FG75-MF

Product Manual

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Revision History

Rev. #	Date	Updated By	Description
1.0.0	2005.03.10	NT.Tsai	Initial
1.0.1	2005.03.17	NT.Tsai	Modify the content of appendix for the emergency matching.
1.0.2	2005.03.18	NT.Tsai	Modify the specification of FAR/FRR
1.0.3	2005.03.24	NT.Tsai	Change the name product of FG75 to FG75-MF

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1. Introduction

FG75-MF, a new product introduced by STARTEK in 2005, is specially designed for access control systems that comply with Wiegand interface. Easy to use, competitive pricing, and combination of fingerprint and contact-less card are the features promise FG75-MF to be a main attraction among biometric access control devices. With a built-in MIFARE card reader, FG75-MF does not requires external database. There is no limit for number of users because fingerprint templates are stored in user's MIFARE card.

The delicate design of FG75-MF allows it to be easily attached to any conventional access control system without experiencing an interface hassle. After a successful matching, FG75-MF provides standard 26-bit Wiegand output as most general card readers do. FG75-MF could be considered as a stick-on solution to be conveniently integrated into an existing contact-less card system of a building that has installed an access control system.

Hardware specification, installation guide, and illustration of connection to host can be found in following sections. For details, please refer to *Host Management Software Guide*.

⚠ Note: The manufacture is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

2. Hardware Specification

2.1. Package List

FG75-MF package:

1. FG75-MF x 1 (main-body and screw cover)
2. Hanger x 1
3. 1K Bytes blank MIFARE card x 4
4. Power adapter x 1
5. Pigtail connector x 1
6. Screws
7. Product manual x 1
8. Warranty letter x 1

Host package:

1. Installation CD x 1
2. FM200 x 1
3. MIFARE reader/writer (RS232) x 1
4. Host management software guide x 1

2.2. Dimensions

The dimension of FG75-MF is 166 × 70 × 80 mm (6.54” × 2.76” ×3.15”). All of the FG75-MF components are illustrated in Figure 1.

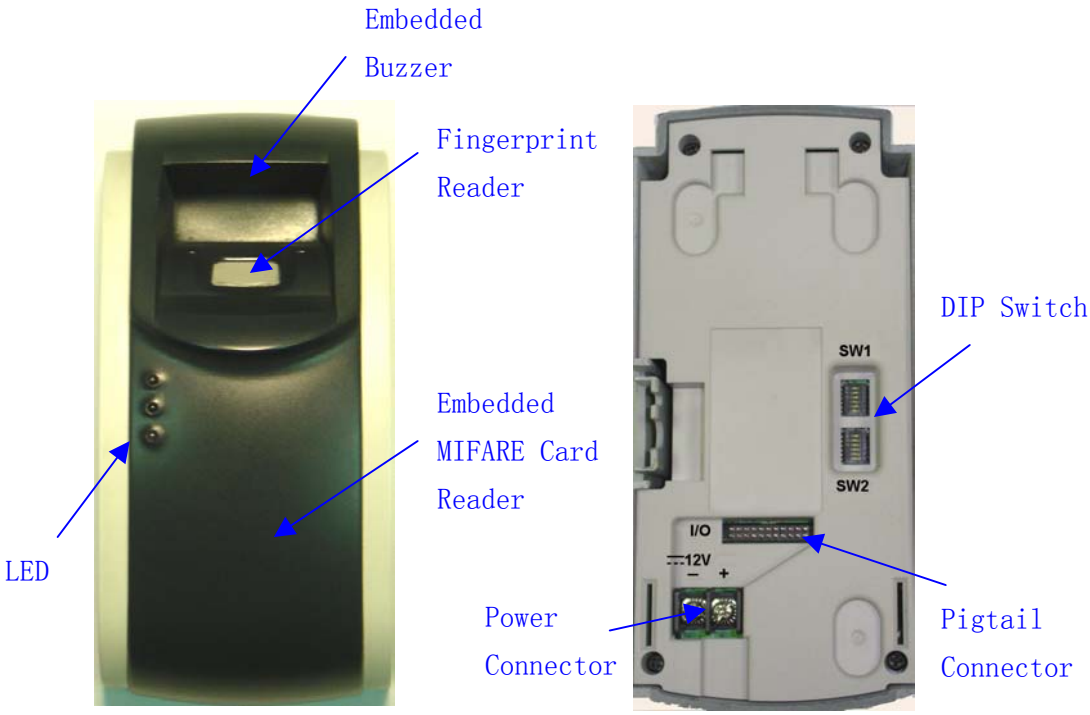


Figure 1: Appearance of FG75-MF

2.3. Weight

The assembled device weights 260g without the hanger.

