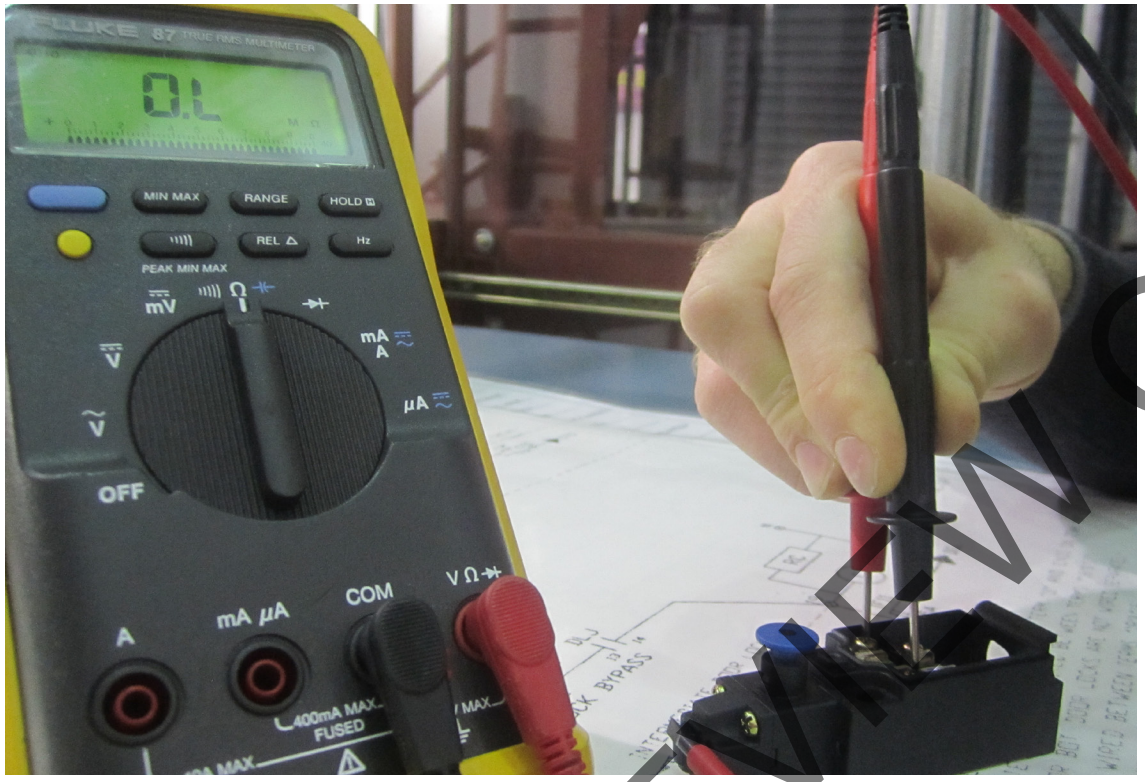
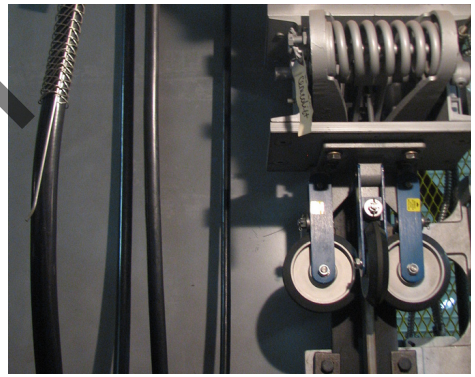
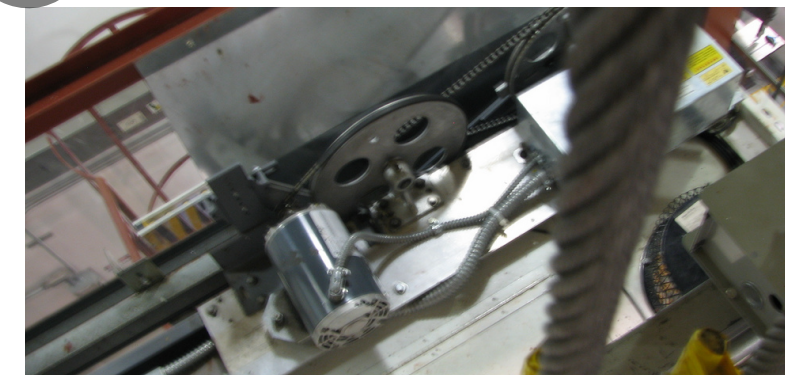
Instructor Guide







