

SJT-WVF5-F series
Escalator controller

Instruction manual

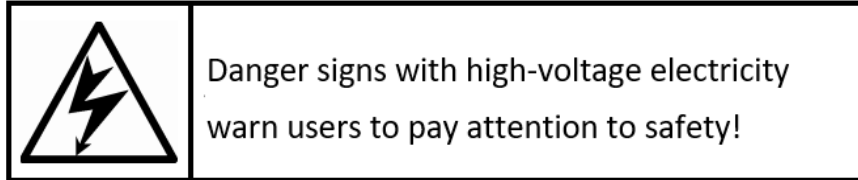
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Chapter1 Precautions

1.1 Safety and precautions



This equipment operates at voltages that can cause severe electric shock or burns, possibly resulting in death. A high degree of caution is required at all times when you are using or near this equipment.

This equipment is designed as a component to provide monitoring and protection of multiple safety functions for escalators or moving walkways. If installed incorrectly, escalators or moving walkways may pose safety hazards; system design, installation, commissioning, operation, and maintenance personnel must receive necessary training and have appropriate experience. They must carefully read this accompanying document and other relevant user manuals, and please keep them properly for future use. Equipment supporting customers should send this random document and other relevant user manuals with the equipment to the end customer.

The shutdown, start, or input signals of this equipment must not be relied upon to ensure the safety of personnel; they do not isolate hazardous voltages from the equipment. Before accessing electrical connections, power to the moving walkway or escalator must be disconnected using nationally approved insulating components.

1.2 Usage environment

The transportation, storage and use of electronic and electrical equipment on escalators and moving walks must comply with the relevant instructions and specific environmental requirements in this random document and the relevant user manual. Do not withstand excessive external force to avoid damage!

Electronic and electrical equipment on escalators and moving walks should have good ventilation conditions, and the use environment must meet:

- Working temperature: $-5^{\circ}\text{C} \sim +60^{\circ}\text{C}$
- Working humidity: 25%RH $\sim$ 85%RH
- Storage temperature: $-10^{\circ}\text{C} \sim +60^{\circ}\text{C}$
- Storage humidity: 10%RH $\sim$ 85%RH

In addition, it is necessary to stay away from conductive materials, corrosive gases, flammable gases, metal powders, oil mist, dust and other places.

1.3 Conformity and regulations

It is the installer's responsibility to comply with all relevant regulations, such as national wiring regulations, accident prevention regulations and electromagnetic compatibility (EMC) regulations. Pay special attention to the cross-sectional area of the conductors, the selection of fuses and other protective equipments, and the connection of the protective earth.

Chapter2 Escalator product introduction

2.1 Escalator integrated controller

2.1.1 Escalator integrated controller terminal arrangement

The arrangement diagram of escalator integrated controller terminals is shown in Figure 2.1:

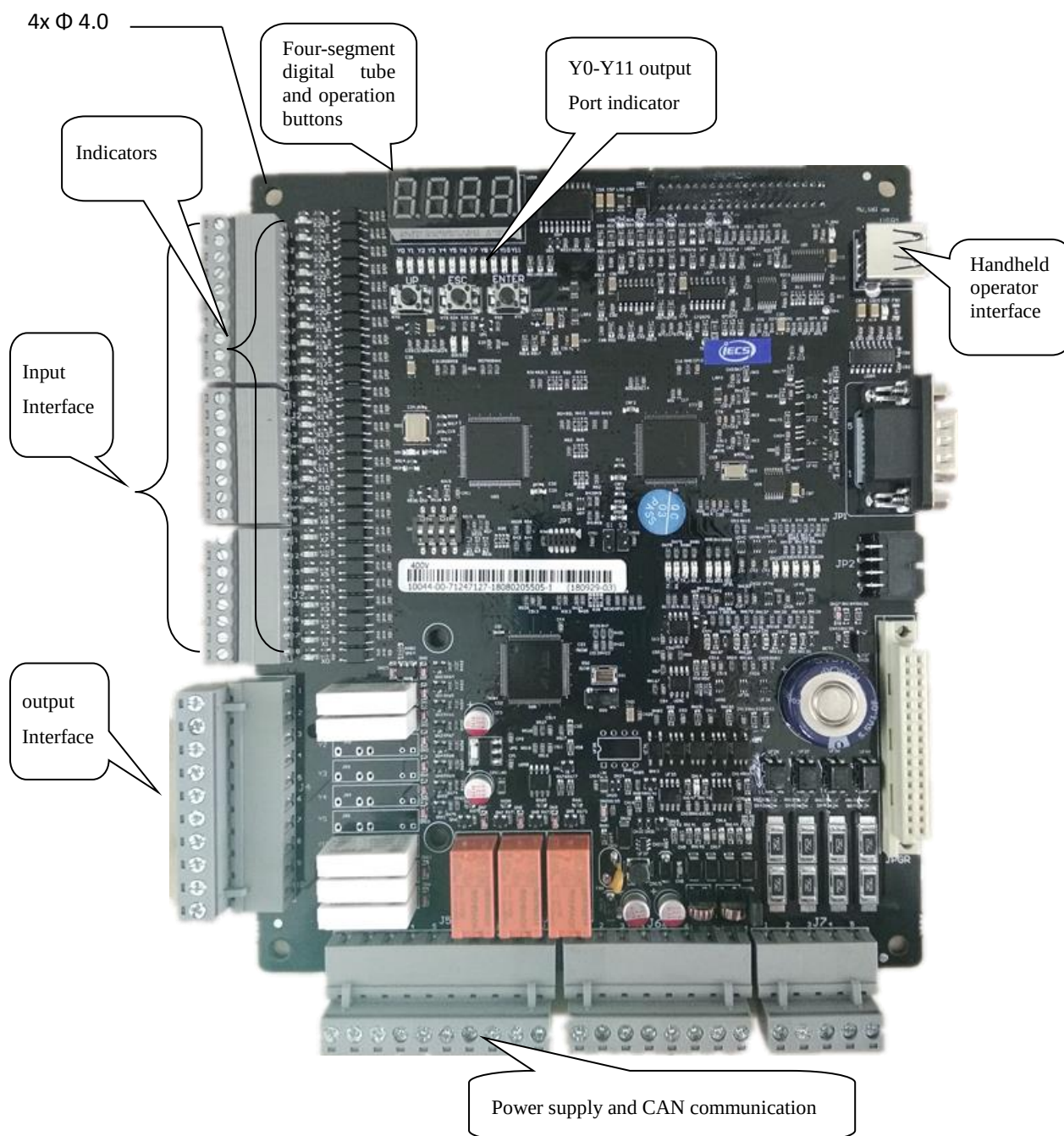


Figure 2.1 Schematic diagram of control circuit terminal arrangement

2.1.2 Escalator integrated controller I/O port definition

Chart 2.1 Control circuit terminal definition and function description

Terminal name	Terminal number	Terminal location	Definition	Usage	Interface technical specifications			
					Interface	Rated load	Off/On Time	Frequency
J1	X25	J1-1	null	input	Optocoupler	DC24V 7mA	10ms	100Hz
	X24	J1-2	Safety circuit detection 16					
	X23	J1-3	Safety circuit detection 15					
	X22	J1-4	Safety circuit detection 14					
	X21	J1-5	Safety circuit detection 13					
	X20	J1-6	Safety circuit detection 12					
	X19	J1-7	Safety circuit detection 11					
	X18	J1-8	Safety circuit detection 10					
	X17	J1-9	Safety circuit detection 9					
	X16	J1-10	Safety circuit detection 8					
J2	X15	J2-1	Safety circuit detection 7	input	Optocoupler	DC24V 7mA	10ms	100Hz
	X14	J2-2	Safety circuit detection 6					
	X13	J2-3	Safety circuit detection 5					
	X12	J2-4	Safety circuit detection 4					
	X11	J2-5	Safety circuit detection 3					
	X10	J2-6	Safety circuit detection 2					
	X9	J2-7	Safety circuit detection 1					
J3	X8	J2-8	null	input	Optocoupler	DC24V 7mA	10ms	100Hz
	X7	J3-1	Brake contactor KLZ feedback					
	X6	J3-2	Upper sensor input					
	X5	J3-3	Lower sensor input					
	X4	J3-4	null					
	X3	J3-5	Running Contactor KDY feedback					
	X2	J3-6	Downward input					
	X1	J3-7	Upward input					
J4	X0	J3-8	Inspection input	output	Relay	DC 10A30V AC 10A250V	5/10ms	20cpm
	COM0	J4-1	Y0~Y1 Public end					
	Y0	J4-2	Automatic refueling output					
	Y1	J4-3	Alarm output					
	COM1	J4-4	Y2~Y5 Public end					
	Y2	J4-5	Running contactor output					
	Y3	J4-6	Brake contactor output					
	Y4	J4-7	Upward input					
	Y5	J4-8	Downward input					
	COM4	J4-9	Y10 Public end					
	Y10	J4-10	null					

Chart2.1 Control circuit terminal definition and function description (Cont'd)

Terminal name	Terminal number	Terminal location	Definition	Usage	Interface technical specifications			
					Interface	Rated load	Off/On Time	Frequency
J5	COM5	J5-1	Y11 Public end	output	Relay	DC 10A30V AC 10A250V	5/10ms	20cpm
	Y11	J5-2	null					
	null	J5-3	null					
	null	J5-4	null					
	null	J5-5	null					
	COM3	J5-6	Y6~Y9 Public end					
	Y6	J5-7	Energy saving low speed output					
	Y7	J5-8	Upward output to programmable safety circuit board					
	Y8	J5-9	Downward output to programmable safety circuit board					
J6	Y9	J5-10	null					
	+24V	J6-1	Power input	Power	Power	DC 24V 10A	--	--
	GND IN	J6-2	PE input	Input	Analog	-10V~+10V	--	--
	AG0 IN	J6-3	null	Power PE	Power PE	--	--	--
	GND IN	J6-4	PE input	Communication Interface	CAN	80mA	--	25KH
	OL	J6-5	Running Display Communications -					
	OH	J6-6	Running Display Communications +	Communication Interface	CAN	80mA	--	25KH
	1L	J6-7	null					
J7	1H	J6-8	null	--	--	--	10ms	100Hz
	X30-	J7-1	null					
	X31+	J7-2	null					
	X30+	J7-3	null					
	X29-	J7-4	Safety circuit detection 18-					
	X29+	J7-5	Safety circuit detection18+					

2.1.3 Intelligent frequency conversion operation

This escalator has a variety of frequency conversion energy-saving operation modes:

(1) No leisure mode: When the escalator is stopped, use the operator to set the F1-00 parameter to 0, save the parameters, and the escalator enters this operating mode. In this mode, the escalator always runs at the rated speed, and there is no leisure energy saving.

(2) Leisure low-speed mode: When the escalator is stopped, use the operator to set the F1-00 parameter to 1, save the parameters, and insert the key to start the escalator. If no one enters the sensor detection range beyond the set time (parameter F2-07, unit: seconds), the escalator will crawl at the set speed (F1-03). When there are people riding in the running direction, the escalator will accelerate to the rated speed, and reverse riding will be invalid.

(3) Leisure stop mode: When the escalator is stopped, use the operator to set the F1-00 parameter to 2, save the parameters, and insert the key to start the escalator. If no one enters the sensor detection range after the set time (parameter F2-07, unit: seconds), the escalator will Soft braking stops; when there are people riding in the direction of travel, the escalator accelerates to full speed; when it stops automatically and there are people riding in the reverse direction, the escalator creeps in the original direction and activates the alarm. It stops automatically after

running for 10 seconds to inform passengers that they are riding in the wrong direction.

(4) For leisure, first slow down and then stop: When the escalator is stopped, use the operator to set the F1-00 parameter to 3 and save the parameters. Insert the key to start the escalator. If no one enters the sensor detection range beyond the set time (parameter F2-07, unit: seconds), the escalator will crawl at the set speed (F1-03). If there is still no one riding the escalator after the set time (parameter F2-08, unit: seconds), the escalator will soft-brake and stop; when there are people riding in the running direction, the escalator will accelerate to full speed; after the automatic stop, if there are people riding in the reverse direction, the escalator will creep in the original direction and activate the alarm. After running for 10 seconds, it will automatically stop and notify the passengers that the escalator is riding in the wrong direction.

