Elevator Smart Card Control System

User Manual

Note: Before connecting, operating or adjusting this product, please read these instructions completely. Please keep this manual for future reference. Specifications are subject to change without notice.

Revision date：July 18, 2014

Applied product type：ITL-DT

Contents

Chapter 1 INTRODUCTION

1.1 Overview

Elevator is one of the most important parts in modern buildings, allowing people to transmit between floors. However, floor accessibility should be controlled for management convenience and security concern. This product is used to control the floor accessibility and elevator running time with contactless smart cards as identification.

The system enables the household floor control buttons (others are closed) after the specific card is read so that users can press corresponding buttons to move the elevator to the corresponding floors.

1.2 Specification

1) Power Supply: DC 24 V $\pm$10% / 2A

   Maximum Working Current: 500 mA

2) 32 dry contacts on main board with:

   On resistance < 1 Ω;

   Off resistance > MΩ;

   AC 125 V　-　0.5 A;

   DC 60 V　-　0.3 A;

   DC 30 V　-　1 A

3) Work Environment:

   Temperature: 0 -- 60℃;

   Humidity: 20% -- 90% without condensation

4) Storage Environment:

   Temperature: -10 -- 90℃;

   Humidity: 20% -- 90% without condensation

5) Recognizable card type:

   Mifare ®1 card: 0.2 second operation time

   CPU card: 0.3 second operation time

6) Communication interface: RS485 / RS232:

   9600 bps baud rate, 8, N, 1

7) Card or password controlled

8) Carrier Frequencies:13.56MHz(CH.1)

9) Modulation Type:ASK

10) Antenna Type:PCB loop antenna

11) Antenna Gain:-1dBi

12) Power Output: ≤0.3nW

1.3 Feature

1) The system is able to store 8192 blacklists.
2) Main board is able to control 16 floors, which can be increased to 112 floors with expansion board.
3) Every floor is able to process 16 guest cards at the same time.
4) Password keyboard (optional) allows 40 passwords for each floor.

5) The system is able to store 30080 offline records.
6) Whenever the elevator is found abnormal , like low power supply or communication error between main board and card reader, the control system stops elevator control to make it work alone without any effects from this product.
7) Even if power is off, data will NOT lose.
8) Where and when the single-floor cards are read can be recorded.
9) Where and when the user password is used can be recorded.
10) When the guest cards are read can be recorded.
11) The cards read are checked whether is legal.

Chapter 2 Adjustment & Setting

2.1 Main Board

2.1.1 PCB of Main Board
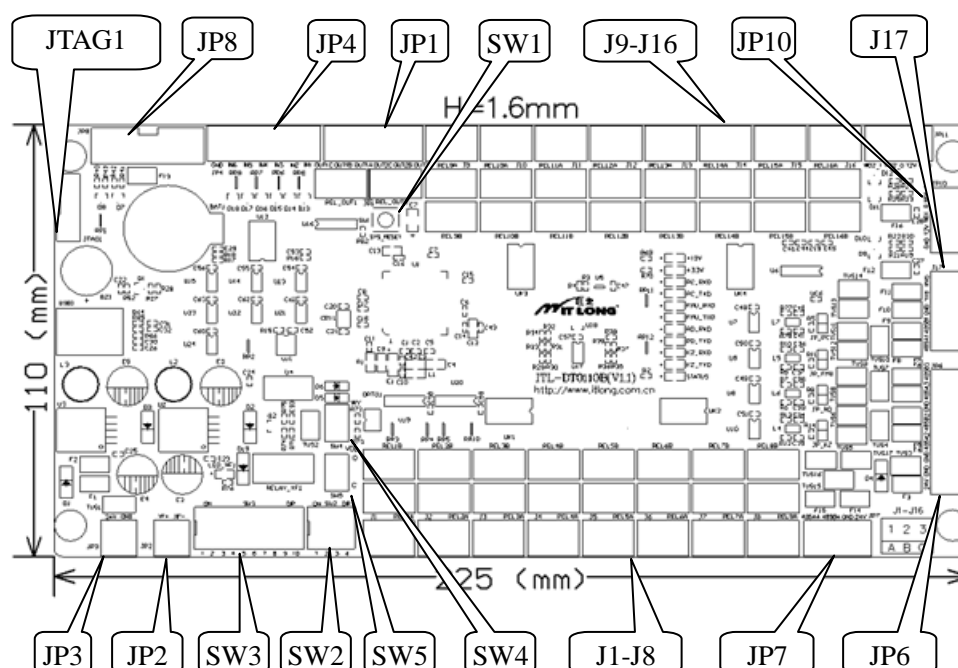
JP1：Reserved Output Terminal	**JP2**：Firefighting Signal Terminal
JP3：Power Joint	**JP6**：Card Reader/Floor Collector Terminal
JP10：Wiegand Terminal	**J17**：PC/Collector Terminal
JP8：Floor Expansion Board Terminal	**JP4**：Reserved Input Terminal
J1-8：$1^{st} – 8^{th}$ Floor Control Terminal	**J9-16**：$9^{th} – 16^{th}$ Floor Control Terminal
SW1：System Reset Button	**SW2**：System Setting Switch
SW3：Controller Number Setting DIP	**SW4, 5**：Firefighting Input Selection Switch
JP7：Expansion Board 485 Signal Terminal	**JTAG1**: Programming Port