2.4. Power

The power requirement is DC 9-24V. The power consumption under normal operation is less than 3W at DC 12V.

2.5. Appearance

The appearance of FG75-MF is in a streamlined look with charcoal gray in the main-body and pearl white in the lateral.

2.6. Fingerprint reader

The fingerprint sensor of FG75-MF is optical type manufactured by Startek. The sensor is the same as other optical based products from Startek. Therefore, it grants customers the convenience of selecting different devices in their system. Optical sensors perform with better stability in comparison with chip sensor, and are recommended to be used in access control system.

2.7. MIFARE card reader

The ISO14443A compliant contact-less card reader is built in FG75-MF. It accepts both 1K-bytes and 4K-bytes MIFARE cards. The operating frequency is 13.56MHz and the valid distance is 3cm from the device at most.

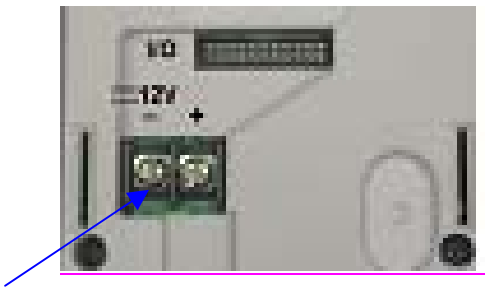
2.8. Indicators

There are three LEDs and an embedded monotonic beeper to indicate the status of FG75-MF, but no traditional keypad and display.

3. Mechanical Specification

3.1. Mounting

FG75-MF should be mounted to a wall. A metallic hanger that can be found in the package needs to be fixed onto the wall by screws. Then hang up FG75-MF on the hanger. A hole on the wall is necessary for the connections to power supply and pigtail connector.



Note: Connect the adapter to Power Connector with screws fully tightened. Provided that there is any slack, it might lead to power discontinuity and affect the performance.

3.2. Mounting Position

The recommended height for mounting FG75-MF is between 42 and 48 inches (from top of the device to the ground).

3.3. Mounting Guideline

The mounting guidelines are as follows, referring to the figure 3.

i. Mount back hanger and use it as the base first.

ii. Next, tile the FG75-MF until it forms a 30-degree angle against the wall and then push the FG75-MF toward the wall so that pins B and C are inserted into their designated slots.

iii. Attach the whole body against the wall and push it down so that the pin A will slide into the slot in the back of the FG75-MF.

iv. Check if A, B and C are in their positions.

v. Finally, check the stability of FG75-MF.

The actual size of the hanger is designated in Figure 2, and the illustration of the way to mount FG75-MF is in Figure 3.

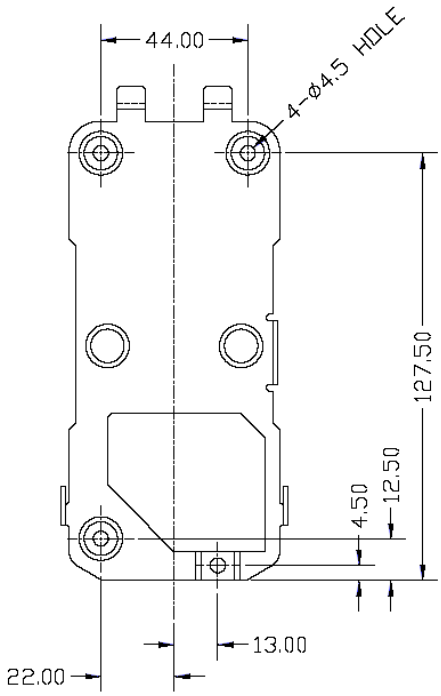
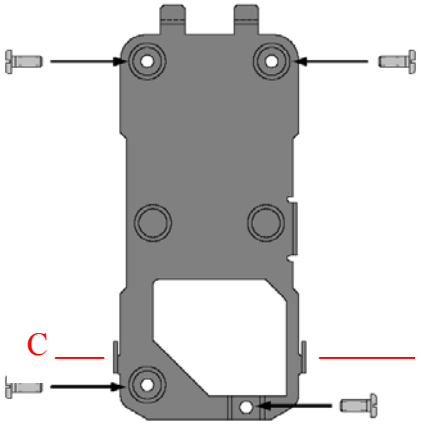