(5) Bidirectional operation: When the escalator is stopped, use the operator to set the F1-00 parameter to 4 and save the parameters. Insert the key to start the escalator. If no one enters the sensor detection range for more than the set time (parameter F2-07, unit: second), the escalator will softly brake and stop; when someone is riding, it will run in the riding direction, either up or down.

2.2 Programmable safety panels for escalators and moving walkways

(SJT-APE-V2)

This product SJT-APE-V2 meets the requirements of the national standard GB 16899-2011 "Safety Specification for the Manufacturing and Installation of Escalators and Moving Walks", and the programmable electronic part meets the requirements of IEC61508/GB/T20438. In order to meet the above requirements, this product has passed the functional safety level assessment of the Functional Safety Center Certification Center of Beijing Institute of Machinery Industry Instruments and Comprehensive Instruments (CNAS-L3331), and its safety protection capabilities have reached SIL3 level. This product has functions such as escalator overspeed, reversal, step missing protection, and handrail underspeed protection.

2.2.1 Safety related

1. This equipment is connected to AC 220V/110V voltage which is an obvious high voltage indication area . When you are near or using this equipment, you need to remain highly vigilant at all times.

2. In order to avoid safety hazards caused by incorrect installation, the installation, debugging and maintenance of the system must be carried out by personnel who have received necessary safety certification, product use training and professionals with corresponding experience.

3. The shutdown, start or input signals of this equipment cannot isolate dangerous voltages. Please be sure to disconnect the automatic power supply for sidewalks or escalators.

2.2.2 Others

1. The user needs to select the sensor, switching power supply and travel switch of the model specified in this manual (see 2.2.8.1 for model details). If you use the above-mentioned devices that are different from this regulation, the manufacturer does not assume any responsibility for

any problems arising therefrom.

2. The function of this safety device does not cover the following provisions of the functional requirements for electrical safety devices of escalators and moving walkways in GB16899-2011:

- 1) "Elements that directly drive steps, treads or belts (e.g. chains or racks) are broken or overstretched, should be prevented from starting;
- 2) "The distance between the driving device and the steering device is (unintentionally) extended or shortened";
- 3) "Foreign objects are caught in the steps or pedals or tape entering the comb plate";
- 4) "Escalator and moving walkway exits are blocked by building structures (e.g. gates, fire doors)";
- 5) "Foreign objects caught in the entrance of the handrail";
- 6) "Install the detachable manual turning device.";

3. The crawling signal in this device is only used for escalators or moving walks with frequency conversion mode.

2.2.3 Usage environment

1. This safety device must be installed in the control cabinet of the escalator or moving walkway, and its use environment must meet:

- 1) Ambient temperature: $-20^{\circ}\text{C} \sim +65^{\circ}\text{C}$;
- 2) Humidity: $\leq 95\% \text{RH}$, no condensation;
- 3) Protection level (single board): None;
- 4) Protection level (with shell): IP53.

2. When installing, be careful that the PCB cannot withstand excessive external force to avoid damage. It should be kept away from conductive materials, corrosive gases, flammable gases, metal powders, oil mist, dust, etc.

2.2.4 Components

Chart2.2 Introduction of main components

Part Name	Quantity	Model	Functional Overview
Security main control board (Bluelight)	1	SJT-APE-V2	Core control board
Sensors (Purchased)	6	See Chart 2.7 for specific models	Collect speed and direction signals of escalators or moving walkways
Limit Switch (Purchased)	10	See Chart 2.7 for specific models	Brake action feedback, additional braking action feedback, cover opening, step sinking feedback
Switching Power Supply (Purchased)	1	See Chart 2.7 for specific models	Provide power to the system
Protective enclosure (optional)	--	--	Provide necessary protection for the main control board



Figure 2.2. SJT-APE device (with housing)

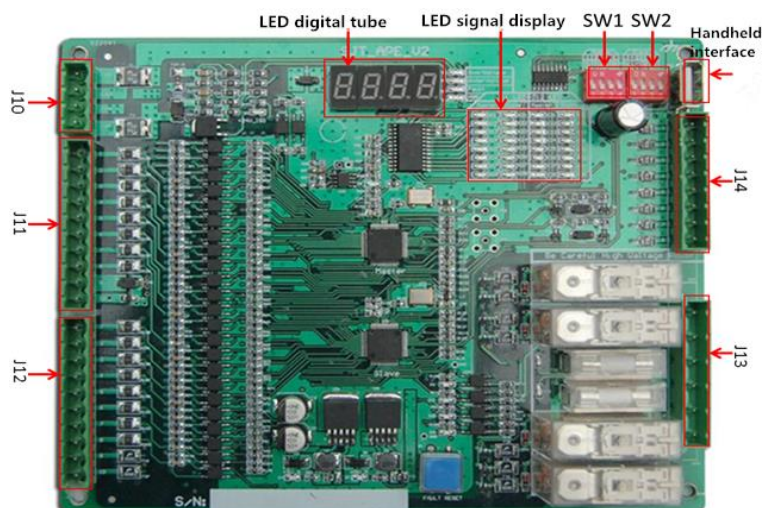


Figure 2.3. SJT-APE-V2 (Single board)

2.2.5 System block diagram and sub-module introduction

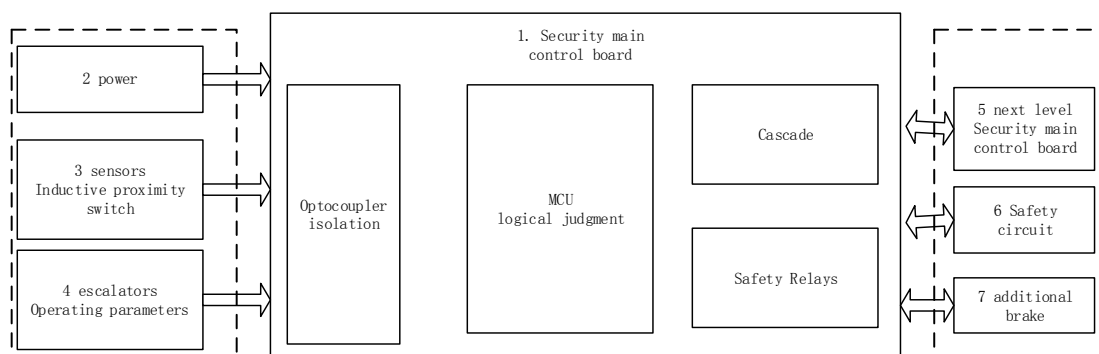


Figure 2.4. System block diagram

Chart 2.3 Introduction to some modules

Number	Name	Function
1	Escalator operation parameters	Display the operating status of the escalator
2	Cascade	For monitoring multiple consecutive escalators or moving walks without intermediate exits: when one of them stops running, the entire cascade of escalators or moving walkways shall enter a safe state.
3	Safety circuit	Control the on and off of the safety circuit
4	Additional brakes	Control the action of additional brakes

2.2.6 Security function description

Chart 2.4 Introduction to security features

Number	Security Function	Cut off the main engine and main working brake	Cut off the additional brake	Manual reset
1	Checks for overspeeding and takes effect before speed exceeds 1.2 times nominal speed	YES	--	YES
2	Checks for overspeeding and takes effect before speed exceeds 1.4 times nominal speed	YES	YES	YES
3	Non-manipulated reversal operation Detection	YES	YES	YES
4	Detect the sinking of steps or pedals to prevent them from touching the comb plate (this article does not apply to tape-type moving walkways);	YES	--	YES
5	Detects missing steps or treads to prevent them from contacting the comb plate	YES	--	YES
6	Detect whether the speed of the handrail deviates from the actual speed of the steps, pedals or tapes by greater than -15% and lasts greater than 15s	YES	--	--
7	The detection braking distance exceeds the maximum allowable value (set by the manufacturer within the standard range) by 1.2 times	YES	--	YES
8	Detect opening and removal of access covers in the truss area and opening of floor slabs	YES	--	--
9	Used for linkage protection of multiple cascaded escalators or moving walkways	YES	--	--
10	Monitor the working status of additional brakes	YES	--	--
11	Detect the working status of the working brake	YES	--	YES

2.2.7 Terminal description and wiring method

2.2.7.1 System wiring diagram

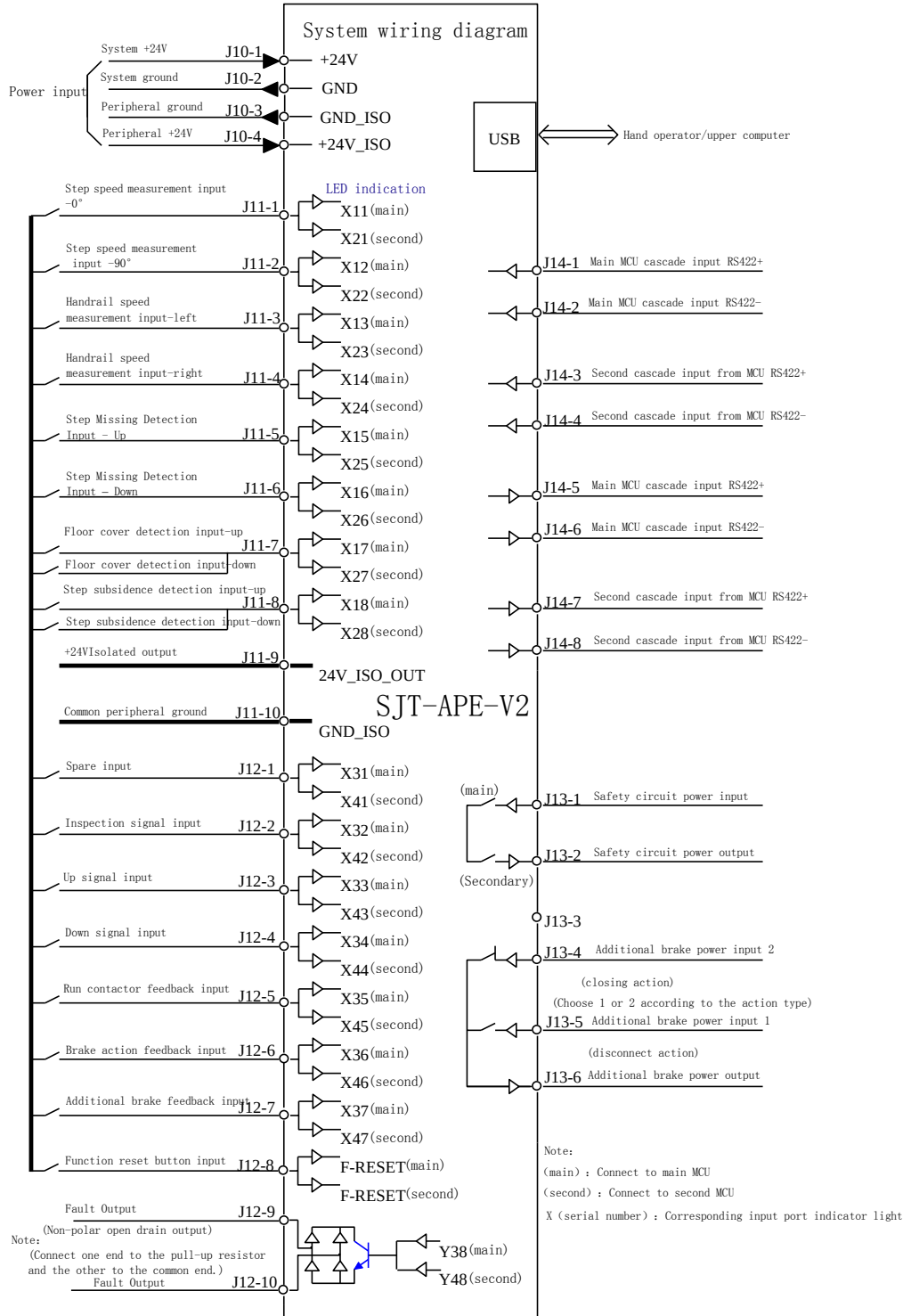


Figure 2.5. System wiring diagram

When there are no entrances and exits between multiple escalators, cascade signals are needed to determine whether each escalator is operating normally.

