Preface

Thank you for purchasing the MCTC-PES-E1 system.

MCTC-PES-E1, independently developed and produced by Suzhou Monarch Control Technology Co., Ltd., is a programmable electronic system in safety related applications for escalators and moving walkways (PESSRAE).

The MCTC-PES-E1 adopts dual-CPU control and provides multiple security monitoring protections for escalators and moving walkways. The system satisfies the GB/16899-2011 Safety Rules for the Construction and Installation of Escalators and Moving Walks.

This manual describes the correct use of the MCTC-PES-E1 system. System installation, commissioning and maintenance must be performed only by qualified personnel with related experience.

It introduces the construction, features, security prompts, design & installation, operation & maintenance, and faults & solutions of the MCTC-PES-E1 system. Read and understand the manual before use, and keep it properly for future reference.

Notes
• The drawings in the manual are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions. • The drawings in the manual are shown for description only and may not match the product you purchased. • The instructions are subject to change, without notice, due to product upgrade, specification modification as well as efforts to increase the accuracy and convenience of the manual. • Contact our agents or customer service center if you have some questions during the use.

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1

Safety Information and Precautions

Chapter 1 Safety Information and Precautions

1.1 Safety Precautions

Use Stage	Safety Grade	Precautions
During installation	⚠ DANGER	• Do not install the equipment if you find water seepage, component missing or damage upon unpacking. • Do not install the equipment if the packing list does not conform to the product you received. • Install the equipment on incombustible objects such as metal, and keep it away from combustible materials. Failure to comply may result in a fire. • Do not loosen the fixed screws of the components.
	⚠ WARNING	• Handle the equipment with care during transportation to prevent damage to the equipment. • Do not use the equipment with damaged or missing components. Failure to comply will result in personal injury. • Do not touch the components with your hands. Failure to comply will result in static electricity damage. • Install the equipment in places free of vibration and direct sunlight.
At wiring	⚠ DANGER	• Wiring must be performed only by qualified personnel under instructions described in this manual. Failure to comply may result in unexpected accidents. • Ensure that the power supply is cut off before wiring. Failure to comply may result in electric shock. • Before wiring, cut off the power supply of the escalator or moving walkway using reliable insulation device. Do not guarantee safety of engineers by depending on the stop, startup or input signal of the equipment because these signals cannot insulate hazardous voltage.
	⚠ WARNING	• Pay attention to the marks of the wiring terminals and ensure correct wiring. Failure to comply will result in damage to the controller. • Use a shielded twisted pair (STP) cable with twist pitch of 20−30 mm for communication, and ensure that the shield is reliably grounded.

Use Stage	Safety Grade	Precautions
During operation	⚠ DANGER	• Perform wiring of all peripheral devices under the instructions of the manual and ensure correct wiring according to the circuit diagram in the manual. Failure to comply will result in accidents. • Do not touch the system or surrounding circuits. Failure to comply will result in electric shock. • Do not touch any I/O terminal of the system. Failure to comply may result in electric shock. • Non-qualified personnel are prohibited to perform signal detection during operation. Failure to comply may result in personal injury or damage to the equipment.
	⚠ DANGER	• The equipment has high voltage input. The hazardous voltage may result in severe electric shock or even death. Please keep cautious when you use or get close to the system that has been connected to the power supply.
	⚠ WARNING	• Ensure correct wiring of input and output terminals before use for the first time, check whether short circuit exists in the peripheral circuits connected to the MCTC-PES-E1, and check whether the wiring is secure. Failure to comply will result in damage to the MCTC-PES-E1. • Do not change the default settings of the MCTC-PES-E1. Failure to comply may result in damage to the system.
During maintenance	⚠ DANGER	• Do not repair or maintain the MCTC-PES-E1 at power-on. Failure to comply will result in electric shock. • Repair or maintenance of the MCTC-PES-E1 may be performed only by qualified personnel. Failure to comply will result in personal injury or damage to the equipment. • Set and check the parameters again after the MCTC-PES-E1 is replaced. • All the pluggable components must be plugged or removed only after power-off.

1.2 General Precautions

1) Service life

The service life of the MCTC-PES-E1 is 15 years. To ensure normal use and security, you need to replace the product that has been used for approximately 10 years (calculated from delivery) or return them to Monarch for repair and maintenance.

2) Statement on selection of parts

The power supply switches and sensors required by the MCTC-PES-E1 system have been certified by related institutions and must be selected according to the listed models in the manual. Monarch will assume no risk or responsibility if you use the models that are not recommended in the manual.

3) Installation environment requirements

The MCTC-PES-E1 system is installed in the machine room of the escalator or moving walkway. The installation environment must satisfy the requirements described in Table 1-2. Monarch will assume no risk or responsibility if a fault occurs in the system because the installation environment requirements are not satisfied.

Table 1-2 Installation environment requirements

Item	Requirements
Ambient temperature	-20°C to +65°C
Humidity	Less than 95% RH, without condensing
Mounting location	Free from conducting materials, corrosive gas, combustible gas, metal powder, oil dirt and dust
IP level	IP00 (no IP level requirement on board) IP5X (with housing) Note: The MCTC-PES-E1 system has the housing that satisfies IP5X. If you purchase the board only, install the board in the control cabinet or other housing satisfying IP5X.

2

Product Information

Chapter 2 Product Information

2.1 Introduction

The MCTC-PES-E1 is designed to provide multiple security monitoring protections for escalators and moving walkways. It adopts dual-CPU control and judges the signals related to the escalator or moving walkway simultaneously. Once detecting a fault, the two CPUs instruct the safety relays to act and output the fault signal.

Furthermore, the two CPUs monitor each other. If one CPU breaks down or is damaged, the other instructs the safety circuits to act immediately and output the corresponding fault signal. The MCTC-PES-E1 has an LED operation panel, on which you can perform operations such as parameter modification and working status monitoring.

The following figure shows the physical appearance of the MCTC-PES-E1.

Figure 2-1 Physical appearance of the MCTC-PES-E1 (a control board fixed inside the black housing)

2.2 System Components and Functions

2.2.1 System Configuration

The MCTC-PES-E1 is configured with a control board, a protective guard, and a switching-mode power supply (the models are introduced in Table 2-1).

Table 2-1Models of switching-mode power supply

Component	Quantity	Adapted Model			Remarks
Switching-mode power supply	1	ECU EPR-35-24 (35 W, 24 VDC)	Schneider ABL2REM24015H (35 W, 24 VDC)	Mean Well NES-35-24 (35 W, 24 VDC)	The switching-mode power supply of MCTC-PES-E1 is provided by Monarch.

Note

The switching-mode power supply provides power supply only to the components of the MCTC-PES-E1 (including the control board and the connected sensors and detection switches). It is prohibited to provide power supply to any other devices.

When installing the MCTC-PES-E1, six sensors and seven detection switches are required. The sensor models are designated and sold by Monarch, while the detection switches are decided by the customer. The recommended models of the sensors and detection switches are introduced in Table 2-2.

Monarch will assume no risk or responsibility if the customer uses the models that are not recommended in the manual.

Table 2-2 Models of sensors and detection switches

Accessory	Quantity	Recommended Model		Remarks
Sensor		Schneider	P+F	Specify the required sensor models in your order. Monarch will deliver them (except NBN40-L2-E0-V1) together with the MCTC-PES-E1.
Escalator/Moving walkway speed sensor	2	XS2 18BLNAL2C	NBN8-18GM50-E0-MO	
Handrail speed sensor	2	XS2 12BLNAL2C	NBN4-12GM50-E0-MO	
Step loss detection sensor	2	XS2 30BLNAL2C	NBN15-30GM50-E0-MO NBN40-L2-E0-V1	
Detection Switch		Schmersal	OMRON	Customer option
Motor brake detection switch	2	TS236-02Z TS236-11Z	D4N-4132 D4NA-4131	
Auxiliary brake detection switch	1	TS236-02Z TS236-11Z	D4N-4132	
Floor plate detection switch	4	TS236-02Z TS236-11Z	D4N-4132 D4N-2B64-E1	

2.2.2 System Functions

The MCTC-PES-E1 is designed to ensure safe running of escalator and moving walkway according to the security grading defined in the newest escalator security standard GB16899-2011. It has the following security functions:

1) Overspeed protection
2) Unintentional reversal protection
3) Handrail speed deviation protection
4) Service brake and auxiliary brake monitoring protection
5) Step or pallet loss protection
6) Braking-to-stop distance detection and alarm
7) Floor plate state monitoring

■ Working States

The following table describes the states of the MCTC-PES-E1.

