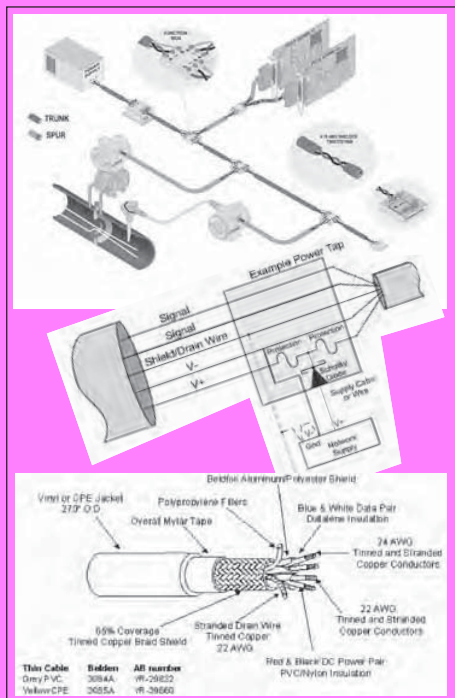


# PRACTICAL FIELDBUS, DEVICENET AND ETHERNET FOR INDUSTRY



## COVERING:

- RS-232/RS-485
- DeviceNet
- ASiBus
- Profibus
- Foundation Fieldbus
- Industrial Ethernet

## YOU WILL LEARN HOW TO:

- Compare the Ethernet and Fieldbus/Devicenet standards
- Troubleshoot and fix simple DeviceNet, Profibus and foundation Fieldbus problems
- Design and install simple Ethernet networks
- Know when to use repeaters, bridges, switches, and routers
- Apply switched Ethernet systems effectively
- Install the cabling and hardware for a typical industrial Ethernet network
- Decide on the best cabling and connectors for your harsh or office environment
- Apply the structured cabling system concepts to your next project
- Perform simple troubleshooting tasks on a network

## WHO SHOULD ATTEND:

- Anyone involved in the installation, design and support of industrial communications systems
- IT managers working with networks
- Electrical engineers
- Project engineers
- Design engineers
- Systems engineers
- Electrical and instrumentation technicians
- Maintenance engineers and supervisors
- Instrumentation and control system engineers
- Process control designers and systems engineers
- Instrumentation technologists and engineers

## The Workshop

The Fieldbus and DeviceNet standards are becoming a standard at the field and instrumentation level, and are replacing the traditional approaches in the plant today. Ethernet is fast becoming the obvious choice for industrial control networking at the higher levels.

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. There has also been a convergence between Fieldbus and DeviceNet standards in that they are also increasingly becoming based on industrial Ethernet for the higher speed data transfer applications.

There is a fair degree of confusion about where Fieldbus, DeviceNet and Ethernet, are applied and the workshop commences with a clear comparison between the different standards and where they are applied.

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

## Practical Sessions

This is a practical, hands on workshop enabling you to work through practical exercises which reinforce the concepts discussed.

- 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 and hub
- Addition of TCP/IP protocol
- Use of basic utilities for troubleshooting
- Set up ASibus, Profibus and DeviceNet networks
- Design calculations of foundation Fieldbus systems
- Connection between Ethernet and Fieldbus /DeviceNet systems
- Design calculations for DeviceNet

## The Program

### FUNDAMENTAL PRINCIPLES OF INDUSTRIAL COMMUNICATIONS

- Quick revision of communications
- Interface standards (RS-232/RS-485)
- Industrial protocols (Modbus)
- Industrial networks
- Road map and comparison of Ethernet/Fieldbus/DeviceNet standards

### DEVICENET

- Fundamentals
- Configuration
- Troubleshooting

### ASI BUS

- Fundamentals
- Configuration
- Troubleshooting

### PROFIBUS PA AND DP

- Fundamentals
- Configuration
- Troubleshooting

### FOUNDATION FIELDBUS

- Fundamentals
- Configuration
- Troubleshooting

### CONNECTING ETHERNET, FIELDBUS AND DEVICENET

- Connecting the different systems together

### FUNDAMENTALS OF ETHERNET

- Ethernet standards
- Collisions and CSMA/CD
- Ethernet frames
- MAC addresses – hardware/unicast/multicast and broadcast
- Sub Network Access Protocol (SNAP) frame format
- Full duplex Ethernet
- Frame related terms (runt/fragment/jabber/jam, interpacket-gap/slot time)
- 10Base-5, 10Base-2, 10Base-T
- Problems with and upgrade options
- Full duplex Ethernet

### CONSTRUCTION OF THE ETHERNET SYSTEM CABLING – FIBRE AND COPPER

- Structured cabling
- Unshielded twisted pair (Cat5, Cat5E, Cat6)
- Twisted pair cables and connector
- Fibre optic cables and connectors
- Ethernet repeater hubs
- Ethernet switching hubs
- Troubleshooting Ethernet

### 100MBIT/S FAST ETHERNET

- Fundamentals of fast Ethernet
- Media Independent Interface (MII)
- 100 Mbit./s physical level encoding
- Fast Ethernet 100 Base-TX, 100Base-FX, 100Base-T4, 100Base-T2
- Design considerations

### 1 GBIT/S AND 10 GBIT/S ETHERNET

- Operation
- IEEE 802.3z
- Gigabit Ethernet repeaters and switches
- Backward compatibility

### VIRTUAL LANs (VLANs) USING ETHERNET

- Essentials of VLANs
- VLANs based on ports, MAC addresses, protocols
- Frame encapsulation methods (eg IEEE 802.1Q)
- Trunking protocols

### ETHERNET INTERCONNECTION AND OPERATION

- Repeaters, switches, bridges
- Routers
- Gateways
- Redundancy and reliability
- Switched Ethernet
- Spanning tree algorithm

### PROTOCOLS THAT WORK WITH ETHERNET

- TCP/IP
- Modbus and Ether/IP
- Routing on the network
- User Datagram Protocol (UDP)
- Utilities with TCP/IP

### SUMMARY, OPEN FORUM AND CLOSING