates  DAA 0x74 DA with administrator verification  DT 0x16 Delete by scan  DSA 0x72 DS with administrator verification  DW 0x1F Delete by Wiegand ID  DWA 0x73 DW with administrator verification  LT 0x18 List user ID  CT 0x19 Check user ID  FP 0x23 Fix all provisional templates  DP 0x24 Delete all provisional templates  RI 0x20 Read image  RIX 0x84 RI through data transfer protocol  SI 0x15 Scan image  SIX 0x83 SI through data transfer protocol  RT 0x14 Read template  ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LD 0x3E Delete log data	VH	0x22	Verify host template by scan
IIX 0x81 II through data transfer protocol IT 0x13 Identify by template DA 0x17 Delete all templates DAA 0x74 DA with administrator verification DT 0x16 Delete template DS 0x1E Delete by scan DSA 0x72 DS with administrator verification DW 0x1F Delete by Wiegand ID DWA 0x73 DW with administrator verification LT 0x18 List user ID CT 0x19 Check user ID FP 0x23 Fix all provisional templates DP 0x24 Delete all provisional templates RI 0x20 Read image RIX 0x84 RI through data transfer protocol SI 0x15 Scan image SIX 0x83 SI through data transfer protocol RT 0x14 Read template ST 0x21 Scan template  KS 0x35 Scan template with challenge data KW 0x34 Write encryption key ML 0x31 Get size of user memory MW 0x32 Write to user memory TW 0x3A Write current time TR 0x3B Read current time TR 0x3B Read log data LD 0x3E Delete log data	IS	0x11	Identify by scan
IT 0x13 Identify by template  DA 0x17 Delete all templates  DAA 0x74 DA with administrator verification  DT 0x16 Delete template  DS 0x1E Delete by scan  DSA 0x72 DS with administrator verification  DW 0x1F Delete by Wiegand ID  DWA 0x73 DW with administrator verification  LT 0x18 List user ID  CT 0x19 Check user ID  FP 0x23 Fix all provisional templates  DP 0x24 Delete all provisional templates  RI 0x20 Read image  RIX 0x84 RI through data transfer protocol  SI 0x15 Scan image  SIX 0x83 SI through data transfer protocol  RT 0x14 Read template  ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LD 0x3E Delete log data	II	0x12	Identify by image
DA	IIX	0x81	II through data transfer protocol
DAA 0x74 DA with administrator verification  DT 0x16 Delete template  DS 0x1E Delete by scan  DSA 0x72 DS with administrator verification  DW 0x1F Delete by Wiegand ID  DWA 0x73 DW with administrator verification  LT 0x18 List user ID  CT 0x19 Check user ID  FP 0x23 Fix all provisional templates  DP 0x24 Delete all provisional templates  RI 0x20 Read image  RIX 0x84 RI through data transfer protocol  SI 0x15 Scan image  SIX 0x83 SI through data transfer protocol  RT 0x14 Read template  ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  TW 0x3A Write current time  TR 0x3B Read log data  LD 0x3E Delete log data	IT	0x13	Identify by template
DT	DA	0x17	Delete all templates
DS  Ox1E Delete by scan  DSA  Ox72 DS with administrator verification  DW  Ox1F Delete by Wiegand ID  DWA  Ox73 DW with administrator verification  LT  Ox18 List user ID  CT  Ox19 Check user ID  FP  Ox23 Fix all provisional templates  DP  Ox24 Delete all provisional templates  RI  Ox20 Read image  RIX  Ox84 RI through data transfer protocol  SI  Ox15 Scan image  SIX  Ox83 SI through data transfer protocol  RT  Ox14 Read template  ST  Ox21 Scan template  KS  Ox35 Scan template with challenge data  KW  Ox34 Write encryption key  ML  Ox31 Get size of user memory  MW  Ox32 Write to user memory  MR  Ox33 Read from user memory  TW  Ox3A Write current time  TR  Ox3B Read current time  LN  Ox3C Get number of log data  LD  Ox3E Delete log data	DAA	0x74	DA with administrator verification
DSA 0x72 DS with administrator verification DW 0x1F Delete by Wiegand ID  DWA 0x73 DW with administrator verification  LT 0x18 List user ID  CT 0x19 Check user ID  FP 0x23 Fix all provisional templates  DP 0x24 Delete all provisional templates  RI 0x20 Read image  RIX 0x84 RI through data transfer protocol  SI 0x15 Scan image  SIX 0x83 SI through data transfer protocol  RT 0x14 Read template  ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LD 0x3E Delete log data	DT	0x16	Delete template
DW 0x1F Delete by Wiegand ID  DWA 0x73 DW with administrator verification  LT 0x18 List user ID  CT 0x19 Check user ID  FP 0x23 Fix all provisional templates  DP 0x24 Delete all provisional templates  RI 0x20 Read image  RIX 0x84 RI through data transfer protocol  SI 0x15 Scan image  SIX 0x83 SI through data transfer protocol  RT 0x14 Read template  ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LD 0x3E Delete log data	DS	0x1E	Delete by scan