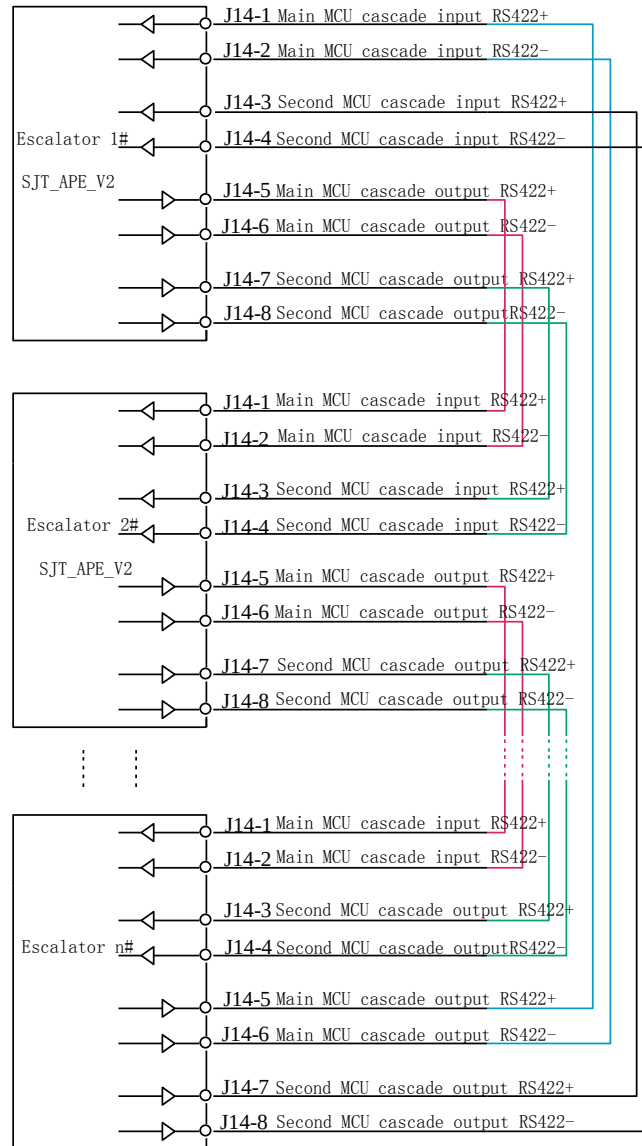


Figure 2.6. Cascade wiring diagram

2.2.7.2 Interface Description

Chart 2.5 Interface definitions

Terminal	Terminal Definition	Function	Remark
J10	1	24V Power Input	Internal logic system power supply
	2	GND	Internal logic system ground
	3	GND_ISO	Peripheral interface ground
	4	24V Power Input	Peripheral interface power supply
J11	1	Step speed input (0°)	Step speed measurement pulse, detect whether overspeeding, and judge whether to reverse based on the phase of the two pulses
	2	Step speed input (90°)	
	3	Left armrest with speed input	Handrail speed measurement, detect whether the handrail speed deviates from the ladder speed -15% and exceeds 15 seconds
	4	Right armrest with speed input	
	5	Upper step missing detection input	Detect missing steps errors
	6	Lower step missing detection input	
J11	7	Floor cover detection input	Detect whether the floor cover is closed. If not closed, elevator is prohibited from operating.
	8	Step sinking detection input	Detect the error of step sinking
	9	24V_ISO	Peripheral interface power output
	10	GND_ISO	Connect to peripheral interface ground
J12	1	Spare signal	--
	2	Inspection signal	Connect the escalator inspection signal
	3	Upward signal	Connect the escalator upward signal
	4	Downward signal	Connect the escalator downward signal
	5	Running contactor feedback	Detects whether the running contactor is operating as required
	6	Working brake action feedback	Detects whether the brakes are acting as required
	7	Additional brake action feedback	Detects whether the additional brake is acting as required
	8	Function reset button	Manually clear the error information to make the system leave the safe state and enter the operating state.
	9	Error Output	Non-polar open-drain output, requires external pull-up
	10		

Chart 2.5 Interface Definition (Cont'd)

Terminal		Terminal Definition		Function	Remark
J13	1	Safety circuit power input		Connect the elevator safety circuit and cut off the safety circuit power supply when an error occurs to bring the elevator into a safe state.	AC220V/110V
	2	Safety circuit power output			
	3	--		--	--
	4	Additional brake power input 1—Energize to Operate		Connect the additional brake controller to control the additional brake action when 1.4 times overspeed or non-control reversal occurs.	Select 1 or 2 access according to the additional brake action type
	5	Additional brake power input 2—De-energize to Operate			
	6	Additional brake power output common terminal			AC220V/110V
J14	1	Master MCU	RS422+	Two cascade inputs in the front stage. When the front stage of multiple consecutive elevators without intermediate exits occurs error, enter the safe state.	Cascade signal line RS422 level
	2	cascade input	RS422-		
	3	Slave MCU Cascade	RS422+		
	4	Input	RS422-		
	5	Master MCU	RS422+	Two cascade outputs in the rear stage, multiple continuous elevators without intermediate exits, cut off the cascade signal transmission when an error is detected and enters the safe state or when the cascade signal of the front stage is not detected.	
	6	cascade output	RS422-		
	7	Slave MCU Cascade	RS422+		
	8	output	RS422-		

2.2.8 Installation Guide

2.2.8.1 Related device selection Chart

Chart2.7 Device selection Chart

Accessories category	Specification	Model	Function
Sensor	Diameter: 12mm	Beifuning GBM4-12GM-N1 Schneider XS212BLNAL2C Turk NI4-M12-AN6X	Measure escalator speed or handrail speed
	Diameter: 12mm	Beifuning GBM4-12GM-N2 Schneider XS212BLNBL2C Turk Ni4-M12-RN6X	Measuring handrail speed (metal wheel)
	Diameter: 18mm	Beifuning GBM8-18GM-N2 Schneider XS218BLNBL2C Turk Bi5-M18- RN6X	Measuring handrail speed (metal wheel)
	Diameter: 18mm	Beifuning GBM8-18GM-N1 Schneider XS218BLNAL2C Turk NI4-M12-AN6X	Measure escalator speed, handrail speed, or steps missing
	Diameter: 30mm	Beifuning GBM15-30GM-N1 Schneider XS230BLNAL2C Turk Ni15-M30-AN6X Ni50U-QV40-AP6X2-H1141	Measure steps missing (if the steps are made of aluminum alloy, it is recommended to use Turck Ni50U sensor, please consult the company's after-sales service for details)
	Note: Users can choose the above sensors reasonably according to the different materials of the induction (proximity switch). Ni50U-QV40-AP6X2-H1141 needs to be connected to the company's interface conversion board SJT_APE_PNP shell.		
Switching power supply	--	Mingwei NED-75BLG Mingwei NES-35-24 Schneider ABL2REM24045H Schneider ABL2REM24015H	--
	--	Huayao EPR-35-24	--
Limit switch	--	Daya ME-8104 Schneider XCKP2145P16 XCKN2108P20C Omron D4NA412G D4A-3116N	Step sinking and floor cover detection
	--	Zhong Yao NZ-TS236-11Z Schneider XCKP2102P16 Omron D4NA-4131	Brake action feedback, additional brake action feedback

2.2.8.2 Safety device installation

Our company can provide two kinds of safety devices with and without shells according to customer needs. The dustproof and waterproof grade of the safety device with shell is IP53. This product should be installed in the machine room of the escalator or moving walkway. The installation dimensions are as shown in the figure below:

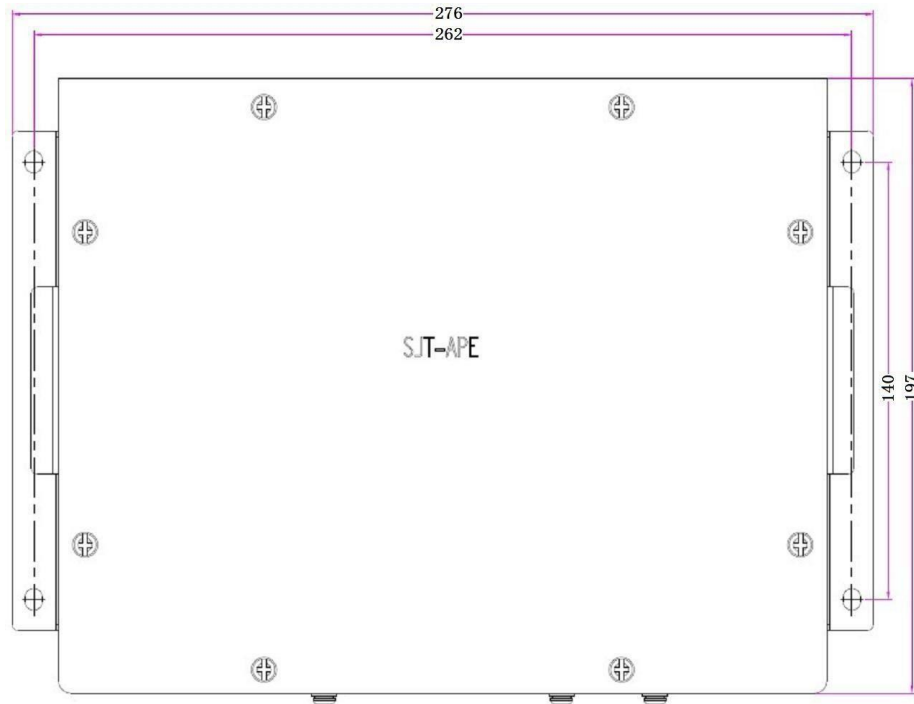


Figure2.7. Safety device (with shell) size

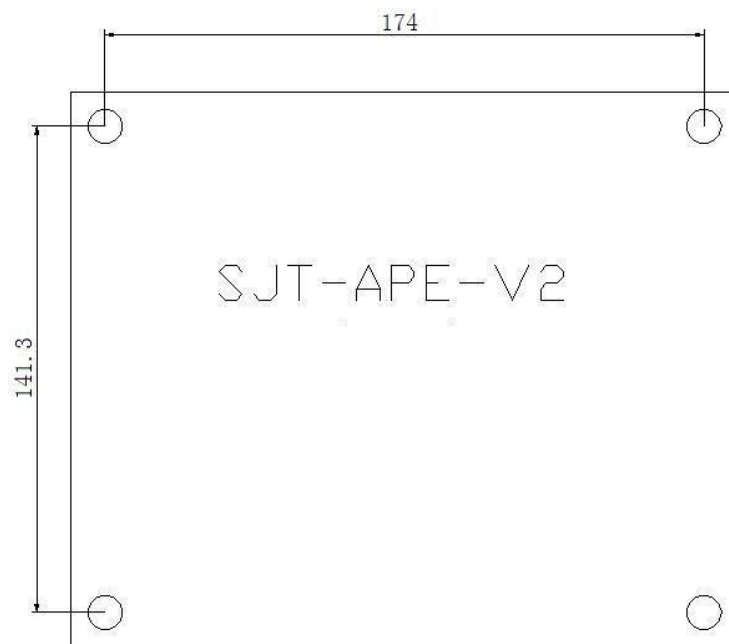


Figure 2.8. Control board size

2.2.8.3 Sensor installation

(1) Main drive wheel sensor installation

Installation points:

- 1) Angular position: Two proximity switches are installed on two different gear teeth with a phase difference of 90° . When installed, one is aligned with the tooth peak, and the other is aligned with the $1/4$ position of the tooth peak spacing. Multiple tooth peaks are allowed between the proximity switches, but they should be pointed as much as possible toward the axis of the gear.
- 2) Spacing: $d \approx 2\text{mm}$ is required, $l \approx L/4 + nl$, where L is the tooth spacing of the gear, l is the installation spacing of the AB two-phase proximity switch, and d is the installation distance from the proximity switch to the gear.
- 3) Guide the installation through the sensor position menu of digital operation: run the elevator in the inspection state, check the AB two-phase phase difference in the operator, and gradually adjust the size of l so that the operator displays the AB two-phase phase difference in the range of 10% to 40% in the upward direction (25% is optimal), and in the range of 60% to 90% in the downward direction (75% is optimal).