300: Input Output Control Equipment
Module 1: Understanding Control Devices

TRANSIT ELEVATOR/ESCALATOR CONSORTIUM

Table of Contents

Icons Used In This Guide

REVIEW slides

INDIVIDUAL ACTIVITY

ASK

WRITE

CLASSROOM ACTIVITY

Multimedia

SMALL GROUP ACTIVITY

REFER participants to

Agenda

Topic #	Topic Title	Duration
1	Overview	30 Minutes
2	Control Devices	60 Minutes
3	Sensors	30 Minutes
4	Switches	30 Minutes
5	Indicators	30 Minutes
6	Field Trip	120 Minutes
7	Summary	30 Minutes
	Total Time:	330 Minutes

Overview

Purpose The purpose of this module is to:

Provide the participant with an overview of the types of input and output control devices present in transit elevator and escalator systems.

Objectives

At the end of this lesson, the transit elevator/escalator trainee will be able to:

- Describe the general function of a control device
- Differentiate between what is meant by an input and an output device
- Identify and list general input and output devices categories associated with transit elevators and escalators
- List the safety rules associated with working with input/output devices
- Describe how sensors work
- Describe how switches work
- Describe how indicators work

Materials

Mandatory Make sure you have the following

- PowerPoint Presentation
- Coursebook
- Quizzes
- Pencils
- Handouts: Escalator Safety Devices, Escalator Safety Device Locations

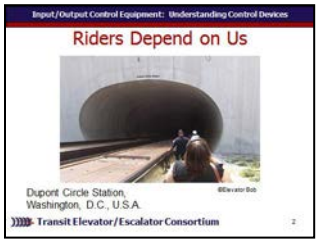
Optional You may also want the following for optional activities:

- Chalk board with chalk, large paper with marker, etc.
- Internet connection
- Lab, simulator or out of service elevator

Elevator-Escalator: Understanding Control Devices

Instructor's Guide

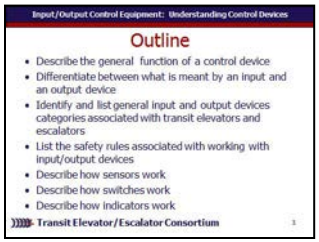
Module Length: 330 min | Time remaining: 330 min | This section: 30 min (6 slides) | *Section start time: _____* | *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW introduction slides **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Welcome to the course on Understanding Control Devices. ***Advance*** Riders depend on us. Here is an escalator, a very large escalator, located at the Dupont Circle Station in Washington DC. The operation of this escalator, just like all other escalator and elevator systems in transit, depend on control devices and their proper operation. ***Advance***	✓PPT slides 1, 2  

Elevator-Escalator: Understanding Control Devices

Instructor's Guide

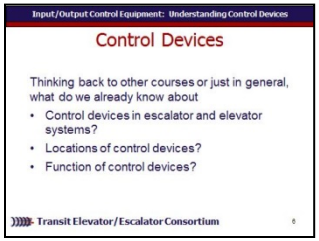
Module Length: 330 min | Time remaining: 330 min | This section: 30 min (6 slides) | *Section start time: _____* | *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW module objectives **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Today we will • Describe the general function of a control device • Differentiate between what is meant by an input and an output device • Identify and list general input and output devices categories associated with transit elevators and escalators • List the safety rules associated with working with input/output devices • Describe how sensors work • Describe how switches work • Describe how indicators work ***Advance***	✓PPT slide 3 

Elevator-Escalator: Understanding Control Devices

Instructor's Guide

Module Length: 330 min | Time remaining: 330 min | This section: 30 min (6 slides) | *Section start time: _____* | *Section End Time: _____*

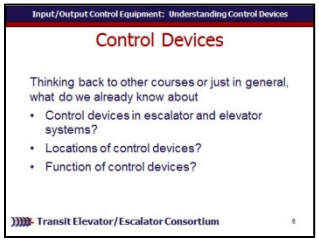
DO	SAY	Materials Needed
ASK **SMALL GROUP ACTIVITY** **WRITE** **Instructor's Notes**	**In your own words:** Thinking back to other courses or just in general, what do we already know about: • Control devices in escalator and elevator systems? • Locations of control devices? • Function of control devices? ***Allow participants to think for a minute and perhaps discuss with a partner ideas as well as write down any ideas. Discuss participant responses and if possible list them on a chalk board or similar.*** Control devices are devices that communicate with the controller to impact the operation of a given system. ***Continued***	✓PPT slide 6  ✓ Paper ✓ Pencils or pens ✓ Larger paper , chalk board, or similar