Table 2-3 States of the MCTC-PES-E1

State	Description
Startup	The system is powered on and then starts to run properly. In the startup process, the system completes self-check and all relays are in the OFF state.
Setting	You can modify parameters and reset faults using the external operation panel. This mode is active only when the system is in the stop state. When the system is running, you can change nothing using the operation panel.
Stop	The system is not powered on and all relays are in the OFF state.
Fault	The system itself has abnormality, such as self-check failure. In such state, all relays are cut off. You need to power on the system again.
Normal	All functions are normal during running.
Inspection	The system enters the inspection state after the inspection signal becomes active. In such state, the step loss detection function, motor braking detection function and handrail speed detection function are disabled, while the other functions are available.
Manual reset	The system enters the manual reset state after the manual reset signal becomes active. In such state, all securitiy functions are disabled and all relay outputs are in the OFF state.

■ Description of Security Functions

The following table describes the security functions provided by the MCTC-PES-E1.

Table 2-4 Description of security functions

No.	Security Function	Description
1	Over-speed protection 1	Check the speed and acts before the speed exceeds 1.2 times of nominal speed.
2	Over-speed protection 2	Check the speed and act before the speed exceeds 1.4 times of nominal speed.
3	Unintentional reversal protection	Check the unintentional reversal running.
4	Brake monitoring protection	Check the action of the auxiliary brake.
5	Step or pallet loss protection	Check whether the step or pallet is lost.
6	Brake monitoring protection	Check whether the main brake is released.
7	Handrail speed deviation protection	Check the deviation between the handrail speed and the actual step or pallet speed. If the speed deviation is greater than -15% and continues for 15s, the system performs protection.
8	Braking-to-stop distance detection and alarm	Check the braking-to-stop distance. If the distance exceeds 1.2 times of the allowable maximum value, the system performs protection.
9	Floor plate detection switch	Check whether the floor plate is opened or removed.

■ Security Measures After Security Functions Enabled

The following table describes the security measures after the security functions become enabled.

Table 2-5 Security measures after the security functions enabled

No.	Description of Security Function	Security Circuit Open	Power off the Supply of Auxiliary Brake	Manual Reset
1	Check the speed and acts before the speed exceeds 1.2 times of nominal speed.	Yes	No	Yes
2	Check the speed and acts before the speed exceeds 1.4 times of nominal speed.	Yes	Yes	Yes
3	Check the unintentional reversal running.	Yes	Yes	Yes
4	Check the action of the auxiliary brake.	Yes	No	No
5	Check whether the step or pallet is lost.	Yes	No	Yes
6	Check whether the main brake is released.	Yes	No	Yes
7	Check the deviation between the handrail speed and the actual step or pallet speed. If the speed deviation is greater than -15% and the duration exceeds 15s, it performs protection.	Yes	No	No
8	Check the braking-to-stop distance. If the distance exceeds 1.2 times of the allowable maximum value, it performs protection.	Yes	No	Yes
9	Check whether the floor plate is opened/ removed.	Yes (see the "Note" below.)	No	No

Note

The security circuit of the escalator or moving walkway is cut off after the floor plate is opened or removed. After the system enters the inspection state, the fault is reset automatically.

3

Mechanical and Electrical Installation

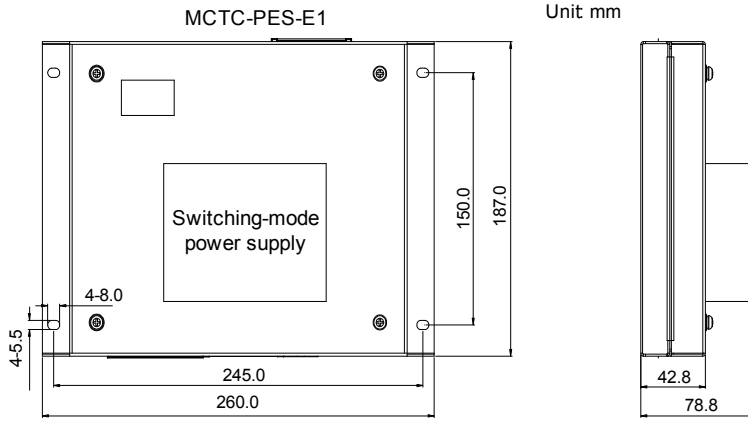
Chapter 3 Mechanical and Electrical Installation

3.1 Mechanical Installation

3.1.1 Installation Dimensions

The following figure shows the dimensions of the MCTC-PES-E1 system.

Figure 3-1 Dimensions of the MCTC-PES-E1 system



Only the control board (without the protective guard) is required in some applications. The following figures show the physical appearance and installation dimensions of the control board.

Figure 3-2 Physical appearance of the control board

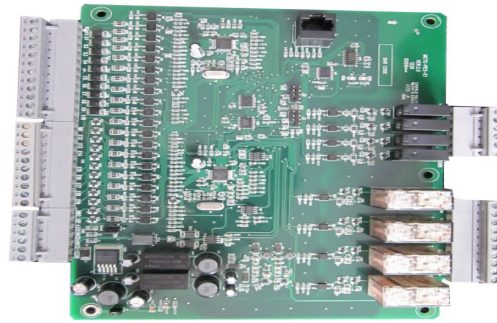
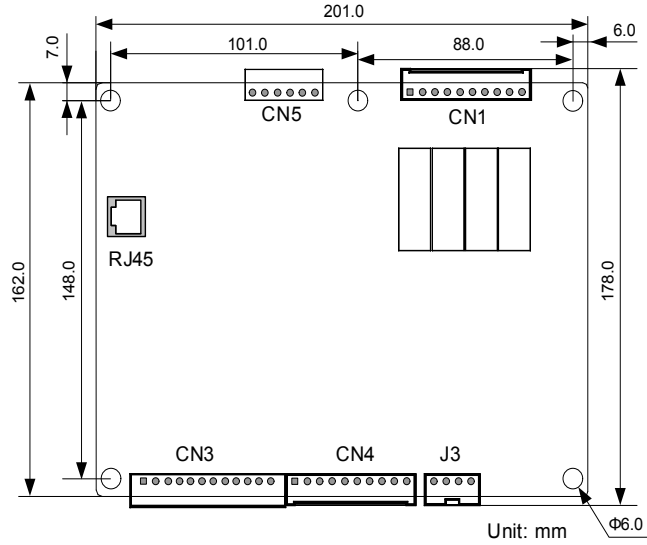


Figure 3-3 Installation dimensions of the control board



3.1.2 Installation Method and Precautions

To install the MCTC-PES-E1 system, do as follows:

1. Process the installation side in the main control cabinet. For the processing dimensions, refer to Figure 3-1.
2. Mount the MCTC-PES-E1 on the installation side and fix it with screws.

If only the control board (without the protective guard) is required, do as follows:

1. Process the installation side in the main control cabinet. For the processing dimensions, refer to Figure 3-3.
2. Mount the control board on the installation side and fix it with screws.

Observe the following precautions during installation:

1) The switching-mode power supply has been fixed on the protective guard of the MCTC-PES-E1 system upon delivery.
2) The screws for fixing the protective guard are not delivered together with the MCTC-PES-E1 and you need to prepare them yourself. When selecting screws, consider the plate thickness of the installation side, the thickness of the protective guard and the dimension of the hole in Figure 3-1.
3) The MCTC-PES-E1 system is installed in the main control cabinet of the machine room of the escalator or moving walkway. Keep the installation room clean, well ventilated and dust & moisture proofing. Especially when only the control board without the protective guard is installed, take other dust & moisture proofing measures.

3.2 Installation of Sensors

3.2.1 Technical Data of Sensors

The following table describes the technical data of the sensors.