Figure 2: Actual size of hanger



1. Fix the hanger on the wall

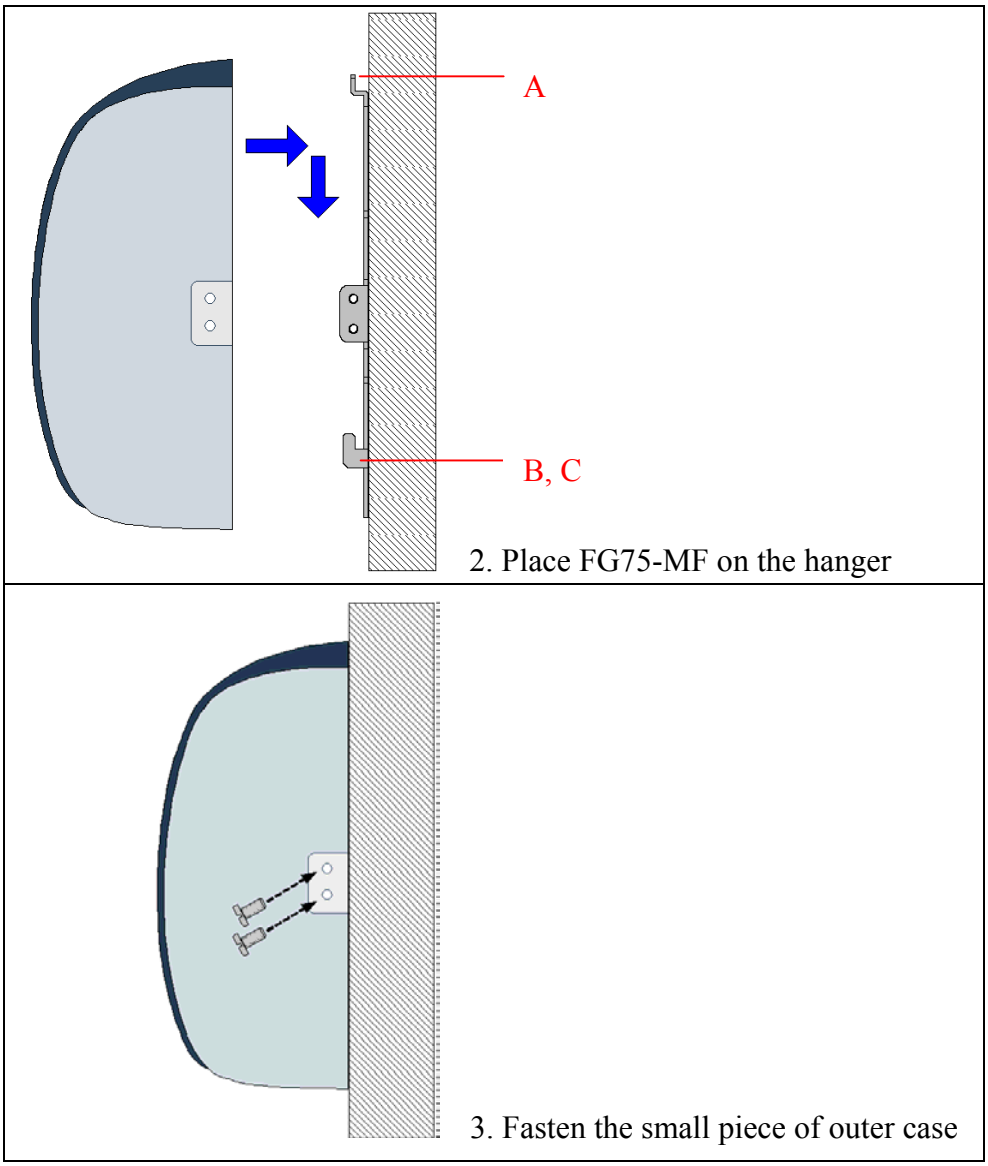


Figure 3: Installation guideline of FG75-MF

4. Environment Specification

4.1. Operating Temperature

The operating temperature of FG75-MF should be in the range from 0℃ to 45℃. Warning! The device cannot be exposed under the sunlight or any inclement environment.

