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# BACK TO BASICS DATA COMMUNICATIONS, NETWORKING AND PROTOCOLS FOR INDUSTRY



## **YOU WILL LEARN HOW TO:**

- Understand the basic concepts of data communications used in industry
- Talk knowledgeably to their peers, clients and suppliers of equipment on data communications
- Have a good understanding of the best current practice for data communications
- Specify simple hardware and software requirements of data communications systems
- Competently explain the RS-232, RS-422 and RS-485 interface standards;
- Provide a working explanation of current industrial protocols such as Modbus
- Troubleshoot simple data communications systems
- Understand how to construct simple Ethernet and TCP/IP networks
- List and describe simply the most important Fieldbus and DeviceNet standards

## **WHO SHOULD ATTEND:**

This workshop is designed specifically if you have NO knowledge of Data Communications, Networking and Protocols for Industry and wish to acquire a simple understanding of how to apply this to your work. You will be working in the engineering and industrial environment.

# The Workshop

An efficient data communications system underpins all modern manufacturing industry, mining plant, water and electrical utilities and it is critical to have a good working knowledge of what is being used. No one and certainly no industrial equipment is an island any longer but connected together in some form of network. People who don't work in the area of data communications often have a fear of the unknown and this workshop demystifies the technology and gives you a solid understanding of how to apply it effectively to your job.

This training workshop assumes you have no knowledge of the technology and gives you a thorough review of the basics of industrial data communications, networking and protocols so that you can apply this knowledge to your work immediately on the completion of the course.

## Pre-requisites

None whatsoever besides an enthusiasm to learn.

# The Program

## OUTLINE OF COURSE OBJECTIVES

### BACKGROUND TO DATA COMMUNICATIONS

- What is Data Communications
- Brief Overview of the course
- Overview of modern industrial systems

### DEFINITIONS AND BASIC PRINCIPLES

- Bits , Bytes and Characters
- Parallel and Serial Communications
- Analog and Digital Signals
- The Coding of Messages - The ASCII Code
- Practical Demonstration of Coding
- Data Transmission Speeds
- The Format of Messages
- Introduction to Error Detection and Correction
- The Importance of Standards
  - ISO , ANSI , CCITT , IEEE , EIA
  - EIA , RS-232 Interface Standard

### DATA COMMUNICATIONS STANDARDS BASICS

- RS-232
- Trouble Shooting of RS-232
- RS-422 Interface Standard
- RS-485 Interface Standard
- Comparison of "RS" standards
  - RS-232/485 interface Converters
  - Current Loop Interface
- Troubleshooting RS-232 and RS-485
- Testing Equipment (Breakout Box , Line Analyser)
- Protocol Analyser Practical

### SELECTION AND INSTALLATION OF DATA CABLES

- Cables with Copper Conductors
- Interference and Noise
- Optical Fibre cables
- Cable Selection and Installation Recommendations

## MODEMS

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

## OSI-OPEN SYSTEMS INTERCONNECTION

- Modern Factory Automation & Process Control Systems
- OSI Reference Model and Standards

## PROTOCOLS FUNDAMENTALS

- The Concept of a Protocol
- Simple ASCII Based Protocols
- Practical Demonstration of ASCII
- Industry Standard Protocols eg Modbus
- Practical Demonstration of Modbus
- Allen Bradley Data Highway Plus Protocol

## ETHERNET AND TCP/IP BASICS

- How Ethernet Works
- The very basics of TCP/IP
- How TCP/IP fits onto Ethernet
- How to construct a simple Ethernet and TCP/IP network

## SMART INSTRUMENTS CONCEPTS

- What is a smart instrument
- HART

## FIELDBUS AND DEVICENET BASICS

- Actuator Sensor Interface (ASI)
- DeviceNet
- Profibus
- Foundation Fieldbus
- Where to use each smart instrument standard

## SIMPLE ROADMAP OF DATA COMMUNICATIONS STANDARDS