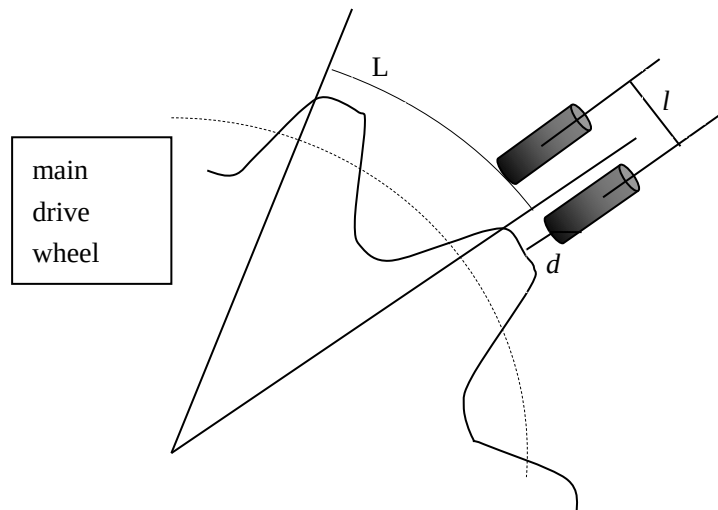


Figure 2.9. Main Drive Wheel Sensor Installation Diagram

(2) Handrail speed measurement sensor installation

Installation points:

- 1) There is an inductive proximity switch on each of the left and right handrails. The installation position of the sensor is opposite to the sensing device on the speed measuring wheel (the driven wheel of the handrail) to fix the sensor.
- 2) If the driven wheel of the handrail is a non-metal type, use screws as sensing devices at the edge. If it is a metal driven wheel, part of the metal can be hollowed out. The cross-section should be similar to the cross-section of the sensor head, and the hole depth should be at least 3mm.
- 3) Installation distance: $1\text{mm} \leq L \leq 3\text{mm}$

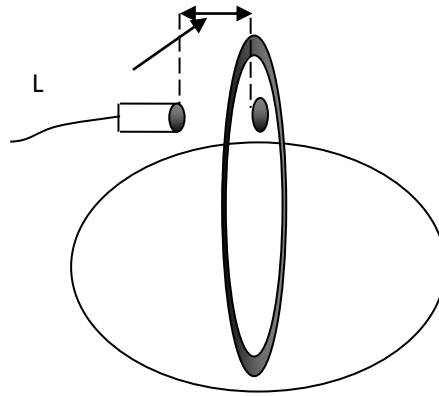


Figure 2.10. Installation diagram of handrail speed sensor

(3) Step Missing Measurement Sensor Installation

Installation points:

- 1) The missing step measurement sensor is installed at each of the upper and lower terminal stations. In order to comply with the requirements of national standards, the manufacturer needs to determine the installation location based on the performance of the entire escalator.
- 2) The detection point generally considers the requirements of the stopping distance and the requirement that the missing step must be detected before it rotates out of the comb plate.
- 3) Installation distance: $2\text{mm} \leq L \leq 4\text{mm}$



Figure 2.11. Step missing measurement sensor installation schema

2.2.9 User Interface

2.2.9.1 User Interface Composition

The system display interface includes:

1. 4-digit digital tube: displays the current escalator running direction and speed, and displays the Error Code corresponding to the current fault in the event of a Error Code (during normal operation, the first digit shows the running direction (upward is represented by $\cup$, downward is represented by $\cap$), The second, third and fourth digits display the escalator running speed; when a fault occurs, the first and second digits display E-, The third and fourth digits display the Error Code).
2. LED signal indication: displays the current input signal status (a flashing LED means that a pulse signal is generated, and a continuous light means that the signal is always valid)。
3. LED status indicator: Indicates the current system operating status and system power status, etc.

2.2.9.2 Error code

Chart 2.8 Error code

Error code	Instruction	Error code	Instruction
E-01	Operation over speed	E-24	Abnormal self-test for step sinking
E-02	Retrograde	E-25	Spare
E-03	Abnormal speed of left handrail	E-26	Braking distance over range
E-04	Abnormal speed of right handrail	E-27	Master-slave microcontroller speed measurement inconsistency
E-05	Missing upper step	E-28	Floor cover open
E-06	Missing lower step	E-29	Brake opening error
E-07	Step sinking	E-30	Abnormal 0° sensor signal during operation
E-08	Braking failure during escalator operation	E-31	Abnormal 90° sensor signal during operation
E-09	Outer side 24V overvoltage	E-32	Additional brake operation error
E-10	Outer side 24V lower voltage	E-33	Broken chain error
E-11	Escalator not operating after startup	E-34	Internal error *
E-12	Escalator not in sChart condition	E-35	Internal error *
E-13	Outer side +24V power down	E-36	Internal error *
E-14	Escalator cascade error	E-37	Internal error *
E-15	Internal safety relay K1 feedback error	E-38	Internal error *
E-16	Internal safety relay K2 feedback error	E-39	Internal error *
E-17	0° phase step speed self-test abnormality	E-40	Communication timeout
E-18	90° phase step speed self-test abnormality	E-41	Running contactor self-test error
E-19	Abnormal left handrail belt speed self-test	E-42	Abnormality self-test of brake
E-20	Abnormal right handrail belt speed self-test	E-43	Abnormal self-test of additional brakes
E-21	Abnormal self-test for missing upper step	E-44	Internal safety relay K3 feedback error
E-22	Abnormal self-test for missing lower step	E-45	Internal safety relay K4 feedback error
E-23	Abnormal floor cover self-test	--	--

Note : *When an internal error code is found, please contact the manufacturer for processing.

2.2.9.3 LED Signal indication content description

Chart 2.9 LED Signal indication instructions

LED number	Description	LED number	Description
X11/X21	0° tachometer pulse Master/Slave	X31/X41	
X12/X22	90° tachometer pulse Master/Slave	X32/X42	Inspection Master/Slave
X13/X23	Left handrail tachometer pulse Master/Slave	X33/X43	Operation upward Master/Slave
X14/X24	Right handrail tachometer pulse Master/Slave	X34/X44	Operation downward Master/Slave
X15/X25	Missing upper step Master/Slave	X35/X45	Running contactor feedback Master/Slave
X16/X26	Missing lower step Master/Slave	X36/X46	Brake action feedback Master/Slave
X17/X27	Floor cover open Master/Slave	X37/X47	Additional brake action Master/Slave
X18/X28	Step sinking Master/Slave	Y38/Y48	Fault Output Master/Slave (See the following section for details)

2.2.9.4 LED indicator status description

- 1) D12 lights up, indicating undervoltage and the peripheral circuit is less than 17V;
- 2) D11 lights up, indicating overvoltage and the peripheral voltage is greater than 30V;
- 3) D13 lights up, indicating a fault. The main MCU drives the output and a fault occurs.
- 4) D14 flashes, indicating that the main MCU is operating normally;
- 5) Y38/Y48 lights up, indicating that the master and slave MCUs have detected a fault, indicating that the master and slave MCU error.

2.2.10 System debugging

2.2.10.1 Debugging Tools

This system requires an external Bluetooth standard digital operator (handheld operator) OP-V6 through the USB interface. This operator is a special tool for debugging and maintenance of our control system. The installation operation is simple and easy to understand, and users can easily read and set the operating parameters of this safety system. The appearance of the operator is shown in Figure 2.12. The functions of the operation keys are shown in Chart 2.10 below:



Figure 2.12 Bluelight OP-V6 handheld operator appearance

2.2.10.2 Operator button definition

Chart 2.10 Definition and functions of operation keys

Button	Functions
[RUN] Button	This system does not use this button
[STOP] Button	This system does not use this button
[LEFT] Button	This system does not use this button
[SHIFT] Button	This system does not use this button
[RES] Button	This system does not use this button
[MENU] Button	Back to Home page
[UP] Button	Used to scroll up menu items under menu navigation or digit values in numeric edits
[DOWN] Button	Used to scroll down menu items under menu navigation or digit values in numeric edits
[RIGHT] Button	Used to select the number of bits to set the parameter to the right
[ENTER] Button	Used to enter the next-level submenu of the menu navigation item; enter the set value and issue a command
[ESC] Button	Return to the previous menu of the current submenu

2.2.10.3 Operator connection

1) Connect one end of the dedicated communication cable for the digital operator (handheld operator) to the digital operator and the other end connect to the USB(XP2) connector on the system circuit board.

2) If the handheld operator cannot communicate normally with the system, please first check the status of switch No. 2 of SW1 and SW2 on the system circuit board (should be in the open state), and then confirm the status of switches No. 3 and 4 of SW1 (should be in the open state)。

2.2.10.4 Menu interface

The main interface menu of the operator is shown in Figure 2.13.

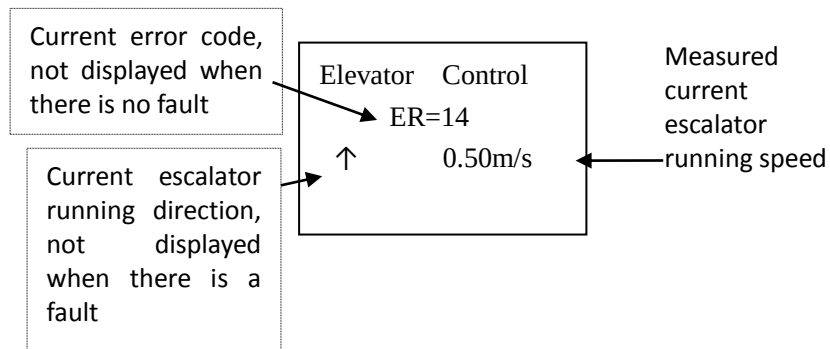


Figure 2.13. Main interface display

The main interface displays the main current running status information of the escalator: error code (the error code serial number in the handheld terminal is the same as the error code displayed in the four-digit digital tube), running direction and running speed. In this interface, the above status information is updated in real time. Under the main interface menu, there are the following 4-level submenus, which can be accessed by pressing the up and down keys respectively.

1) I/O status (I/O Input)

In this interface, the user can view the level status of the system's 16 I/O ports through the up or down keys, where ☐ indicates no valid signal and ☒ indicates a valid signal (the level status of the valid signal can be set in the setup menu).

2) Sensor Position

Mainly used to guide the installation of sensor locations when installing and debugging escalators;

3) Software No.

4) Parameter Setting

In the main interface menu, press the Enter key to directly enter the setting or parameter viewing menu. This level of menu is password protected (factory password 00001010). When the system is in standby mode (parameter settings cannot be made while running), press the Enter key in the main menu interface and enter the correct password to enter the parameter setting menu. You can set parameters, enable some functions, save parameters and set passwords for the system.

