

Programmable Logic Controllers (PLCs) 1: Domains and Competencies

Operation of a PLC

Describe the function of a programmable logic controller and give an application
List advantages of a PLC
Describe the functions of the basic components of a PLC
Describe the basic operation of a PLC
Describe how I/O modules communicate with the PLC processor

Memory Organization and addressing

Recognize languages used to program a PLC
Identify the function and purpose of a tag
Identify a memory map (register map, I/O map)
Identify the difference between physical and logical input output addressing
Describe how PLC module terminals are referenced by tag names

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Discrete I/O Interfacing

Describe features used to select a PLC discrete input module
Describe features used to select a PLC discrete output module
Explain how to interface a sensor with a sink or source input
Explain how to interface a device with a sink or source output
Identify the uses of a relay output, transistor and triac
Describe how to interface a PLC to a machine controller
Connect and test a limit switch to a discrete input module
Connect and test the operation of a solenoid valve to a PLC output
Connect and test the operation of an electronic sensor to a PLC input module
Connect and test the operation of a PLC input module to a robot output module
Connect and test the operation of a PLC discrete output module to a robot input module
Develop an interface wiring diagram to interface a PLC to a machine controller
Describe the function and operation of input/output diagrams

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Function and Use of Monitoring Devices

Describe the function and basic operation of serial communication and give an example
Describe how to setup a serial communications driver
Online program editing
Offline program editing
Online program monitoring
Program documentation (printing and saving)
Diagnosing malfunctions
Troubleshooting control systems
Running and stopping PLC
Software / Hardware compatibility
Name methods of entering a PLC program and give an advantage of each

Open a PLC program
Download a PLC processor file using PLC programming software
Upload a PLC processor file using PLC programming software
Monitor PLC operation using PLC programming software

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Basic PLC Logic Instructions

Describe the operation of normally open and normally closed input instructions
Know the operation of an output instruction
Describe the basic operation of PLC ladder logic (AND/OR/NOT/NAND)
Recognize different types of numbering systems and explain their importance
Describe the operation of the Decimal numbering system and give an application
Describe the operation of the Binary numbering system and give an application
Convert between Decimal and Binary
Identify the purpose of a PLC project
Describe how an input device can reference multiple input instructions
Describe how input device logic affects input instruction logic
Describe how a PLC controls multiple outputs at the same time

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PLC Timer and Counter Instructions

Demonstrate an understanding of Time Base
Describe the function of retentive and non-retentive PLC timing instructions and give an application of each
Describe the operation of a retentive timer on-delay instruction
Describe the function and application of two types of non-retentive timer instructions (on delay and off delay)
Describe the operation of the non-retentive timer on-delay instruction
Describe the operation of an off-delay timer instruction
Define time-driven sequencing and give applications
Describe the operation of a time-driven sequence program
Enter and edit a PLC program that uses an RTO instruction
Enter and edit a PLC program that uses a TON instruction
Enter and edit a PLC program that uses a TOF instruction
Design a PLC program that provides low voltage starting of an electric motor
Design a PLC program that controls a centrifugal air compressor
Describe the functions of PLC counter instructions
Describe the operation of a Count Up instruction
Describe the operation of a count down instruction
Describe Counter Reset
Describe Timer Reset
Enter and edit a PLC program that uses a Count Up instruction
Design a PLC program to indicate when preventive maintenance should be performed
Enter and edit a PLC program that uses an Up/Down Counter instruction
Design a PLC program that controls an adjustable counting station

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Basic PLC Motor control applications

Describe methods by which a PLC can be used to start and stop a motor
Identify a PLC input output diagram for a motor application
Describe how input instructions can be controlled by PLC output instructions
Describe the function and operation of PLC seal-in and latch logic
Describe the function and operation of a program interlock and give an application
Describe how a program interlock is used for safety
Design a PLC program to jog a motor
Design a PLC program to control the start/stop of a bi-directional motor
Design a PLC program to interlock two motors
Design a PLC program that uses a safety interlock to control the operation of a machine

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Basic PLC Sequencing Applications

Define event-driven sequencing
Describe the operation of a pick and place PLC program
Describe the operation of a continuous pick and place PLC program
Describe the operation of a basic multiple actuator sequence program
Design a reciprocating actuator sequence PLC program
Design a continuous cycle clamp and drill sequence PLC program
Troubleshoot a clamp and drill sequence PLC program

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Basic PLC Machine Application

Describe the steps used to design a controller program
Describe the operation of a PLC program with manual and automatic modes
Describe methods of stopping a PLC-controlled machine
Describe the application of timers and counters in industrial control
Design a PLC program (case studies and/or examples)
Troubleshoot a PLC program with manual and automatic modes
Design a motor control program which uses both manual and automatic modes
Design a PLC program which has both Halt and Cycle-Stop functions
Troubleshoot a PLC program which has both Halt and Cycle-Stop functions
Design a PLC program to control the number of production cycles
Design a PLC program to control a piston filler machine
Troubleshoot a PLC program which controls a piston filler machine

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Troubleshooting PLC Based Systems

Describe hardware and software troubleshooting and give an application of each
Define components of a PLC system
Describe the functions of PLC status and diagnostic indicators
Describe the operation of the master control relay circuit to the PLC
Describe how to troubleshoot MCR power problems

Describe how to troubleshoot a PLC chassis power supply
Describe how to test PLC discrete input devices
Describe how to test a PLC discrete input module
Describe the Force function and give an application
Describe how to test a PLC discrete output device
Describe how to test a PLC discrete output module
Use PLC status indicators to determine the status of PLC operation
Troubleshoot PLC power supply problems
Test a PLC discrete input device
Test a discrete input module
Use the Force Function to force an input or output
Use the Force function to test a PLC discrete output device
Test a PLC discrete output module

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Troubleshooting PLC Hardware and Software

Describe how to troubleshoot a PLC processor which controls local I/O
Describe methods of PLC troubleshooting and give an application of each
Describe four types of PLC component tests
Describe a systematic PLC troubleshooting sequence
Describe the function of project documentation and give an application
Troubleshoot a processor fault
Use a six-step sequence to troubleshoot a PLC system
Troubleshoot a PLC-controlled electric motor system
View project documentation and use it to operate a PLC project
Document a PLC program file
Scenario - find a fault or solution