2.1.2 Wire Jumper of Main Board

SW4, SW5 - Firefighting Input Selection Switch

SW4 is used to define whether the input signal of JP2 firefighting is voltage signal or switch signal (including dry contact and collector open electronic switch)；SW5 is used to define whether the input signal of JP2 is normal or effective. The logic is defined as follows：

SW4	SW5	Function
Down	Down	Set firefighting signal when there's a voltage of 8 to 48 V in JP2.
Down	Up	Set firefighting signal when the voltage is below 1V in JP2.
Up	Down	Set firefighting signal when input short circuit in JP2.
Up	Up	Set firefighting signal when input cutting off in JP2.

Note: UP in the table means that switch is turned to the part far away from the direction of floor electric relay, while DOWN means that switch is turned to the part near the direction of floor electric relay. The default setting of SW4 is Up and SW5 is Down.

SW1 - System Reset Button

This button is used to reset system without restart.

SW2 – System Mode Setting Switch

SW2.1 – default OFF

SW2.2 – default OFF

SW2.3 – reserved

SW2.4 – reserved

SW3 - Controller Number Setting DIP Switch

This dial in-line package switch is used to choose the number of controller. The function of each pin is defined as follows:

DIP	Connotation
1	Bit 0 of controller number
2	Bit 1 of controller number
3	Bit 2 of controller number
4	Bit 3 of controller number
5	Bit 4 of controller number
6	Bit 5 of controller number
7	Bit 6 of controller number
8	Bit 7 of controller number
9	Bit 8 of controller number
10	Initialize controller switch

This dial in-line package switch is used to choose the address of motherboard. If we use n0, n1, n2, n3, n4, n5, n6, n7, n8 to represent the NO.1, 2, 3, 4, 5, 6, 7, 8, 9 dial in-line package switch of SW3 (1 presents on, otherwise off), No to present the number of

controller，then the equation to calculate the number of controller is as follows：

$$No=n0+n1 \times 21+n2 \times 22+n3 \times 23+n4 \times 24+n5 \times 25+n6 \times 26$$

The 10th bit of SW3 is used to initialize controller. Turning to "ON" means initializing controller, otherwise it means operating normally. Specific steps of initializing controller are defined as follows:

1. Turn SW3.10 into ON.

2. The status indicator light on the controller will flash five times quickly, signifying the controller is going to do self check to the circuit inside and begin initialization.

3. Turn SW3.10 into OFF.

4. After the status indicator light flashing five times, it will do some self check to the circuit inside and begin initialization. The status indicator light will always be on during this time. If there is something wrong in initializing and self-checking, the indicator light will twinkle quickly. If self-check and initialization succeed, the controller board will work with the indicator light flashing at a frequency of 0.5 Hz.

5. Press SW2 to reset the controller to work and it is finished.

The largest number allowed is 384. If it is larger than 384, it will be set to 384 automatically. 0 is NOT allowed, or the system will suspend.

JP_FMU - Communication Resistance Selection (seldom used)

This jumper is only used in the condition that the controller is connected to floor data collector through RS485. When this controller is connected at the end of the communication bus wire, it must be short-circuited to prevent energy reflection in communication wire.

JP_RD - Communication Resistance Selection (seldom used)

This jumper is only used in the condition that the controller is connected to card reader through RS-485. When this controller is connected at the end of the communication bus wire, it must be short-circuited to prevent energy reflection in communication wire.

