Essential Technologies for Making Accurate PC-Based Measurements
(592 words)

Errors and inaccuracies introduced into a PC-based data acquisition (DAQ) system during data collection can ripple through an application and undermine the quality of the results. To ensure precise results from the DAQ system, DAQ products should feature design technologies that deliver accurate measurements. The essential technologies for making a measurement include: multilayer design, hands-free calibration with certificates of conformance, guaranteed settling times at all gains, high-speed memory access, flexible timing and triggering, and complete driver software.

Multilayer Design
Digital signals can produce noise on nearby analog signals, causing analog readings to be inaccurate. Multilayer design reduces noise by separating sensitive analog circuitry from digital signals. Proper design prevents this noise on analog signals. Routing analog and digital circuits onto different layers separated by solid copper ground planes prevents digital noise from corrupting analog signals.

Hands-Free Calibration
Calibration corrects errors that occur due to environmental changes, such as electronic emissions, or gain errors from manufacturing tolerances in various components. For example, one type of error corrected with calibration is offset error. A common real-world offset error occurs on a regular analog scale. Sometimes, when nothing is on the scale, the reading is set at one pound, which alters the true measurement. But if the needle is adjusted by the knob on the scale, the "at rest" reading can be calibrated back to zero for an accurate reading. In DAQ, sometimes the board has an offset error and reads one volt when at rest rather than zero volts. Without hands-free calibration, the user would have to take the board out of the computer and use a screwdriver to turn a knob to calibrate the board. Hands-free calibration means that the software automatically calibrates the board. If a DAQ board is not calibrated regularly or properly, data readings suffer. Hands-free calibration automatically delivers the best performance.

Guaranteed Settling Times
In the same way that a rubber ball bounces several times after being dropped on the ground before it comes to rest, a signal needs time to settle to its final reading state. When a measurement is made before the signal settles, the reading is inaccurate. With guaranteed settling times, users do not take their measurement faster than the board can settle the reading.

High-Speed Memory Access
With high speed memory access, users can quickly access the PC's memory without interruption. PCI DAQ boards become the bus master. Normally, the computer is the bus master. If the computer is the bus master and is executing another task, the signals may not be acquired as quickly as necessary.

Flexible Triggering and Timing
Triggering offers the flexibility to couple timing signals between several channels and devices and provides precisely controls the timing of signal generation and acquisition. Using triggers to synchronize measurements increases flexibility, efficiency, and accuracy of measurements. Triggering also increases productivity. Timing is the ability to precisely determine when a measurement is taken. The more flexibility the user has in defining triggering and timing and synchronizing on multiple boards, the better they can make measurements.

Robust Driver Software
Users need robust driver software to take advantage of all of the features of a DAQ board. With feature-packed driver software, users can tell the board exactly what to do. Expect your driver software to come with example programs that demonstrate every feature of the hardware. Even if the hardware device has all of the features needed for an application, without complete driver software and examples, users cannot take advantage of the features, and cannot solve their application.