Table 3-1 Technical data of Schneider sensors

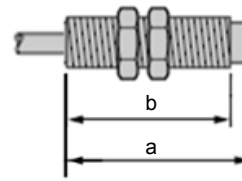
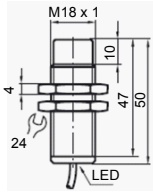
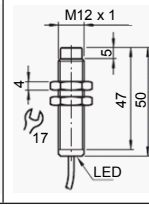
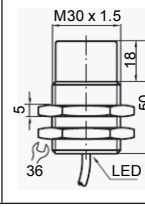
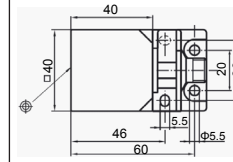
Brand	Schneider		
Sensor	Escalator/Moving walkway speed sensor	Handrail speed sensor	Step loss detection sensor
Model	XS2 18BLNAL2C	XS2 12BLNAL2C	XS2 30BLNAL2C
Diameter	18 mm	12 mm	30 mm
Sensing Distance	≤ 8 mm	≤ 4 mm	≤ 15 mm
Length	50.6 mm	41.3 mm	50.6 mm
Power Supply (DC)	12–24 V	12–24 V	12–24 V
Output	NPN	NPN	NPN
Definition of Cables	Brown (BN): positive Blue (BU): negative Black (BK): output signal	Brown (BN): positive Blue (BU): negative Black (BK): output signal	Brown (BN): positive Blue (BU): negative Black (BK): output signal
Appearance			
Dimension	a = 50.6 mm b = 40.4 mm	a = 50.6 mm b = 34.1 mm	a = 50.6 mm b = 35.4 mm
			

Table 3-2 Technical data of the P+F sensors

Brand	P+F			
Sensor	Escalator/ Moving walkway speed sensor	Handrail speed sensor	Step loss detection sensor	
Model	NBN8-18GM50-E0-MO	NBN4-12GM50-E0-MO	NBN15-30GM50-E0-MO	NBN40-L2-E0-V1
Diameter	18 mm	12 mm	30 mm	Square (see the dimension)
Sensing Distance	≤ 8 mm	≤ 4 mm	≤ 15 mm	≤ 40 mm
Length	50 mm	50 mm	50 mm	See the dimension.
Power Supply (DC)	10–30 V	10–30 V	10–30 V	10–30 V
Output	NPN	NPN	NPN	NPN
Definition of Cables	Brown (BN): positive Blue (BU): negative Black (BK): output signal	Brown (BN): positive Blue (BU): negative Black (BK): output signal	Brown (BN): positive Blue (BU): negative Black (BK): output signal	Brown (BN): positive Blue (BU): negative Black (BK): output signal Do not connect the white cable.
Appearance				
Dimension				

Note

- All the sensor models except NBN40-L2-E0-V1 are obtainable in Monarch.
- The principle on selecting step or pallet loss sensor is as follow:
  - For iron step or pallet, select XS2 30BLNAL2C or NBN15-30GM50-E0-MO.
  - For aluminum step or pallet, it is suggested to select NBN40-L2-E0-V1 (P+F), whose detection distance is long and signal is reliable.

3.2.2 Installing the Speed Sensor and Running Direction Sensor for Escalator/Moving Walkway

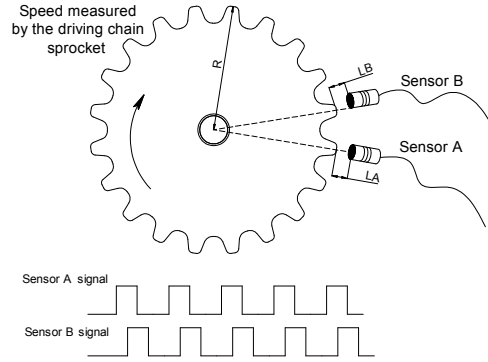
■ Installation

1) Align the center of the sensing face of one sensor with the center of one tooth on the driving chain sprocket and align the sensing edge of the other sensor with the center of the neighboring tooth on the driving chain sprocket, as shown in the following figure.

2) Installation distance 3 mm ≤ LA = LB ≤ 8 mm

The following figure shows the installation of the escalator/moving walkway speed sensor and running direction sensor.

Figure 3-4 Installation of the escalator/moving walkway speed sensor and running direction sensor



■ Detection Principle

1) Overspeed protection function

By measuring the speed of the driving chain sprocket through sensor A and sensor B, the MCTC-PES-E1 system judges whether the running speed of the escalator/moving walkway exceeds the allowable speed. If yes, the MCTC-PES-E1 system will perform overspeed protection.

When the driving chain sprocket rotates, every time a sensor detects a tooth, the sensor sends a pulse. The MCTC-PES-E1 system calculates the running speed of the escalator/moving walkway based on the time interval of detected pulses.

Sensor A and sensor B are redundant speed measuring channels for each other. By setting a certain pulse cycle or frequency threshold, 1.2 times or 1.4 times overspeed can be detected.

2) Unintentional reversal protection

By fixing the relative positions of the two sensors correctly, make the phase of sensor A in advance of the phase of sensor B and ensure that the two sensors have overlapping pulse part. In this case, the MCTC-PES-E1 system detects the logic sequence of the two sensors and judges the actual running direction of the escalator/moving walkway through the logic sequence, preventing reversal running.

3.2.3 Installing the Handrail Speed Sensor

■ Installation

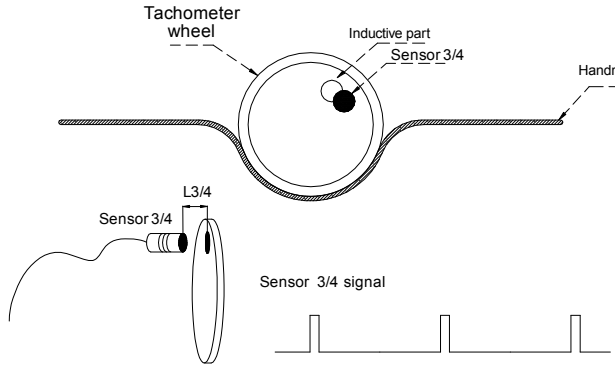
1) Align the sensor with the inductive part on the tachometer wheel.

   If the tachometer wheel is made of plastic, use a ferric device as the inductive part. If the tachometer wheel is ferric, drill a hole as the inductive part in the wheel. The section size of the inductive part should be approximate to that of the sensing face of the sensor.

2) Installation distance: 1 mm ≤ L3 = L4 ≤ 4 mm

   The following figure shows the installation position of the handrail speed sensor.

   Figure 3-5 Installation position of the handrail speed sensor



■ Detection Principle

Sensor 3/4 is used to measure the left/right handrail speed. The tachometer wheel is driven by the handrail to rotate and its linear speed is basically consistent with the handrail speed. An inductive part is set on the tachometer wheel to mount sensor 3/4 on a fixed mechanical structure with the sensing face toward the inductive part.

When the tachometer wheel follows the handrail to rotate, sensor 3/4 outputs pulses, as shown in Figure 3-5. A pulse is output every time the tachometer wheel rotates a revolution.

With the pulses and radius of the wheel, the system can measure the rotational speed of the tachometer wheel. Then the system calculates the handrail speed and compares it with the escalator/moving walkway speed. If the handrail speed is lower than 85% of the corresponding escalator/moving walkway speed and the handrail underspeed continues for 15s, the system cuts off the power supply to the safety circuit of the escalator/moving walkway to stop the running, implementing protection.

3.2.4 Installing the Step/Pallet Loss Sensor

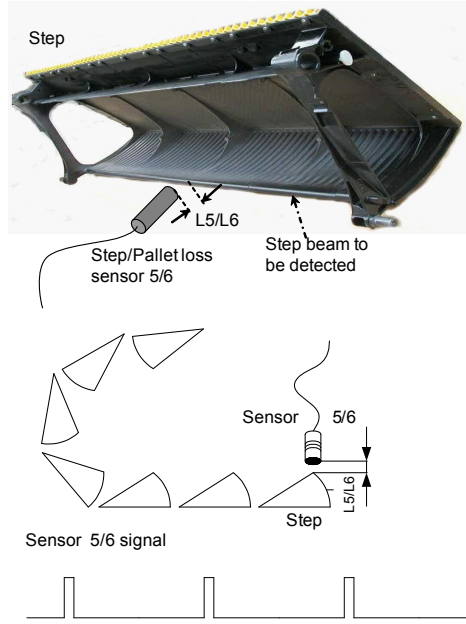
1) Installation

For aluminum step or pallet, it is suggested to select NBN40-L2-E0-V1 (P+F), whose detection distance is long and signal is reliable. Each step/pallet loss sensor is required for the top and bottom machine rooms respectively. Install the sensor with the sensing face toward the step beam to be detected.

2) Installation distance: 5 mm ≤ L5 = L6 ≤ 15 mm

The following figure shows the installation position of sensor (5/6) for the escalator.

Figure 3-6 Installation position of the step/pallet loss sensor for escalator



3) Detection Principle

Each sensor (5/6) is installed in the return/driving station in the top/bottom machine room, respectively to detect step loss. Based on signals of speed sensor A/B for the motor, the system calculates the number of pulses of sensor A/B between two adjacent pulses of sensor 5/6 to judge whether step/pallet loss occurs.