JP_PC - Communication Resistance Selection (seldom used)

This jumper is only used in the condition that the controller is connected to PC through RS-485. When this controller is connected at the end of the communication bus wire, it must be short-circuited to prevent energy reflection in communication wire.

JP_KZ - Communication Resistance Selection (seldom used)

This jumper is only used in the condition that the controller is connected to expansion board through RS-485. When this controller is connected at the end of the communication bus wire, it must be short-circuited to prevent energy reflection in communication wire.

2.1.3 Internal Interface of Main Board

JP1, JP4 - Reserved Input Terminal

JP1 is reserved for output interface. JP4 is reserved for input interface.

JP2 - Firefighting Signal Terminal

This terminal is internally connected with pin5, 6 of data collection and firefighting interface. The input type is decided by SW4 and SW5. When SW4 is down (vol) and SW5 is up (o): the main controller board works normally only if the JP2's voltage on XF+ is DC +12~30V and is is GND on XF-. The system will switch into firefighting status when the voltage of XF+ port reduces to 0V.

JP3 - Power Joint

24V DC power input joint has been internally connected to the switching power supply:

Port	Function
+24V	DC 24V ,positive terminal of power supply；
GND	negative terminal of power supply；

JP6 - Card Reader / Floor Signal Collector Terminal

The interface of card reader and floor signal collector are defined as follows:

Port of JP6	Function
485B3	RS485B port of floor signal collector. It is connected to the network and pin 1 of floor signal collection interface.
485A3	RS485A port of floor signal collector. It is connected to network and pin 2 of floor signal collection interface.
GND	GND port of floor signal collector. It is connected to network and pin 5 of floor signal collection interface.
485B2	B port of card reader. It is connected to pin 1 of card reader interface.
485A2	A port of card reader. It is connected to pin 2 of card reader interface.
GND	GND port of signal. It is connected to pin 3 of card reader interface.
GND	GND port of power supply. It is connected to pin 4 of card reader interface.
VPP	Voltage port of power supply. It is connected to pin 5 of card reader interface.

JP7 – RS485 Bus Terminal for Expansion Board

The interface is used to connect expansion boards. It is used to connect to expansion board to controlling more than 16 floors. With this interface, 12 expansion boards can be connected and 112 floors can be controlled. P1 of expansion board is connected with cables to transmitted electricity and data.

JP8 - I2C Bus Terminal for Expansion Board

The interface is used to connect expansion boards. J10 of expansion board is connected

with cables to transmit electricity and data. In the condition of controlling more than 16 floors, it is used to connect to expansion board to increase controlled floors. With this interface, 4 expansion boards can be connected and 48 floors can be controlled. By default, JP8 is replaced with RS485 of JP7 for expansion board connection. JP8 is used as Compatible interface only when the ARM elevator system is added.

JP10 -Wigand Terminal

It is reserved to connect the card reader interface inside the chassis and connect the device with Wigand interface.
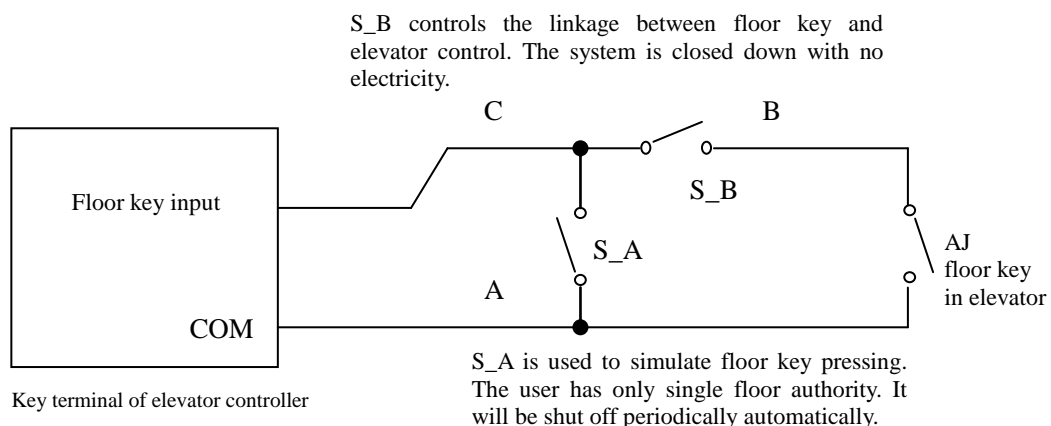
J17 - PC / Collector Terminal

This terminal is used for RS485/Rs232 communication. It can communicate with the software of PC directly or communicate with data collector.