2.2.10.5 Parameters that can be set and viewed

Chart 2.11 Parameters that can be set and viewed

Operating Parameter	Default value	Parameter range	Description
Given Speed	0.5m/s	0-1.99m/s	Set the operating speed of the escalator
Gear Diameter	660mm	0-9999mm	Set the diameter of the main driving wheel to measure the actual escalator speed
Pulse	65	0-9999	Set the number of main drive gear teeth to measure the actual escalator speed
Hand Diameter	100mm	0-9999mm	Set the diameter of the handrail driven wheel to measure the handrail speed

Chart 2.11 Enable Parameters that can be viewed and set (Cont'd)

Operating Parameter	Default value	Parameter range	Description
Step Width	400mm	0-9999mm	Set the width of the step pedal to detect steps missing
Break Distance	1200mm	0-9999mm	Set maximum braking distance
FSD Time	15s	0-9999s	Speed deviation of the handrail is 15%, and a fault will be reported after this time.
Inverse Time	1500ms	0-9999ms	The given direction is different from the actual direction, and a fault will be reported after this time.
FJ_Check Enable	OFF	ON/OFF	Control whether the additional brake self-test
AQ_Check Enable	OFF	ON/OFF	Control whether the safety circuit is self-tested
Expend Enable	OFF	ON/OFF	Escalators connected by multiple escalators without intermediate exits, one of which is reported to be faulty, and all safety boards connected to it are failed to link
IO_Check Enable	ON	ON/OFF	After enabling, the input port performs self-test after power-on
FSD_YS Enable	OFF	ON/OFF	After enabling, if there is no signal from the handrail within 3 seconds, the escalator will stop operating
ALL_JC	ON	ON/OFF	After setting it to OFF, turn off gear speed measurement, step missing detection, and handrail speed measurement
FSD_JC	ON	ON/OFF	After setting it to OFF, only the handrail speed measurement function will be turned off separately
Miss_JC	ON	ON/OFF	When set to OFF, only individual rungs lose functionality.
DIR	ON	ON/OFF	
Language Set	ON	ON/OFF	ON- Chinese OFF-English

2.2.11 Maintenance and care

2.2.11.1 Safety Precautions for Maintenance and Care


◇ Maintenance operations must be performed after disconnecting the input power supply ◇ There is high voltage connected to this device, please do not touch its terminals at will. ◇ Never modify the security monitoring system yourself ◇ Please designate trained and authorized qualified professionals to perform maintenance, inspection or replacement of parts. ◇ Before maintenance personnel work, please take off your metal accessories (such as watches, rings, etc.). When working, you must use clothing that meets insulation requirements and insulated tools. ◇ Do not replace wiring or disassemble terminals and connectors while power is on. ◇ After the repair is completed, please make sure that all screws are tightened and all connectors are firmly connected.
◇ Do not touch the control board directly with your hands, as CMOS integrated circuits are used on it, so please be careful.

2.2.11.2 Daily maintenance

Usually check the following points when daily maintenance

- 1) LED signal indication and LED indicator status on the user interface.
- 2) Whether there is abnormal noise, vibration and abnormal smell.
- 3) Whether the equipment is abnormally heated.
- 4) Whether the surrounding ambient meets the requirements of the product's working ambient.

2.2.11.3 Regular maintenance

Chart 2.12 Appearance maintenance (Once a year default)

Components Maintenance	Items maintenance	Judgment criteria
Operating ambient	1. Check the temperature, humidity, vibration, dust, corrosive gases, oil stains, etc. 2. Any dangerous goods around?	1. Meet specified working ambient requirements 2. No dangerous goods
Sensor	1. Whether the joints are loose 2. Whether the sensor housing is damaged	1. No abnormality 2. No damage
Connecting wires	Whether the peripheral protective layer is aged or damaged?	No damage, age
Control board	1. Whether there is conductive dust and oil 2. Whether the relay shell is cracked 3. Whether the circuit board has discoloration and peculiar smell 4. Whether the capacitor is free of leakage, discoloration, cracks and shell swelling 5. Whether the circuit board is cracked, damaged, or deformed	No abnormality
Switching power supply	1. Whether the capacitor is free of leakage, discoloration, cracks and shell expansion 2. Measure whether the output voltage is normal	No abnormality

Chart 2.13 Functional Detection

Number	Safety function	Detection method	Judgment conditions
1	Checks for overspeeding and takes effect before speed exceeds 1.2 times nominal speed	Use the digital operator to set the nominal speed between 0.7 and 0.8 times the actual operating speed.	The system digital tube reports an E-01 fault. Meanwhile, the safety relays K1 and K2 act, and the main contactor of the escalator is disconnected and enters a stop state.
2	Checks for overspeeding and takes effect before speed exceeds 1.4 times nominal speed	Use the digital operator to set the nominal speed to be less than 0.7 times the actual operating speed.	The system digital tube reports an E-01 fault. Meanwhile, the safety relays K1, K2, K3, and K4 act. The main contactor of the escalator is disconnected, the additional brake operates, and the escalator stops.
3	Detect non-manipulative reversal operation (Advanced direction discrimination enables parameter needs to be set to OFF)	Exchange the wiring sequence of 0° (J11-1) and 90° (J11-2) speed measurement input signals.	The system digital tube reports an E-02 fault. Meanwhile, the safety relays K1, K2, K3, and K4 act. The main contactor of the escalator is disconnected, the additional brake operates, and the escalator stops.

Chart 2.13 Functional detection (Cont'd)

Number	Safety function	Detection method	Judgment conditions
4	Detect steps sinking or pedals to prevent them from touching the comb plate (this article does not apply to tape-type moving walkways);	Remove the escalator sinking input signal J11-8 wiring and jumper the J11-8 terminal to ground (J11-10)	The system digital tube reports E-07 fault. Meanwhile, the safety relays K1 and K2 act, and the escalator main contactor disconnects and enters into stop state.
5	Detects steps missing or treads to prevent them from contacting the comb plate	Divided into two parts: 1. Remove the input signal top step missing (J11-5). 2. Remove the input signal (J11-6) bottom step missing	Corresponding to the two test, systems reported E-05 and E-06 faults respectively. Meanwhile, the safety relays K1 and K2 acted, and the escalator main contactor disconnects and enters into the stop state.
6	Detect whether the speed of the handrail deviates from the actual speed of the steps, pedals or tapes by greater than -15% and lasts greater than 15s	Divided into two times: 1 Remove the handrail and speed measurement left (J11-3) input signal 2 Remove the handrail and speed measurement right (J11-4) input signal	Corresponding to the two tests, the system reported E-03 and E-04 faults respectively. Meanwhile, the safety relays K1 and K2 act, and the escalator main contactor disconnects and enters into the stop state.
7	Detection of stopping distance exceeding the maximum permissible value (set by the manufacturer within the standard range) by 1.2 times.	Use the digital operator to set the maximum braking distance to 50mm	The system digital tube reports an E-26 fault. Meanwhile, the safety relays K1 and K2 act, and the escalator main contactor disconnects. The escalator cannot be started again until the fault is cleared.
8	Detect opening and removal of access covers in the truss area and floor slabs opening	Remove the floor cover input signal J11-7 wiring and jumper the J11-7 terminal to ground (J11-10)	The system digital tube reports an E-28 fault. Meanwhile, the safety relays K1 and K2 act, and the escalator main contactor disconnects and cannot enter the running state.
9	Used for linkage protection of multiple cascaded escalators or moving walkways	When this function is enabled, remove one or more of the front-end cascade input signals J14-1, J14-2, J14-3, and J14-4.	The system digital tube reports an E-14 fault. Meanwhile, the safety relays K1 and K2 act, and the escalator main contactor disconnects and enters into stop state.
10	Monitor the working status of additional brakes	Remove the floor cover input signal J12-6 wiring and jumper the J12-6 terminal to ground (J11-10)	The system digital tube reports an E-29 fault. Meanwhile, the safety relays K1 and K2 act, and the escalator main contactor disconnects and enters into stop state.
11	Check the working status of the working brake	Remove the floor cover input signal J12-7 wiring and jumper the J12-7 terminal to ground (J11-10)	The system digital tube reports an E-32 fault. Meanwhile, the safety relays K1 and K2 act, and the escalator main contactor disconnects and enters into stop state.

Note:

1. The above tests need to be carried out one by one. After each test is completed, the fault information is cleared and normal wiring is restored before the next test can be carried out;
2. When the test involves changing the wiring, the wiring needs to be changed when the system is powered off.

2.2.12 Warranty period

Under normal use, if a malfunction or damage occurs, the manufacturer is responsible for the warranty period. The warranty period of this product is 18 months from the date of shipment (recorded on the nameplate). Reasonable maintenance fees will be charged after the warranty period.

During the warranty period, faults or damage caused by the following reasons will also be repaired for a fee:

1. Problems caused by not using it correctly according to the instructions or repairing or modifying it by yourself without permission.
2. Problems caused by use beyond standard specifications.
3. Drops after arrival or damage during transportation.
4. Damage caused by force majeure (such as fire, flood, earthquake, lightning strike and other natural disasters and their associated causes).

Chapter 3 Digital Hand Operator

The SJT-WVF5-F series escalator integrated control cabinet is equipped with a digital operator OP-V6 with LCD display. This operator is a special tool for control system debugging and maintenance. It provides users with a friendly human-computer dialogue channel and interface, with an LCD display in Chinese and English. This chapter explains the composition, function, display, operating mode and switching method of the digital operator.



Figure 3.1 Appearance diagram of digital operator

3.1 Composition, display and functions of digital operator

The digital operator OP-V6 consists of a 128×64 LCD display, 5 LED light-emitting diodes and 11 function keys. The appearance is shown in Figure 3.1.

3.1.1 Operator LED Display

LEDs on the top of the operator display controller current state simply and directly. The definition and display function of each LED, as shown in chart 3.1.

Chart 3.1 LED definition & display function

Name	Function
DRV	When the controller is in operation, the LED light.
FWD	When the controller is in forward running operation, the LED light.
REV	When the controller is in reversal running operation, the LED light.
COM	When the controller communication is normal, the LED light.
ERR	When the controller is in fault, the LED light.

3.1.2 Operator Keys

The name definitions and functions of the 11 membrane operation buttons in the middle and lower part of the digital operator are shown in chart 3.2.

Chart 3.2 Operator Keys names and functions

Keys	Name	Function Description
	[RUN] Key	Run the controller in keypad control mode; button is disabled in program control mode. Enable/disable is set through parameters.
	[STOP] Key	Stop the controller in keypad control mode; button is disabled in program control mode. Enable/disable is set through parameters.
	[MENU] Key	Return to main menu on any screen.
	[SHIFT] key	Enable the 2 nd function of other keys.
	[RESET] Key	Enter the digit setting option for certain parameters.
	[UP] Key	Scroll up menu options or edit figures in certain setting page.
	[DOWN] Key	Scroll down menu options or edit figures in certain setting page.
	[LEFT] Key	For parameter setting, choose the left digit for editing.
	[RIGHT] Key	For parameter setting, choose the right digit for editing.
	[ENTER] Key	Enter the next level sub-menu on main screen; Input set value on parameter setting; Give command; Check fault/warning information.
	[ESC] Key	Return the previous level menu.

3.1.3 LCD Display

Controller enters the main interface after power on. The main interface is shown in Figure 3.2. The main interface displays the main information of the elevator in present status, including floor number, elevator speed, running direction, door lock status, running model, fault code and else. On the main interface, the above information is live updated.

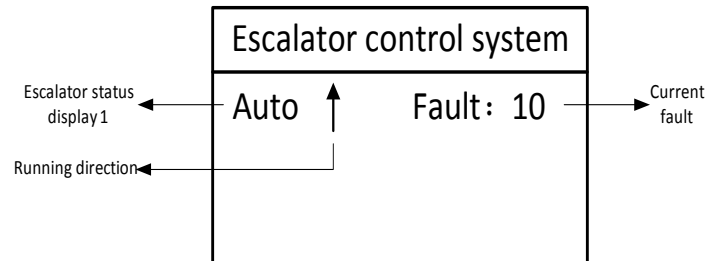


Figure3.2 Main interface on digital operator

The instructions for the information shown in the Digital operator LCD display interface are as following:

1. The status of the elevator display1:
INSP
AUTO
2. Present error:
ERR: XX Display the present Error code.
3. Running direction:
↑ up
↓ down

3.1.4 Function of Operator

The function of digital operator is as follows:

1. LCD display with English and Chinese
2. Setting log in level and corresponded password.
3. Parameter check, setting and save.
4. System clock setting
5. Error history log record and check.
6. Parameter copy, upload and download.
7. Restore to factory setting.

3.1.5 Installation and Connection of Digital Operation

The connection for the digital operator of the opening controller is as follows: remove the front cover of the controller, connect one side of the special communication cable to digital operator, and connect the other side to the USB connection on the main board. Make sure the connection is securely; install the front cover of the controller.

NOTE:

1. The installation, dismantle, insert and remove of the digital operator can be carried out when the controller is power-on. That is to say, hot plug is accepted by the digital controller.

