Data Acquisition and Signal Conditioning

Overview

Using LabVIEW, data acquisition devices, and signal conditioning hardware, the Data Acquisition and Signal Conditioning course teaches you the fundamentals of PC-based data acquisition and signal conditioning. During the course, you get hands-on experience installing and configuring data acquisition hardware and you learn to use data acquisition software functions to build your application. Although LabVIEW is the application software used during the class, non-LabVIEW users using the NI-DAQmx API will also benefit by learning about analog input, triggering, analog output, digital I/O, counters, signal conditioning, and synchronization.

Duration

Two (2) Days

Audience

- Developers using LabVIEW with DAQ and/or signal conditioning hardware to create data acquisition and control applications
- Developers using the NI-DAQmx API with text-based languages (LabWindows/CVI, C, Visual Basic, etc.) to create DAQ applications
- Users new to PC-based data acquisition and signal conditioning

Prerequisites

- LabVIEW Core 1

NI Products Used During the Course

- LabVIEW Professional Development System
- NI-DAQmx
- NI multifunction I/O data acquisition device
- NI BNC-2120 terminal block
- NI CompactDAQ device

After attending this course, you will be able to:

- Develop integrated, high-performance data acquisition systems that produce accurate measurements
- Acquire data from sensors, such as thermocouples and strain gages, using NI DAQ hardware
- Apply advanced understanding of LabVIEW DAQ VIs and the NI-DAQmx API to create applications
- Eliminate measurement errors due to aliasing and incorrect signal grounding
- Initiate measurements using hardware and software triggering
- Acquire and generate single and continuous analog waveforms
- Acquire and generate digital signals
- Make edge, pulse, frequency, and position measurements using counters
- Generate single pulses and pulse trains
- Use signal conditioning to improve the quality of acquired signals
- Synchronize multiple operations and devices

Suggested Next Courses

- LabVIEW Core 2
- LabVIEW Core 3

Registration

Register online at ni.com/training or
call (800)433-3488 Fax: (512)683-9300
info@ni.com

Outside North America, contact your local NI Office.
Worldwide Contact Info: ni.com/global

Part Number

910010-xx

-01 NI Corporate or Branch
-11 Regional
-21 Onsite (at your facility)

Data Acquisition and Signal Conditioning Outline

Day 1

Overview of a DAQ System

This lesson introduces the basics of data acquisition (DAQ). You learn the purpose of each component in a data acquisition system. Topics include:

- Components of a typical data acquisition system
- Overview of sensors
- Overview of types of signals and signal information
- Overview of DAQ hardware, signal conditioning, and DAQ software

Data Acquisition Hardware and Software

In this lesson, you learn about DAQ hardware components, choosing an appropriate DAQ device, and DAQ software. Topics include:

- Components of a DAQ device
- Bus, signal, and accuracy considerations when choosing DAQ hardware
- Configuring the Measurement & Automation Explorer (MAX)
- Overview of NI-DAQmx driver software, VIs, and property nodes

Analog Input

In this lesson, you develop LabVIEW applications that perform analog input. You learn how to properly ground your system, determine an appropriate sampling rate to prevent both aliasing and buffer overflow, and develop single sample software-timed, finite buffered, and continuous buffered analog input data acquisition applications. Topics include:

- When to use differential, referenced single-ended, and non-referenced single ended grounding modes
- Preventing the effects of aliasing on your signal
- Acquiring voltage signals using analog input
- Single sample software-timed acquisition
- Finite buffered acquisition
- Continuous buffered acquisition
- Implementing different types of triggering

Analog Output

In this lesson, you learn different methods of generating voltage levels and waveforms on a DAQ device. Topics include:

- Analog output architecture
- Single sample generation
- Finite buffered generation
- Continuous buffered generation
- Triggered generation

Data Acquisition and Signal Conditioning Outline

Day 2

Digital I/O

This lesson describes digital signals and how to develop digital input and digital output applications using software timing and hardware timing. Topics include:

- Digital Signals
- Digital I/O
- Hardware-timed Digital I/O

Counters

This lesson focuses on the counter functionality of a DAQ device. It begins with an overview of counters, including counter signals, the parts of a counter, the pins you connect a counter signal to, and basic counter terminology. The lesson also describes how to develop applications for various counter operations.
Topics include:

- Over view of counter signals, parts, and terminology
- Edge Counting
- Advanced Edge Counting
- Pulse Generation
- Pulse Measurements
- Frequency Measurements
- Position Measurement

Signal Conditioning

In this lesson, you learn to use appropriate signal conditioning techniques, such as amplification, attenuation, and filtering, to properly prepare a signal for voltage measurements. You also learn the signal conditioning techniques recommended for sensors, such as thermocouples, strain gages, and accelerometers. Topics include:

- Overview of signal conditioning
- Signal conditioning systems
- Signal conditioning for voltage measurements
- Temperature measurements
- Strain and pressure measurements
- Sound and vibration measurements

Synchronization

This lesson describes synchronization of tasks on a single device, on multiple devices, and with counters.
Topics include:

- Synchronizing measurements
- Single device synchronization
- Multiple device synchronization
- Counters and synchronization