Elevator-Escalator: Understanding Control Devices

Instructor's Guide

Module Length: 330 min | Time remaining: 330 min | This section: 30 min (6 slides) | *Section start time:* _____ | *Section End Time:* _____

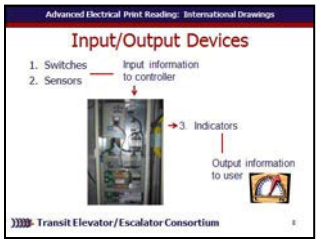
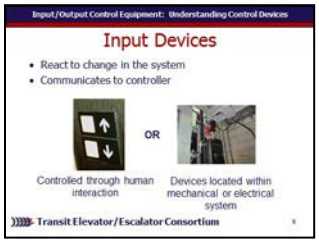
DO	SAY	Materials Needed
ASK **SMALL GROUP ACTIVITY** **WRITE** **Instructor's Notes**	**In your own words:** In elevators and escalators this includes start up, speed up, slow down, stopping, and directional change ***Advance***	✓PPT slide 6

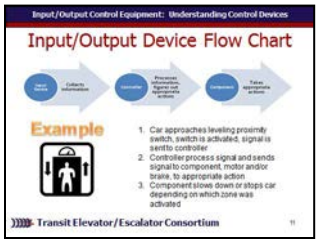


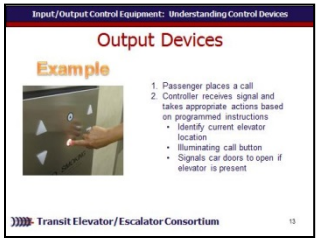
Elevator-Escalator: Understanding Control Devices

Instructor's Guide

Module Length: 330 min | Time remaining: 300 min | This section: 60 min (20 slides) | *Section start time:* _____ | *Section End Time:* _____

DO	SAY	Materials Needed
REVIEW slides **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Sensors and switches will input information into the controller. Indicators give the passengers and maintenance personnel feedback on the operating mode or condition of the system. **Input devices**, react to changes in the system and communicate this to the controller so that it can take the appropriate action. ***Advance*** Input devices can either be controlled through **human interaction** such as a patron pressing a call button on an elevator or they can be devices located within the mechanical or electrical system that automatically react to changes in the progression of the system. ***Advance***	✓PPT slides 8, 9  

DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** This change in signal level is interpreted through the controller program as a movement of the car into the zone of this particular sensor. The controller then takes the appropriate action which may be either to begin slowing the car down or bring it to a stop depending on the location of this particular zone switch. ***Advance*** The controller then communicates the necessary action to the appropriate system component(s) to fulfill the output commands of the program. In this case those components would be the motor and/or brakes controllers. The controller will signal to the motor to slow down and/or stop depending on which zone switch was activated. ***Advance***	✓PPT slide 11 

DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** The controller then takes a series of actions based upon the program instructions - one of which is to identify on which floor the elevator is currently located. ***Advance*** The controller may output several signals at this time, such as illuminating the call button to indicate to the passenger that the call request was received by the system. Another action would be to signal the car doors to open if the elevator is already positioned at the floor from which the call was placed. Once the passenger enters the car and depresses the desired destination floor button and the elevator begins to move, the controller outputs a signal to the position indicator display panel within the car which lets the passenger know the location of the car. ***Advance***	✓PPT slide 13 

