

Basic Programmable Logic Controllers (PLCs) (Instructor-Led Training)

Course Description

This course teaches the basic functionalities and capabilities of Programmable Logic Controllers (PLCs), which are now an integral part of the industrial environment.

Course Prerequisites

- GTA Web-Based Training
 - Communication and Protocols I
 - Communication and Protocols II
- Instructor-Led Training
 - Control Systems PID Control

Course Objectives

Upon completion of this course, the student will have received instruction designed to assist him/her in the following:

- Describe the history of PLCs in industry.
- Describe the function and purpose of PLCs.
- List the basic components of a PLC.
- Describe the basic operation of a PLC (block diagram level).
- Explain the advantages of a PLC system compared to a typical hardwired system.
- Describe how to connect an analog module.
- Connect power to the PLC using the procedure provided.
- Describe how a PLC communicates with a field device.
- Explain how points are addressed.
- Describe PLC processor indicators.
- Describe PLC communications.
- Select proper cabling when connecting a PLC to a laptop.
- Describe how to use XIO, XIC, OTE, Latch, Timers, Counters, Moves, Arithmetic Commands, MCRs, and Subroutines

Course Outline

1. Programmable Logic Controller (PLC) Overview
 - a. What is a PLC?
 - b. History of the PLC
 - c. Advantages of PLCs
 - d. Components of a PLC
 - e. Input/Output Modules
 - f. Central Processing Unit (CPU)
 - g. Co-processor Modules
 - h. Software
 - i. Peripheral Device
 - j. Basic Operation of a PLC
 - k. Ladder Logic of a Hardwired System
 - l. Simple Ladder Diagram of a Hardwired Circuit
2. PLC Operations
 - a. Basic Operation
 - b. Operational Sequence
 - c. The Scan Cycle
 - d. Logic Scan
3. PLC Hardware
 - a. PLC Components
 - b. Power Supply
 - c. Input/Output Modules
 - i. Input Modules
 1. Input Module Wiring
 2. Input Indicators
 - ii. Output Module
 1. Output Module Wiring
 - d. Discrete Modules
 - i. Discrete Module Wiring

- e. Numerical Data Modules
 - f. AC/DC Input Modules
 - i. AC Input Modules
 - ii. DC Input (Discrete) Modules
 - iii. DC Input (Analog) Modules
 - g. AC/DC Output Modules
 - i. AC Output Modules
 - h. DC Output Modules (Discrete)
 - i. DC Output Modules (Analog)
 - i. Proportional Integral and Derivative (PID) Processor Module
 - j. Controls and Indicators
 - k. Scanning
 - l. User Program
4. Addressing and Number Systems
- a. Types of Number Systems
 - i. Octal
 - 1. Decimal to Octal/Octal to Decimal Conversion
 - 2. Binary to Octal/Octal to Binary Conversion
 - ii. Hexadecimal
 - 1. Binary-Coded Decimal
 - iii. Addressing
 - 1. Addressing Terminology
5. PLC Communications
- a. PLC Communication Description
 - b. PLC Communication Protocols
 - c. PLC Networking
 - i. DeviceNet
 - ii. ControlNet
 - iii. Ethernet
 - d. Data Highway Plus (DH+)

- e. PLC Terms
 - f. Remote I/O Configurations
 - g. Peer-to-Peer Configurations
 - h. Host Computer
6. PLC Software
- a. Software vs. Firmware
 - b. HMI (Human Machine Interface)
 - c. Ladder Logic Diagrams
 - d. Logic Instructions
 - e. Relays
 - f. Examine If Closed (XIC)
 - g. Examine If Open (XIO)
 - h. Output Energized (OTE)
 - i. Timers
 - i. Timer On Delay (TON)
 - ii. Timer Off Delay (TOF)
 - iii. Retentive Timer On (RTO)
 - j. Counters
 - i. Count Up Counter (CTU)
 - ii. Count Up Counter (CTD)
 - iii. Reset Command (RES)
 - k. Data Transfer Instructions
 - i. Arithmetic Commands
 - l. Data Manipulation Instructions
 - i. Master Control Reset
 - m. Program Control Instructions
 - i. Subroutines

Recommended Resources

- GTA Basic PLCs Participant Guide
- GTA Basic PLCs Instructor Presentation.
- Internet sites related to Programmable Logic Controllers.
- Textbooks or other publications related to Programmable Logic Controllers.