



PLC Technology 3 with Siemens S7-1200 Course Outline

Catalog number	8220-0030
Category	Electronics and Electrical Control
Duration	15 Hours
Software supplied	Siemens STEP7 TIA Portal
Prerequisites	PLC Technology 1 & 2 with the Siemens S7-1200

Activity 1: Getting Started

What is Mechatronics?

History of Mechatronics

Pneumatics

Electric Control vs. Pneumatic Control

Using PLC to Control a Pneumatic System

Activity 2: The Pneumatic HMI

Electro-Pneumatic Components

Double-Acting Cylinder with Magnetic Sensors

The 5/2 Solenoid-Solenoid Valve

The 5/2 Solenoid-Spring Valve

Electrical Push Buttons

Other Important Components

What is an HMI?

The Pneumatic HMI

Activity 3: Manual Control of a Pneumatic Piston

Programming the Manual Control of a Pneumatic Piston in a Bus Door
PLC Instruction Designing the Ladder Diagram
Task: Programming the Manual Control of a Pneumatic Piston
Task: Debugging and Editing Tools
Task: Simulating the Manual Control of a Pneumatic Piston
Task: Activating a Lamp Whenever the Bus Door is Open
Task: Simulating the Modified Program

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Activity 4: Semi-Automatic Control Systems

Programming the Manual Extension and Automatic Retraction of a Double-Acting Cylinder

Designing the Ladder Diagram

Task: Programming the Manual Extension and Automatic Retraction of a Double-Acting Cylinder

Task: Simulating the Manual Extension and Automatic Retraction of a Double-Acting Cylinder

Task: Modifying the Program to Reverse System Operation

Task: Simulating the Modified Program

Activity 5: Semi-Automatic Action Using a 5/2 Spring-Return Valve

The 5/2 Sol-Spring Valve

Programming a Semi-Automatic Cycle Using a 5/2 Sol-Spring Valve

Review of Latch and Unlatch Instructions

Designing the Ladder Diagram

Task: Programming a Semi-Automatic Cycle Using a 5/2 Sol-Spring Valve

Task: Simulating a Semi-Automatic Cycle Using a 5/2 Sol-Spring Valve

Task: Modifying the Program to Reverse System Operation

Task: Simulating the Modified Program

Activity 6: Fully Automatic Operation

Programming the Fully Automatic Operation of a Double-Acting Cylinder

Designing the Ladder Diagram

Task: Programming the Fully Automatic Operation of a Double-Acting Cylinder

Task: Simulating the Fully Automatic Operation of a Double-Acting Cylinder

Task: Modifying the Program to Reverse System Operation

Task: Simulating the Modified Program

Review of Counter Instructions

Task: Adding a Counter that will Activate a 2nd Lamp After 5 Cycles

Task: Simulating the Modified Program





Activity 7: Fully Automatic Operation with Spring

Programming the Fully Automatic Operation of a Double-Acting Cylinder Controlled by a 5/2 Sol-Spring Valve

Designing the Ladder Diagram

Task: Programming the Fully Automatic Operation of a Double-Acting Cylinder Controlled by a 5/2 Sol-Spring Valve

Task: Simulating the Fully Automatic Operation of a Double-Acting Cylinder Controlled by a 5/2 Sol-Spring Valve

Task: Modifying the Program to Work in the Reverse Order

Task: Simulating the Modified Program

Task: Adding a Counter that will Turn on a Second Lamp After 5 Cycles

Task: Simulating the Modified Program

Activity 8: Timers

Programming the Operation of System of Two Double-Acting Cylinders, a Timer and a Sensor

Timer ON Delay

Designing the Ladder Diagram

Task: Programming the Operation of Two Double-Acting Cylinders, a Timer and a Sensor

Task: Simulating the Operation of Two Double-Acting Cylinders, a Timer and a Sensor

Task: Modifying the Program to Open the Doors Only When the Door Sensor has been Activated for One Second

Task: Simulating the New Program

Activity 9: Counters

Programming the Operation of a Double-Acting Cylinder and a Counter

Review of the Count Up Instruction

Designing the Ladder Diagram

Task: Programming the Operation of a Double-Acting Cylinder and a Counter

Task: Simulating the Operation of a Double-Acting Cylinder and a Counter

Task: Modifying the Program to Restart Only After a 4 Second Pause

Task: Simulating the Modified Program





Activity 10: Sequential Operation with Two Double-Acting Cylinders

Programming a Sequential Operation with Two Double-Acting Cylinders

Designing the Ladder Diagram

Task: Programming Sequential Operation with Two Double-Acting Cylinders

Task: Simulating Sequential Operation with Two Double-Acting Cylinders

Task: Adding a Counter to the Program

Task: Simulating the Modified Program

Activity 11: Sequential Operation with Three Double-Acting Cylinders

Programming Three Double-Acting Cylinders

Designing the Ladder Diagram

Task: Programming the Sequential Operation of Three Double-Acting Cylinders

Task: Simulating a Sequential Operation with Three Double-Acting Cylinders

Task: Adding a Timer that will Release Piston C Two Seconds After Piston B has Fully Retracted

Task: Simulating the New Program

Activity 12: Solving Opposing Control Signals

Using a PLC to Control a Metal Cutting Machine Designing the Ladder Diagram Task: Programming the Metal Cutting Machine Task: Simulating the System What is an Opposing Control Signal? Timing Diagrams Drawing the Piston Position vs. Time Drawing the Piston Position vs. Time Drawing the 5/2 Valves' Control Signals vs. Time Locating Overlapping Signals Using Timing Diagrams Using the Positive Edge Instruction Task: Modifying the Ladder Diagram to Fix the Opposing Control Signal Problem Task: Simulating the Modified Program





Activity 13: Solving Opposing Control Signals in a Three Cylinder System

Using PLC to Control a Drilling System with Liquid Coolant Designing the Ladder Diagram Task: Programming the Drilling System with Little Coolant Task: Simulating the Drilling System with Liquid Coolant Identifying Overlapping Signals Using a Timing Diagram Task: Modifying the Ladder Diagram Task: Simulating the Modified Program

Final Project: Advanced Operation

Using a PLC to Control a Filling Station with an Advanced Operation Designing the Ladder Diagram Task: Programming the Ladder Diagram Task: Simulating the Filling Station

Final Project: Solution

Explanation of Filling Station Program