Data Acquisition and Control Tutorial

PC-based Data Acquisition System Overview

In the last few years, industrial PC I/O interface products have become increasingly reliable, accurate and affordable. Because of this, PC-based data acquisition and control systems are widely used in industrial and laboratory applications like monitoring, control, data acquisition and automated testing.

Selecting and building a DA&C (Data Acquisition and Control) system that actually does what you want it to do requires some knowledge of electrical and computer engineering. This tutorial gives a brief introduction to what DA&C systems do and how to configure them. It covers:

- Transducers and actuators
- Signal conditioning
- Data acquisition and control hardware
- Computer systems software

Transducers and Actuators

A transducer converts temperature, pressure, level, length, position, etc. into voltage, current, frequency, pulses or other signals.

Thermocouples, thermistors and resistance temperature detectors (RTDs) are common transducers for temperature measurement. Other types of transducers include flow sensors, pressure sensors, strain gauges, load cells and LVDTs which measure flow rate, pressure variances, force or displacement.

An actuator is a device that activates process control equipment by using pneumatic, hydraulic or electrical power. For example, a valve actuator opens and closes a valve to control fluid rate.
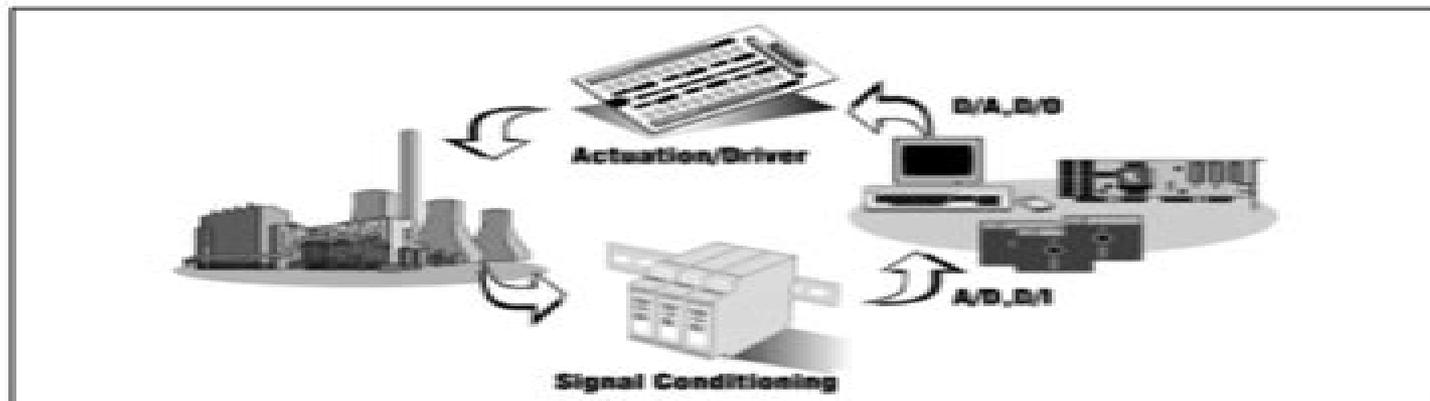
Signal Conditioning

Signal conditioning circuits improve the quality of signals generated by transducers before they are converted into digital signals by the PC's data-acquisition hardware. Examples of signal conditioning are signal scaling, amplification, linearization, cold-junction compensation, filtering, attenuation, excitation, common-mode rejection, and so on.

One of the most common signal conditioning functions is amplification. For maximum resolution, the voltage range of the input signals should be approximately equal to the maximum input range of the A/D converter. Amplification expands the range of the transducer signals so that they match the input range of the A/D converter. For example, a x10 amplifier maps transducer signals which range from 0 to 1 V onto the range 0 to 10 V before they go into the A/D converter.

Data Acquisition & Control Hardware

Data acquisition and control hardware generally performs one or more of the following functions: analog input, analog output, digital input, digital output and counter/timer functions. This section will discuss each function and list some considerations that are important when you select a data acquisition and control system.

The layout of a typical PC-based data acquisition system

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Scott C. Dulebohn

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Energy Research Abstracts ,1990   A Petroleum Geologist's Guide to Seismic Reflection William Ashcroft,2011-05-06 This book is written for advanced earth science students geologists petroleum engineers and others who want to get quickly up to speed on the interpretation of reflection seismic data It is a development of material given to students on the MSc course in Petroleum Geology at Aberdeen University and takes the form of a course manual rather than a systematic textbook It can be used as a self contained course for individual study or as the basis for a class programme The book clarifies those aspects of the subject that students tend to find difficult and provides insights through practical tutorials which aim to reinforce and deepen understanding of key topics and provide the reader with a measure of feedback on progress Some tutorials may only involve drawing simple diagrams but many are computer aided PC based with graphics output to give insight into key steps in seismic data processing or into the seismic response of some common geological scenarios Part I of the book covers basic ideas and it ends with two tutorials in 2 D structural interpretation Part II concentrates on the current seismic reflection contribution to reservoir studies based on 3 D data   **Optical Multichannel Analyzer Techniques for High Resolution Optical Spectroscopy** James Lee Chao,1980   Guide to the High Technology Industries Ballingerry Publishing,1983   **Scientific and Technical Aerospace Reports** ,1989   **NASA Tech Briefs** ,1993   **Tutorial--VLSI Testing & Validation Techniques** Hassan K. Reghbati,1985   EDN ,1990   **Tutorial--gallium Arsenide Computer Design** Veljko Milutinović,David A. Fura,1988   *Tutorial, Microcomputer Networks* Harvey A. Freeman,Kenneth J. Thurber,1981   **Biomechanics Cinematography and High Speed Photography** Juris Terauds,1981   **Neuropsychobiology** ,1987   *Byte* ,1992   **Project Woksape** Renee A. Holoien,1989   *Government Reports Annual Index* ,1990   **Checklist of State Publications** ,1977   **Government Reports Annual Index: Keyword A-L** ,1987   **Electronic Design** ,1996   *Sound & Vibration* ,2001   **EDN, Electrical Design News** ,1998

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