DWA 0x73 DW with administrator verification  LT 0x18 List user ID  CT 0x19 Check user ID  FP 0x23 Fix all provisional templates  DP 0x24 Delete all provisional templates  RI 0x20 Read image  RIX 0x84 RI through data transfer protocol  SI 0x15 Scan image  SIX 0x83 SI through data transfer protocol  RT 0x14 Read template  ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LD 0x3E Delete log data	DSA	0x72	DS with administrator verification
LT 0x18 List user ID  CT 0x19 Check user ID  FP 0x23 Fix all provisional templates  DP 0x24 Delete all provisional templates  RI 0x20 Read image  RIX 0x84 RI through data transfer protocol  SI 0x15 Scan image  SIX 0x83 SI through data transfer protocol  RT 0x14 Read template  ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LD 0x3E Delete log data	DW	0x1F	Delete by Wiegand ID
CT 0x19 Check user ID  FP 0x23 Fix all provisional templates  DP 0x24 Delete all provisional templates  RI 0x20 Read image  RIX 0x84 RI through data transfer protocol  SI 0x15 Scan image  SIX 0x83 SI through data transfer protocol  RT 0x14 Read template  ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LD 0x3E Delete log data	DWA	0x73	DW with administrator verification
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DP 0x24 Delete all provisional templates  RI 0x20 Read image  RIX 0x84 RI through data transfer protocol  SI 0x15 Scan image  SIX 0x83 SI through data transfer protocol  RT 0x14 Read template  ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LR 0x3D Read log data  LD 0x3E Delete log data	СТ	0x19	Check user ID
RIX 0x20 Read image  RIX 0x84 RI through data transfer protocol  SI 0x15 Scan image  SIX 0x83 SI through data transfer protocol  RT 0x14 Read template  ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LR 0x3D Read log data  LD 0x3E Delete log data	FP	0x23	Fix all provisional templates
RIX 0x84 RI through data transfer protocol  SI 0x15 Scan image  SIX 0x83 SI through data transfer protocol  RT 0x14 Read template  ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LR 0x3B Read log data  LD 0x3E Delete log data	DP	0x24	Delete all provisional templates
SI 0x15 Scan image  SIX 0x83 SI through data transfer protocol  RT 0x14 Read template  ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LR 0x3D Read log data  LD 0x3E Delete log data	RI	0x20	Read image
SIX 0x83 SI through data transfer protocol  RT 0x14 Read template  ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LR 0x3D Read log data  LD 0x3E Delete log data	RIX	0x84	RI through data transfer protocol
RT 0x14 Read template  ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LR 0x3D Read log data  LD 0x3E Delete log data	SI	0x15	Scan image
ST 0x21 Scan template  KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LR 0x3D Read log data  LD 0x3E Delete log data	SIX	0x83	SI through data transfer protocol
KS 0x35 Scan template with challenge data  KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LR 0x3D Read log data  LD 0x3E Delete log data	RT	0x14	Read template
KW 0x34 Write encryption key  ML 0x31 Get size of user memory  MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LR 0x3D Read log data  LD 0x3E Delete log data	ST	0x21	Scan template
ML 0x31 Get size of user memory  MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LR 0x3D Read log data  LD 0x3E Delete log data	KS	0x35	Scan template with challenge data
MW 0x32 Write to user memory  MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LR 0x3D Read log data  LD 0x3E Delete log data	KW	0x34	Write encryption key
MR 0x33 Read from user memory  TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LR 0x3D Read log data  LD 0x3E Delete log data	ML	0x31	Get size of user memory
TW 0x3A Write current time  TR 0x3B Read current time  LN 0x3C Get number of log data  LR 0x3D Read log data  LD 0x3E Delete log data	MW	0x32	Write to user memory
TR 0x3B Read current time  LN 0x3C Get number of log data  LR 0x3D Read log data  LD 0x3E Delete log data	MR	0x33	Read from user memory
LN 0x3C Get number of log data  LR 0x3D Read log data  LD 0x3E Delete log data	TW	0x3A	Write current time
LR 0x3D Read log data  LD 0x3E Delete log data	TR	0x3B	Read current time
LD 0x3E Delete log data	LN	0x3C	Get number of log data
	LR	0x3D	Read log data
WW 0x41 Write Wiegand configuration	LD	0x3E Delete log data	
	ww	0x41	Write Wiegand configuration

