



Training Program:
PLC (Programmable Logic Controller) & SCADA
(Supervisory Control and Data Acquisition) Systems

INTRODUCTION

In modern manufacturing and industrial processes, petroleum industries, utilities, petrochemical and pipeline industries, telemetry is often needed to connect equipment and systems separated by large distances. This can range from a few meters to thousands of kilometers. Telemetry is used to send commands, programs and receives monitoring information from these remote locations. SCADA refers to the combination of telemetry and data acquisition. SCADA encompasses the collecting of the information, transferring it back to the central site, carrying out any necessary analysis and control and then displaying that information on a number of operator screens or displays. The required control actions are then conveyed back to the process.

Computer-based supervisory control and data acquisition (SCADA) systems have evolved over the years, from standalone, compartmentalized operations into networked architectures that communicate across large distances. In addition, their implementations have migrated from custom hardware and software to standard hardware and software platforms. These changes have led to reduced development, operational and maintenance costs as well as providing executive management with real-time information that can be used to support planning, supervision and decision making.

The functionality of the PLC has evolved over the years to include capabilities beyond typical relay control; sophisticated motion control, process control, distributive control systems and complex networking have now been added to the PLC's list of functions. The PLC is still one of the most widely used control systems in industry. As need to monitor and control more devices in the plant grew, the PLCs were distributed and the systems became more intelligent and smaller in size.

This course is designed to cover the PLC and SCADA systems covering also other new developments in this area. It commences with a brief review of the fundamentals of PLC and SCADA systems hardware, software and the typical communications systems (such as RS-232, RS-485, Ethernet and TCP/IP) that connect the SCADA operator situations together.

The course is intended to be product independent but examples will be taken from existing products to ensure that all aspects of the protocols are covered. Allen Bradley and Siemens simulators will be used for practical sessions. Finally, this course will provide you with the tools to design your next SCADA system more effectively using open protocols and to integrate same with your PLCs as RTUs.

WHO SHOULD ATTEND

- Instrumentation and Control Engineers
- Process control Engineers

- Electrical Engineers
- Consulting Engineers
- Design Engineers
- Control Systems Sales Engineers
- Maintenance Supervisors
- Control System application engineers
- Project Engineers
- Technicians
- Plant Engineers
- IT Personnel

CERTIFICATE

BTS attendance certificate will be issued to all attendees completing minimum of 80% of the total course duration.

COURSE OBJECTIVES

Upon the successful completion of this course, participants will be able to:-

- Apply knowledge and skills on programmable logic controllers (PLC) and SCADA systems
- Discuss the PLC digital bit functions and its application
- Determine the types and various applications of advance control with PLC and the functions of PLC sequencer and PID control along with the analog PLC operation
- Identify the Intelligent Electronic Devices (IED's)

- Ensure the correct application of Ethernet & TCP/IP networks and be familiarize with Fieldbus and SCADA communication system
- Apply the “best practice” decisions on the best and most cost effective use of SCADA open protocols

COURSE OUTLINE

Overview of Programmable Logic Controllers

Programmable Logic Controllers • Parts of a PLC • Principles of Operation • Modifying the Operation • PLC versus Computers • PLC Size and Application • PLC Hardware Components

Overview of SCADA Systems

SCADA Systems • Remote Terminal Units • PLCs used as RTUs • The Master Station • Communication Architectures • Communication Philosophies • Basic Standards: RS-232 and RS-485 • SCADA Protocols • The Open Systems Interconnection Model

Overview of PLC Programming

Processor Memory Organization • Program Scan • PLC Programming Languages • Relay-Type Instructions • Instruction Addressing • Branch Instructions • Internal Relay Instructions • Programming

EXAMINE IF CLOSED and EXAMINE IF OPEN Instructions • Entering the Ladder Diagram • Modes of Operation

PLC Digital Bit Functions and Applications

Introduction • Bit Patterns in a Register • Changing a Register Bit Status
• Shift Register Functions • Shift Register Applications

Advanced Control with PLCs

The Concept of Reusable Logic • Examples, and Alarm Handling • Functions • Blocks

PLC Sequencer Functions

Introduction • Electromechanical Sequencing • The Basic PLC Sequencer Function • A Basic PLC Sequencer Application with Timing • Other PLC Sequencer Functions

PID Control

The Importance of Timing and Scan Time • When PID is not always Appropriate, • PID applications

Practical Session

Programming Examples • Practical Programs Implementation

Analog PLC Operation

Introduction • Types of PLC Analog Modules and Systems • PLC Analog
Signal Processing • BCD or Multibit Data Processing

Practical Session

Programming Examples • Practical Programs Implementation

Open SCADA Protocols

Interoperability and Open Standards • Development of Standards •
Interoperability and Open Standard • System Topology • Background
and Development

Intelligent Electronic Devices (IEDs)

Definitions • Functions

Ethernet & TCP/IP Networks

IEEE 802.3 CSMA/CD ('Ethernet') • Physical Layer • Signaling Methods
• Medium Access Control • Frame Transmission • Frame Reception
• Collisions • MAC Frame Format • Difference between 802.3 and
Ethernet • Reducing Collisions • Ethernet Design Rules • TCP/IP

Fieldbus & SCADA Communications Systems

Introduction • Profibus • Foundation Fieldbus

Practical Session

Introducing Print Out for Actual SCADA Systems Design & Displays

Wrap-UP & General Discussion