Programmable Logic Controllers (PLC)

Programmable Logic Controller Technology gives students a solid grasp of the control logic behind the operation of industrial PLCs, ladder logic programming, inputs and output devices and electrical control. The PLCLine panel is integrated with PLCMotion, a simulation software package that lets students observe and understand the control logic behind the operation of industrial PLCs. Students learn to program a PLC and simulate industrial applications. They also use a virtual training panel to test input and output responses to ladder diagrams.

Course List

Programmable Logic Controllers courses emphasize PLC theory and basic programming. Students learn how to program and use PLCs in industrial applications that require electrical control. The PLC courses feature powerful PLC simulation control software that allows students to program a PLC and simulate industrial applications. The combination of graphic simulation software with PLC virtual hardware enables students to test and correct control programs both online and offline.

PLC Technology 1: Fundamentals of Ladder Logic

Course Outline
- Examining Input/Output Relationships
- PLC Monitoring Tools
- Writing and Simulating a Basic Ladder Diagram
- Project: Controlling a Sorting System
- NOT Logic
- AND Logic
- OR Logic
- Project: Arsenic Filling Station
- Latching and Unlatching Outputs
- Improving Elevator Control
- One Shot Rising
- Timer On Delay
- Timer Off Delay

PLC Technology 2: Advanced Ladder Logic

Course Outline
- Bits and Words
- Counter Up and Reset
- Counter Down
- Project: Implementing CTU and CTD
- The Equal (EQU) Instruction
- The Not Equal (NEQ) Instruction
- Project: Applying Equal and Not Equal
- The Less Than (LES) Instruction
- The Greater Than (GRT) Instruction
- Project: Implementing GRT and LES
- The Move (MOV) Instruction
- The Add (ADD) Instruction
- The Subtract (SUB) Instruction

Prerequisite
PLC Technology I

PLC Technology 3: PLC-Controlled Pneumatic Systems

Course Outline
- The Pneumatic HMI
- Manual Control of a Pneumatic Piston
- Semi-Automatic Control Systems
- Semi-Automatic Action Using a 5/2
- Spring-Return Valve
- Fully Automatic Operation
- Fully Automatic Operation with Spring
- Timers
- Counters
- Sequential Operation with Two Double-Acting Cylinders
- Sequential Operation with Three Double-Acting Cylinders
- Solving Opposing Control Signals
- Solving Opposing Control Signals in a Three Cylinder System
- Controlling a System with a Variable Timer
- Advanced Operation

Prerequisite
PLC Technology II

PLC Technology 4: PLC-Controlled Hydraulic Systems

Course Outline
- Using a 4/2 Sol-Sol Valve to Control a Double-Acting Cylinder
- Using a 4/2 Sol-Spring Valve to Control a Double-Acting Cylinder
- Using a 4/3 Sol-Sol Valve to Control a Double-Acting Cylinder
- Using a Fully Automatic Hydraulic Circuit
- Using a Fully Automatic Hydraulic Circuit with a Timer
- Using a 4/3 Sol-Sol Valve with a Counter
- Using a Fully Automatic Hydraulic Circuit with an OSR Instruction
- Sequential Operation with Two Double-Acting Cylinders
- Sequential Operation with Three Double-Acting Cylinders
- Sequential Operation with Two Double-Acting Cylinders and a Delay
- Sequential Operation with Three Double-Acting Cylinders and a Delay
- Variable Timers
- Variable Counters
- Project: Port Soil Removal System

Prerequisite
PLC Technology III
PLCLine training system

Specifications
- PLC benchtop panel
  - Aluminum, table-top training panel
  - Dimensions: (WxH) 600 mm x 560 mm (23.6” x 22”)
  - Panel can be laid flat, raised to any angle, or wall-mounted
  - Components are permanently mounted on the panel
- DC servo motor
  - 4 VDC servo motor
- Optical encoder unit
  - One-slot rotating disk with photoelectric sensor
  - Supply voltage: 5 to 24 VDC ± 10% Ripple P•P
  - Current: 100mA
  - NPN, Normally Open (sink)
- Lead screw
  - Lead screw with a nut is connected to the motor output shaft by means of a coupling
  - Nut detection: mechanical limit switch, inductive proximity sensor
- Output lamps
  - Supply voltage: 24 VDC
  - Power: 2 W; Current: 83 mA
- Buzzer
  - Supply voltage: 24 VDC
  - Current: 10mA; Solenoid
  - Tubular solenoid housed in a mild steel case
- Pushbutton/toggle switches
  - Operating voltage: 0-250 V; Current: 10A
  - Limit switch, small
    - Normally open
  - Normal Operating distance: 6 mm
  - Inductive proximity Sensor
    - Supply Voltage: 10-30 VDC
    - Maximum Consumption: 200mA
    - NPN, Normally Open (sink)
    - M12 thread
    - Length: 50 mm
- PLC
  - MicroLogix 1000
    - 10 inputs, 24 VDC sink/source
    - 6 relay outputs
    - RS232 and DH485 communication
  - Power supply 20.4-26.5 VDC
  - 1K EEPROM Memory
  - SLC 500
    - 32 inputs
  - 16 Relay outputs
  - RS232 and DH485 communication
  - Battery-backed memory
  - Memory capacity: 8K or 16K words
- Banana plug cables
  - Universal flexible lines with 4 mm banana plugs
  - Supply voltage: 24 VDC; Current: 10A
  - Certified for CE safety compliance
  - Power Requirements
    - 24 VDC, 2A - or 110V/220V with power supply

PLCMotion

PLCMotion transforms your PC into a powerful PLC station. The PLCMotion software package includes several modules that together create a complete PLC experience.

Standard Features
- PLC editing module
  - A fully operational editor for creating PLC ladder diagrams that incorporates all the basic functions of PLC programming.
  - Run, debug and print ladder diagrams from within the PLC editor, making programming easier.
  - Create logic control applications by selecting PLC programming functions (inputs, outputs, timers, counters and flags) and linking these instructions to variable addresses.
- PLC simulation module
  - Enables online and offline activation of the application in the HMI alone, or together with actual equipment.
  - PLC simulator runs the ladder logic control program while the HMI responds accordingly.
- Ladder diagrams
  - Export and display ladder diagrams as IEC 1131-3 Instruction List.
- PLC training panel simulator module
  - Activates the PLC simulator with the panel HMI interface.
  - Allows students to run a previously programmed ladder and observe it in the training panel simulation.

Ordering Information

Hardware
- MicroLogix PLC Line Training Panel
  - 003075
- Allen Bradley SLC 500 PLC Line Training Panel
  - 003053

Software
- PLCMotion
  - 009241

Curriculum
- PLC Technology 1: Fundamentals of Ladder Logic, LearnMate course
  - 17-8008-0000
- PLC Technology 2: Advanced Ladder Logic, LearnMate course
  - 17-3025-0000
- PLC Technology 3: PLC-Controlled Pneumatic Systems, LearnMate course
  - 17-3026-0000
- PLC Technology 4: PLC-Controlled Hydraulic Systems, LearnMate course
  - 17-3035-0000

Bundles
- MicroLogix PLC Trainer includes PLC Aluminum Table Top Trainer & PLC Technology 1: Fundamentals of Ladder Logic curriculum
  - 16-8009-1000
- SLC 500 PLC Trainer includes PLC Aluminum Table Top Trainer & PLC Technology 1: Fundamentals of Ladder Logic curriculum
  - 16-8079-1000

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