4.2. Storage Temperature

The storage temperature of FG75-MF ranges from –10℃ to 70℃. Please avoid violent vibration storage conditions

4.3. Humidity

The humidity for FG75-MF installation should be in the range from 0% to 80%, non-condense.

4.4. Operation

The case of FG75-MF is made by ABS (Acrylonitrile Butadiene Styrene, one kind of plastic). Any pounding against the device or scratching on prism of the fingerprint reader should be avoided.

4.5. Certifications

To be in compliance with requisite international standards for access control devices, FG75-MF has passed the international standards of CE, FCC, and UL. Please find marking of these certifications on the back of FG75-MF.

5. Communication Specification

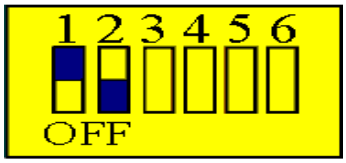
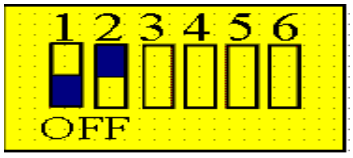
5.1. Dip Switch

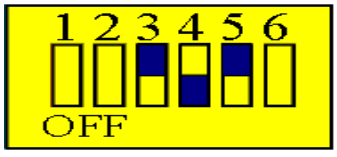
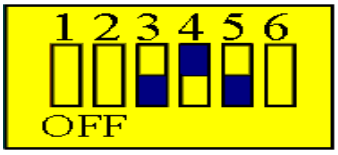
There are two switches at the back of FG75-MF. The upper one is SW1 and the other is SW2. The settings are listed in the table 1.

i. COM2: This serial port is used for RS232/485 connection

ii. COM1: This serial port is used for either MIFARE reader or computer (updating program)

iii. To specify the module ID for RS485, adjust the 6 dips to indicate its binary form.

COM2 configuration (SW1)			
	Dip1	Dip2	Illustrations-SW1
COM2 for RS232(default)	On	Off	
COM2 for RS485	Off	On	

COM1 configuration (SW1)				
	Dip3	Dip4	Dip5	Illustrations-SW1
COM1 for MIFARE reader (default)	On	Off	On	
COM1 for PC	Off	On	Off	

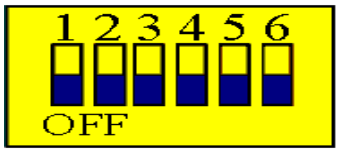
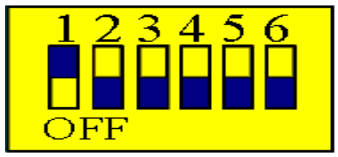
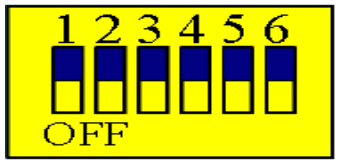
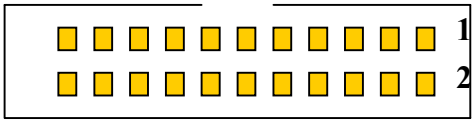
Module ID configuration (SW2)							
	Dip1	Dip2	Dip3	Dip4	Dip5	Dip6	Illustrations-SW2
ID = 0(default)	Off	Off	Off	Off	Off	Off	
ID = 1	On	Off	Off	Off	Off	Off	
ID = 2 ~ 62	Switch the 6 dips to indicate its binary form						
ID = 63	On	On	On	On	On	On	

Table 1: Dipswitch settings

5.2. Connector

All input and output signals are provided by a 2 by 11 header. A pigtail wire can be found in the package. The right upper corner is the 1st pin. All pin assignments are listed in table 2.



Pin	Symbol	Description
1	TXD1	COM1 RS232 transmit/output (update program)
2	RXD1	COM1 RS232 receive/input (update program)
3	GND	Ground
4	GND	Ground
5	TXD2	COM2 RS232 transmit/output
6	RXD2	COM2 RS232 receive/input
7	GND	Ground
8	GND	Ground
9	DATA+	COM2 RS485 data+
10	DATA-	COM2 RS485 data-
11	GND	Ground
12	GND	Ground
13	WOUT0	Wiegand-out data ‘0’
14	WOUT1	Wiegand-out data ‘1’
15	GND	Ground
16	GND	Ground
17	WIN0	Wiegand-in data ‘0’
18	WIN1	Wiegand-in data ‘1’
19	TTL_O	Alarm output, 5V TTL signal output (low active)
20	GND	Ground
21	LN_TRG	Adjustable line trigger (high active)
22	GND	Ground

