Controller Programming Logic Developer PLC

Course Description

Learn programming for PACSystems, 90/70, 90/30, and VersaMax controllers in this Machine Edition class featuring the PACSystems RX3i Controller. This class covers programming techniques and the advanced features of the PACSystems Controller using Logic Developer PLC Machine Edition software. Starting with the controller software architecture, students are taught how to effectively develop control applications using building block concepts. This course builds upon Object-Oriented concepts with PACSystems User-Defined Function Blocks (UDFBs), as well as the development of application components using Ladder Diagram (LD) and Function Block Diagram (FBD) programming languages

Who should attend?

This course is intended for those who are or will be involved in the development, modification, and troubleshooting of control systems using Logic Developer PLC and PACSystems Controllers.

Are there any prerequisites?

Participants should be comfortable operating in a Microsoft Windows environment, and have a basic understanding of electrical/control fundamentals.

Course Length

4 days

Suggested Class Size

8 students

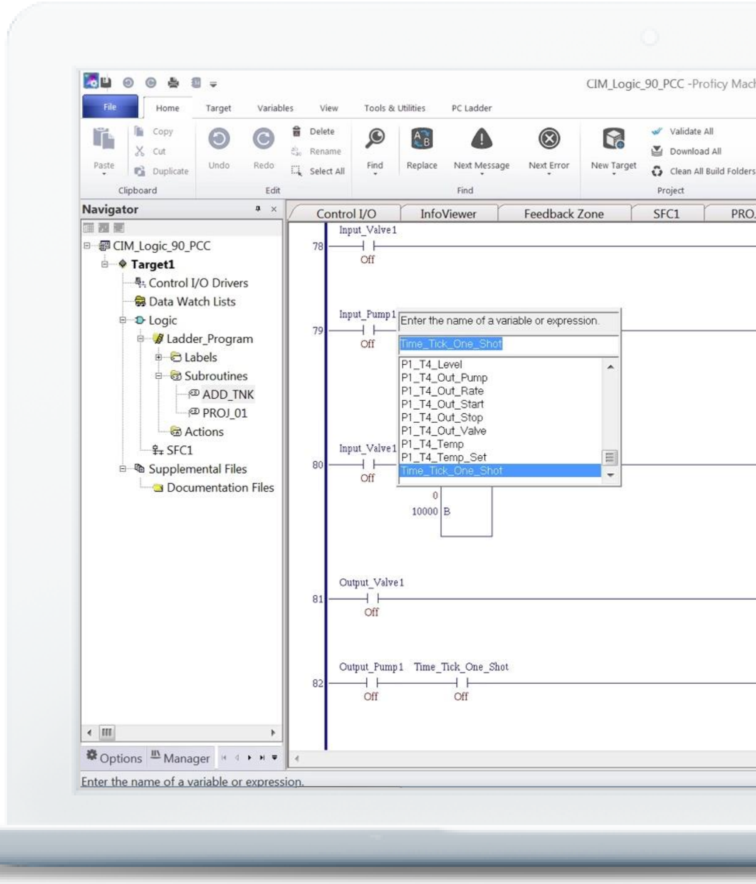
Class Hours

9:00 am - 5:00 pm, daily

What topics will be covered in this course?

Upon completion of this course, the student will be able to: Describe Control System Architecture & Operational Fundamentals

- Operate Machine Edition
- Establish and Utilize Communications to the Controller
- Configure a Controller and its associated hardware modules
- Effectively use and create Controller Variables
- Create Projects in Ladder Diagram (LD), Function Block Diagram (FBD), and Structured Text (ST)
- Understand and program Arithmetic, Timer, Counter, and Move operations
- Utilize programming guidelines for developing robust control applications
- Use User Defined Function Blocks (UDFBs) to build structured applications
- Effectively use the Machine Edition Tool chest as a repository for Application Building Blocks
- Create, Monitor, and Modify running Controller applications



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Day 1 - Morning
Control System Fundamentals
Operating Machine Edition
Machine Edition Options
Day 1 Afternoon
Working with Controllers
Controller Hardware Overview
Configuring Controller and IO

Day 2 – Morning
Ladder Diagram Basics
Machine Edition Toolchest
Day 2 – Afternoon
Online Monitoring Tools
Online Application Modification
Contacts and Coils
Program Flow Operations

Day 3 – Morning
Timers and Counters
Conversion Operations
Math Operations
Relational Operations
Data Operations
Control Operations
Bit Operations
Day 3 – Afternoon
Working with Variables
FBD Programming

Day 4 – Morning
Structured Text Programming
Day 4 – Afternoon
Programming Guidelines
User Defined Function Blocks

Day 1 – Morning

Control System Fundamentals

Introduction to Controllers components and the roles Controllers play in automation.
Controller application components and Logic Structure.
Basic Controller Variables, Data Types, and Numbering Systems.
Understanding the Controller Scan.