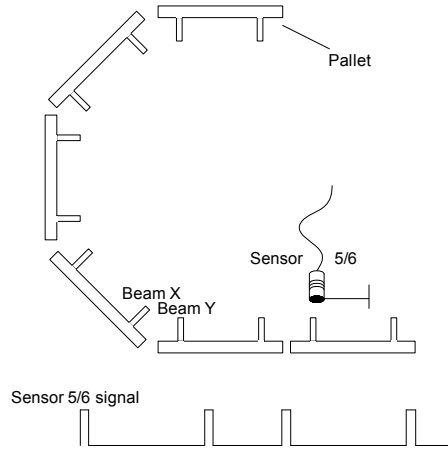
When a step passes, sensor 5/6 receives the signal and outputs a pulse. Set the time interval between two adjacent pulses of sensor 5/6 as T and the pulse counting of sensor A/B within T as X. In the case of no step loss, the X value is within a certain threshold regardless of the escalator speed. If X exceeds the threshold, the system judges that step loss occurs. Then the escalator stops running immediately and enters the safety state.

Note

If the detection principle is not suitable to the use habit of escalator manufacturers, step loss can be monitored by using sensor 5/6 to detect the step auxiliary wheel. The prerequisite is to ensure that the auxiliary wheel is lost while the step gets lost in any way.

To detect whether a pallet of the moving walkway is lost, install sensor 5/6 in the machine room, as shown in the following figure.

Figure 3-7 Installation position of the step/pallet loss sensor for moving walkway



WARNING

Besides the MCTC-PES-E1 and the six sensors, you need to prepare the following two devices:

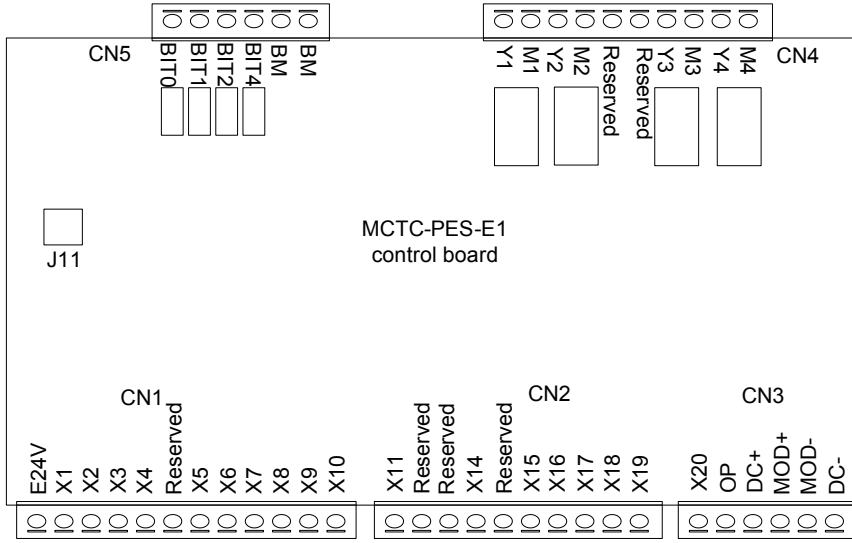
- Relay at front end of signal X1 on the MCTC-PES-E1 board
- Switch for manual fault reset

3.3 Electrical Installation

3.3.1 Description of System Terminals

The following figure shows the layout of the system terminals.

Figure 3-8 Layout of the system terminals



The following table describes the terminals of the MCTC-PES-E1.

Table 3-3 Description of terminals of the MCTC-PES-E1

Type	Terminal Symbol	Terminal Name	Function Description	Remark
Power/Communication terminal (CN3)	DC+/DC-	24 V power supply	The + 24 VDC power is provided by specialized switching-mode power supply.	The switching-mode power supply complies with the EN60950 standard.
	MOD+/MOD-	Modbus communication	It communicates with Inovance NICE2000 integrated escalator controller. When a safety fault occurs, the NICE2000 displays the fault code.	The shielded twisted cable is suggested.

Type	Terminal Symbol	Terminal Name	Function Description	Remark
Digital input terminal (CN1/2)	E24V	External +24 V power supply	It is connected to the input terminal 24V of the control system when X1 to X4 are connected with corresponding signals of the control system in parallel.	The switching-mode power supply complies with the EN60950 standard.
	X1	Normally open (NO) inspection signal	They are connected to the inspection signal input terminals of the control system. When X1/ X2 becomes ON, the related functions of the MCTC-PES-E1 are disabled according to GB standard.	1) Optical coupling isolation, low level input active 2) Input impedance: 3.3 kΩ 3) Input voltage range: 0–30 V
	X2	Normally closed (NC) inspection signal		
	X3	Up signal	It receives the up signal of the control system and is edge-triggered.	
	X4	Down signal	It receives the down signal of the control system and is edge-triggered.	
	X5	Service brake signal	It is connected to the auxiliary contact of the service brake.	
	X6	Service brake action detection 1	It is connected to the action switch of the service brake.	
	X7	Service brake action detection 2	It is used in the dual-motor application. It is shorted with X6 in the single-motor application.	
	X8	Auxiliary brake signal	It is connected to the auxiliary contact of the auxiliary brake.	
	X9	Auxiliary brake action detection	It is connected to the action switch of the auxiliary brake.	
	X10	Floor plate switch 1	It is connected to the floor plate switch. This signal must be active during normal running and can be inactive during inspection.	
	X11	Floor plate switch 2	It has the same function as the X10.	
	X12	Reserved		
	X13	Reserved		
	X14	Manual reset signal	It is used for manual fault reset. The input becomes active after the terminal keeps ON for more than 2s and then keeps OFF for more than 2s.	

Type	Terminal Symbol	Terminal Name	Function Description	Remark
Digital input terminal (CN1/2)	X15	Escalator speed detection phase A signal	They are used for input of escalator speed detection pulses The MCTC-PES-E1 detects the overspeed fault based on the frequency or cycle of two pulses, and detects the unintentional reversal fault based on the pulse phase.	1) Optical coupling isolation, low level input active 2) Input impedance: 3.3 kΩ 3) Input voltage range: 0–30 V
	X16	Escalator speed detection phase B signal		
	X17	Up step loss detection	It detects the A/B pulses. If the pulse counting exceeds the threshold, the MCTC-PES-E1 judges that it is step loss.	
	X18	Down step loss detection	It uses the same detection mode as X17.	
	X19	Left handrail speed detection	If the MCTC-PES-E1 detects that the handrail speed is 15% lower than the actual speed of the step, pallet or step chain and the duration exceeds 15s, it reports the handrail underspeed fault.	
	X20	Right handrail speed detection		
	OP	X15 to X20 polarity selection	When X15 to X20 are connected to sensors of low level active, OP is shorted to DC+. When X15 to X20 are connected to sensors of high level active, OP is shorted to DC-.	Shorting OP and DC+/DC- is effective for X15 to X20 only.
Relay output terminal (CN4)	Y1/M1	Fault output	It becomes OFF when a fault occurs. It is connected to the system safety circuit with Y2/M2.	Rated voltage: 250 VAC Rated current: 6 A
	Y2/M2		It becomes OFF when a fault occurs. It is connected to the system safety circuit with Y1/M1.	
	Y3/M3	Aulixiary brake output	It becomes OFF when 1.4 times overspeed or unintentional reversal running occurs. It is connected with Y4/M4 to control the auxiliary brake.	
	Y4/M4		It becomes OFF when 1.4 times overspeed or unintentional reversal running occurs. It is connected with Y3/M3 to control the auxiliary brake.	