2. Please install, dismantle, insert and remove the digital operator carefully to avoid unwanted damage of the digital operator.

3. Please save the removed digital operator and communication cable well, DO NOT press, damage the operator or put it in extreme environment.

4. Please DO NOT use the self-made (> 3m) communication cable.

3.2 Structure and Switch process of the Operator Interface

The structure and interface switch process of the digital operator, as shown in Figure 3.3.

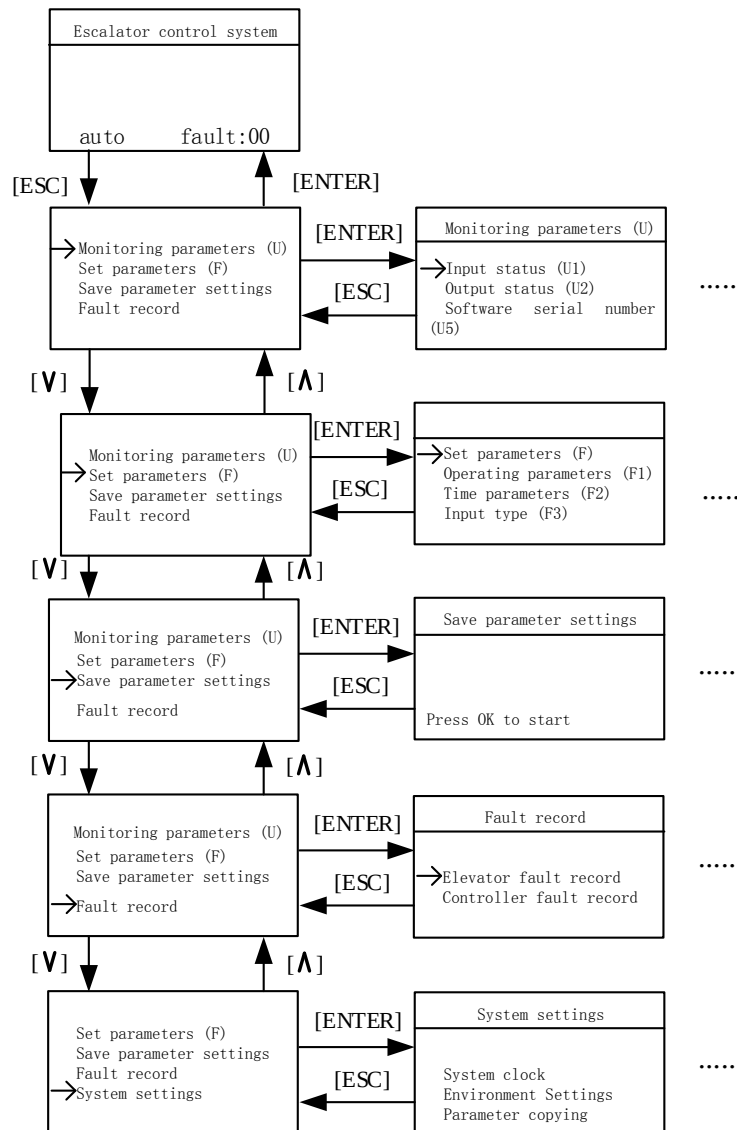


FIGURE 3.3 STRUCTURE FLOWCHART OF OPERATOR MENU

Chapter 4 Parameters

4.1 Parameter hierarchy

The overall hierarchical structure of all parameters of the controller is shown in Figure 4.1.

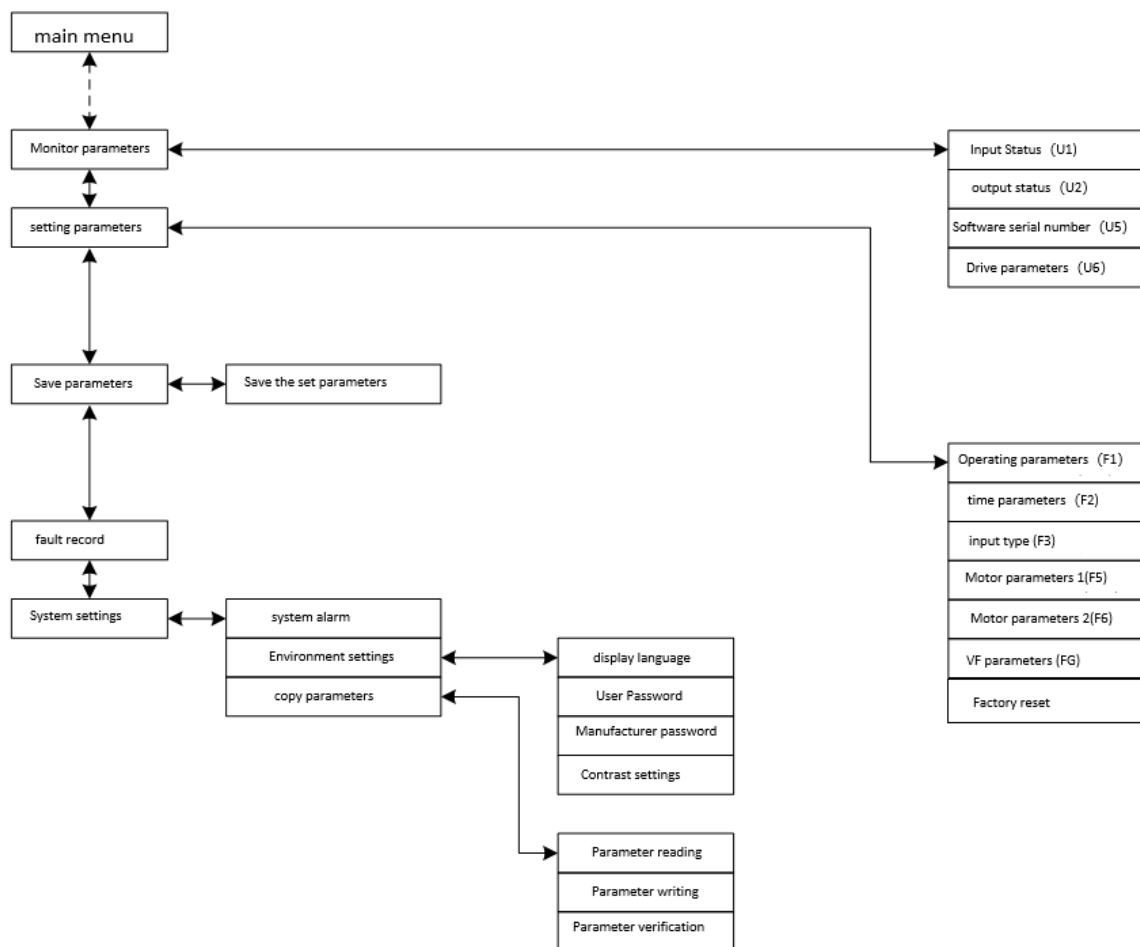


Figure 4.1 Schematic diagram of the overall hierarchical structure of all parameters of the controller

4.2 Monitoring parameter function description

The parameter number, name and content of group U monitoring parameters are shown in chart 4.1~4.2.

Chart 4.1 U1~U5 monitoring parameter chart

Para No.	Chinese display	Content	Range	Unit
	English display			
U1	Input Data	Controller input data show in decimal type. It will be turned into binary type to show the logical status of the input port.	--	--
	Input App	Each line corresponds to one input port, 'On/Off' states the current port status, the following 'n' value states the signal appraisal to input level. Value from '10' to '0' refers to interference condition from good (less interference) to bad (large interference)	--	--
U2	Output Data	Display the output port Y0-Y15 current status. The valid output port has the corresponded indication. Port without output (invalid) will be hidden.	--	--
U5-00	Ctrl SoftWare NO	Show the elevator control software information. Provide the current software version for factory maintenance and software upgrading.	--	--
U5-01	Drive CodeVer	Show the drive control software information. Provide the current software version for factory maintenance and software upgrading.	--	--
U5-02	Cpld Edition	Show the drive control software information. Provide the current software version for factory maintenance and software upgrading.	-- --	-- --

Chart 4.2 U6 driver monitoring parameter chart

Para No.	Chinese display	Content	Range	Unit
	English display			
U6-00	Power	Rated power class	--	kW
U6-01	Ref Speed	Reference Speed	--	RPM
U6-02	Feedback Speed	Feedback Speed	--	RPM
U6-04	DC Voltage	DC BUS voltage	--	V
U6-05	Output Current	Output Current	--	A
U6-06	Temperature	Drive internal temperature	--	°C
U6-07	Output Torque	Output Torque	--	N·M
U6-21~ U6-30	Backup parameters	Alternate parameters	--	--

4.3 Parameter setting function description

4.3.1 Parameters for Running Setup (F1)

The parameter number, name and content of the operation setting parameter F1 are shown in chart 4.3.

Chart 4.3 Running Setup Parameters List

Para No.	Chinese display	Content	Range	Default value	Unit
	English display				
F1-00	Control Mode	0- no leisure mode; 1- 1- Low speed during leisure; 2- Stop at leisure; 3- For leisure, first slow down and then stop; 4- Bidirectional operation;	0~4	1	--
F1-01	Rated Freq	The rated frequency of the motor.	1~50	50	Hz
F1-02	Hi-speed Freq	The frequency when the escalator is running at normal full speed.	1~50	50	Hz
F1-03	Lo-speed Freq	The escalator saves energy frequency when running at low speed.	1~50	15	Hz
F1-04	Insp Freq	Frequency of inspection operation.	1~50	25	Hz
F1-05	Auto-oil Type	0- Continuous refueling; 1- Intermittent refueling;	0~1	1	--
F1-06	Display direction	Display panel display direction adjustment.	0~1	0	--

4.3.2 Time Setup Parameters (F2)

The parameter number, name and content of time setting parameter F2 are shown in chart 4.4.

Chart 4.4 Time Setup Parameters List

Para No.	Chinese display	Content	Range	Default value	Unit
	English display				
F2-00	Brake ON Time	Brake open first then run elevator speed curve. This is to improve the elevator start comfort and match control system with different machine brake on time.	0.00~9.99	0.20	s
F2-01	Brake OFF Time	Brake close first then disable elevator run. This is to improve elevator stop comfort and avoid slip at elevator stop.	0.00~9.99	1.00	s
F2-02	Accel Time1	Acceleration time from stop to full speed.	1~10	4	s

Chart 4.4 Time setup Parameters List (Cont'd)

Para No.	Chinese display	Content	Range	Default value	Unit
	English display				
F2-03	Accel Time2	Recreational time acceleration to full speed at low speed.	1~10	8	s
F2-04	Decel Time1	The time to decelerate from full speed to stop.	1~10	5	s
F2-05	Decel Time1	The time to decelerate from full speed to low speed.	1~10	8	s
F2-06	InspAccel Time	Acceleration time during inspection operation.	1~10	3	s
F2-07	Leisure Time1	When no one used, it will enter the energy-saving operation mode after this delay.	1~999	60	s
F2-08	Leisure Time2	In operation mode 3, after the escalator has been running at low speed and energy saving, if no one is riding, it will enter the stop mode after this delay.	1~999	180	s
F2-09	Oil Time	The escalator is refueled at set intervals (running time).	1~999	48	H
F2-10	Add Oil Time	Keep time between refueling.	1~999	30	s
F2-11	Add Oil Interval	Refuel intermittently according to the set time.	1~9999	500	ms
F2-14	Stop Time h	Automatic closing of escalators (hours)	0~23	0	H
F2-15	Stop Time m	Automatic closing of escalator (minutes)	0~59	0	m
F2-16	Start Time h	Automatic escalator operation (hours)	0~23	0	H
F2-17	Start Time m	Automatic elevator opening (hours)	0~59	0	m

4.3.3 Input type setup Parameters (F3)

Chart 4.5 Input Type Setup Parameters List

Para No.	Chinese display English display	Content	Range	Unit
F3-00	Input Type	Setting the input type on main control panel. Each bit corresponds to one terminal. Set default level of mainboard input port. ON: Close enable, OFF: Open enable.	0~4294967295	3992977407
F3-02	Input select 1	X19 Input Function Selection	0~35	19
F3-03	Input select 2	X22 Input Function Selection	0~35	22
F3-04	Input select 3	X23 Input Function Selection	0~35	23
F3-05	Input select 4	X24 Input Function Selection	0~35	24
F3-06	Input select 5	X25 Input Function Selection	0~35	25
F3-07	output select 1	Y10 Output Function Selection	0~35	4
F3-08	output select 2	Y11 Output Function Selection	0~35	5
F3-09	output select 3	Alternate output function selection.	0~35	12

The main control board input type (F3-00) can be set according to the actual switch value effective state. When the switch value is in the effective position or in the effective state, the switch value is closed, and the input type is set to ON; when the switch value is in the effective position or in the effective state, the switch value is open, and the input type is set to OFF. The main control input signal input type setting is shown in chart 4.6.