Port of J17	functions
RXD	RXD port of data collector. It is connected to pin 1 of collector and firefighting interface of the chassis.
TXD	TXD port of data collector. It is connected to pin 2 of collector and firefighting interface of the chassis.
GND	GND port of signal. It is connected to pin 3 of collector and firefighting interface of the chassis, and pin 9 of network and floor data collector interface of the chassis as well.
485B1	B port of PC communication interface. It is connected to pin 8 of network and floor data collector interface of the chassis.
485A1	A port of PC communication interface. It is connected to pin 7 of network and floor data collector interface of the chassis.

J1-J16 - Floor Signal Output 1-16

Every floor signal output interface consists of A, B, C port. The fundamental principle of floor control is defined as follow:

S_B controls the linkage between floor key and elevator control. The system is closed down with no electricity.

C   B

S_B

Floor key input

S_A

A   AJ floor key in elevator

COM

Key terminal of elevator controller

S_A is used to simulate floor key pressing. The user has only single floor authority. It will be shut off periodically automatically.

Operation: B and C terminals of every floor are closed when elevator controller is power off; while they are switch off when the controller is power on. After setting open period, holidays or using multilayer visitor's card, B and C send close signal. When slotting effective multilayer visitor's card is detected, B and C terminals of corresponding floor will be closed and then switched off after 4 seconds. When slotting effective single floor visitor's card, B and C terminals are the same, with A and C terminals to be closed and then switched off after 1 seconds.

2.1.4 External Interface of Main Board

All the external connection signals should be transmitted through the interfaces on the chassis except the floor control output signal. These interfaces are defined as follow:

3PIN AC Power Socket

It is connected to AC120V power supply with power lines.

Data Collection and Firefighting Interface

It is used to connect to external devices with 232 interfaces, like collector, and firefighting switch using 6PIN ⌀20 male aviation plug. The interface is defined as follows:

| PIN	Function
1	RXD port of local 232
2	TXD port of local 232
3	GND port of local 232
4	NC
5	A port of firefighting signal. It is positive end if is electrical level.
6	B port of firefighting signal. It is negative end if is electrical level.

Card Reader Interface

It is used to connect to IC card reader using 5PIN ⌀20 male aviation plug. The interface is defined as follows:

PIN	Function
1	485B port of card reader
2	485A port of card reader
3	GND port of 485 bus
4	GND port of card reader's power
5	+24V port of card reader's power

2.2 Expansion Board

2.2.1 PCB of Expansion Board
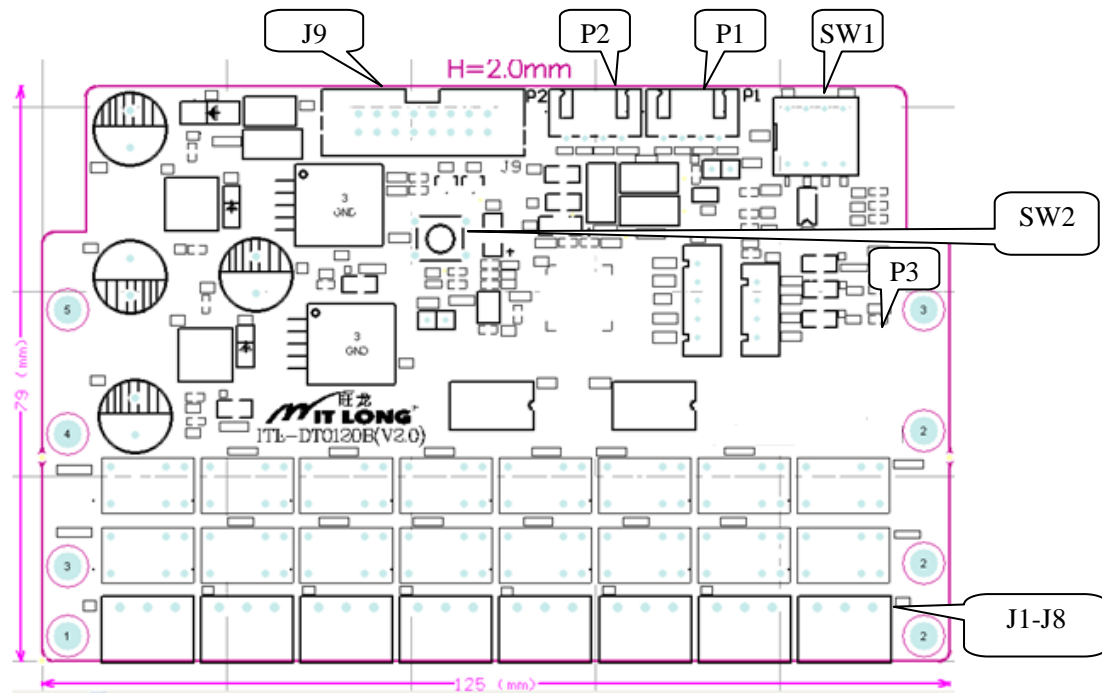
SW1: Floor Address DIP	**J1-J8:** Floors Signal Output Terminal
J9: I2C Bus Terminal	**P1,P2:** RS485 Bus Terminal
P3: Programming Port	**SW2:** Reset Button

