



Training Program:
Industrial Data Communications & SCADA basics

INTRODUCTION

Industrial data communication is characterized by its operating environment. Electromagnetic interference (EMI), long distances and physical barriers set industrial communications apart from typical business office requirements. Conventional equipment usually lacks the versatility to adapt to the unique requirements of data monitoring and process control. In response to the growing needs in industrial data communications, a number of purpose developed industrial data communications devices have entered the marketplace. Their designs are a result of field experience in solving difficult data communications problems and optimizing characteristics for all aspects of reliability and economy. With so many different standards on the market today, the debate is not about what is the best - be it Foundation Fieldbus, Profibus, Devicenet or Industrial Ethernet but rather about selecting the most appropriate technologies and standards for a given application and then ensuring that best practice is followed in designing, installing and commissioning the data communications links to ensure they run fault-free. The industrial data communications systems in your plant underpin your entire operation. It is critical that you apply best practise in designing, installing and fixing any problems that may occur. This Course distils all the tips and tricks with the benefit of many years of experience and gives the best proven practices to follow. Ethernet, TCP/IP and the Internet technologies are reshaping the way that control, data transfer, and maintenance are being carried out in industrial plants around the world. In this course, you will learn more about the latest developments in networking, including practical tips on testing TCP/IP based networks and where to safely use an industrial Web intranet. This course provides a thorough understanding of modern industrial data communication including basic communication principles, hardware interfaces such as RS232, communication protocols: ASCII based protocol, Modbus and other industrial protocols in peer-to-peer or network environment. The Course provides "hands-on" work experience in using communication protocols handshaking techniques for various modern smart instruments and devices.

WHO SHOULD ATTEND?

This course is designed for personnel with a need to understand the techniques required to use and apply modern industrial communications and telecommunications technology as productively and economically as possible. This includes electrical, control and instrumentation, SCADA and telemetry systems, process control engineers and supervisors, engineering managers, network administrators, field technical support staff and project management staff.

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 the latest technology of industrial data communications and telecommunications in accordance with the international standard, EIA-232, 422, 423 and 485
- Explain the inner working of proprietary PLC networks and the Local Area Network (LAN) topologies and protocols
- Compare media access techniques such as CSMA/CD, token passing and master/slave
- Describe design methods for LANs using Ethernet and identify the different Ethernet varieties and which are best for industry
- Apply the options for Ethernet hardware to avoid instant obsolescence and being locked in the past and describe the Open Systems Interconnection (OSI)
- Discuss the structure of the telephone system impacts industrial networks and the analog dial-up connections and modems standards
- Employ the LAN, WAN, Intranet, Internet, TCP/IP protocols, addressing and troubleshooting
- Describe Smart Instrument Systems such as HART and discuss the fieldbus protocols and configurations

COURSE OUTLINE

Introduction

- What is Data Communications

Definitions , Basic Principles and Coding

- Background to Data Communications
- Sources , Receivers and the Communications Interface
- Transmission Modes - Simplex and Duplex
- Bits , Bytes and Characters
- Parallel and Serial Communications
- Analog and Digital Signals
- The Coding of Messages - The ASCII Code
- Data Transmission Speeds
- The Format of Messages
- Introduction to Error Detection and Correction (EDAC)

Data Communications Standards

- Null Modems
- Modem Control & Handshaking
- Trouble Shooting on RS-232
- EIA-RS-423 Interface Standard
- EIA-RS-422 Interface Standard
- EIA-RS-485 Interface Standard
- Comparison of EIA Interface Standards
- Interface Converters
- Current Loop Interface
- Introduction to Networks
- Testing Equipment (Breakout Box , Line Analyser)

- Protocol Analyser Practical

Selection and Installation of Copper Data Cables

- Cables with Copper Conductors
- Interference and Noise (IEEE-518)
- Cable Selection and Installation Recommendations

Modems and Interface Converters

- Concept of a modem
- Various Modulation Techniques
- Smart Modems

OSI-Open Systems Interconnection

- Modern Factory Automation & Process Control Systems
- OSI Reference Model and Standards
- Individual Layers
- Illustrative Example of OSI

Local Area Networks

- LAN History
- LAN Topologies
- LAN Media Access Control techniques
- LAN Standards
- Protocols: TCP/IP
- LAN Extension and Interconnection (Bridging, Switching, Routing)
- Physical Issues
- CSMA/CD Bus (Ethernet Standard)
- Industrial Ethernet
- Wireless local Area networking: IEEE 802.11

Proprietary Protocols

- The Concept of a Protocol
- Protocol Design
- Data Processing Protocols
- Allen Bradley Data Highway Plus Protocol

Proprietary Protocols (cont'd)

- Modbus history and evolution
- Modbus concepts and message structure
- Modbus Plus
- Modbus TCP/IP
- Modbus interfacing

**Selection of Standards and Protocols
Smart Instrument Systems**

- Digital vs. Analog Data Transmission
- Cabling
- Remote diagnostics and calibration
- HART

Fieldbus Protocols

- Actuator Sensor Interface (ASI)
- CANBus
- DeviceNet
- InterBus

Fieldbus Protocols (cont'd)

- Profibus DP
- Profibus PA

- Foundation Fieldbus

SCADA

- SCADA system
- Control centres
- Remote Terminal Units
- Communication
- SCADA advantages
- Typical SCADA applications

Conclusion

- Pulling all the Strands Together