Chart 4.6 Input type settings

Name	Port number	Terminal Position	Definition	Parameter	Default Input Level settings
Main control panel F3-00	X0	J3-8	Inspection Input	F3-00-00	ON
	X1	J3-7	Run up Input	F3-00-01	ON
	X2	J3-6	Run Down Input	F3-00-02	ON
	X3	J3-5	Running contactor feedback Input	F3-00-03	ON
	X4	J3-4	Spare	F3-00-04	ON
	X5	J3-3	Bottom Limit sensor Input	F3-00-05	ON
	X6	J3-2	Top Limit sensor Input	F3-00-06	ON
	X7	J3-1	Brake Contactor Feedback Input	F3-00-07	ON
	X8	J2-8	Spare	F3-00-08	ON
	X9	J2-7	Safety circuit detection 1	F3-00-09	ON
	X10	J2-6	Safety circuit detection 2	F3-00-10	ON
	X11	J2-5	Safety circuit detection 3	F3-00-11	ON
	X12	J2-4	Safety circuit detection 4	F3-00-12	ON
	X13	J2-3	Safety circuit detection 5	F3-00-13	ON
	X14	J2-2	Safety circuit detection 6	F3-00-14	ON
	X15	J2-1	Safety circuit detection 7	F3-00-15	ON

Chart 4.6 Input type settings(Cont'd)

Name	Port number	Terminal Position	Definition	Parameter	Default Input Level settings
Main control panel F3-00	X16	J1-10	Safety circuit detection 8	F3-00-16	ON
	X17	J1-9	Safety circuit detection 9	F3-00-17	ON
	X18	J1-8	Safety circuit detection 10	F3-00-18	ON
	X19	J1-7	Safety circuit detection 11	F3-00-19	ON
	X20	J1-6	Safety circuit detection 12	F3-00-20	ON
	X21	J1-5	Safety circuit detection 13	F3-00-21	ON
	X22	J1-4	Safety circuit detection 14	F3-00-22	ON
	X23	J1-3	Safety circuit detection 15	F3-00-23	ON
	X24	J1-2	Safety circuit detection 16	F3-00-24	ON
	X25	J1-1	Spare	F3-00-25	OFF
	X26	J7-5	Spare	F3-00-26	ON
	X27	J7-4	Spare	F3-00-27	ON
	X28	J7-3	Spare	F3-00-28	OFF
	X29	J7-1	Spare	F3-00-29	ON
	X30	J7-2	Spare	F3-00-30	ON
	X31	J7-1	Spare	F3-00-31	ON

4.3.4 Motor Setup Parameters (F5-F6)

Chart 4.7 Motor Setup Parameters List

Para No.	Chinese display	Content	Range	Default value	Unit
	English display				
F5-00	Motor Type	Set motor type (0: sync- outer rotor, 1: async machine, 2: sync-inner rotor)	0~2	1	--
F5-01	Poles	Motor poles (Nameplate)	1~99	6	--
F5-02	Sync Freq	Motor synchronous frequency (Nameplate)	0.001~99.999	50	Hz
F5-03	Rated Power	Motor rated power (Nameplate)	0.1~50	7.5	kW
F5-04	Rated Speed	Motor rated speed (Nameplate)	1~1999	960	RPM
F5-05	V IN	Motor counter-EMF (Nameplate)	1~380	380	V
F5-06	L_phase	Motor phase inductance set. (Auto-tuning/ manual input)	Auto-tuning /Nameplate	16.1mH	mH
F5-07	R_phase	Motor phase resistance set. (Auto-tuning/ manual input)	Auto-tuning /Nameplate	2.4	Ω
F5-08	Rated FLA	Motor rated current. (Nameplate)	0~99.999	17	A

Chart 4.7 Motor Setup Parameters List(Cont'd)

Para No.	Chinese display English display	Content	Range	Default value	Unit
F5-09	NO-Load Current	For asynchronous machine, no-load excitation current.	0.1~50	9	A
F5-10	F_SlipFrq	For asynchronous machine rated slip. (Nameplate)	0.1~10	2	Hz
F6-00	Carrier Freq	Set controller carrier frequency.	6~12	8	kHz
F6-02	SpeedZoom	Speed Zoom (Reduce elevator actual running speed)	0~100	100	%
F6-03	DirSel	Select motor running direction (0/1: Motor rotates anti-clockwise, car move down/up).	0/1	0	--
F6-04	Kp	Speed loop proportional gain. (Valid for complete curve if not used in multiple PI.)	0~65535	1000	--
F6-05	KI	Speed loop integral gain. (Valid for the complete curve if not used in multiple PI.)	0~65535	600	--

4.3.5 VF curve mode (FG)

Chart 4.8 VF curve mode

Para No.	English display	Range	Default value	Unit
FG-00	VF curve mode	0~2	0	--
FG-01	Torque increase %	0.0-30.0	1.0	--
FG-02	Torque boost frequency %	0.0-100.0	5.0	--
FG-03	VF slip supplement gain %	0.0~300.0	0.0	--
FG-04	VF oscillation suppression gain	0~500	100	--
FG-05	VF working mode	0~5	0	--
FG-06	VF debug mode	0~250	40	--
FG-07	VF control lower limit frequency value	0~50	1.00	--
FG-08	VF controls the intermediate frequency value	0~50	10.00	--
FG-09	VF control upper limit frequency value	0~50	50.00	--
FG-10	VF control lower limit voltage value	0~40000	20	--
FG-11	VF controls the intermediate voltage value	0~40000	70	--
FG-12	VF control upper limit voltage value	0~40000	380	--
FG-13	Current filter coefficient 1	0~2000	1000	Hz
FG-14	Current filter coefficient 2	0~500	100	Hz
FG-15	Oscillation suppression filter coefficient	0~100	5	Hz
FG-16	Slip compensation filter coefficient	0~1000	10	Hz
FG-17	Voltage compensation filter coefficient	0~1000	10	Hz

Chapter 5 Fault Codes

5.1 Logic faults and solutions

Chart 5.1 Logic fault list

Error Codes	instruction	method
00	Safety circuit abnormality	Check whether the safety circuit is disconnected or sealed, and check whether the input type of the safety circuit fault collection point is correct.
01	Safety circuit ground protection fault	Check the power input wiring.
02	Drive chain disconnection failure	Check the input circuit and drive chain part. If the drive chain is broken, replace the drive chain.
03	Left and right step chain failure	Check the input circuit and step chain components, if damaged they should be replaced.
04	Left and right lower comb tooth failure	Check the input circuit and lower comb components. If damaged, replace them.
05	Left and right lower entrance and exit failure	Check the input lines and lower inlet and outlet components. If damaged, replace them.
06	Left and right lower apron panel failure	Check the input circuit and lower apron components, if damaged they should be replaced.
07	Lower stop/Emergency stop of lower control box	Check the input circuit and lower stop or emergency stop components. If damaged, replace them.
08	Lower front panel / lower access socket	Check the input circuit and the lower front panel or inspect the socket components. If they are damaged, replace them.
09	Lower step sinks	Check the input circuit and lower step components, if damaged they should be replaced.
10	Upper step sinks	Check the input circuit and upper step components, if damaged they should be replaced.
11	Upper front panel/upper control box access socket	Check the input circuit and the upper front panel or upper control box access socket components. If damaged, replace them.
12	Upper stop/Upper control box emergency stop	Check the input circuit and upper stop or upper control box emergency stop components. If damaged, replace them.
13	Left and right upper apron panel failure	Check the input circuit and upper apron components, if damaged they should be replaced.
14	Left and right upper entrance and exit failure	Check the input circuit and upper inlet and outlet components. If damaged, replace them.
15	Left and right upper comb tooth failure	Check the input circuit and upper comb components, if damaged they should be replaced.
16	Host cranking switch / thermal failure	Check the input circuit and cranking switch or thermal switch components. If damaged, replace them.
17	Mainboard X25 signal input error	Check input wiring and X25 input type.
18	PES safety protection failure	Check the safety circuit board for faults.
30	Safety circuit contactor coil and feedback contact are inconsistent.	Check the input type, input wiring and safety contactor. If the contactor is damaged, replace it.

Chart 5.1 Logic fault list(Cont'd)

Error Codes	instruction	method
32	The holding brake and its contact action are inconsistent	Check the input type (X7), brake monitoring switch and wiring. If there is no such switch, set the brake feedback detection enable (Break, Feedback) to OFF.
33	Inverter operation failure	Check the inverter direction, enable signal and running signal output circuit, and check the relevant parameter settings of the inverter. (Note that the escalator is under open-loop control)
34	Operation is inconsistent with its contact action	Check the input type (X3), input wiring and transport contactor. If the transport contactor is damaged, replace the contactor.
35	Multiple faults in a given direction	Find the up and down input circuits.
37	Inverter failure	Find the inverter error code and determine the cause. When a frequency converter fault occurs, the frequency converter will power down and reset twice. If there is still a error, the frequency converter main contactor will power down.
40	Leisure mode has no leisure time set	Please set leisure time.
98	Driver program locked	Please contact with supplier.
99	Logic program locked	Please contact with supplier.

5.2 Driver Faults

Chart 5.2 Driver Fault List

Error Code	Display	Definition	Possible Causes	Possible Solution
DF1	UV	DC bus under voltage (for 400V drive, 380V at UV protection; for 200V drive, 220V at UV protection)	1. Phase lost on input supply; 2. Instantaneous power lost; 3. Excessive input voltage fluctuation; 4. Loose terminals at input; 5. Surge Resistance didn't release; 6. UPS running, but X18 is invalid.	1. UV error after power ON; Check input power supply; Check input power cable terminals; Check cable between main board and power board; 2. Without load, up running is normal, but down running shows UV error, Check surge resistance; 3. UV error while ARD running, Check X18 connection; 4. UV error after power off. This is normal condition; system record each time of power off by UV error.

Chart 5.2 Driver Fault List(Cont'd)

Error Code	Display	Definition	Possible Causes	Possible Solution
DF2	OV	DC bus over voltage (for 400V drive, 760V at OV protection; for 200V drive, 410V at UV protection)	1. Too short deceleration time; 2. Brake resistance value mismatch; 3. Supply voltage too high; 4. No connection to braking resistor or abnormal braking resistor or lack of capacity.	1. Increase deceleration time; 2. Connect capacity and connection of brake resistor; Check power supply.
DF3	OH	Heat sink overheated Find temperature of module is higher than a preset value and keep for certain time; Find temperature of module is lower than zero degree and keep for certain time;	1. Excessively ambient temperature; 2. Damaged cooling fan; 3. Existence of heat source around; 4. Ambient temperature is below zero degree; 5. Bad connection between main board and power board.	1. Reduce ambient temperature; 2. Remove heat source around; 3. Check the fan and wiring; 4. Set FX-21 to OFF (disable minus temperature warning); Check cable between main board and power board.
DF4	IF	IPM fault Find drive module has serious short circuit error, system trigger a hardware over-current protection. Please get rid of external short circuit before retrying	1. IPM over current/short circuit; 2. IPM over heat; 3. Abnormal IPM control power (UV); 4. Motor wire adhered or short to ground; 5. Abnormal star-sealed contactor action.	1. Check output short circuit; 2. Check motor short circuit; 3. Check star-sealed contactor action; Contact with supplier.
DF5	OC	Overcurrent Phase current of controller has exceeded limit and keep for certain time	1. Inverter output short circuit; 2. Machine over-load; 3. Accel/decel time too short; 4. Encoder signals have a bad connection; 5. Wrong motor or encoder parameter setting: (1)Wrong original point (Gearless); (2)Rated slip is too large(Geared); (3)Wrong poles setting; (4)Wrong encode pulse setting; (5)Wrong P & I parameter setting.	1. Check motor short circuit; 2. Check accel/decel time, slow down if needed; 3. Check if inverter's capacity match load; 4. Check encoder connection: (1)Check original point (Gearless); (2)Check rated slip (Geared); (3)Check poles setting; (4)Check encoder pulse setting; (5)Check P & I parameter setting.