Type	Terminal Symbol	Terminal Name	Function Description	Remark
Power/ Communication terminal (CN3)	BIT0	Fault binary code	It outputs the current fault code using the 8421 code and can be connected to the external LED display. It supports both common anode LED display and common cathode LED display.	A common relay is used.
	BIT1			
	BIT2			
	BIT3			
	BM	Common terminal		
Interface for operation panel (J11)	RJ45	Interface for the operation panel	It is connected to the operation panel for modify ing parameters or viewing the status.	-

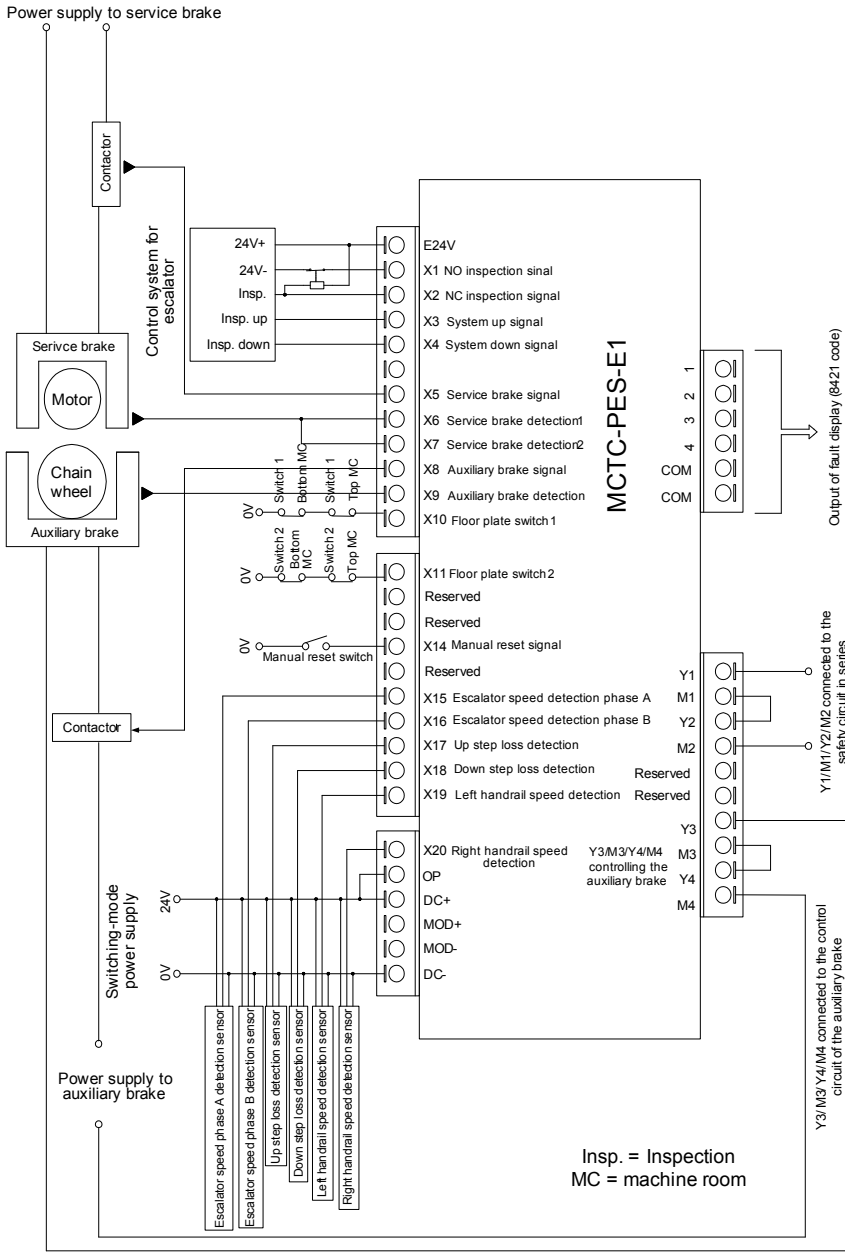
Note

- If there is no auxiliary brake in the system, short X8 and X9 to DC-.
- If the floor plate switches in the system have the compulsory break-off function, the related function of this system can be disabled. In this case, short X10 and X11 to DC-.

3.3.3 Wiring of the MCTC-PES-E1

The following figure shows wiring of the MCTC-PES-E1 system.

Figure 3-9 Wiring of the MCTC-PES-E1 system



The precautions on electrical wiring are as follows:

1) All input signals are low level active.

2) E24V is connected to the 24 V power supply of the escalator control system. DC+/DC- is connected to the switching-mode power supply of the MCTC-PES-E1. The X1 to X4 terminals are connected to the 24 V power supply of the escalator control system and cannot use the power supply of the MCTC-PES-E1.

3) X1, X3 to X9 and X14 are NO signals by default, while X2, X10 and X11 are NC signals by default. The NO/NC feature of X1 to X5, X8 and X14 cannot be modified.

4) Because X1 is NO and X2 is NC, you need to install an NC relay before X1. The wiring method is shown in Figure 3-8. If X1 and X2 open or close simultaneously, the MCTC-PES-E1 reports a fault.

⚠WARNING
The inspection signal connecting to the relay before X1 and that connecting to X2 must be obtained separately from the inspection switch and cannot share one cable.

If there is no auxiliary brake, short X8 and X9 to 0V. If the service brake uses an inspection switch, short X6 to X7.

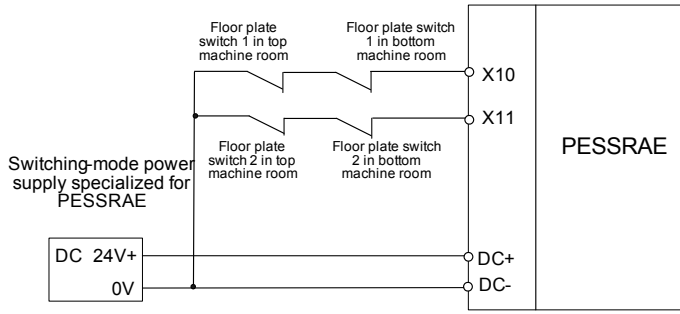
5) If the floor plate switches have the compulsory break-off function, the function of X10 and X11 can be disabled. In this case, X10 and X11 must be active, which can be implemented by shorting them or modifying their NO/NC feature.

6) OP is active only for X15 to X20. For low-level active signals (NPN output), short OP to 24V. Otherwise, short OP to 0V.

3.3.3 Connecting the Floor Plate Switches

The system can detect opening or removal of the floor plate. If the floor plate detection function is enabled, a total of four floor plate switches are required. The top machine room and bottom machine room respectively need to install two detection switches. The following figure shows connection between the four detection switches and the system.

Figure 3-10 Connection of the four floor plate switches



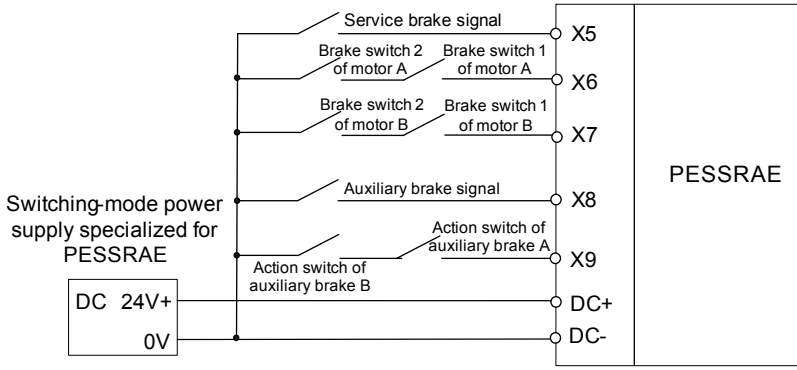
As shown in Figure 3-10, the two switches in the top machine room must be connected to the two switches in the bottom machine room in series. The two signals are respectively connected to X10 and X11. Thus, if any floor plate is removed, both signals have a change.

3.3.4 Connecting Brake Detection Switches in Dual-Motor Application

In the application of dual motors and dual brakes, to satisfy China's GB standard, obey the following instructions:

1) Each of the dual motors has a service brake. The two brakes can be controlled by the same contactor. The contactor is connected to the NO auxiliary contact of the service brake signal X5
2) The two auxiliary brakes can also be controlled by a contactor. The contactor is connected to the NO auxiliary contact of the auxiliary brake signal X8.
3) When the service brake is applied, its action switches must be in the OFF state and be connected according to Figure 3-11.That is, the two action switches of the brake for motor A are connected in series and used as the input of X6. The two action switches of the brake for motor B are connected in series and used as the input of X7.
4) When the auxiliary brake is applied, its action switches must be in the OFF state and be connected according to Figure 3-11.That is, the two action switches of auxiliary brake A and auxiliary brake B are connected in series and used as the input of X9.

