



# **PLC & SCADA Systems: Integration, Communication & Troubleshooting Training**

15 – 19 November 2026  
Muscat (Oman)



## PLC & SCADA Systems: Integration, Communication & Troubleshooting Training

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PLC & SCADA Systems: Integration, Communication & Troubleshooting Training is a 5-day intermediate course on connecting controllers to supervisory systems, running the networks between them and tracing faults quickly. It is for instrumentation, control, electrical and maintenance staff who support automated plants. You work through PLC, network and SCADA cases and take back a completed PLC-SCADA Fault Finding Toolkit. The course is delivered by Mercury Training Center.

### About This Course

A tag freezes on the operator screen, a remote station drops offline and nobody knows whether the cause is the field device, the controller logic or the network. To follow this course you should already read ladder logic and wiring diagrams. You practice by configuring tags, analyzing protocol traffic and diagnosing staged faults step by step.

### Who It Is For

- Staff who maintain and modify controller hardware, I/O and logic on running process or production lines
- Staff responsible for configuring and supporting supervisory screens, servers, historians and alarms
- Staff who install and support plant networks, remote terminal units and field communication links
- Operators who monitor plants from a control room and first report abnormal readings
- Engineers who commission or upgrade control systems and must hand them over in working order

This course is not for newcomers who have never worked with controllers, who are better served by an introductory automation course, nor for specialists who want vendor-specific advanced programming, who are better served by a platform-specific controller course.

### Competencies You Will Build

- Controller Logic Reading: you follow the scan cycle and program flow to explain why an output behaves as it does
- Supervisory System Integration: you link controller data to operator screens, historians and alarms without mismatched tags
- Protocol Selection and Setup: you choose and configure the right industrial protocol for each link in the plant
- Network Health Checking: you inspect topology, addressing and traffic to confirm a link is sound
- Structured Fault Finding: you isolate a fault to field device, I/O, logic, network or SCADA in a logical sequence
- Control System Security Awareness: you spot weak access points in plant networks and report them

## What You Will Be Able to Do

By the end of the course you will be able to:

- Given an I/O list and a control narrative, write and test a short IEC 61131-3 routine in ladder and function block form
- Using a controller address map, build a SCADA tag database with scaling, quality flags and alarm limits
- From a plant sketch, draw a network architecture that assigns Modbus TCP, EtherNet/IP, Profinet, DNP3 or OPC UA to each link
- Given a protocol capture, identify timeouts, exception codes and addressing errors on a failing link
- Using diagnostic buffers and status indicators, locate a staged I/O or controller fault and record its root cause
- From a set of alarm records, separate nuisance alarms from real events and propose corrections

## Course Content

### Day 1: PLC Hardware, Scan Cycle and Programming

- PLC CPU, Memory Organization and Digital and Analog I/O Modules
- Scan Cycle Timing and Its Effect on Fast Process Signals
- IEC 61131-3 Languages: Ladder, Function Block and Structured Text
- Timers, Counters and Interlocks in Pump and Valve Control
- Analog Signal Scaling for 4-20 mA Transmitters

### Day 2: SCADA Architecture and System Integration

- SCADA Layers: Field Devices, RTUs, Servers and HMI Clients
- PLC-to-SCADA Tag Mapping, Addressing and Data Quality Flags
- Historian Configuration for Trends and Production Records
- Alarm Design and Rationalization Using ISA-18.2 Principles
- Redundant Servers and Failover in Continuous Process Plants

### Day 3: Industrial Communication and Networks

- Modbus RTU and Modbus TCP Framing, Registers and Exception Codes
- Profibus, Profinet and EtherNet/IP on Production Lines
- DNP3 IEEE 1815 for Remote Stations in Utility Networks
- OPC UA IEC 62541 for Linking Controllers to Plant Information Systems
- Network Topologies, Segmentation and IEC 62443 Security Basics

## Day 4: Structured Fault Finding

- Troubleshooting Road Map from Symptom to Root Cause
- Field Device and I/O Fault Diagnosis with Multimeter and Loop Checks
- Controller Diagnostic Buffers, Status LEDs and Online Monitoring
- Communication Link Diagnosis with Protocol Analyzers and Traffic Captures
- SCADA Data Faults: Stale Tags, Bad Quality and Time Stamp Errors

## Day 5: Integrated Troubleshooting Practice

- Exercise Revisiting the Tag Database on a Case Pumping Station
- Exercise Tracing a Lost Remote Station Across the Communication Path
- Exercise Diagnosing a Staged Logic and I/O Fault on a Case Line
- Fault Records, Handover Notes and Preventive Checks
- Completing and Presenting the PLC-SCADA Fault Finding Toolkit

## Case Studies and Exercises

The following are suggested activities used during the course.

- Case study: a water utility whose remote pumping stations report intermittently on the SCADA screen; you decide whether the fault lies in the radio link, the RTU or the polling setup.
- Case study: an oil and gas gathering facility with frequent nuisance alarms; you rationalize the alarm list and reset limits.
- Exercise: a packaging line with a Profinet device that drops out under load; you analyze the traffic and correct the configuration.
- Exercise: a power plant auxiliary system with a frozen analog value; you trace it from transmitter to HMI and record the root cause.

## What You Take Back

You return with a PLC-SCADA Fault Finding Toolkit for your own site. In your first month back you use it to review one system with your team, check its tag database and network map, and apply the checklists to the next fault reported from the control room.

- Step-by-step fault finding road map with decision points
- Tag database and alarm review checklist
- Network architecture sheet with protocol and addressing records
- Fault record template for root cause and corrective action

## Quick Answers FAQ

### What should I know before PLC and SCADA troubleshooting training?

You should already read ladder logic, loop and wiring diagrams and use basic test instruments. Hands-on time with any controller platform helps, since the course builds on that experience rather than starting from first principles.

### How does PLC and SCADA integration training differ from a PLC programming course?

A programming course centers on writing controller logic on one platform. This intermediate course covers the whole chain from field device to operator screen, so you work on tag mapping, protocols, networks and fault isolation across the system.

### Which industrial communication protocols are used between PLCs and SCADA?

Common choices are Modbus RTU and TCP, Profibus and Profinet, EtherNet/IP, DNP3 for remote stations and OPC UA for linking to plant information systems. The right one depends on distance, device support, speed and the security needs of each link.

### What do I take back from PLC and SCADA fault finding training?

You take back a PLC-SCADA Fault Finding Toolkit with a troubleshooting road map, tag and alarm checklists, a network architecture sheet and a fault record template for your own site.

### For Your Manager

After the course, your team member will be able to read controller logic, integrate controller data with SCADA, configure industrial protocols and isolate faults across I/O, logic, network and supervisory layers. They return with a PLC-SCADA Fault Finding Toolkit, first used to review one site system and to handle the next fault reported from the control room.