Elevator-Escalator: Understanding Control Devices

Instructor's Guide

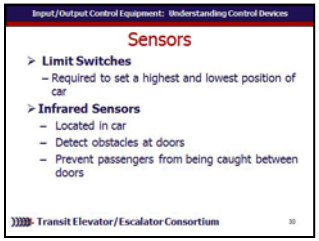
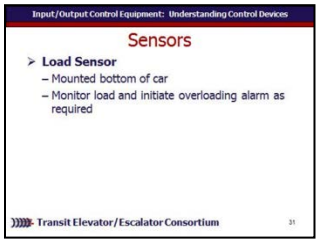
Module Length: 330 min Time remaining: 300 min This section: 60 min (20 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide **INDIVIDUAL ACTIVITY** **WRITE** **Instructor's Notes**	**In your own words:** ***DISTRIBUTE: Handout 1. Instruct participants to close course books and allow them 10 minutes to match as many as they can remember independently.*** ***Call time.*** ***Allow participants 5 minutes to review their answers using their course books.*** ***Review correct answers with participants calling on participants to provide correct answer for each safety device.*** ***DISTRIBUTE: Handout 2*** ***Continued***	✓PPT slide 17  ✓Handout 1 Escalator Safety Devices ✓Handout 2 Escalator Safety Device Locations

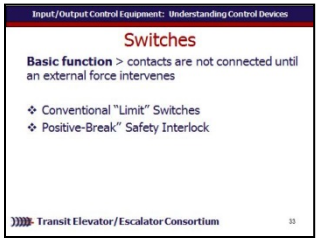
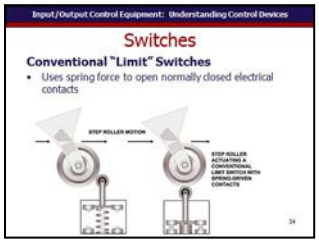
Module Length: 330 min | Time remaining: 300 min | This section: 60 min (20 slides) | *Section start time:* _____ | *Section End Time:* _____

DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Additionally, make sure to always stand on the dielectric mat, like seen here, in front of the controller as this creates an extra layer of grounding. ***Advance*** Always follow your Transit Authority's safety policies. ***Advance***	✓PPT slides 21, 22  

DO	SAY	Materials Needed
ASK **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Check appropriate steps to achieve an electrically safe condition. ❑ Operate car without load ❑ Visually verify all blades of disconnecting devices are fully open or withdrawn ❑ Transfer system to standby power ❑ Determine all sources of electrical supply ❑ Ground phase conductors where possibility exists for induced or stored energy ***Call on participants for answer*** ***Advance for the correct answer*** Answer: Yes ***Advance.***	✓PPT slide 24

DO	SAY	Materials Needed
REVIEW slides **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** To prevent elevators from running off the rails, ***Advance*** **limit switches** are required to set a highest and a lowest position for car. ***Advance*** **Infrared sensors** are located in car to detect obstacles at doors with purpose to prevent passengers from being caught between doors. ***Advance*** In addition, there is a **load sensor….** ***Advance*** mounted at the bottom of car to monitor load and initiate the overloading alarm as required. ***Advance***	✓PPT slides 30, 31  

Module Length: 330 min | Time remaining: 210 min | This section: 30 min (10 slides) | *Section start time:* _____ | *Section End Time:* _____

DO	SAY	Materials Needed
REVIEW slides **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** There are many types of switches but the basic function is that there are sets of contacts that are not connected until an external force intervenes. These include conventional "Limit" switches as well as positive-break safety interlocks. ***Advance*** **Conventional "limit" switches** are typically designed to use a spring force (resilient mechanism) to open normally closed electrical contacts. ***Advance*** Here is a step roller actuating a conventional limit switch with spring driven contacts. Conventional normally-closed contacts open by resilient mechanical mechanism (spring). Contacts may not open due to spring failure or welded contacts. ***Advance***	✓PPT slides 33, 34  

DO	SAY	Materials Needed
ASK **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Located in the car, a _____ sensor detects objects at the doors and prevents passengers from being caught between doors. a. Infrared b. Current c. Leveling d. Load e. Hall ***Call on participants for answer*** ***Advance for the correct answer*** Answer: a. Infrared ***Advance***	✓PPT slide 40 

Module Length: 330 min | Time remaining: 180 min | This section: 30 min (5 slides) | *Section start time:* _____ | *Section End Time:* _____

DO	SAY	Materials Needed
ASK **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Lets see what we have learned so far: Yes or No. An indicator can be an input or an output device. ***Call on participants for answer*** ***Advance for the correct answer*** Answer: No, an indicator can only be an output device. ***Advance*** A buzzer sound from a door indicating the door has been open too long is an example of a _____ indicator. ***Call on participants for answer*** ***Advance for the correct answer*** Answer: audible ***Advance***	✓PPT slides 46, 47