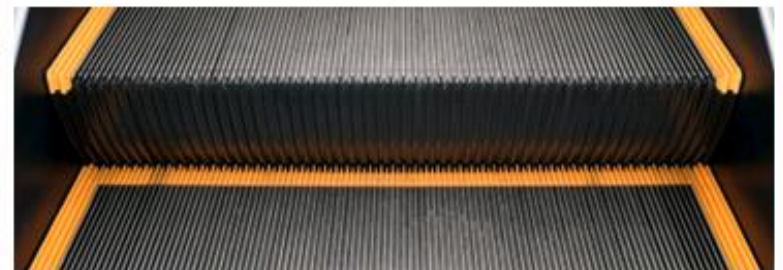


Instructor/Participant Guide



209: Escalator-Specific: Electrical Systems

Module 4: Escalator Control Circuits



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PREVIEW ONLY



Icons Used in This Guide

Throughout the Instructor's Guide, the following icons indicate the type of content presented.



Refer To



PowerPoint



Multimedia



**Web based
Training**



Write



Ask



Individual Activity



**Small Group
Activity**



**Classroom
Activity**



Duration

Agenda

Topic No.	Topic Title	Duration
1	Introduction	5 minutes
2	Control Transformers	20 minutes
3	Permissive and Interlock Circuits	20 minutes
4	Fail Safe Circuits	20 minutes
5	Programmable Logic Controllers	20 minutes
6	Summary	5 minutes
Total Time:		1.5 hours



Overview

Purpose

The purpose of this module is to:

- Provide the participants with a basic knowledge of the various types of electrical control circuits and components; and how they are interrelated in a transit escalator system.

Objectives

At the end of this chapter, the learner will be able to:

- Describe the methods of starting and stopping an escalator
- Describe the method of controlling speed, reversing, and braking an escalator
- Given a system schematic, locate the major components of the control system and describe their function
- Operate and test a working escalator control system
- Describe the function of an escalator PLC
- Identify the major components of a PLC
- Demonstrate the ability to remove and replace a PLC module

Materials

Make sure you have the following:

- Laptop (one for leader)
- Participant Guides
- PowerPoint slide deck
- LCD projector

- A17.1 Safety Code for Elevators and Escalators
- A17.2 Guide for Inspection of Elevators, Escalators and Moving Sidewalks
- A17.3 Safety Code for Existing Elevators and Escalators
- Heavy Duty Transportation System Elevator Design Guidelines (APTA RT-RP-FS 008-03)
- Heavy Duty Transportation System Escalator Design Guidelines (APTA RT-RP-FS 007-02)
- Field Employees' Safety Handbook
- Transit Agency Handbook

Preparation


PREPARE flip charts with the following title:

- Class Expectations



Instructor's Notes

Escalator Control Circuits



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Escalator Control Circuits

Outline

- Describe the methods of starting and stopping an escalator.
- Describe the method of controlling speed, reversing, and braking an escalator.
- Given a system schematic, locate the major components of the control system and describe their function.
- Operate and test a working escalator control system.
- Describe the function of an escalator PLC.
- Identify the major components of a PLC.
- Demonstrate the ability to remove and replace a PLC module.

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Slide 1

GAIN audience attention by introducing yourself.



WELCOME the participants to the Escalator Control Circuits Module.



ASK the participants to describe a control circuit.

DIRECT participants to the objectives on slide 2.



REVIEW the objectives on slide 2.

Slide 2

Introduction

Welcome to the Escalator Specific: Escalator Control Circuits Module.

What is a control circuit?



Instructor's Notes

Escalator Control Circuits

Control Transformers

- An electromagnetic device that steps down the incoming phase voltage to a single phase level.
- Control transformers also provide electrical isolation.



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Slide 3



REVIEW control transformers.

CONTENT: Direct participants to describe in their own words the purpose of the control transformer.

APPLICATION FEEDBACK: Now that we have discussed a little about control transformers, have the participants answer the following questions.



ASK: What is mutual inductance?

PREVIEW

Escalator Control Circuits

Control Transformers

- The control transformer used in an escalator control panel typically has multiple windings on both the primary and secondary side.
- The multiple windings serve to make the transformer adaptable in order to function in different circuits.
- Use extreme caution when troubleshooting a live control panel.
- Follow the necessary electrical safety guidelines and wear the proper PPE when working these types of voltages.

