

# Programmable Logic Controllers, Maintenance and Troubleshooting

4.5 Days, 3.6 CEUs

This course is designed to provide the student with basic information of programmable logic controllers (PLC), as well as maintenance and troubleshooting techniques necessary to keep these products running. Although the course, and lab equipment, is designed around Allen Bradley SLC and MicroLogix equipment it can be used as a basic foundation for a good understanding of all PLC equipment.

This course provides engineers, electricians, maintenance technicians, etc., with the foundation to program and troubleshoot the PLC system resulting in less downtime and increased uptime.

**PREREQUISITE:** A good understanding of relay logic and print reading. It is recommended that students attend our Basic Electrical Troubleshooting (BET) and our Motor Controls and Starters, Low Voltage (MCSLV) courses prior to attending.

## Learning Objectives:

Upon completion of this course the student will be qualified to:

- Review relay control.
- Understand how peripheral devices are connected to the PLC.
- Interpret Hard Wiring Diagrams connections to input/output (IO) Modules.
- Interpret PLC ladder logic and scan cycle.
- Use software instructions for Programming techniques.
- Correctly and safely use Force commands.
- Modify existing logic including timers, counters, etc.
- Perform actual wiring of peripheral IO devices to their related modules.
- Establish communications with PLC using RSLinx.
- Troubleshoot software and hardware.

## SCOPE

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| <p><b>I. Introduction</b></p> <ul style="list-style-type: none"> <li>A. What is a Programmable Logic Controller?</li> <li>B. What are the Advantages over an Electromechanical System?</li> </ul> <p><b>II. Relay-Based Control System Basics</b></p> <ul style="list-style-type: none"> <li>A. Identifying Peripherals Devices</li> <li>B. Identifying Related Symbols</li> </ul> <p><b>III. Installation of a PLC-Based System</b></p> <ul style="list-style-type: none"> <li>A. Emergency Stop and Safety Concerns</li> <li>B. Connection to Input and Output Interface Modules</li> <li>C. Wiring of AC, DC, and Relay Modules</li> </ul> <p><b>IV. Identify Sections of the MicroLogix 1000</b></p> <ul style="list-style-type: none"> <li>A. Power Supply Requirements</li> <li>B. Input Section               <ul style="list-style-type: none"> <li>1. Wiring terminals</li> <li>2. Status indicators</li> </ul> </li> <li>C. Output Section               <ul style="list-style-type: none"> <li>1. Wiring terminals</li> <li>2. Status indicators</li> </ul> </li> <li>D. Communication Port</li> <li>E. Processor Status Indicators</li> </ul> <p><b>V. Conversion of Relay Logic to PLC Ladder Logic</b></p> <ul style="list-style-type: none"> <li>A. Considerations and Strategy of Converting Hardwired Logic to PLC Logic</li> <li>B. Electromechanical Devices that become Software Instructions</li> </ul> | <p><b>VI. How Does a Programmable Logic Controller Work</b></p> <ul style="list-style-type: none"> <li>A. What does the Processor do?</li> <li>B. Scan Cycle</li> <li>C. Addressing</li> <li>D. Number Systems used in the PLC</li> <li>E. Information Transfer</li> </ul> <p><b>VII. Identify Sections of the MicroLogix Software</b></p> <ul style="list-style-type: none"> <li>A. Understanding and Using Specific Areas of the Software</li> <li>B. Identify Locations and Applications of the Software</li> <li>C. Navigating through the Software</li> </ul> <p><b>VIII. Understanding &amp; Programming Basic Control Instructions</b></p> <ul style="list-style-type: none"> <li>A. Programming Basic Relay Functions</li> <li>B. Saving a Program</li> <li>C. Modify Existing Programs</li> </ul> <p><b>IX. Communications</b></p> <ul style="list-style-type: none"> <li>A. Connecting the PLC to a PC</li> <li>B. Baud Rate and Node Identification</li> <li>C. Uploading/Downloading/Restoring Program Files</li> </ul> <p><b>X. Interpreting Timer and Counter Instructions</b></p> <ul style="list-style-type: none"> <li>A. On Delay, Off Delay, and Retentive Timers</li> <li>B. Up and Down Counters</li> </ul> | <p><b>XI. Program and Interpreting Program Control Instructions</b></p> <ul style="list-style-type: none"> <li>A. Jump to Subroutine Instruction</li> <li>B. Zone Control Instructions               <ul style="list-style-type: none"> <li>1. Master control reset</li> <li>2. Jump and label instructions</li> </ul> </li> </ul> <p><b>XII. Applying and Interpreting Program Control Instructions</b></p> <ul style="list-style-type: none"> <li>A. Comparing Values Two Values for Logic Purposes</li> <li>B. Comparing Values within Parameters</li> </ul> <p><b>XIII. Troubleshooting</b></p> <ul style="list-style-type: none"> <li>A. Using the I/O and Status Indicator Lights</li> <li>B. Using the Programming Software</li> <li>C. Forcing and Other Temporary Measures</li> </ul> <p><b>XIV. Safety</b></p> <ul style="list-style-type: none"> <li>A. Safety Considerations of Utilizing Forcing Methods</li> <li>B. Special Precautions when Troubleshooting PLC systems</li> </ul> <p><b>XV. Conclusion</b></p> <ul style="list-style-type: none"> <li>A. Final Exam</li> <li>B. Completion of Course Paperwork</li> </ul> |
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