

JobMaster Programmable Logic Controller (PLC) Training

Intelitek's Programmable Logic Controller Technology training is a four part curriculum that 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 courseware is delivered using the JobMaster Training Station (JMTS) and the LearnMate LMS. The training is integrated with PLCMotion and vendor simulation software packages that let students program, observe and understand the control logic behind the operation of industrial PLCs. Students will learn to program a PLC and simulate industrial applications. They also use simulation to test input and output responses to ladder diagrams.



Advanced Blended Learning

Programmable Logic Controllers curriculum 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 PLC simulation control software that allows students to program a PLC and simulate industrial applications. The combination of graphic simulation software with real industrial PLC hardware enables students to test and correct control programs both online and offline.

Industrial PLC Hardware

Intelitek's blended learning solution introduces students to popular industrial vendors PLCs and application software. Intelitek partners with Siemens and Allen Bradley and use Siemens STEP 7 software and Allen Bradley Studio 5000 applications in the training to offer students real-world hands-on experience with the hardware and applications they will encounter on the job.

PLC Technology 1: Fundamentals of Ladder Logic

Skills Covered

- 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

Skills Covered

- 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

PLC Technology 3: PLC-Controlled Pneumatic Systems

Skills Covered

- 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

PLC Technology 4: PLC-Controlled Hydraulic Systems

Skills Covered

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

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First Steps
Create the system! Perform these steps:

1. Using the electrical connectors, wire the power, input, and output connections between the appropriate JMTS modules. You can see the connections on the right.
2. Connect your computer to the PLC with an Ethernet cable.
3. Turn on the power supply module.
4. Open the TIA Portal and create a new project called YourName11A or similar.

Example of a test configuration in the PLC 2 curriculum

JobMaster Programmable Logic Controller Technology Training (continued)

JMTS PLC Training System

The JMTS PLC training system gives students complete hands-on experience in the design and construction of PLC circuits commonly used in industrial applications.

Standard Features

- JMTS is an educational panel for the assembly of circuits and systems. Students can mount and configure PLCs, control components, HMI panels, pneumatic and hydraulic components, and more on the training panel to create a variety of realistic industrial applications.

Hardware Kit for PLC Training

- 4 VDC servo motor
- Optical encoder unit
 - One-slot rotating disk with photoelectric sensor
 - Supply voltage: 5 to 24 VDC ± 10% Ripple P•P 10% or less
 - 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
- Inductive Proximity Sensor
 - Supply Voltage: 10-30 VDC
 - Maximum Consumption: 200mA
 - NPN, Normally Open (sink)
 - M12 thread
 - Length: 50 mm
 - Normal Operating distance: 6 mm
- Banana plug cables
 - Universal flexible lines with 4 mm banana plugs
 - Certified for CE safety compliance

JMTS PLC Options:

- Allen Bradley CompactLogix 5380
 - 8 inputs/outputs
 - 1 EtherNet/IP ports
 - 1 USB port
 - Controller capacity 0.6 MB
 - Optional nonvolatile memory: SD card
 - Programming languages: Ladder Diagram (LD)
- Allen Bradley PanelView 5310 Terminal
 - 7" touch screen color display
 - Resolution: 800 x 480
 - Communications: EtherNet/IP™, USB
- Siemens SIMATIC S7-1200
 - 14 digital inputs, 10 relay outputs
 - 2 analog inputs, 2 analog outputs
 - Communications: PROFINET
 - Work memory: 125 kbyte
 - Load memory: 4 Mbyte
 - Programming language: STEP 7
- Siemens SIMATIC HMI KTP700 touch panel
 - 7" touch screen color display
 - Resolution: 800 x 480
 - Communications: PROFINET, RS485, USB

Programming and Simulation Software

PLC software lets students program, observe and understand the control logic behind the operation of industrial PLCs. The PLC software can be used as an offline simulation tool with a collection of sample applications or it can be used for online operation and control of industrial PLCs.

Intelitek's training uses the industrial PLC control software typical to the PLC vendor to program and simulate PLC activity including Siemens STEP 7 and Allen Bradley Studio 5000 suites.

What you Will Learn

Automation Design with PLCs

- How to design, configure, and connect PLCs with inputs and outputs to control an industrial process.

PLC Programming

- 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.
- Export and display ladder diagrams as IEC 1131-3 instruction list.
- Create logic control applications by selecting PLC programming functions (inputs, outputs, timers, counters and flags) and linking these instructions to variable addresses.

PLC simulation

- Online and offline activation of the application in the HMI.
- Run the ladder logic control program while the HMI responds accordingly.

Siemens SIMATIC STEP 7 Software

- STEP 7 Basic (TIA Portal) controller software is used for SIMATIC S7-1200 Controllers and SIMATIC HMI panels.
- STEP 7 Basic offers direct online diagnostics, easy creation of technology objects and a library concept for time-saving, programming components reuse.
- STEP 7 Basic supports the IEC programming languages LAD (Ladder Diagram), FBD (Function Block Diagram) and SCL (structured text).
- Intelitek PLC Training integrates curriculum and tutorials for STEP-7 Basic ensuring the student emerges with the ability to operate the Siemens PLC line independently.

Allen-Bradley Studio 5000 Mini Software

- Studio 5000 Mini package is the software used to for CompactLogix 5380 PLCs and PanelView HMI terminals
- Studio 5000 Logix Designer easily configures devices with graphical wizards and simplified, modern programming with multiple editors and modular programming features
- Studio 5000 View Designer is the design environment for the PanelView™ HMI and helps build modern applications more easily and improve operator performance

JMTS Electrical Modules Required:

(not included)

- Power Supply 24 VDC, 4A
- Relay Module
- Operational Module
- PLC Module
- HMI Module

Ordering Information

Curriculum for Siemens Simatic S7-1200 PLC

PLC Technology 1 - Fundamentals of Ladder Logic	77-8220-0010
PLC Technology 2 - Advanced Ladder Logic	77-8220-0020
PLC Technology 3 - PLC-Controlled Pneumatic Systems	77-8220-0030
PLC Technology 4 - PLC-Controlled Hydraulic Systems	77-8220-0040

Curriculum for Allen Bradley CompactLogix PLC

PLC Technology 1 - Fundamentals of Ladder Logic	77-8230-0010
PLC Technology 2 - Advanced Ladder Logic	77-8230-0020
PLC Technology 3 - PLC-Controlled Pneumatic Systems	77-8230-0030
PLC Technology 4 - PLC-Controlled Hydraulic Systems	77-8230-0040

Hardware

JMTS PLC Kit - Hardware accessories kit for PLC curriculum	00-3075-1000
JMTS - PLC Module (Siemens S7-1200)	10-2550-4000
JMTS - PLC Module (Allen Bradley CompactLogix)	10-2550-7000
JMTS - HMI (Siemens)	10-2550-5000
JMTS - HMI (Allen Bradley)	10-2550-8000



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