

# PRACTICAL DATA ACQUISITION USING PERSONAL COMPUTERS AND STANDALONE SYSTEMS



## YOU WILL LEARN HOW TO:

- Install and configure a data acquisition system
- Choose and configure the correct software
- Apply state of the art approaches in design of data acquisition systems
- Configure data communications systems
- Avoid the common pitfalls of designing a data acquisition system

## WHO SHOULD ATTEND:

- Instrumentation and control system engineers
- Electrical engineers
- Project engineers
- Design engineers
- Technicians
- Process control engineers
- Maintenance engineers
- Systems engineers
- DCS Personnel



## The Workshop

### Pre-requisites

Basic electrical knowledge would be useful.

## Practical Sessions

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

## The Program

### INTRODUCTION

- What is data acquisition and control
- Fundamental principles of data acquisition and control systems
- Typical PC based applications

### ANALOG AND DIGITAL SIGNALS

- Classifications of signals
- Sensors and Transducers
- Temperature Transducers (RTD / Thermocouples / Silicon IC'S)
- Strain Gauges
- Single Ended and Differential Systems
- Noise and Interference
- Sources and Types of Noise
- Field Wiring and Noise Considerations
- Ground Loops
- Common Mode Voltages and CMRR
- Earthing and Isolation Techniques to Reduce Noise
- Cable Shielding and Earthing

### SIGNAL CONDITIONING

- Classification of signal Conditioning Hardware
- Distributed I/O (Two wire Transmitters / Digital Transmitters)
- Signal Conditioning Functions
- Instrumentation Amplifiers
- Filters for Signals (Low Pass / Band Pass / High Pass / Butterworth)
- Isolation and Overvoltage Protection

### LAB VIEW SOFTWARE PRACTICAL

### PLUG IN DATA ACQUISITION BOARDS

- Advantages of plug in systems
- Typical Analog to Digital (A/D) boards
- Analog Input Circuitry (Multiplexers / Amplifiers / Sample and Hold)
- Analog to Digital Board specifications
- Single Ended vs Differential Signals
- Resolution / Dynamic range / Accuracy of A/D boards
- Sampling Rate and Nyquist Theorem
- Preventing Aliasing
- Sampling Techniques ( Channel Scanning / Simultaneous Sampling / Block Mode Operations)
- Speed versus Throughput
- Typical Digital to Analog (D/A) boards
- Digital I/O boards
- Interfacing Digital I/O
- Electromechanical vs Solid State Relays
- Practical considerations in the use of digital I/O boards
- Counter Timer I/O boards

### RS-232 / RS-485 SERIAL DATA COMMUNICATIONS STANDARDS

- RS-232 Hardware Interface
- RS-485 Hardware Interface
- Multipoint Systems
- Serial Interface Converters
- Communication Protocols
- Error Detection
- Trouble shooting Serial Data Communications
- DISTRIBUTED AND STANDALONE CONTROLLERS / DATA LOGGERS
- Choice between External and Internal Systems
- Hardware Structure of Standalone Devices
- Software and Firmware Design
- Practical applications of Data Loggers
- How to minimise communication Bottlenecks
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- How to minimise communication Bottlenecks

### CITECT PRACTICAL

### IEEE-488 SYSTEMS

- IEEE-488.1 / IEEE-488.2 and SCPI Specifications
- Hardware Configuration
- Device Types (Controllers / Listeners/ Talkers)
- Basic Communications
- Advanced Communications
- Multiple Device Communications
- Problem Diagnosis
- System Specification

### SUMMARY, OPEN FORUM AND CLOSING

