Datasheet

Ver. 1.0



Revision History

Rev No.	Issued date	Description
1.0	Oct.13, 2009	Initial Release

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Overview

The SFM modules 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 modules provide complete fingerprint solutions by incorporating fingerprint sensor interface and embedded fingerprint recognition algorithm into a half business card sized module.

The SFM3500 series is the latest SFM module equipped with world's leading fingerprint authentication algorithm (ranked No. 1 in FVC2004 and FVC2006) 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 module has a state-of-the-art 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 modules stand ready to meet your requirements and adapt to your applications.

1. SFM3500 Series

The SFM3500 series is the latest SFM module equipped with world's leading fingerprint authentication algorithm, which ranked No. 1 in FVC2004 and FVC2006. The SFM3500 series is based on powerful DSP technology, optimized for performance while minimizing power consumptions.

Table 1 summarizes available combinations of modules and sensors.

Table 1 SFM3500 Series combinations

Model name	Supported sensors	Main board
SFM3510-FC	Atmel Fingerchip	SFM3510
SFM3520-OP	Optical sensor I	SFM3520
SFM3530-OD	Optical sensor II	SFM3530
SFM3540-OL	Optical sensor III	SFM3540
SFM3550-TC1	UPEK TouchChip TCS1CD	SFM3550
SFM3550-TC2	UPEK TouchChip TCS2CF	

2. Features

- World best authentication performance (ranked No. 1 in FVC2004 and FVC2006)
- High speed fingerprint verification
- Compact size
- Low power consumption
- Fast power on time
- Supports various communication interfaces
- Supports fingerprint data encryption
- Supports various fingerprint sensors
- Highly configurable I/O signals
- Operates with a single 5.0v dc supply

3. Fingerprint Authentication Specifications

3.1. Fingerprint Authentication Performance

EER*	<0.1%
Enrollment time	<1 sec
Verification time	<1 sec

^{*}EER is dependent on databases

3.2. Fingerprint Sensor Specifications

Device Name	Optical sensor III
Sensor technology	Optical
Sensing area	15.5mm x 17.7mm
Image size(pixels)	256 x 288
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	Units
Supply voltage	V_{DD}	4.5	5.0	5.5	V
Operating temperature	T _{OP}	0		70	°C

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}		111		mA
Supply current (scanning)	I_{DD2}		188		mA
Supply current (identifying)	I_{DD3}		192	220	mA
High level input voltage	V _{IH}	2.0		5.5	V
Low level input voltage	V _{IL}	-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 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, 2 Outputs	
J3	Wiegand I/O port.	
]4	Aux interface port	
J5	Host interface port	
J6	Battery connector for time keeping	
J7 Internal use only		
J8 Sensor interface port		

1. Connectors J1 \sim J6 are Molex 53261-8090 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	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	TTL input	Wiegand input, DATA0	
WIN1	3	TTL input	Wiegand input, DATA1	
NC	4	No connect	Reserved for future use	
VCC	5	Power	Power Supply. 5Vdc	
WOUT0	6	TTL output	Wiegand output, DATA0	
WOUT1	7	TTL output	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		Power Ground
VBATT	2	Power	RTC power supply. 3~3.6V
GND	GND 3 Power		Power Ground

4.6. Physical Dimensions

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

Figure 1 Main board dimensions

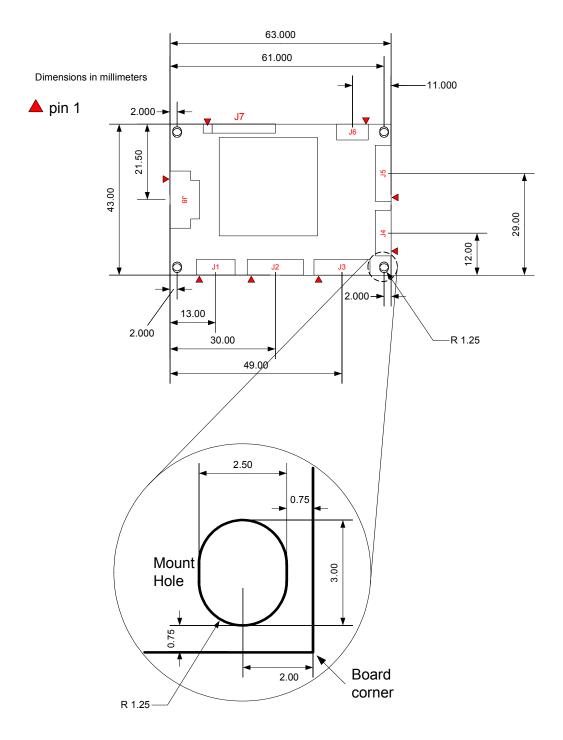
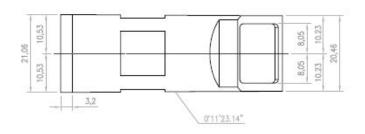
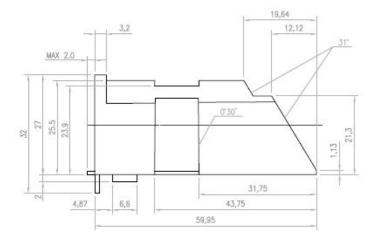
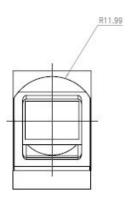
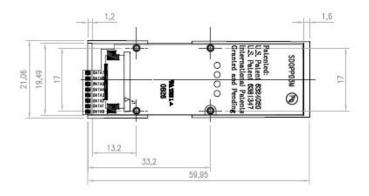


Figure 2 Sensor dimensions









Dimensions in millimeters

5. Communication Protocol Summary

The SFM modules provide 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 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 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	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 LN 0x3C Get number of 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
DAA 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	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 current time LN 0x3C Get number of log data LD 0x3E Delete log data	IT	0x13	Identify by template
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 LR 0x3D Read log data LD 0x3E Delete log data	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
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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
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	LT	0x18	List user ID
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
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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

WR 0x42 Read Wiegand configuration WG 0x43 Get Wiegand input WS 0x44 Set Wiegand output WM 0x68 Map Wiegand id to input function WL 0x69 List Wiegand id mapping WC 0x6A Clear Wiegand id mapping IW 0x47 Write input configuration IR 0x48 Read input configuration	
WS 0x44 Set Wiegand output WM 0x68 Map Wiegand id to input function WL 0x69 List Wiegand id mapping WC 0x6A Clear Wiegand id mapping IW 0x47 Write input configuration	
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