Operating Machine Edition

Orientation to the Machine Edition programming environment and purpose of each of its tools.
Machine Edition "Best-Kept Secrets".
Define a Project and Target. Navigate through the Project.
Backup, Delete, and Restore a Project.
Provide Project and Target Documentation.

Machine Edition Options

Day 1 – Afternoon

Working with Controllers

Communications over Serial and Ethernet connections.
Validate a Machine Edition Project.
Download to and Upload from a Controller.
Verify Information between a Project and a Controller.
Work with Fault Tables.
View Controller Status information.

Controller Hardware Overview

Basic controller system hardware components.
Find information using InfoLink and web sites.

Configuring Controller and IO

Configure the Controller, IO, and Option Modules.
Understand Hardware Configuration Status indicators.
Assign Reference Addresses to I/O Modules.
Use the Hardware Reference View. Import and Export Hardware Configuration.
Run and Print Hardware Configuration Reports

Day 2 - Morning

Ladder Diagram Basics

Understand basic operation of the Ladder Diagram (LD) programming language.
Enter a simple LD program with Contacts and Coils. Assign Variables to logic components.
Print LD logic. Place LD Blocks in a Toolchest Drawer for re-use.

Machine Edition Toolchest

Navigating through the Toolchest.
Create Toolchest Drawers.
Share Toolchest Drawers.
Save logic to a Toolchest drawer.
Use Toolchest logic in application.
Save logic modifications to Toolchest.
Toolchest use of Universal Variables "$".

Day 2 - Afternoon

Online Monitoring Tools

Monitor programs using online Logic Monitoring, Data Watches, Reference View Tables, & the Data Monitor.

Online Application Modification

Make program changes while the Controller is running.
Understand online change methods: Word-for-Word, Run Mode Store, and Test Edit.

Contacts and Coils

Understand basic operation of LD Contacts & Coils.
Develop Series and Parallel LD logic.
Utilize System Bits in LD logic.
Find Variable references in a Project. Monitor, modify, and force Boolean Variables.

Program Flow Operations

Understand LD Program Flow operations.
Understand the Controller Block Architecture and the operation of _MAIN and Interrupt Blocks.
Create and call Program Blocks.
Include Toolchest Program Blocks in an application.

Day 3 – Morning

Timers and Counters

The basic operation of LD Timers and Counters.
The organization of Timer and Counter Instance Data.
Use Timers and Counters in LD Logic.

Conversion Operations

The basic operation of LD Conversion instructions.
How to change data display formats in the LD Editor.

Math, Relational, Data, Control, Bit Operations

The basic operation of LD Math instructors.
The concept of Typed Instructions.
Change Variable data values directly in the LD Editor.
The basic operation of LD Relational instructions.
The basic operation of LD Data instructors.
Initialize application data using Data Move Functions.
The basic operation of a Shift Register.
The basic operation of LD Control instructions.
The PID Function Block parameters and its data structure.
The Service Request Function parameters, parameter block, and its uses.
How to display Controller ASCII String information.
Basic operation of LD Bit instructors.
Operation of the Masked Compare Function.

Day 3 – Afternoon

Working with Variables

Understand basic Variable concepts, along with Universal, Local, Global, and Alias scoping of Variables.
Understand Variable Types, Variable access, and the various Variable attributes.

FBD Programming

Introduction to Function Block Diagram (FBD) programming.
Create/ Edit Monitor and Print of FBD Blocks, Logic, Comments and Instructions. Edit and wire FBD logic, negative Boolean flow.
Understand FBD logic solve order.
Call UDFBs from FBD logic. Set FBD Editor configuration options.
Build FBD Blocks for Re-use.

Day 4 – Morning

Structured Text Programming

Create ST Blocks
Create ST Logic
Create ST Comments
ST language Statements, Operators, and Syntax
Types of ST statements: Assignment, CASE, Function Call, RETURN, EXIT, IF, FOR, WHILE, Repeat, and Empty
Edit ST logic
Use/Create variables in ST logic,
Monitor ST logic
Call UDFBs from ST logic
ST Editor configuration options
Considerations when programming in ST
Build ST Blocks for Re-use.

Day 4 – Afternoon

Programming Guidelines

Guidelines such as program organization and naming conventions for variables, blocks, etc.

User Defined Function Blocks

Basic UDFB facts.
UDFB Input, Output, and Member Variables.
How UDFBs operate.
How to create and monitor UDFBs.
UDFB Toolchest considerations.
Update an existing UDFB with a new UDFB.
Build UDFB Blocks for Re-use.

Course Options ½ Day

Introduction to PROFINET [OPTIONAL]

Introduction to PROFINET industrial automation networking.
Overview of the GE PROFINET solution.
PROFINET reference resources.
Hands on PROFINET exercises.

Part #: 44A728312-447

Controller Programming – Logic Developer
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