

# JobMaster Programmable Logic Controllers (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 in conjunction with the JobMaster Training Station (JMTS) and the LearnMate LMS. The training is integrated with PLCMotion, a simulation software package that lets students observe and understand the control logic behind the operation of industrial PLCs. Students learn to program a PLC and simulate industrial applications. They also use a virtual training panel to test input and output responses to ladder diagrams.



## Course List

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

### 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

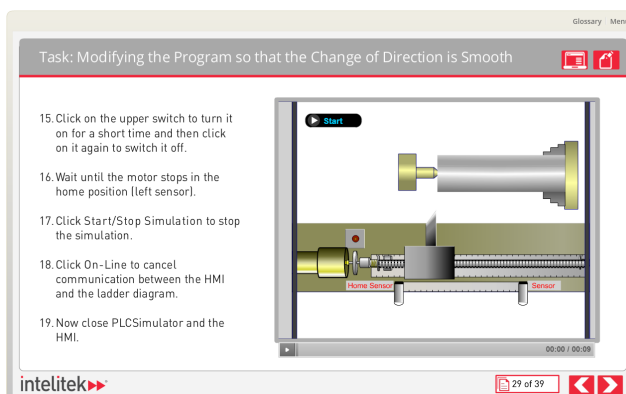
#### Skills Covered

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



Example of a simulation 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, pneumatic and hydraulic components, and more on the training panel to create a variety of applications.

### Hardware Kit PLC1 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 Electrical Modules Required:

(not included)

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

### JMTS PLC Options:

- MicroLogix 1100
  - 10 inputs, 24 VDC sink/source
  - 6 relay outputs
  - RS232 and DH485 communication
  - 1K EEPROM Memory
- 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

## PLCMotion or PLC Software

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

Intelitek's PLCMotion is a fully functional PLC control software used with different PLCs to program and simulate PLC activity. PLCMotion includes a powerful HMI simulator to learn how to program and operate industrial PLCs with HMI. Some PLCs (like the Siemens) include proprietary programming packages and Intelitek Curriculum will use the vendor's software.

### Standard Features

#### PLC editing module

- Editor for 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.
- Create logic control applications by selecting PLC programming functions (inputs, outputs, timers, counters and flags) and linking these instructions to variable addresses.

#### PLC simulation module

- Enables online and offline activation of the application in the HMI alone, or together with actual equipment.
- PLC simulator runs the ladder logic control program while the HMI responds accordingly.

#### Ladder diagrams

- Export and display ladder diagrams as IEC 1131-3 Instruction List.

#### PLC HMI Panel Simulator Module

- Activates the PLC simulator with the panel HMI interface.

- Allows students to run a previously programmed ladder and observe it in the training panel simulation.

### Siemens SIMATIC STEP 7 Software

- STEP 7 Basic (TIA Portal) is controller software 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.

### Languages

- English
- Spanish
- Chinese (Simplified, China)

### Computer Requirements

- Pentium 4 Dual Core 3 GHz
- 1GB RAM (2 GB for Windows 7/10)
- 1 GB available disk space
- Windows XP SP3 / Win7 - 32 or 64 bit / Win10 - 32 or 64 bit
- CD ROM drive
- Separate RS232 ports on the PC-for each hardware device which uses an RS232 port (or USB ports with RS232 - USB adapter)

## Ordering Information

### Curriculum

PLC Technology I - Fundamentals of Ladder Logic	77-3032-0000
PLC Technology II - Advanced Ladder Logic	77-3033-0000
PLC Technology III - PLC-Controlled Pneumatic Systems	77-3034-0000
PLC Technology IV - PLC-Controlled Hydraulic Systems	77-3035-0000

### Hardware

JMTS PLC1 Kit - Training kit for PLCs	
JMTS - PLC Module (Siemens S7-1200)	10-2550-4000
JMTS - PLC Module (Micrologix 1100)	

### Software

PLCMotion	63-9241-0000
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