Figure 3-11 Connecting brake detection switches in the dual-motor application



4

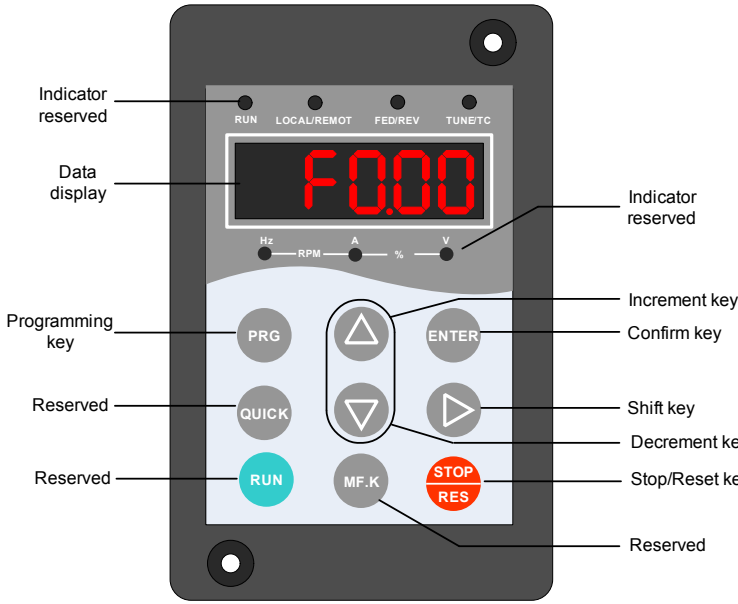
System Operation and Commissioning

Chapter 4 System Operation and Commissioning

4.1 Operation Panel

The MCTC-PES-E1 system has a built-in LED operation panel on it. You can modify the parameters, monitor the working status and view the fault information by operating the operation panel, as shown in the following figure.

Figure 4-1 Diagram of the operation panel



4.1.1 Description of Keys on the Operation Panel

Table 4-1 Description of keys on the operation panel

Key	Name	Function
PRG	Programming	Enter or exit Level I menu.
ENTER	Confirm	Enter the menu interfaces level by level, and confirm the parameter setting.
△	Increment	Increase data or function code.
▽	Decrement	Decrease data or function code.

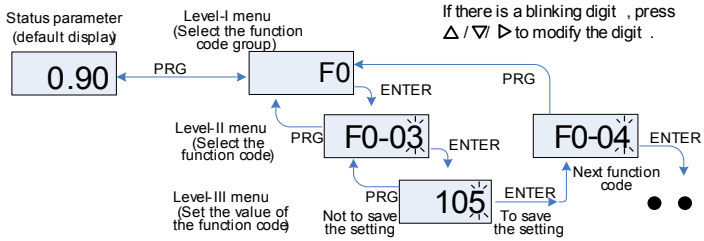
Key	Name	Function
▷	Shift	Select the digit to be modified when modifying parameters.
RUN	Reserved	Reserved
STOP RES	Stop/Reset	Perform the reset operation when the system is in the fault state.
MF.K	Reserved	Reserved
QUICK	Reserved	Reserved

4.2 Viewing and Modifying Function Codes

The operation panel of the MCTC-PES-E1 adopts three-level menu.

The three-level menu consists of function code group (Level I), function code (Level II), and function code setting value (level III), as shown in the following figure.

Figure 4-2 Operation procedure on the operation panel

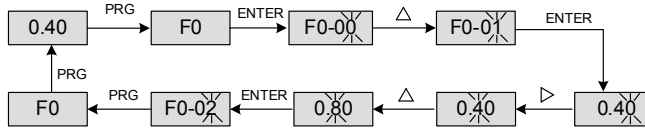


You can return to Level II menu from Level III menu by pressing PRG or ENTER. The differences are as follows:

- After you press ENTER, the system saves the parameter setting first, and then goes back to Level II menu and shifts to the next function code.
- After you press PRG, the system does not save the parameter setting, but directly returns to Level II menu and remains at the current function code.

Here is an example of changing the value of F0-01 from 0.40 m/s to 0.80 m/s.

Figure 4-3 Example of changing the parameter value



In Level III menu, if the parameter has no blinking digit, it means that the parameter cannot be modified. This may be because:

- Such a function code is only readable, such as, actually detected parameter and running record parameter.
- Such a function code cannot be modified in the running state and can be changed only at stop.

4.3 Function Code Description and Applications

The symbols in the function code tables are described as follows:

"★": The parameter can be viewed but cannot be modified when the system is in the running state. It can be modified when the system is in the stop state.

"●": The parameter is the actually measured value and cannot be modified.

In commissioning, you only need to adjust the parameters in group F0. Group F1 contains state parameters, group F2 contains fault parameters, FF contains factory parameters and group FP contains the specialized application parameters.

Group F0: Basic Parameters

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F0-00	System type	0: Escalator 1: Moving walkway	0	-	★

It is used to set the system type and defines the upper limit of nominal speed (F0-01).

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F0-01	Nominal speed	0.30–0.90	0.50	m/s	★

It indicates the nominal speed when the escalator/moving walkway is in the no-load state.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F0-02	Radius of driving chain sprocket	0.30–0.90	0.33	m	★

It indicates the radius of the driving chain sprocket. The linear speed of the driving chain sprocket calculated based on the radius is the step running speed.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F0-03	PPR of driving chain sprocket	1–200	65	-	★

It is used to set the pulses per revolution (PPR) of the driving chain sprocket, namely, the number of teeth of the driving chain sprocket.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F0-04	Maximum braking-to-stop distance	0.20–1.69	0.5	m	★

The upper limit and lower limit of this parameter are controlled by F0-01 (Nominal speed). If the system detects that the braking-to-stop distance exceeds 1.2 times of the setting of F0-04, the system reports the braking-to-stop over-distance fault.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F0-05	Handrail pulse time interval at nominal speed	0.01–5.00	0.68	s	★

It is used to set the time interval between handrail pulses at nominal speed. The system detects whether the handrail speed is consistent with the escalator speed based on the nominal speed, the setting of F0-05 and the actually detected escalator speed.

For example, the nominal speed is 0.5 m/s and F0-05 is set to 0.10s. When the actually detected escalator speed is 0.4 m/s, the time interval between handrail signals should be 0.5 x 0.1/0.4 = 0.125s. If the actually detected time interval between handrail signals is longer than 0.125s, it indicates that the handrail is slow. If the detected handrail speed remains 15% slower than the escalator speed for 15s, the system reports the related fault.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F0-06	Upper limit of phase A/B pulses between two step signals	-	0	-	★

It is used to set the upper limit of phase A/B pulses between two step signals. For every step the escalator turns, the number of teeth of the driving chain sprocket counted by the sensor is fixed.

After you set F0-06 to 0 first, the system automatically calculates the number of phase A/B pulses between two step signals and saves it. Then you can set the upper limit of phase A/B pulses between two step signals according to the following principle:

If the automatic calculation value is A, it is suggested to set 2 times value 2 x A limitation for F0-06.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F0-07	Lower limit of phase A/B pulses between two step signals	0 to F0-06	0	-	★

It is used to set the lower limit of phase A/B pulses between two step signals and should be a litter smaller than the automatic calculation value of the system.

- For the escalator, it is mainly used to filter the incorrect signal that may arise (for example, interference) between two adjacent step signals.
- For the moving walkway, the value of F0-07 should be larger than the number of phase A/B pulses between the detected beams of two adjacent pallets (for example, beams X and Y in Figure 3-7). Otherwise, the system will report fault Err12.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F0-08	Auxiliary function selection	0–65535	0	-	★

The auxiliary functions of the system are described in the following table.

Table 4-2 Auxiliary functions indicated by bits of F0-08

Bit	Description
Bit0	0: Escalator running not available when the auxiliary brake is applied 1: Escalator running available only in the upward direction when the auxiliary brake is applied For some escalators, the auxiliary brake has the braking effect only in the downward direction and can be released only after the escalator runs upward for a certain distance. In this case, set Bit0 to 1. The running in the upward direction can last only10s each time. If the running times out, the MCTC-PES-E1 disconnects outputs, forces the escalator to stop running and reports fault Err10. After the fault is reset, the escalator can run upward for 10s again.
Bit1	0: Auxiliary brake available 1: Auxiliary brake unavailable Not all escalators must install the auxiliary brake. If Bit1 is set to 1, the MCTC-PES-E1 disconnects only Y3 and Y4 (the two relays stop the output).
Bit2	0: Step loss not detected during inspection 1: Step loss detected during inspection
Bit3	0: Handrail underspeed not detected during inspection 1: Handrail underspeed detected during inspection
Bit4	0: Brake not detected during inspection 1: Brake detected during inspection
Bit5	0: Detection of handrail speed pulse frequency too high enabled 1: Detection of handrail speed pulse frequency too high disabled
Bit6	Reserved
Bit7	0: Feedback signal detected after brake release 1: Feedback signal not detected after brake release

Note

The signals input by X10 and X11 are not detected in the system inspection state.