Table 2: Pin assignments of FG75-MF pigtail connector

5.3. Power

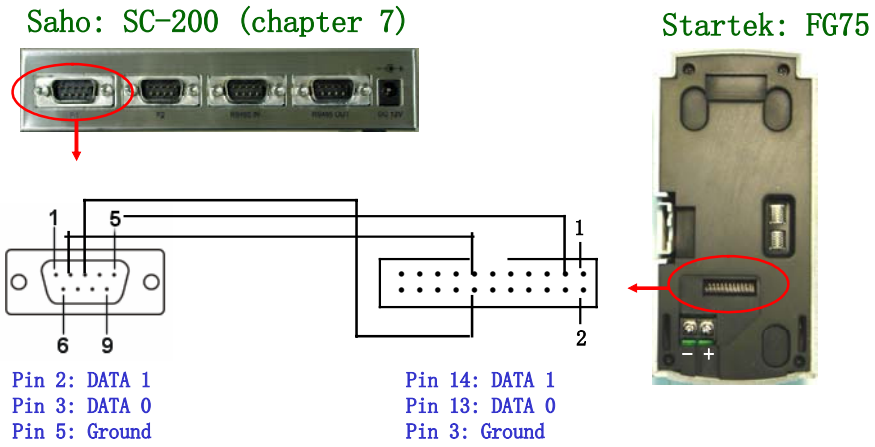
DC 9-24V is required for the power. The power connector is separated into two poles. The positive pole is in the right side with a triangle sign in the inner PC-board.

5.4. Reset Button

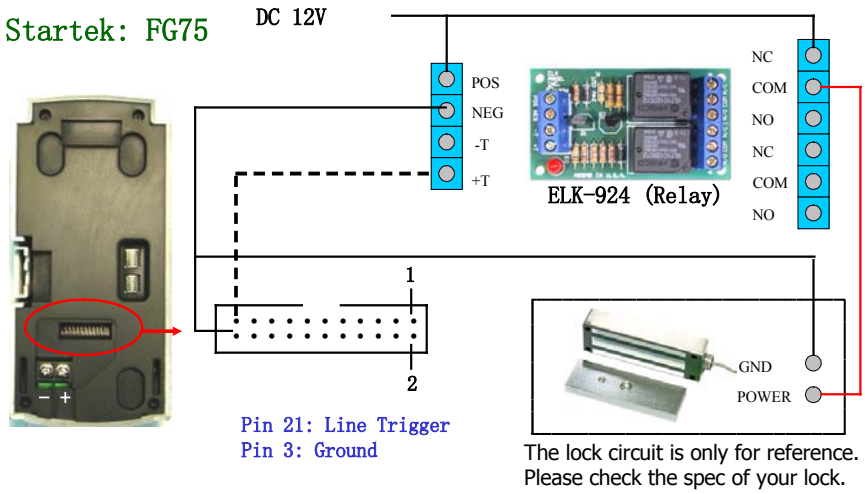
The reset button is in the bottom of FG75-MF. If FG75-MF works improperly, use a needle to stick the reset button and to restart again.

5.5. Reference Connections

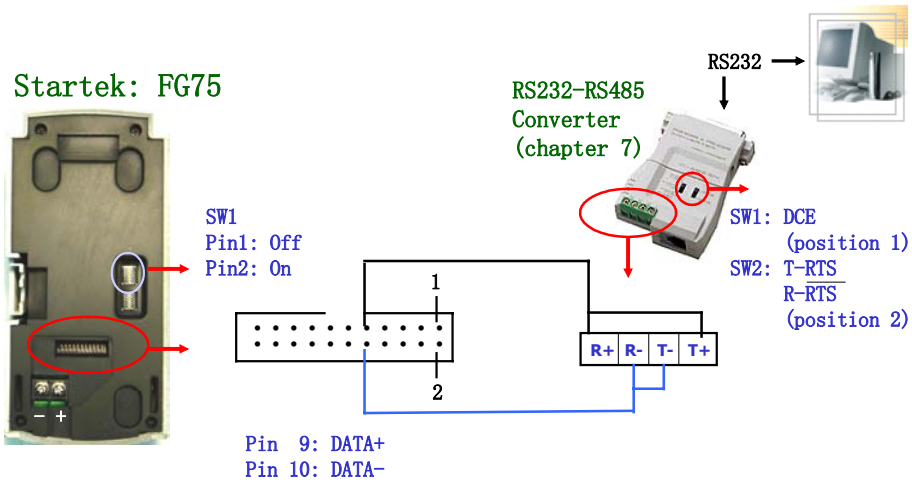
1. Connection to Wiegand controller: It is recommended to use a Wiegand controller to set the access permission and record the access log.