2.2.2 Wire Jumper of Expansion Board

S2 - Floor Address DIP Switch

The DIP is used to set floor address of expansion board. The settings are defined as follows:

SW1.1	SW1.2	SW1.3	SW1.4	Corresponding floors of J1 – J8
OFF	OFF	OFF	OFF	17-24
ON	OFF	OFF	OFF	25-32
OFF	ON	OFF	OFF	33-40
ON	ON	OFF	OFF	41-48
OFF	OFF	ON	OFF	49-56
ON	OFF	ON	OFF	57-64
OFF	ON	ON	OFF	65-72
ON	ON	ON	OFF	73-80
OFF	OFF	OFF	ON	81-88
ON	OFF	OFF	ON	89-96
OFF	ON	OFF	ON	97-104

ON	ON	OFF	ON	105-112

JP1 – Communication Resistance Select Jumper (seldom used)

This jumper wire is only used in the condition that the expansion board is connected to main board through RS-485. When this expansion board is connected at the end of the communication bus wire, it must be short-circuited to prevent energy reflection in communication wire.

2.2.3 Interface of Expansion Board

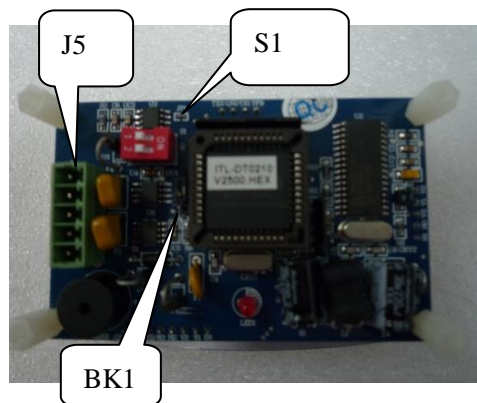**J1-J8 – No.1 to No.8 Floors Signal Output Terminal of Expansion Board**

The definition is similar to the J1-J16 of main board.

P1, P2 – RS485 Bus Terminal of Expansion Board

They are used to connect main board.

2.3 Card Reader

2.3.1 PCB and Appearance of Card Reader

J5: Main Board Terminal	**S1:** Card Reader Address DIP
BK1: Matching Communication Jumper	

2.3.2 Jumper of Card Reader

BK1 – Communication Jumper

It is RS485 communication jumper. When the card reader is connected at the end of the communication bus wire, it must be short-circuited to prevent energy reflection in communication wire. To short-circuit the jumper, soldering iron should be used.

2.3.3 Internal Interface of Card Reader

J5 – Elevator Control board Terminal (from up to down)

It is used to connect main board. The ports are defined from up to down as follow:

Port	Function
485B	485B port to connect 485B2 on JP6 of main board
485A	485A port to connect 485A2 on JP6 of main board
GRD	GND port to connect GND on JP6 of main board
VIN	VIN port to connect VPP on JP6 of main board
GND	GND port to connect GND on JP6 of main board

S1 –Card Reader Number DIP

It is used to distinguish different card readers if more than one reader is connected to main board. The SW1 settings of them cannot be the same.