Group F1: State Parameters

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F1-00	Phase A escalator speed	-	0	m/s	●
F1-01	Phase B escalator speed	-	0	m/s	●

They indicate the escalator speed respectively, detected by sensor A and sensor B.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F1-02	Number of phase A pulses/ cycles for escalator speed	-	0	-	●
F1-03	Number of phase B pulses/ cycles for escalator speed	-	0	-	●

If the number of phase A/B pulses per second at nominal speed (F0-01) is equal to or larger than 30, F1-02 and F1-03 display the actually detected number of phase A/B pulses. If their value is smaller than 30, the phase A/B cycles is displayed by a 3-digit decimal in the unit of second.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F1-04	Current running direction	-	0	-	●

It displays the escalator speed signal state. The 5-digit display is abcde from left to right.

Display	Description
a	0 indicates that the direction is not given. 1 indicates that the startup command in upward direction is given. 2 indicates that the startup command in downward direction is given.
b	0 indicates that the feedback signal is abnormal. 1 indicates that the feedback running direction is upward. 2 indicates that the feedback running direction is downward.
c, d	Reserved
e	It represents the orthogonality. 0 indicates the worst, and 9 indicates the best. Ensure the value above 5 by adjusting the position of the two speed sensors.

The parameter has three normal values: 00000, 21001 and 10110.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F1-05	Braking-to-stop distance after stop	-	0	m	●

It indicates the detected braking-to-stop distance after stop.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F1-06	Pulse time interval of left handrail	-	0	s	●
F1-07	Pulse time interval of right handrail	-	0	s	●

They indicate the actually detected cycles of left and right handrail signals (no display during inspection).

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F1-08	Number of phase A pulses between two up step signals	-	0	-	●
F1-09	Number of phase B pulses between two up step signals	-	0	-	●
F1-10	Number of phase A pulses between two down step signals	-	0	-	●
F1-11	Number of phase B pulses between down step signals	-	0	-	●

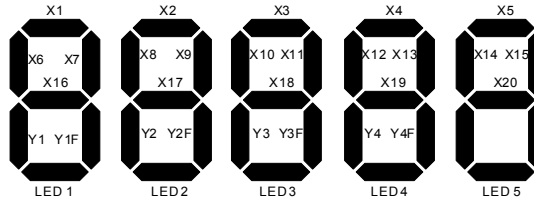
They indicate the actually detected number of phase A/B pulses between two step signals (no display during inspection).

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F1-12	States of I/O terminals	-	0	-	●
F1-13	States of I/O terminal functions	-	0	-	●

F1-12 indicates the states of the I/O terminals. F1-13 indicates the states of the I/O terminal functions.

The states are displayed by the following 5-digit LEDs.

Figure 4-4 LED indicating the states of the I/O terminals and their functions



If OP is shorted to DC+, input terminals X15 to X20 are low level active. If OP is shorted to DC-, X15 to X20 are high level active. The other input terminals are low level active and become ON when they are shorted to 0V.

The function of a terminal indicated by an LED segment in the preceding figure may be valid when this segment is ON or OFF. Whether this function is valid at segment ON or OFF is decided by the NO/NC feature of the terminal. Y1F to Y4F are detection signals and indicate the action state of the detected relays Y1 to Y4. In normal state, Y1F to Y4F are ON or FF with Y1 to Y4 simultaneously.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F1-14	Number of pulses per second at nominal speed	-	0	-	●

It indicates the number of phase A/B pulses per second at nominal speed, which is calculated based on parameters in group F0.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F1-15	Number of pulses for 1.2 times of braking-to-stop distance	-	0	-	●

It indicates the number of phase A/B pulses for 1.2 times of braking-to-stop distance, which is calculated based on parameters in group F0.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F1-16	Number of pulses between two adjacent step signals	-	0	-	●

It indicates the number of phase A/B pulses between two adjacent step signals, which is calculated based on parameters in group F0 and the escalator step of 40 cm wide.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F1-17	ER-00	-	0	-	●

It indicates the faults that have occurred and need to be reset manually. Each fault is allocated with a bit. The corresponding relationship is as follows:

Bit0: Err01; Bit1: Err02; ……Bit15: Err16

After the system reports the fault, the corresponding bit will become valid and is saved in F1-17 after being converted to a decimal number.

Note

This parameter records only the faults that need manual reset. After the fault is reset manually, the fault record is cleared.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F1-18	Err Flag	-	0	-	●

It indicates the faults that have occurred. Besides the faults that need manual reset, it records the faults that can be reset at power failure.

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F1-19	Current MCTC-PES-E1 state	-	0	-	●

The unit's digit indicates the auxiliary chip state, and the ten's digit indicates the main chip state. On normal condition, the main chip and auxiliary chip are in the same state. The chips have a total of four states, indicated by 3, 4, 5 and 6, whose meaning is as follows:

- 3: MCTC-PES-E1 faulty
- 4: MCTC-PES-E1 in normal working state
- 5: Inspection state
- 6: fault reset state

Group F2: Fault Information

Function Code	Parameter Name	Setting Range	Default	Unit	Property
F2-00	1st fault code	-	-	-	●
F2-01	1st fault sub-code	-	-	-	●
F2-02	2nd fault code	-	-	-	●
F2-03	2nd fault Sub-code	-	-	-	●
F2-04	3rd fault code	-	-	-	●
F2-05	3rd fault sub-code	-	-	-	●
F2-06	4th fault code	-	-	-	●
F2-07	4th fault sub-code	-	-	-	●
F2-08	Latest fault code	-	-	-	●
F2-09	latest fault sub-code	-	-	-	●
F2-10	Nominal speed at latest fault	-	-	-	●
F2-11	Radius of driving chain sprocket at latest fault	-	-	-	●
F2-12	PPR of driving chain sprocket latest fault	-	-	-	●
F2-13	Maximum braking-to-stop distance at latest fault	-	-	-	●
F2-14	Handrail pulse time interval at nominal speed at latest fault	-	-	-	●
F2-15	Upper limit of phase A/B pulses for step signals at nominal speed at latest fault	-	-	-	●
F2-16	Lower limit of phase A/B pulses for step signals at nominal speed at latest fault	-	-	-	●
F2-17	Function selection at latest fault	-	-	-	●
F2-18	MCTC-PES-E1state at latest fault	-	-	-	●
F2-19	Input state 1 at latest fault	-	-	-	●
F2-20	Input state 2 at latest fault	-	-	-	●
F2-21	Output state at latest fault	-	-	-	●
F2-22	Phase A escalator speed at latest fault	-	-	-	●
F2-23	Phase B escalator speed at latest fault	-	-	-	●
F2-24	Detected running direction at latest fault	-	-	-	●
F2-25	Left handrail pulse time interval at latest fault	-	-	-	●
F2-26	Right handrail pulse time interval at latest fault	-	-	-	●

- F2-19 records the state of input terminals X1 to X16 when the latest fault occurs. Each terminal is allocated with a bit. The corresponding relationship is as follows:

  Bit0: X1; Bit1: X2; …… Bit15: X16

- F2-20 records the state of input terminals X17 to X20 when the latest fault occurs. Each terminal is allocated with a bit. The corresponding relationship is as follows:

  Bit0: X17 Bit1: X18; Bit2: X19; Bit3: X20

- F2-21 records the state of relays Y1 and Y3. Each relay is allocated with a bit. The corresponding relationship is as follows:

  Bit0: Y1; Bit1: Y1F; Bit2: Y3; Bit3: Y3F

- F2-22 and F2-23 record the phase A/B escalator speed when the latest fault occurs. The actual record is phase A/B pulse cycle (unit: 10 ms) or the number of phase A/B pulses a second. They can be determined based on F2-10, F2-11 and F2-12.

Group FF: Factory Parameters

Group FP: Management Parameters

Function Code	Parameter Name	Setting Range	Default	Unit	Property
FP-00	User password	0–6553	0	-	★
FP-01	Software version	0–6553	-	-	●
FP-02	Reserved	-	-	-	●

4.4 Examples of Commissioning Applications

Here gives some commissioning application examples, in which the rated speed is set as the actual running speed.