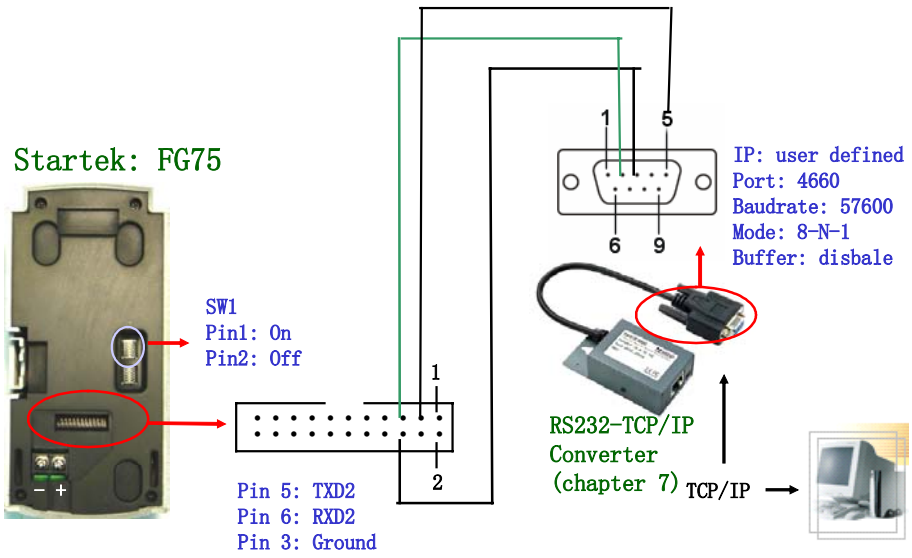
2. Connection to relay: This is the easiest way to control the door by the line trigger signal.



3. Connection for RS485 network: Connect all devices to 2-wire RS485 line, and use a converter to control by a server. Each device should be assigned a module ID to identify.



4. Connection to Ethernet: Use a TCP/IP converter to provide the Ethernet interface and each device is assigned with a unique address.



6. Operation Specification

6.1. Enrollment

To utilize FG75-MF as an authentication device, users should enroll on a server first. Some materials, including MIFARE reader/writer with RS232 interface, FM200 optical fingerprint reader with USB interface, and an installation CD, can be found in the host package. Install the program and follow the instructions described in *Host Management Software Guide* to launch the enrollment functions.

The templates are stored inside the card, and no local database is necessary inside FG75-MF. The administrator can define the section to record the template(s) inside the card. Any card that has been used for other purposes can be applied to FG75-MF as well if there is enough data space to store template(s).

6.2. Matching

FG75-MF combines two determinant authentications, fingerprint and contact-less card, in one unit. It provides an easy and unique way to match a user's finger(s). Present the user's MIFARE card containing his template(s) and then place his corresponding finger to match. FG75-MF performs a 1:1 matching inside the device precisely and then indicates the result.

The following is the operating example.

Standby

Present the user's MIFARE card with his template(s)

Place his corresponding finger to match

Green led blinks if 1:1 matching ok

All matching results are implied by means of the indicators, 3 LEDs and a beeper. Refer to table 3 in appendix to check the meanings.

There are four special settings for matching.

i. **Anti-threaten finger:** Three templates at maximum can be stored in one card. The first two could be alternative and make the accessing possible if any one of the two fingers gets injured while the individual tries to access the entry. Moreover, the third enrolled finger is set as the anti-threatened one. If he/she is threatened to open the door, a byte-inversed ID will be sent via Wiegand output instead of original ID. Besides, FG75-MF outputs a pulse of an alarm.

ii. **Card only:** Sometimes, for example, someone cannot enroll successfully or someone doesn't want to use fingerprint authentication, FG75-MF provides a peculiar way to access the entry. Mark the card as "card only" from server, and then someone can just use this card to access the entry without matching his/her finger again.

iii. **Black list:** Due to some security reasons, FG75-MF provides a black list to suspend the user to access even though he/she passes the matching. If someone's card is getting lost or disabled, the card will be rejected when it is found in the black list.

iv. **White list:** Sometimes, only several members are allowed to get the access permission of the entry. The administrator can edit the list to control those who are accepted to match. Only the members in the list can match their fingers, and other cannot enter the matching process even though he/she has the MIFARE card with his/her fingerprint inside.

