



# MAINTENANCE TROUBLESHOOTING INTERNATIONAL LLC

PLC-302

Hands-On Training Center: 2860 Ogletown Road, Newark, DE 19711  
Corporate Offices & Mailing Address: 2917 Cheshire Road Wilmington, DE 19810  
Phone/TXT: 302.593.2698 (Frank) Email: Frank@mtroubleshooting.com  
Website: www.mtroubleshooting.com

## PLC-302 INTRODUCTION TO PROGRAMMABLE LOGIC CONTROLLERS

Programmable logic controllers (PLCs) are increasing in use, and technicians in all fields must be familiar with the fundamentals of installing and programming digital and analog PLCs. Using the SLC 500 Allen Bradley family of processors, this course focuses on understanding PLCs; how they work, terminology, and the hardware and software elements that make up a programmable logic controller. Students will learn to use various slot addressing techniques; how to understand program and data table file organization, number systems and processor information flow; and how basic relay type instructions, timers and counters, & data manipulation instructions can be used to achieve PLC solutions. This class is 80% Hands-On use of the Allen Bradley MicroLogix 1400 Controller. Our hands-on training center uses custom training equipment made to be just like the equipment on the floor of our facility. This is one of our most attended courses



### History

- Relay logic
- Programmable logic controller

### PLC Architecture

- Rack, power supply, processor, I/O
- Smart modules
- Communication networks
- Programming tools – software

### Input and Output Systems

- I/O interfaces - voltages
- Data transfer from module to processor
- Number of I/O per module
- Analog data versus digital data
- Remote I/O systems

### Ladder logic

- Ladder diagrams versus ladder logic
- Sensor and load connections to PLC
- Rungs and instructions

### Relay Instructions

- Examine if on
- Examine if off
- Output energize, output latch/unlatch
- Differences between instructions and field devices (on/off versus open/closed)

### Addressing, Data Memory and Scan Time

- I/O address relation to module location
- Internal data memory – binary files
- Internal data memory – integer files
- Register memory versus bitwise memory
- I/O, memory and rung scan process

### Number Systems

- Decimal, octal, binary and hexadecimal systems
- Binary Coded Decimal (BCD)
- Data conversion

### Sizing PLCs

- Estimating system I/O requirements
- CPU and memory sizing
- Interpreting manufacturer specifications

### Creating Relay Logic Diagrams

- Use symbols to represent different types of input and output devices

- Create relay logic diagrams using the standard relay logic rules
- Place comments on relay logic devices using the standard rules
- Create relay logic circuits for process and industrial control problems

### PLC Programming

- List the rules for creating a PLC ladder logic diagram
- Convert a relay logic diagram to a PLC ladder logic diagram
- Create ladder logic diagrams when the PLC is in the offline mode

### Download PLC Ladder Diagrams and Test on a Trainer

- Use the force instruction for troubleshooting
- Create and print program reports
- Save and open ladder diagram projects

### PLC Timer Instructions

- Use non-retentive and retentive timer ON-delay instructions to create PLC ladder logic diagrams
- Use move (MOV) instructions to create variable preset value timer instructions.
- Use OFF-delay timers to create PLC LLC's
- Connect timer instructions to interlock
- Cascade timer instructions in a PLC ladder logic diagram to increase the timer preset values

### PLC Counter Instructions

- Use count up instructions to create PLC ladder logic diagrams
- Use count down instructions to create PLC ladder logic diagrams
- Reset counter instructions
- Connect different counter instructions and cascade counter instructions
- Use timer and counter instructions to create PLC ladder logic diagrams

### PLC Math Instructions

- Program the Add Instruction
- Program the Subtract Instruction
- Program the Multiply Instruction
- Program the Divide Instruction

### PLC Compare, Jump, & MCR Instructions

- Use a compare instruction to energize a coil
- Cascade compare instructions to set upper and lower limits in a control system.
- Use the jump (JMP) instruction to skip over rungs in a PLC LLC diagram.
- Use multiple jump (JMP) instructions with multiple label (LBL) instructions in a PLC ladder logic diagram.
- Use compare instructions to energize the jump (JMP) instructions.
- Use a master control reset (MCR) instruction to halt the operation of a section of a PLC ladder logic diagram.

### Data Handling

- Use PLC instructions for moving data from one register to another.
- Create stacks for storing and retrieving data from PLC memory.
- Move data between tables.
- Use PLC instructions for number system conversion.

### CLASS FORMATS AVAILABLE

- MTI Hands-On Center \$995/person
- ZOOM Interactive (Not offered)
- On-Site (Your Location) Ask for Quote  
Quick Quote Available in 48 hrs.

### CLASS DURATION

2-days, 15 hours of instruction  
60% Hands-On

### CLASS SUPPLIES

Small generic PLC's are supplied to allow the trainee to work with real equipment, but the manufacturer might not be the same as in use at the trainee's work location.

**Class Details:** Each student will receive class books, work activity sheets, self-test progress evaluations, as well as questions from the instructor to make sure they understand the material presented. It is expected that an attendee will leave the class with the basic knowledge of the subject and possess new found skills to better equip them when they return to their job. A certificate suitable for framing will be issued to each attendee who successfully completes the course. Call, email or check the website for the next time this course is scheduled at the MTI training center. On-site sessions? Request a quick 48-hour turnaround quote. Revised: 03/02/2021