1) Suppose that escalator is used in the application. The rated speed of the escalator is 0.5 m/s, the radius of the driving chain sprocket is 0.3 m and the number of teeth of the driving chain sprocket is 72. Set parameters in group F0 as follows:

Function Code	Parameter Name	Setting Range	Setting
F0-00	System type	0: Escalator 1: Moving walkway	0
F0-01	Nominal speed	0.30–0.90	0.50
F0-02	Radius of driving chain sprocket	0.30–0.90	0.30
F0-03	PPR of driving chain sprocket	1–200	72
F0-04	Maximum braking-to-stop distance	1–200	Set according to China's standard

2) Generally, the step is 0.4 m wide. Set the radius of the handrail tachometer wheel to 0.05 m and there is only one inductive device on it. The following data can be obtained.

   • F0-05: 0.63

   Firstly calculate the perimeter of the handrail tachometer wheel: 0.05 x 2 x π ≈ 0.314. Then calculate the value of F0-05: 0.314/F0-01 = 0.63.

   • F0-06: 15.27

   Firstly calculate the perimeter of the driving chain sprocket: 0.3 x 2 x π ≈ 1.885. Then calculate the value of F0-06: 0.4/1.885 x 72 = 15.27. Because F0-06 must be set a little larger than the calculation value (the automatic calculation value is integer 16), you can set F0-06 to any value in the range of 18 to 32.

   • F0-07

   You can set F0-07 to any value in the range of 0 to 14.

   Note that the deviation between the setting of F0-06 and F0-07 and the automatic calculation result 16 must be a little large, at least by 2. For example, set F0-06 to 18 and F0-07 to 14.

   Set parameters in group F0 as follows:

Function Code	Parameter Name	Setting Range	Setting
F0-05	Handrail pulse time interval at nominal speed	0.01–5.00	0.63
F0-06	Upper limit of phase A/B pulses for step signals	-	18
F0-07	Lower limit of phase A/B pulses for step signals	0 to F0-06	14

3) If the escalator does not have an auxiliary brake, set F0-08 to 2.

Function Code	Parameter Name	Setting Range	Setting
F0-08	Auxiliary function selection	0–65535	2

5

Troubleshooting

Chapter 5 Troubleshooting

The MCTC-PES-E1 system provides a total of 16 pieces of fault information and protective functions. It monitors various input signals, running conditions and external feedback information in real time. After a fault occurs, the system implements the protection function, and displays the fault code.

You can first determine the fault type, analyze the causes, and perform troubleshooting according to the following tables.

Table 5-1 Description of the faults of the MCTC-PES-E1

Fault Code	Fault Name	Description
ERR1	Overspeed of 1.2 times	The running speed exceeds 1.2 times of the nominal speed during normal running. If this fault occurs during commissioning, check whether the setting of parameters in group F0 is improper.
ERR2	Overspeed of 1.4 times	The running speed exceeds 1.4 times of the nominal speed during normal running. If this fault occurs during commissioning, check whether the setting of parameters in group F0 is improper.
ERR3	Unintentional reversal	Unintentional reversal occurs during the escalator running. If this fault occurs during commissioning, check whether the escalator speed detection signals (X15, X16) are reversed.
ERR4	Over-braking distance	The braking-to-stop distance exceeds the requirement. If this fault occurs during commissioning, check whether the setting of parameters in group F0 is improper.
ERR5	Left handrail underspeed	The left handrail speed is low. The setting of parameters in group F0 is improper. The sensor signal is abnormal.
ERR6	Right handrail underspeed	The right handrail speed is low. The setting of parameters in group F0 is improper. The sensor signal is abnormal.
ERR7	Up step loss	Check whether F0-06 is set to a value smaller than the actual value.
ERR8	Down step loss	Check whether F0-06 is set to a value smaller than the actual value.
ERR9	Service brake release fault	The working brake signal is abnormal.
ERR10	Auxiliary brake action fault	The mechanical switch feedback is inactive after braking. The auxiliary brake switch is active at startup. The auxiliary brake is not released at startup. The running in the upward direction exceeds 10s when the auxiliary brake switch is active. The auxiliary brake switch is active during running. The auxiliary brake contactor is disconnected during running.

Fault Code	Fault Name	Description
ERR11	Floor plate switch fault	The floor plate switch signal is active in normal state.
ERR12	External signal abnormal	1: There are A/B pulses in the stop state. 2: There is no A/B pulse within 4s after startup. 3: The number of A/B pulses for up step signals is smaller than the setting of F0-07. 4: The number of A/B pulses for down step signals is smaller than the setting of F0-07. 5: The left handrail pulse signals are very quick. 6: The right handrail pulse signals are very quick. 7: The two inspection signals are inconsistent. 8: The upward and downward signals are active simultaneously.
ERR13	MCTE-PES-E1 board hardware fault	1–4: The relay feedback is wrong. 5: The EEPROM initialization fails. 6: RAM check is wrong after power-on.
ERR14	EEPROM data wrong	-
ERR15	Main and auxiliary data check abnormal or MCU communication abnormal	The main and auxiliary chips are inconsistent in the following aspects: 1: Software versions of the main and auxiliary MCUs 2: States of the two chips 3: Signal state of terminals X1 to X4 4: Signal state of terminals X17 to X20 5: Output 6: Phase A escalator speed 7: Phase B escalator speed 9: Braking-to-stop distances detected by the main and auxiliary MCUs 8: The orthogonality of A and B pulses is not good and there is jump. 10: The left handrail signal is instable. 11: The right handrail signal is instable. 12, 13: The up step signal is instable. 14, 15: The down step signal is instable. 101–103: The communication between the main and the auxiliary chips is wrong. 104: Communication between the main and auxiliary chips fails at power-on.
ERR16	Parameter abnormal	101: The calculated number of pulses for 1.2 times of maximum braking-to-stop distance is wrong. 102: The calculated number of A/B pulses for step signals is wrong. 103. The calculated number of pulses a second is wrong.

Note

The number in the right column indicates the fault sub-code.

Table 5-2 System prompt for the faults of the MCTC-PES-E1

Fault Code	Fault Name	System Prompt
ERR1	Overspeed of 1.2 times	The LED blinks. The fault code output terminals (designated in Figure 3-9) output the fault code. If the operation panel is connected, it displays the fault code. The faults still exist after the system is powered on again.
ERR2	Overspeed of 1.4 times	
ERR3	Unintentional reversal	
ERR4	Over-braking distance	
ERR7/8	Up/Down step loss	
ERR9	Service brake release fault	
ERR5/6	Left/Right handrail underspeed	The system prompts are the same as above, but the faults are reset after the system is re-powered on.
ERR10	Auxiliary brake action fault	
ERR12/13/14/15	Signal abnormal or MCTC-PES-E1 faulty	
ERR11	Floor plate switch fault	The system prompts are the same as above, but the faults are reset after the system is powered on again.

Monarch Warranty Agreement

1. The warranty period of the product is 18 months (refer to the barcode on the equipment). During the warranty period, if the product fails or is damaged under the condition of normal use by following the instructions, Monarch will be responsible for free maintenance.
2. Within the warranty period, maintenance will be charged for the damages caused by the following reasons:

   a. Improper use or repair/modification without prior permission

   b. Fire, flood, abnormal voltage, other disasters and secondary disaster

   c. Hardware damage caused by dropping or transportation after procurement

   d. Improper operation

   e. Damage out of the equipment (for example, external device)
3. If there is any failure or damage to the product, please correctly fill out the Product Warranty Card in detail.
4. The maintenance fee is charged according to the latest Maintenance Price List of Monarch.
5. The Product Warranty Card is not re-issued. Please keep the card and present it to the maintenance personnel when asking for maintenance.
6. If there is any problem during the service, contact Monarch's agent or Monarch directly.
7. This agreement shall be interpreted by Suzhou MONARCH Control Technology Co., Ltd.

Service Department, Suzhou MONARCH Control Technology Co., Ltd.

Address: 16, Youciang Rd, Wangshan Industrial Park, Wuzhong Economic Development Zone, Suzhou, China P.C.: 215104

Website: http://www.szmctc.cn

Monarch Product Warranty Card

<table>
<tr><td rowspan="3">Customer information</td><td colspan="2">Add. of unit:</td></tr>
<tr><td>Name of unit:
P.C.:</td><td>Contact person:</td></tr>
<tr><td></td><td>Tel.:</td></tr>
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<tr><td colspan="2">Body barcode (Attach here):</td></tr>
<tr><td colspan="2">Name of agent:</td></tr>
<tr><td>Failure information</td><td colspan="2">(Maintenance time and content):

Maintenance personnel:</td></tr>
</table>