0x42	Read Wiegand configuration	
0x43	Get Wiegand input	
0x44	Set Wiegand output	
0x68	Map Wiegand id to input function	
0x69	List Wiegand id mapping	
0x6A	Clear Wiegand id mapping	
0x47	Write input configuration	
0x48	Read input configuration	
0x49	Get input state	
0x4A	Write output configuration	
0x4B	Read output configuration	
0x4C	Read output configuration list	
0x4D	Set output state	
0x37	Write GPIO configuration	
0x36	Read GPIO configuration	
0x38	Clear GPIO configuration	
0x39	Set default GPIO configuration	
0x65	Write administration level	
0x66	Read administration level	
0x67	Clear administration level	
	0x43 0x44 0x68 0x69 0x6A 0x47 0x48 0x49 0x4A 0x4B 0x4C 0x4D 0x37 0x36 0x38 0x39 0x65 0x66	

# 6. System Parameter Summary

Please refer to SFM Protocol Manual for detailed information.

Name	Code	Description	Value ( * denotes default value )
Timeout	0x62	Timeout period	0x30 : infinite
			0x31:1 second
			*0x3A : 10 seconds
			0x44 : 20 seconds

Template Size	064	Template size. When the	Integer between 256 and *384 <sup>(4)</sup>
Template Size	0x64	be a multiple of 32.	integer between 230 and 136417
		be a manaple of 32.	
	0x65	Enroll mode	0x30 : 1 time
			0x31 : 2 times ( 1 request command & 2
			response commands )
			0x32 : 2 times II ( 2 request commands &
Enroll Mode			2 response commands )
			*0x41 : 2 templates ( 1 request command
			& 2 response commands )
			0x42 : 2 templates II ( 2 request
			commands & 2 response commands )
	0x66	Security level	0x30 : 1/10 FAR( False Acceptance Rate )
			0×31 : 1/100
			0x32 : 1/1,000
			0x33 : 1/10,000
			0x34:1/100,000
			0x35: 1/1,000,000
			0x36 : 1/10,000,000
			0x37:1/100,000,000
			0x40 : 3/100
Security Level			0x41 : 3/1,000
			0x42 : 3/10,000
			0x43 : 3/100,000
			0x44 : 3/1,000,000
			0x45 : 3/10,000,000
			0x46:3/100,000,000
			*0x50 : Automatic Normal
			0x51 : Automatic Secure
			0x52 : Automatic More Secure

Encryption Mode	0x67	Encryption mode	*0x30 : Encryption off
			0x31 : Encryption on
Sensor Type		Sensor type	0x31: FC
	0x68		0x33 : OP / OP2 / OP3 / OP4 / OP5
			0x34 : TC1 / TC2 / TC1S / TC2S
			0x38: OC2 / OD/ OC4 / OH
			0x39 : OL
			0x3C: TS4
			0x30 : Gray image
	066	T	*0x31 : Binary image
Image Format	0x6C	Image format	0x32 : 4 bit gray image
			0x33 : WSQ image <sup>(9)</sup>
Module ID	0x6D	Module ID	Integer 0 ~ 65535
Firmware Version	0x6E	Firmware version	4 bytes character
Serial Number	0x6F	Module serial number	Integer (4 bytes)
	0x71	Host baudrate setting	0x31 : 9600 bps
			0x32: 19200 bps
Baudrate			0x33: 38400 bps
			0x34 : 57600 bps
			*0x35 : 115200 bps
	0x72	Auxiliary baudrate setting	0x31 : 9600 bps
Baudrate2 <sup>(2)</sup>			0x32: 19200 bps
			0x33 : 38400 bps
			0x34 : 57600 bps
			*0x35 : 115200 bps
Enrolled Finger	0x73	Current number of fingerprints enrolled	Integer (4 bytes)
Available Finger	0x74	The available number of fingerprints that can be enrolled	Integer (4 bytes)