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Slide 4

Control Transformers

What is mutual inductance?



Figure 1: Step Down Transformer

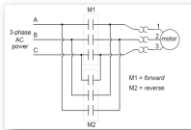


Instructor's Notes

Escalator Control Circuits

Interlock Circuits

- Switch contacts which are designed to prevent a control system from taking two incompatible actions at once.
 - Powering an electric motor forward and backward simultaneously.



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Slide 6



REVIEW slide 6 and review interlock circuits



ASK: What are switch contacts?

Interlock Circuits

What are switch contacts designed to do?



Instructor's Notes

Escalator Control Circuits

Mechanical Interlock

- Only present on some contactors.
- Lever joining the armatures of two contactors together so that they are physically prevented from simultaneous closure.
 - Electrical interlocks may still be used.

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Slide 8



REVIEW slide 8 and discuss the purpose of a mechanical interlock.



ASK participants to describe the purpose of a mechanical interlock?

Mechanical Interlock

What is the purpose of a mechanical interlock?



Instructor's Notes

Escalator Control Circuits

Fail Safe Circuits

- The goal is to make a control system as tolerant as possible to likely wiring or component failures.
- If there are multiple ways in which a digital control circuit can be designed to perform a task, the safest design is the better one to choose.

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Slide 10



REVIEW slide 10 and discuss fail safe circuits.



ASK: What is the main goal of a fail safe circuit?

Fail Safe Circuits

What is the main goal of a fail safe circuit?



Instructor's Notes

Escalator Control Circuits

Operational Controls

Local Operator:

- Operate and test a working escalator control system.
 - Starting
 - Stopping
 - Reversing
 - Slowing

Types of operational control units:

- Manual controls at controller
- Plug-in Portable Control Station
- On unit controls – (key switch and start, alarms, emergency stop)

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Escalator Control Circuits

Maintenance Controls

Portable Plug-in Control Station

- Operates the escalator during maintenance or service work.
- When plugged into the receptacle, there should be no means of operating or permitting the escalator to run.

Manual Start

- Started using the normal key switch and start button or switch located at the top and bottom of the escalator.

PLC Operator's Interface Terminal

- The technician can start the escalator by scrolling through the menu on the Operator's Interface Terminal and finding the start mode.

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Slide 13

Slide 14

REVIEW slides 13 and 14 to discuss operational and maintenance controls.

ASK the participants to describe the listed terms.

Maintenance Controls

Describe the terms below.

Portable Plug-in Control Station:

Manual Start:

PLC Operator's Interface Terminal:



Instructor's Notes

Escalator Control Circuits

Panel View

- Diagnostic and data reporting tool used as an interface with an Allen Bradley PLC.
- Provides a time efficient means for troubleshooting control problems.



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Slide 15



REVIEW slide 15 and discuss the panel view.



ASK the participants what the panel view provides.

Panel View

What does the panel view provide?



Instructor's Notes

Escalator Control Circuits

Programmable Logic Controllers

- The PLC control system aids in identifying abnormal operations or component failures by displaying fault and operating status on a digital display panel and a fault light indicator panel mounted on or near the controller.
- Operation of the fault diagnostic system is possible at the display point via menus and keypads adjacent to or contained as part of the display system.

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Slide 18



REVIEW slides 18 and 19 and discuss PLCs.

CONTENT: Direct participants to describe in their own words the purpose of the PLC.

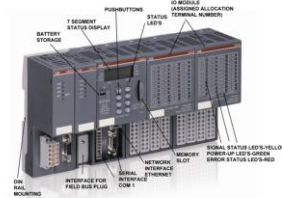
APPLICATION FEEDBACK: Now that we have discussed a little about PLCs, have the participants answer the following questions.



ASK participants to describe how the PLC functions.

Escalator Control Circuits

Programmable Logic Controllers

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Slide 19

Programmable Logic Controllers

Describe how the PLC functions.

ONLY



Instructor's Notes

Summary

Summary

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Slide 20



REVIEW slide 20 and summarize the module.

EVALUATION AND CLOSURE: Recap the main points of the module before moving on to the next topic within this course.



ASK the participants if they have any outstanding questions on what was presented.