Note: it is an alternative to set the list as a black list or a white list. This flag can be changed by the host software.

6.3. Door Control

FG75-MF provides two external mechanisms to control the door lock. There is no internal or built-in component to be connected to the door lock inside FG75-MF. The system administrator should decide how to open the door. The first one way in the following is recommended.

i. **Wiegand collector or door controller:** FG75-MF offers a standard 26-bit Wiegand output as matched user ID. Any controller that supports 26-bit Wiegand input can be selected to use. The administrator can make the user shift to determine he/she is prohibited to enter or not.

ii. **Relay module:** FG75-MF also offers a line trigger with adjustable length to control the relay. Many locks can easily be connected to a relay for door control. If someone is matched by FG75-MF, it will pull high the line trigger but no shift can be referred.

6.4. Time and Attendance

FG75-MF keeps the recent 12,288 log records in the internal flash memory. The 16-byte log format is described in Table 4.

User ID (4 bytes)	Year (2 bytes)	Month (1 byte)	Day (1 byte)	Hour (1 byte)	Minute (1 byte)	Second (1 byte)
Match result (1 byte)		Reserved (4 bytes)				

Matching result:	
0x00	Match OK for card only
0x01	Match OK for fingerprint
0x02	Match OK for emergency fingerprint
0x03	Reserved
0x04	Write system parameters OK
0x05	Read system parameters OK

Table 4: Log format of FG75-MF

The host management software supports some simple time and attendance functions. The administrator who would like to combine FG75-MF with his own time and attendance system may receive the logs from FG75-MF directly and then transfer them into the existent system.

6.5. Performance

The matching performance of FG75-MF, measured by FAR (false acceptance rate) and FRR (false rejection rate), is excellent. The FAR and FRR are adjustable from server. The default setting for 1:1 matching is:

i. FRR: 1/100
ii. FAR: 1/10,000

6.6. Network

FG75-MF supports the network communication with serial interface. There are two kinds of serial interfaces, RS232 and 2-wire RS485. Only one interface could be selected at the same time, and the user shall use dipswitch to setup the interface. The connection to server also can be established with TCP/IP interface by means of an RS232-to-TCP/IP converter.

6.7. Key Management

FG75-MF performs the matching for your fingerprint and the enrolled template that was stored inside your MIFARE card. Every company that adopts FG75-MF as the access control device must prevent the users who come from another companies from entering because the enrolled template is portable. Every company has to set a unique key for issuing MIFARE cards. It can be done when first execute the host software. The instructions are described in *Host Management Software Guide*.

6.8. Synchronization

There are two ways to synchronize all installed devices if there are more than two FG75-MF in the system.

i. **Synchronized by Host:** If all devices are connected in RS485 or TCP/IP network, the host software can synchronize each device.
ii. **Synchronized by System Card:** If no connection for FG75-MF, it is convenient for the administrator to use the system card to synchronize. Reading the parameters from card to device or writing the parameters from device to card are presented.

The list of parameters and the detailed description of synchronization can be found in *Host Management Software Guide*.

6.9. Update Program

FG75-MF reserves the ability to update the firmware inside. Refer the dipswitch settings and connect the COM1 to PC for downloading and updating. Run the update utility to start the process and wait for the updating totally completes. During the updating, the built-in MIFARE reader shall be disabled temporarily.

7. Accessories

7.1. Other Accessories for Access Control System

To implement an entire access control system, some additional devices may be indispensable. Here are some references in the table 5. Startek doesn't supply these accessories. The administrator may need to contact the companies listed below or find out other distributors selling similar products.

Relay module

Reference:
http://www.elkproducts.com/products/elk-924.htm
Description:
Connect the ELK-924 compliant relay module to line trigger. It is used to control the signal for door accessing.

Wiegand controller

Reference:
http://www.saho.com.tw/Emain2-8.htm
Description:
Connect the 26-bit Wiegand controller to FG75-MF. It is used to control the door lock by user-defined shifts.