Send Scan Success	0x75	Enable sending SCAN_SUCCESS response	0x30 : No SCAN_SUCCESS message *0x31 : Send SCAN_SUCCESS message
		response	*UX31 : Sellu SCAN_SUCCESS Message
ASCII Packet	0x76	Flag for packet exchange though	*0x30 : Hexadecimal packet
Rotate Image	0x77	HEX-ASCII format	0x31 : ASCII packet
		Flag for rotating sensor image in	*0x30 : Upright image
	OX77	capture	0x31 : Upside down image
			0x31: 15 degree
			* 0x32: 30 degree
Datation	0x78	Maximum allowable rotation for matching	0x33: 45 degree
Rotation	0.276		0x34: 60 degree
			0x35: 75 degree
			0x36: 90 degree
			0x30 : Least sensitive
Sensitivity	0x80	Parameter for sensor sensitivity	
			*0x37 : Most sensitive
			0x30 : Weak qualification
Imaga Quality	0x81	Parameter for qualifying scanned image	*0x31 : Moderate qualification
Image Quality			0x32 : Strong qualification
			0x33 : Strongest qualification
			*0x30 : No response command
	0x82	Flag for sending automatic response as the result of GPIO	0x31 : Send response command ( host )
Auto Response			0x32 : Send response command ( aux ) (2)
	0x83	input or FreeScan  Flag for default operation mode	0x33 : Send response command ( both ) (2)
			*0x30 : Single mode
Network Mode			0x31 : Network mode ( half duplex )
			0x32 : Network mode ( full duplex ) (2)
Free Scan	0x84	Scan always fingerprint images	*0x30 : Normal mode
		for identification on idle state	0x31 : Free scan mode
Provisional Enroll	0x85	Save enrolled templates at flash	*0x30 : Permanent enrollment

		memory permanently or not	0x31 : Provisional enrollment
Pass When Empty	0x86	Pass or fail when fingerprint DB	*0x30 : Fail when DB is empty
		is empty	0x31 : Pass when DB is empty
			*0x30 : No delay
		Delay for response command	0x31 : 20 msec
Response Delay			
			0x35 : 100 msec
	ı		0x3A : 200 msec
			0x30 : infinite
			0x31 : 1 second
		Timeout period for matching in identification	
Matching Timeout	0x88		*0x33: 3 seconds
a.cgcac			
			0x3A: 10 seconds
			0x44: 20 seconds
Build Number	0x89	Build number	4bytes character
			*0x30 : No check
	0x8A	Displacement between two	0x31 : Above 1 mm away
Enroll Displacement		fingerprints for enrollment in	
Enroll Displacement		case EnrollMode parameter is 2	0x35 : Above 5 mm away
		times or 2 templates	
			0x3A : Above 10 mm away
Lighting Condition	0x90	Tune optical sensors based on	*0x30: Outdoor
		lighting conditions	0x31: Indoor
Free Scan Delay		Delay between consecutive	0x30: No delay
		identification processes in Free	*0x31: 1 second
		Scan Mode.	

			0x40: 10 seconds
			0x30: Normal
Fast Mode	0x93	Fast mode for 1:N matching	0x31: Fast mode 1
			0x35: Fast mode 5(Fastest)
			*0x36: Automatic
Matabalaa	0.404	Watchdog timer	0x30: Don't use Watchdog timer
Watchdog	0x94		*0x31: Use Watchdog timer
			*0x30: Suprema
Template Type	0x96	Template type	0x31: ISO 19794-2
			0x32: ANSI 378
	0x97	Enhanced privacy mode	*0x30: Enhanced mode off
Enhanced Privacy			0x31: Enhanced mode on
			*0x30: Fake detection off
Fake Finger Detection	0x98	Fake finger detection option	0x31: Fake detection on ( Weak <sup>(8)</sup> )
			0x32: Normal <sup>(8)</sup>
			0x33: Strong <sup>(8)</sup>
			*0x30: Don't check latent fingerprints when
Check Latent	0x9A	Latent fingerprint detection option	enrolling
Fingerprint			0x31: Don't check latent fingerprints
			0x32: Check latent fingerprints always
Voltage Warning <sup>(7)</sup>	0x9B	Voltage warning threshold	*0: Don't check voltage
			1 ~ 12000: Threshold voltage in mV
Power Off	_	Timeout for automatic power off	*0: No timeout
Timeout <sup>(7)</sup>	0x9C		1000~: Timeout in msec

<sup>(2)</sup> SFM3500/5500 series

<sup>(4)</sup> Reducing template size might affect authentication performance.

<sup>(7)</sup> SFM4000 Series (8) SFM5060-OH only (9) SFM5500 Series

#### Contact Info

### Headquarters

Suprema, Inc. (<a href="http://www.supremainc.com">http://www.supremainc.com</a>)

16F Parkview Office Tower, Jeongja, Bundang, Gyeonggi, 463-863 Korea

Tel: +82-31-783-4502 Fax:+82-31-783-4503

Email: <a href="mailto:sales@supremainc.com">sales@supremainc.com</a>, <a href="mailto:supremainc.com">support@supremainc.com</a>