Chart 5.2 Driver Fault List(Cont'd)

Error Code	Display	Definition	Possible Causes	Possible Solution
DF6	CF	CPU faults Controller abnormal	Electro-Magnetic interference.	Please contact with supplier.
DF7	OS	Elevator over speed the speed feedback exceeds the speed limit and last longer than set time.	1. Max speed /last time set incorrect; 2. Speed over-tuning; 3. Encoder feedback incorrect; 4. Wrong motor parameters setting.	1. Check speed limit setting; 2. Check the P/I parameter; 3. Check encoder; Check motor parameters.
DF8	OE	Speed over deviation the speed deviation exceeds the allowable range(F9-03) and last longer than set time.	1. System overload; 2. Accel/decel time short; 3. Parameter setting wrong; 4. Encoder cannot work properly; 5. Brake wrongly act; Wrong allowable range set.	1. reduce system load; 2. Increase accel/decel time; 3. Check the parameters; 4. Check the encoder; 5. Exchange motor phase sequence or exchange A+/A- and B+/B- wire; Check brake action.
DF10	FF	Flash memory fault	Data fault at saving parameters.	Please contact supplier.
DF11	BF	Base block circuit error When system find base lock valid and receive running command, but running condition isn't ready.	1. Wiring for base block at X14 is incorrect; 2. Setting electric level for base block at X14 is incorrect.	1. Check the wiring at X14; Modify the parameters.
DF12	OL	Motor overload current output exceed 150% (200%) rated value for 60s (10s). Motor current exceed 150% (200%) rated value for 60s (10s).	1. System load too heavy; 2. System power rating too low; 3. Low capacity controller.	1. Reduce system load; 2. Change a more suitable controller; Change motor or increase F5-08 rated current properly to promote overload capacity.
DF13	MC	MC contactor bad action Controller main contactor MC does not close after given close command for set time.	1. Wrong wiring for MC contactor; 2. MC contactor damaged; 3. Wrong FX-23 surge feedback type setting; 4. Drive power on power board is abnormal.	1. Try to reset the power, if this error come again, contact supplier for replacement; Change FX-23 status, then power off and power on again.

Chart 5.2 Driver Fault List(Cont'd)

Error Code	Display	Definition	Possible Causes	Possible Solution
DF14	BR	Brake unit fault While system find DC bus voltage reach braking range, but braking tube keep open and last over preset time.	- defective brake cable or damaged brake elements or IGBT module; - External brake resistor disconnected or not connected; - Bad connection between the main board and the power board.	- Check brake resistor; - Replace the controller; Check the main board and the power board connector.
DF15	OF	Output phase lost System find phase lost or break, running condition is not ready	- Output cable break or loose terminal; - Motor stator cable disconnect.	- Check output cable/terminal; - Check motor stator cable; Set FD-21.BIT2 to 1 to disable this detection.
DF16	SCF	Output current remains at elevator stop After the system executes the stop instruction, the output current is not zero and the preset time is kept.	- Controller damaged; - Cabinet works abnormally.	Change the controller; Check cabinet wiring.
DF17	SRF	Elevator slips after stop After the system executes the stop command, the encoder's feedback speed is not zero.	- Brake/encoder loose; - Encoder interference.	Fasten brake/encoder; Remove interference source.
DF21	DF	Parameter setting error System find rated current/no-load current/ rated slip/ poles/pulse setting error.	Parameter setting error Check rated current/no-load current/ rated slip/ poles/pulse setting.	Check parameter setting.
DF22	SDF	Internal programmer self-check error The system detected the types of faults that cannot be classified into routine fault types.	Internal data setting error.	Please contact with supplier.

Chart 5.2 Driver Fault List(Cont'd)

Error Code	Display	Definition	Possible Causes	Possible Solution
DF23	150	Current collection sensor error When the elevator starts, the system detected that the instantaneous current value of the current sensor is not near the zero point.	1. Bad contact between main board and drive power; 2. Hardware error.	1. Please with contact supplier; Check the main board and driver power board connection.
DF24	151	Overtime at zero speed The system has detected that the elevator controller has been given a zero-speed state and exceeds the zero-speed timeout time.	Drive controller keep too long time under zero speed.	Check if inspection speed or rated speed is reasonable.
DF25	152	Base lock error System detect base lock signal and cannot reset error	1. Bad contact among chips on mainboard; 2. Bad contact among main board and power board.	1. Check the connection between; Bad contact among chips on mainboard; 2. main board and power cable. Replace main board.
DF26	153	Sequence of load compensation is abnormal When the load compensation device starts, the system detects the rotation of the motor.	While drive controller operate load compensation, the sequence is abnormal. Or brake open time is too short.	Check the brake and if Brake ON Time setting is too short.
DF27	154	Angle tuning fail Angle tuning with load not completed.	Angle tuning fail with fault.	Solve angle tuning fault first, then do it again. Attention: Don't run elevator without successful auto tuning, or it will lose control.
DF28	155	Internal communication error The system has detected the abnormal communication in the main board.	1. Internal communication between controllers is abnormal; 2. Component on mainboard is abnormal; 3. Elevator controller gives wrong commands.	1. Check if there is serious EMI or contact with supplier; Change the main board.

Chart 5.2 Driver Fault List(Cont'd)

Error Code	Display	Definition	Possible Causes	Possible Solution
DF29	156	The running mode of machine is abnormal speed source selection F9-01 cannot match current logic.	Speed source selection F9-01 do not adapt to current control logic.	When normal running, confirm F9-01=2.
DF30	157	Power of bottom case identification error The main board cannot correctly identify the bottom case configuration information.	1. Connection between main board and power drive board is bad; 2. Component on mainboard is abnormal; 3. Component on power drive board is abnormal.	1. Check the connection between main board and drive power; 2. Change main board; Change power board.
DF31	158	Communication error between drive modules Detection of communication error between drive modules	Communication of internal drive chip is abnormal.	1. Check if there is serious EMI or contact with supplier; 2. Change main board.
DF33	160	Before start, feedback speed is abnormal. Before elevator start, system find the feedback speed is over limit.	1. Encoder signal anomaly; 2. Brake force may be not enough or already open.	1. Check A & B signals of encoder; 2. Check brake.
DF34	161	While brake force detecting, feedback movement of encoder is too long.	1. Encoder feedback signal anomaly; 2. Brake force may be not enough or already open.	Check the brake and encoder.
DF35	162	While safety protecting, motor has crept too long When the system is in the state of security protection, it is detected that the encoder feedback displacement is too large.	1. Encoder feedback signal anomaly; 2. Brake force may be not enough or already open. 3. The setting of control parameter is not reasonable.	Check the brake, encoder and parameter setting related to safety protection
DF36	163	Lack of phase protection for 3-phase input power During the operation of the system, the input phase is detected lack, and the shell driving power is abnormal.	1. While running, system find lack of phase. 2. Check if there's IF error in Fault report. If yes, solve error according to IF error. 3. Bad contact between main board and power board.	1. Check 3-phase input power; 2. Check if there's short circuit of output 3-phase; 3. Check cable between main board and power board; While using one phase, set FD-21.BIT0=1 to ignore lack of phase error.

Chart 5.2 Driver Fault List(Cont'd)

Error Code	Display	Definition	Possible Causes	Possible Solution
DF37	164	Three-phase output line short circuit Short circuit between 3-phase output or short to earth or to N line.	1. There is short circuit among 3-phase output or output to earth or output to N line; 2. Imbalance adapt between motor and inverter capacity.	1. Check 3-phase output and output to earth and output to N line; 2. Check if inverter capacity adapts to motor. Note: Set FD-21.BIT3=1 can ignore this error, but we don't suggest doing that. Because it has risk to burn module.
DF38	165	Imbalance of 3-phase output System find the summation of 3-phase current is not zero and last for certain time.	1. The output current feedback way of 3-phase output is seriously abnormal; 2. One of 3-phase may short to earth or N line.	1. Check if there is broken circuit or short circuit with N(Neutral) of 3-phase output; 2. Feedback channel of current sensor.
DF39	166	Output voltage is saturated During the operation of the system, the integrated controller output voltage is detected to be saturated.	1. Low input voltage; 2. Rated motor speed setting is not same with actual speed; 3. For geared motor, rated slip is too low or over load.	1. Check DC bus voltage; 2. Check if rated RPM is same with nameplate or if bus voltage has been dropped down through monitoring running status; 3. Check rated slip for geared motor; 4. Check balance factor.

Chapter 6 Maintenance Inspection

6.1 Routine maintenance of escalators

In order to ensure the smooth and normal operation of the escalator and extend the service life of the escalator, the escalator must be maintained and regularly repaired regularly. Therefore, the following suggestions are made to users:

——Perform daily maintenance at least once a day:

- 1) Clean at least once a day. If there are foreign objects embedded in the tooth grooves of the step pedals and skirting boards, they must be cleaned;
- 2) If the handrails, tempered glass or other obvious parts are dirty, they should be wiped clean;
- 3) Check the appearance of the escalator. If any damage is found, measures should be taken to deal with it in time;
- 4) Pay attention to observe and auscultate the escalator to see if there are any abnormal phenomena or sounds every time it is started;
- 5) There must be a dedicated person responsible for establishing escalator operation records to facilitate shift handover and reference.

——After three months since it is put into operation, an inspection and adjustment must be carried out:

- 1) Regularly inspect and adjust the safety switch;
- 2) Regularly remove dust and maintain the control panel and relevant internal electrical contacts;
- 3) Reliability inspection of the ground terminal and regular inspection of the electrostatic brush.

——Every half month of operation, the upper and lower machine rooms should be cleaned and sorted;

——Every month of operation, check whether there is lubricating oil in the lubricating oil pump, and refill it regularly:

If equipped with a refueling device, the control system automatically accumulates working time based on the normal operating time of the escalator. When the time reaches 24 hours, the refueling device works once. The user needs to add lubricating oil to the refueling device according to the use of the escalator (the lubricating oil interval and lubrication time can be set arbitrarily according to different usage requirements); when the lubricator is a gear pump, manual button refueling can be performed according to maintenance needs.

Overhaul is a comprehensive overhaul of equipment as planned. The equipment

after overhaul should meet the technical requirements of new equipment when it leaves the factory. If some items fail to meet the requirements due to too long service life, the requirements can be relaxed as appropriate while ensuring safe operation. However, the maintenance work cannot be sloppy, and escalators cannot be used casually.

Safety and preventive measures during maintenance work:

- 1) Prepare the maintenance site and remove debris to ensure the working access of maintenance personnel;
- 2) Set up safety fences and warning signs saying "The escalator is under maintenance" around the maintenance site;
- 3) Before starting the maintenance, the electrical main switch should be opened and a warning sign with the words "Under Maintenance" should be hung on the main switch. To ensure safety, the electrical main switch should be locked;
- 4) Except for using disc wheels, it is absolutely not allowed to use human power to turn the escalator;
- 5) After the inspection work is completed, check carefully. No tools or other objects should be left in the escalator, especially between parts with relative motion. Pay more attention.

6.2 Factory transportation and on-site construction

After the escalator leaves the factory, it has been affected by factors such as transportation, lifting, and horizontal positioning at the construction site. Before installation, acceptance, and use at the construction site, electrical components such as the apron board gap switch, front plate comb, comb switch, step missing sensor, escalator speed sensor, handrail speed sensor, and other electrical components must be readjusted.