RS232 to RS485 converter

Reference:
http://www.aten.com/02-p-item.php?id=59
Description:
Wire RS485 lines both to FG75-MF and the converter. It enables FG75-MF to be connected to PC via RS485.

RS232 to TCP/IP converter

Reference:
http://www.atop.com.tw/e/product/GW51E-MINI.htm
Description:
Wire Ethernet line to the converter and then wire serial line to FG75-MF. It enables FG75-MF to be a TCP/IP based device.

Table 5: Reference of FG75-MF accessories

Appendix

1. **System OFF:** System is not working

FM200 LED	OFF		
LED	Red: OFF	Green: OFF	Yellow: OFF
Beeper	OFF		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

2. **System initializing:** System is initializing, still not available

FM200 LED	ON		
LED	Red: ON	Green: ON	Yellow: ON
Beeper	OFF		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

3. **System ready:** System is available

FM200 LED	OFF		
LED	Red: ON	Green: OFF	Yellow: OFF
Beeper	OFF		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

4. **System ready with error status of log:** System is available, but log is in a full status

FM200 LED	OFF		
LED	Red: ON	Green: ON	Yellow: ON
Beeper	OFF		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

5. **System error in card reader:** System fails in card reader

FM200 LED	N/A		
LED	Red: ON	Green: ON	Yellow: ON
Beeper	Continuously play the beep sound		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

6. **System error in fingerprint reader:** System fails in f/p reader

FM200 LED	N/A		
LED	Red: ON	Green: ON	Yellow: ON
Beeper	Continuously play the beep sound		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

7. **Card read OK:** System detects the card successfully

FM200 LED	ON		
LED	Red: ON	Green: OFF	Yellow: OFF
Beeper	Play the beep sound once		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

8. **Card read failed:** System detects the card failed

FM200 LED	OFF		
LED	Red: ON	Green: OFF	Yellow: BLINKING
Beeper	Play the beep sound for four times		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

9. **Rejected by blacklist or whitelist:** System rejects a access of card.

FM200 LED	OFF		
LED	Red: ON	Green: OFF	Yellow: BLINKING
Beeper	Play the beep sound twice		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

10. **Snapping:** System continuously snaps the user's fingerprint

FM200 LED	OFF		
LED	Red: ON	Green: OFF	Yellow: OFF
Beeper	Play the beep sound once		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

11. **Snapping OK:** System gets fingerprint image successfully

FM200 LED	OFF		
LED	Red: ON	Green: OFF	Yellow: OFF
Beeper	OFF		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

12. **Snapping timeout:** System fails to snap

FM200 LED	OFF		
LED	Red: ON	Green: OFF	Yellow: BLINKING
Beeper	Play the beep sound twice		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

13. **Snapping failed:** System cannot snap successfully

FM200 LED	OFF		
LED	Red: ON	Green: OFF	Yellow: OFF
Beeper	Play the beep sound once		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

14. **Matching OK:** System matches the user successfully

FM200 LED	OFF		
LED	Red: ON	Green: BLINKING	Yellow: OFF
Beeper	Play the beep sound for two seconds		
Wiegand OUT	Card ID		
Line Trigger	PLUSE		
Alarm OUT	OFF		

15. **Failing to save a log to flash:** FG75-MF fails to save a log to flash

FM200 LED	OFF		
LED	Red: ON	Green: BLINKING	Yellow: BLINKING
Beeper	Play the beep sound for two seconds		
Wiegand OUT	OFF		
Line Trigger	PLUSE		
Alarm OUT	OFF		

16. **Matching failed:** System fails to match

FM200 LED	OFF		
LED	Red: ON	Green: OFF	Yellow: BLINKING
Beeper	Play the beep sound three times		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

17. **FCP command:** System gets and processes the commands from network

FM200 LED	OFF		
LED	Red: ON	Green: OFF	Yellow: ON
Beeper	OFF		
Wiegand OUT	OFF		
Line Trigger	OFF		
Alarm OUT	OFF		

18. **Emergency matching OK:** Host software sets the user's emergency flag. Next, system matches the user successfully with the 3rd finger.

FM200 LED	OFF		
LED	Red: ON	Green: BLINKING	Yellow: OFF
Beeper	Play the beep sound for two seconds		
Wiegand OUT	Byte-inversed Card ID		
Line Trigger	PLUSE		
Alarm OUT	PLUSE		

Table 3: Meanings of FG75-MF indicators