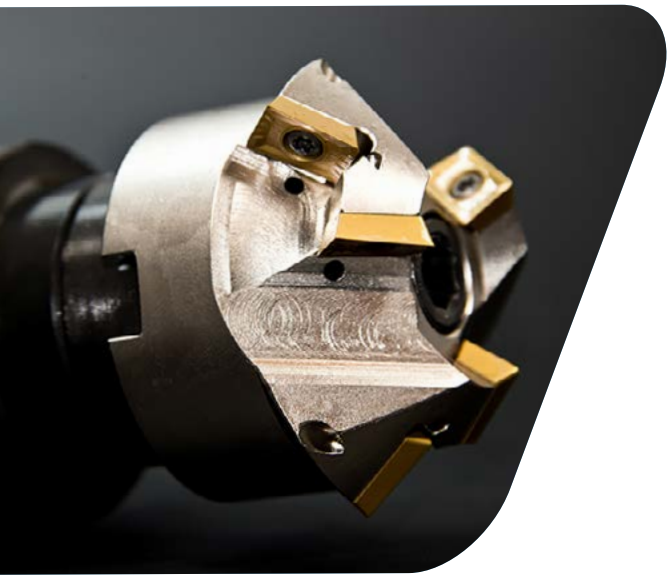
APPLICATION NOTE

CAS DATALOGGERS

ADwin-Based Real-Time System Tests Six Switches in Parallel

ADwin Provides Extremely Fast Closed Loop Control



Multi-axis motion control systems are used extensively in manufacturing and laboratory research for positioning purposes. These systems often rely on feedback from position sensors to maintain closed-loop control for improved accuracy. In test and measurement applications, it is often desirable to use additional inputs as part of the feedback loop. For example, in scanning tunneling microscopes, a sample is moved in the X- and Y-axis while a feedback loop drives an actuator to maintain a constant tunneling current between a probe and sample in the Z-axis. The output of this loop can be used to generate a topographic, or height profile of the sample. To achieve the necessary control and accuracy, ADwin data acquisition and control systems are ideal for use in these applications. The ADwin–which incorporates digital and analog inputs and outputs with a real-time processor in a single unit–can drive stepper motors and/or other actuators, using feedback from various position sensors or other voltage or current inputs.

A system based on an ADwin-Gold real-time system, in this case, designed to test the trigger switches of variable-speed power tools, features six stations which allow up to six separate switches in parallel to be tested. Each test station has a stepper motor that drives an actuator to simulate a person pressing the switch. A home sensor and encoder provide information on the position of the switch. The ADwin system, in addition to driving the stepper motor and reading the position information, measures the RMS voltage, RMS current, and duty cycle (in the case of PWM control) of the output from the switches.

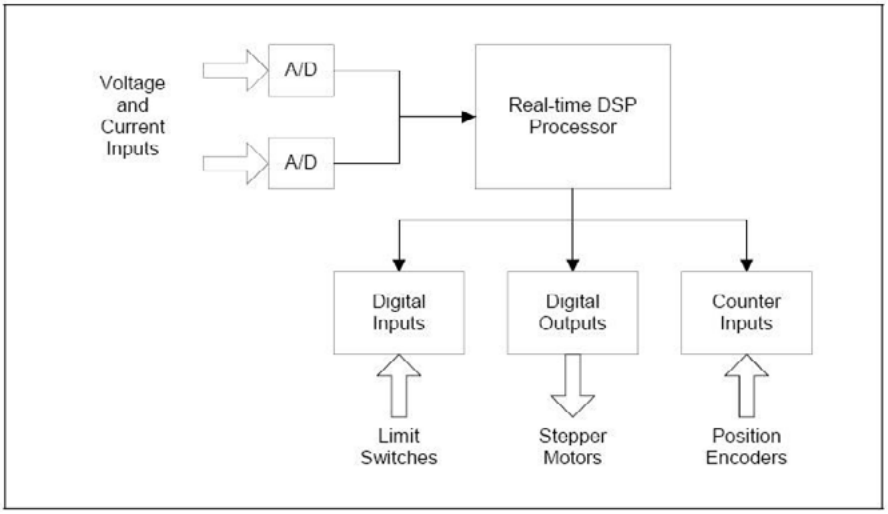


Figure 1 – System Block Diagram

The ADwin's multitasking capabilities provide independent control of each station. One main, high-priority task implements the main control loop for all six test stations. This control loop includes functions which:

- Find the home position;
- Drive the actuators;
- Move the switch to a specified position;
- Monitor the voltage, current and other input parameters.

Practical Example

This main loop executes at 10 kHz which allows accurate measurement of the switch parameters. The move function implements a trapezoidal velocity profile – an algorithm determines the distance from the current position to the target position and calculates a velocity profile with a given acceleration, target velocity and deceleration.

Each test station has an individual process associated with it which sequences through the test steps to verify the operation of the switch. These separate processes allow for independent control of each station so that if the switch at Test Station One fails, it will have no impact on the test operation of a switch on Test Station Two. These processes run at 100 Hz which is more than fast enough since the RMS data is updated at a line cycle frequency of 60 Hz. A user interface designed with LabView™ controls and monitors the operation of each test station through the use of global data that is automatically synchronized between the ADwin hardware and a PC.

This ADwin-based control system meets or exceeds all of the original design goals, performing substantially better than previous devices which utilized PC-based data acquisition boards to perform the measurement and control functions. The previous solution required a PC and DAQ hardware for each test station, at a significantly higher cost to test switches in parallel. This solution also highlights some of the unique features of ADwin systems including:

- Support for multiple concurrent processes
- Tightly-coupled analog and digital I/Os
- Fast real-time operation
- Deterministic operation

These capabilities can be useful in a number of other positioning applications including:

- Dynamic test stands for vibration, force or stress
- Marking or engraving systems
- Automated assembly equipment
- High-speed positioning equipment

CAS DataLoggers is a distributor of data loggers, data acquisition equipment and paperless recorders. We have been in business for over 20 years, and actively involved in selling data loggers and real-time systems since 2001. Our staff has over 100 years of combined experience with different types of data acquisition and test and measurement equipment.

We can help you to select the most appropriate product for your application as well as recommend sensor and transducers to go with the data logger. We also provide free technical support on all of our products along with value-added services including onsite installation, engineering and design services and turn-key systems.

For more information on ADwin Data Acquisition and Control Systems, testing switches in parallel or to find the ideal solution for your application-specific needs, contact a CAS DataLogger Application Specialist at **(800) 956-4437** or www.DataLoggerInc.com.