

Automated Hoist/Winch Test Station For Testing Hydraulic and Electric Hoists/Winches

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Category:

NI Products Used:

LabWindows/CVI 8.0
NI DAQPad-6016 (for USB)
NI DAQPad-6508 (for USB)

The Challenge: Develop a high quality, cost effective solution to operating and testing hydraulic and electric hoists/winches used on rescue helicopters. The client had some legacy C code that they wanted to reuse but the code utilized old and outdated data acquisition hardware from a vendor other than Nation Instruments. The solution was required to run in remote locations and would need to use flexible components that would allow for easy in the field upgrades.

The Solution: Using LabWindows/CVI 8.0 Data Science Automation created an easy to use application that utilized USB data acquisition hardware making it easy to replace the computer or components in a modular fashion. The resulting solution had fewer lines of code to support while providing improved diagnostic capability and accuracy.

Abstract

Flight time can become expensive when operationally testing a hoist on the aircraft. Testing of hoists prior to flight is cost effective and convenient, allowing the client to test the units quickly. To test a hydraulic or electric hoist/winch, the system must perform a series of tasks that involve communicating with the unit under test (UUT), a motor control unit, and an automated take-up drum that provides static and dynamic loads. Different units require different tasks and task sequences. Flexibility (external to the .EXE) in the task sequence and parameters was required to support the broad range of units the client maintained.

Introduction

Data Science Automation was tasked with developing a test system that would be flexible and cost effective. Reusing portions of the legacy C code was easily accomplished using LabWindows/CVI 8.0. Analysis of the analog inputs and outputs as well as the digital inputs and outputs resulted in the selection of two data acquisition devices to meet all the current test station needs. The legacy code was modified to support the new NI hardware, and eliminate the code required for the obsolete hardware.

Modular hardware provided flexibility

At the heart of the test stand (Figure 1) is a PC running Windows XP along with a GE Fanuc PLC. The client required the flexibility to update the PC or replace the PC with a laptop with minimal impact on the overall test station software or procedures. National Instruments USB based DAQpads allows for that flexibility. The two DAQpads can be 'moved' to new hardware allowing for upgrades and diagnostics. Additionally, the new hardware was also more accurate than the legacy data acquisition hardware.

DAQmx reduced the amount of code and made it easier to read

By using the DAQmx API to acquire and generate signals, most DAQ related code was reduced by 80%. With fewer lines of code and meaningful descriptive task names, the client was better able to read the code, focus on functionality rather than syntax, and support the code.

Test Panels improved functionality at a minimum cost

In prior generation of the test station only displayed a small subset of the calculated values derived from the data acquisition readings (Figure 2) - only those values critical to operate the test station. The client could not see all the values read and had to open the cabinet and measure signals with a handheld instrument. Data Science Automation developed diagnostic test panels that ran concurrently with the application and showed the raw voltage and calculated scaled values for all analog inputs and outputs as well as the digital relay and input states. These diagnostic panels improved the ability to test the solution and diagnose problems with task logic.

Sample Diagnostic Panels

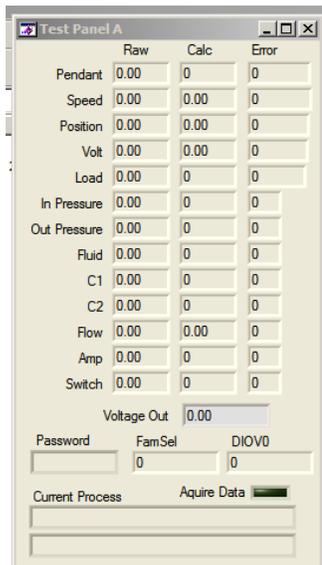


Figure 3. Analog Diagnostic Panel

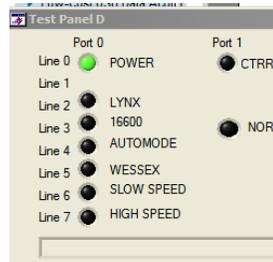


Figure 4. Digital Diagnostic Panel

The resulting solution has met all of the client's requirements and exceeded their expectations of ease of use, flexibility, scalability, and performance. Future enhancements include a simulation made to permit software testing without the physical test stand and possible replacement of the PLC with a modern PAC.