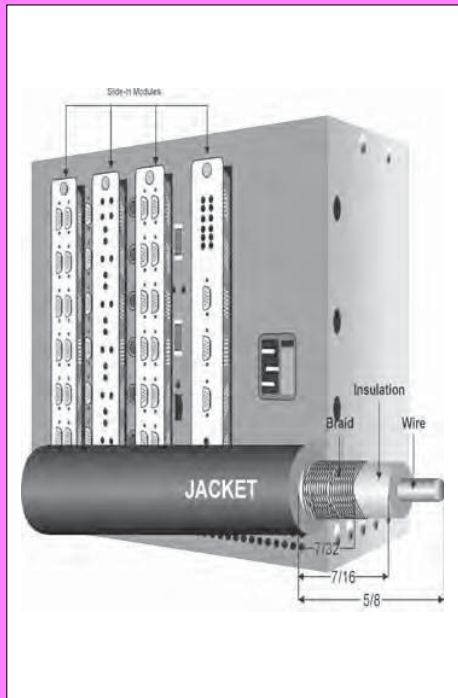


# PRACTICAL INDUSTRIAL NETWORKING FOR ENGINEERS AND TECHNICIANS

The Basics of Industrial Networked Systems including:

- Industrial Ethernet
- TCP/IP
- Fieldbus & DeviceNet
- Switches and Routers
- RS-485
- Cabling rules for Industrial Networks



## YOU WILL GAIN:

- Practical hands-on experience in setting up a LAN including a comprehensive overview of current industrial networking technology
- Fundamental rules for cabling of industrial networking
- How to install and configure a network under expert guidance during practical sessions
- The most effective approaches to troubleshooting from the experts
- The important steps in designing, installing and managing an industrial network system
- How to improve the performance of your system, save your company money and relieve the frustrations of your co-workers and management

## WHO SHOULD ATTEND:

- Instrumentation and Control System Engineers
- Electrical Engineers
- Project Engineers
- Design Engineers
- Electrical and Instrumentation Technicians
- Process Control Engineers
- Maintenance Engineers and Supervisors
- Systems Engineers

## The Workshop

Practical Industrial Networking is a hands-on basic introduction to the world of industrial networking. The focus is on the physical layer and installing and commissioning simple Industrial Networking systems. Despite the focus on the basics and fundamentals you will still leave the workshop with valuable tools in designing, installing, commissioning and installing your own industrial network.

Ethernet is fast becoming the obvious choice for industrial control networking worldwide and the course will focus on this. While the basic structure of Ethernet has not changed much, the faster technologies such as Fast Ethernet and Gigabit Ethernet have increased the complexity and choices you have available in planning and designing these systems.

As Ethernet has become more complex, a number of misconceptions have arisen as to how Ethernet functions and how the system should be optimally configured. This workshop addresses these issues in a clear and practical manner, thus enabling you to apply the technology quickly and effectively in your next project.

The workshop commences with a brief outline of the fundamentals of Ethernet and its operation. The method of access is discussed in depth and topics such as full duplex and auto negotiation are explained. The best methods of designing and installing the cabling systems are then explored with the discussion ranging from 10Base-T over twisted pair to Gigabit Ethernet cabling. Methods of optimising Ethernet to obtain best performance are then defined.

Finally the all important topic of troubleshooting is examined with a summary of the typical problems you are likely to encounter from a two station network all the way up to a system comprising 30,000 PCs.

### Pre-requisites

Fundamental knowledge of basic electrical concepts.

## Practical Sessions

During the 2-days of this workshop there are ten practical sessions including:

- Configuration of an Ethernet Network
- Configuration of a simple Network Protocol
- Demonstration of typical failure points
- Diagnosis of Network Hardware problems
- Configuration of a network with a switch
- Addition of TCP/IP Protocol
- Use of basic utilities for troubleshooting
- Troubleshooting with simple Protocol Analyser
- Identification of Problems with utilities and Protocol Analyser
- Benchmarking performance of Ethernet

## The Program

### INTRODUCTION TO INDUSTRIAL NETWORKING

- Background
- Network Communications
- LANs/MANs/WANs
- The Open Systems Interconnection Model
- Interoperability
- Network Topologies
- Transmission Media and Access Techniques
- Protocols

### FUNDAMENTALS OF INDUSTRIAL NETWORKING

- Main LAN Types
- RS-485
- Modbus
- Master-slave
- Ethernet
- Token Passing

### FIELDBUS AND DEVICENET AS INDUSTRIAL NETWORKS

- ASiBus
- DeviceNet
- Profibus DP/PA
- Foundation Fieldbus

### OPERATION OF ETHERNET SYSTEM

- Ethernet Standards
- Logical Link Control Frames
- Transmission Media and Access Techniques
- Media Access Control Protocol
- Full Duplex Ethernet
- Auto negotiation

### DIFFERENT CABLE TYPES FOR INDUSTRIAL ETHERNET

- Twisted Pair Ethernet
- Fibre Optic Media
- Fast Ethernet Twisted Pair
- Fast Ethernet Fibre Optic Cabling
- Gigabit Ethernet Twisted Pair
- Gigabit Ethernet Fibre Optic Systems

### LAN INTERCONNECTION COMPONENTS

- Repeaters, Switches, Bridges
- Routers
- Gateways
- Multisegment Configuration using Repeaters
- Redundancy and Reliability

### PROTOCOLS THAT WORK WITH ETHERNET

- TCP/IP
- Modbus and Ether/IP
- IPX/SPX and NetBEUI
- IP Addressing
- Routing on the networks
- Error and Control messages
- User Datagram Protocol (UDP)
- Utilities with TCP/IP

### CONSTRUCTION OF THE ETHERNET SYSTEM CABLING AND HARDWARE

- Structured Cabling
- Twisted Pair Cables and Connector
- Fibre Optic Cables and Connectors
- Ethernet Repeater Hubs
- Ethernet Switching Hubs
- Industrial versus Commercial Networks

### NETWORK DESIGN CONCEPTS

- System Design
- Design Simplicity
- Design Documentation

### PERFORMANCE AND TROUBLESHOOTING TYPES OF PROBLEMS

- Hardware
- Protocols
- Software

### TOOLS

- Basic Utilities
- Protocol Analyser
- Ethernet Performance
- Troubleshooting of Ethernet

### WIRELESS AND INDUSTRIAL NETWORKS

- Fundamentals
- Quick overview

### SUMMARY, OPEN FORUM AND CLOSING

## Workshop Objectives

At the end of this workshop participants will be able to:

- Detail where to apply each type of industrial network
- Specify how to install an Ethernet network
- Install and configure a simple Ethernet network
- List and explain the main features of High speed and Gigabit Ethernet
- Know when to use repeaters, bridges, switches, and routers
- Install the cabling and hardware for a typical Ethernet Network
- Learn the truth about deterministic operation of Ethernet Networks
- Decide on the best cabling and connectors for your harsh or office environment
- Apply the structured cabling system concepts to your next project
- Apply the principles of Ethernet security and redundancy
- Perform simple troubleshooting tasks on a Network
- Perform simple troubleshooting tasks on an industrial Network
- Configure and show how TCP/IP are used in a typical Network