

CDN-Automation

TIA Portal Programming Advanced Principles

General Information

Course Code: CDN-ST-TIAADV
Length: 2 Days

Audience

This course is aimed at medium to heavy TIA Portal Programmers. This course is for SIMATIC S7-1500, S7-1200, S7-300, and S7-400 PLC users with engineering experience in the design and sustaining of SIMATIC automation systems and their application programs.

Prerequisites

- TIA Portal Programming 1 or TIA Portal Service 1
- Knowledge of TIA software platform
- Knowledge of Siemens PLC hardware configuration
- Siemens PLC basic programming (blocks, programming languages, standard instructions)
- Siemens PLC basic troubleshooting
- Siemens HMI basic configuration

Profile

This course is a two-day intensive dive to TIA Portal Programming. The focus will be on hands-on labs, rather than lecture.

Objectives

Upon completion of this course, the student shall be able to:

- Leverage the power of Block and Function libraries.
- Use LAD and STL for Programming required functions
- Employ direct and indirect addressing in a program.
- Incorporate System Functions (SFC) in a program.
- Integrate an HMI and Drive system with the PLC on a PROFINET network.
- Program Instance and Multi-Instance Block calls.
- Use interrupt-driven and error processing program execution blocks.
- Leverage STEP7 advanced diagnostics.

Topics

1. HW Commissioning
 - a. Identify and upload h/w in TIA
 - b. Adapt hardware configuration to existing hardware
 - c. Networks configuration and Distributed IO
 - d. HMI configuration
 - e. Compile, download
2. Program Design
 - a. Block types
 - b. Programming editor and instructions
 - c. IEC timers/counters
 - d. Troubleshooting
3. Analog Processing and Arithmetic
 - a. Analog I/O, direct access

- b. Scaling/un-scaling:
 - i. SCALE/UNSCALE, NORM_X/SCALE_X
 - c. IN_RANGE, OUT_RANGE, CALCULATE
 - d. Implicit data conversion
4. Multiple Instancing
 - a. Principles:
 - i. instances using global DB, parameter instances and FB static parameters
 - b. Reusability:
 - i. generically programmed functions, using of libraries and versioning of blocks in libraries
 - c. Optimization:
 - i. DB download without re-initialization, temp variables in optimized blocks, access OB start info in optimized OBs. LAB: multiple instancing for IEC Timer change current FBs into re-useable FBs; use libraries and versions.
5. Complex Data, Addressing
 - a. Date and Time, AT-construct, DTL
 - b. Strings and WStrings
 - c. Slice access
 - d. Arrays:
 - i. loops in LAD with indexed arrays, copy arrays and structures, VARIANT pointer, array DBs, DB_ANY type
6. System Diagnostics, Error Handling
 - a. System diagnostics:
 - i. LEDs, CPU Display, Step7 s/w, CPU webserver, HMI system diagnostics control
 - b. User program:
 - i. error OBs, program instructions LOG2GEO, DeviceStates, GET_ERROR
7. Technology Objects
 - a. TO in Simatic S7
 - b. PID TO
 - c. Motion Control TO
 - d. Technology functions/instructions
8. Review