S1.2	S1.1	Function
OFF	OFF	First card reader
OFF	ON	Second card reader
ON	OFF	Third card reader
ON	ON	Forth card reader

2.3.4 External Interface of Card Reader

P5 - Card Reader Interface

It is used to connect to main board using 5PIN ϕ20 male aviation plug. The aviation plug is connected to P5 terminal of card reader PCB board through 0.6m RVVP6×16×0.15 cable. The PINs of P5 are defined as follows:

PIN	Function
1	485B port of card reader, connected with blue wire
2	485A port of card reader, connected with yellow wire
3	Digital GND port of 485 bus, connected with green wire
4	GND port of card reader's power, connected with black wire
5	+24V port of card reader's power, connected with red wire

Note: The cable has been prepared. The female port of the cable should be connected with the male port from the card reader.

Chapter 3 Getting Start

3.1 Turn on Elevator Controller

Turn on the elevator controller after installation is finished. If it is the first time the main board is turned on, the LED on it will flash 5 times rapidly to show that circuit initialization and self-test has started. During initialization, the LED keeps on until initialization and self-test is finished. If the initialization and self-test successes, the LED flashes in 0.5 Hz to show that the controller has entered working status.

3.2 Download Operation Parameter

In working status, the elevator controller can download operation parameters with data collector, for example, system time, blacklist and so on. The data collector can also be used to collect and store the data of operation record for future inquiry and statistics. For more information about data collector, please refer to *Data Collector User Mannual.*

3.3 Read Smart Card

After downloading secret key and other parameters, the elevator controller can read card and process commands when a smart card enters the sensing range of card reader. There are 6 kinds of smart cards: management card, user card, guest card, VIP user card, VIP guest card, and charge card.

Card	Function
Management Card	Download secret key.
User Card	Enter specific floors.
Guest Card	Enable some controlled floors temporally.
VIP User Card	Enter every authorized floor.
VIP Guest Card	Enable every controlled floors temporally.
Charge Card	Control the elevator with charging. Used like user card after recharge.

3.3.1 Management Card

Management card is used to store secret key. A new system should read the management card before it can read others cards related to it. When a management card enters the sensing range of card reader, the card reader will examine its legality and produce a single sound beep if the card is read successfully. Only after that can the elevator controller process other kinds of cards. If the card reader produces a bunch of sound beep, the controller must have been set by another management card before.

The new card can only be read after the controller has been reset (see SW3 in Chapter 2). The elevator controller can read both Mifare 1 and CPU card. If both of them are used at the same time, their management cards should be read respectively.

3.3.2 User Card

When a user card enters the sensing range of card reader, the card reader will read the

data of it and examine its legality by checking the system password, valid data and authority. If the user card is legal, the controller will produce a single sound beep.

After reading valid user card (single floor), the controller allows the user to enter the floor by closing the B - C switch of the corresponding floor button for 1 second and then switch off.

After reading valid VIP user card (all floor), the controller allows the user to choose a floor by closing the A – C switch of the corresponding floor button for 4 second and then switch off. (See J1-J6 in Chapter 2-1.3)

3.3.3 Guest Card

When a guest card enters the sensing range of card reader, the card reader will read the data of it and examine its legality by checking the system password, valid data and authority. If it is illegal, the controller will produce a bunch of sound beep rapidly and the relay does nothing.

If a legal card has the access of only one floor, the controller will enable or push the button of corresponding floor according to the parity of the card.

If a legal card has the access of multiple floors, the controller will enable the button of corresponding floors according to the parity of the number of floor control times:

- If the controller read the same card odd times, it will produce a long beep followed by a short one. The corresponding floor button is enabled and can be pushed by user to drive the elevator.
- If the controller read the same card even times without any other guest card requesting the same floor, it will produce a short beep followed by a long one. The corresponding button is disabled and user should use his smart card to drive the elevator.
- If the controller read the same card even times with another guest card requesting the same floor, it will produce a short beep followed by a long one. The corresponding floor button remains enabled and can be pushed by user to drive the elevator until disabled.

3.4 Use Card Reader

Without a card, user can also enter the specific floor by typing in the password on the card reader if his card has been allowed to add a password by management center. A user can only set a password, which is as long as 4 digits, for authorized floor.

Take a card for example. The card has a card number of 000001, is able to control 4 floors, and has a 4 digits password.
Set password:
1) Press OK.
2) Type in 045555 or 45555.
3) Press OK.
4) Have 000001 card read.
5) A beep means password is set successfully.
Control elevator with password:

1) Type in 045555 or 45555
2) Press OK.
3) Successful entry is recorded.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.