

Circuit Breaker Cyclic Endurance Testing

by
Ronald J. Cochran
Senior Engineer, Measurement & Automation
Data Science Automation, Inc.
USA

Category:
Manufacturing

Products Used:
LabVIEW 8.2
[CompactDAQ eight slot chassis](#)
[9403 Digital I/O Module](#)

The Challenge:
A manufacturer needed a new application to test their industrial circuit breakers. In addition to cycle testing the breaker, the application needed to pause for operator interaction at set intervals and during failures.

The Solution:
To meet these requirements, Data Science Automation developed an application to control and monitor the test process. This application uses LabVIEW and CompactDAQ to allow for easy expansion and duplication of the system.

Abstract
A circuit breaker manufacturer needed an automated test application to perform endurance testing of their breakers (Figure 1). A key requirement was that in addition to the automated process, the tester also needed the ability to be paused at set intervals for a trained technician or engineer to make additional manual measurements. In addition, the system also needed to pause when an error occurred with the device under test (DUT). Regardless of why a pause occurred, the software needed to collect a comment from the operator that it would then add test results file.

Introduction
The customer selected Data Science Automation to develop software and hardware for the breaker endurance test. The resulting test system monitors the contactor connections and automatically pauses the test and disconnects the power from the supply terminals if a fault occurs.



Figure 1 - Industrial Breaker

The application main panel (Figure 2) provides fields for the operator to enter the information for the DUT Identification, Item number, and Catalog number. The software uses these pieces of data – along with the time and date – to create a unique file name for saving the test data. The recorded test data contains the cycle count at which the test paused, the status of the faults, a note giving the reason for the pause, and the time and date of the pause in the testing.

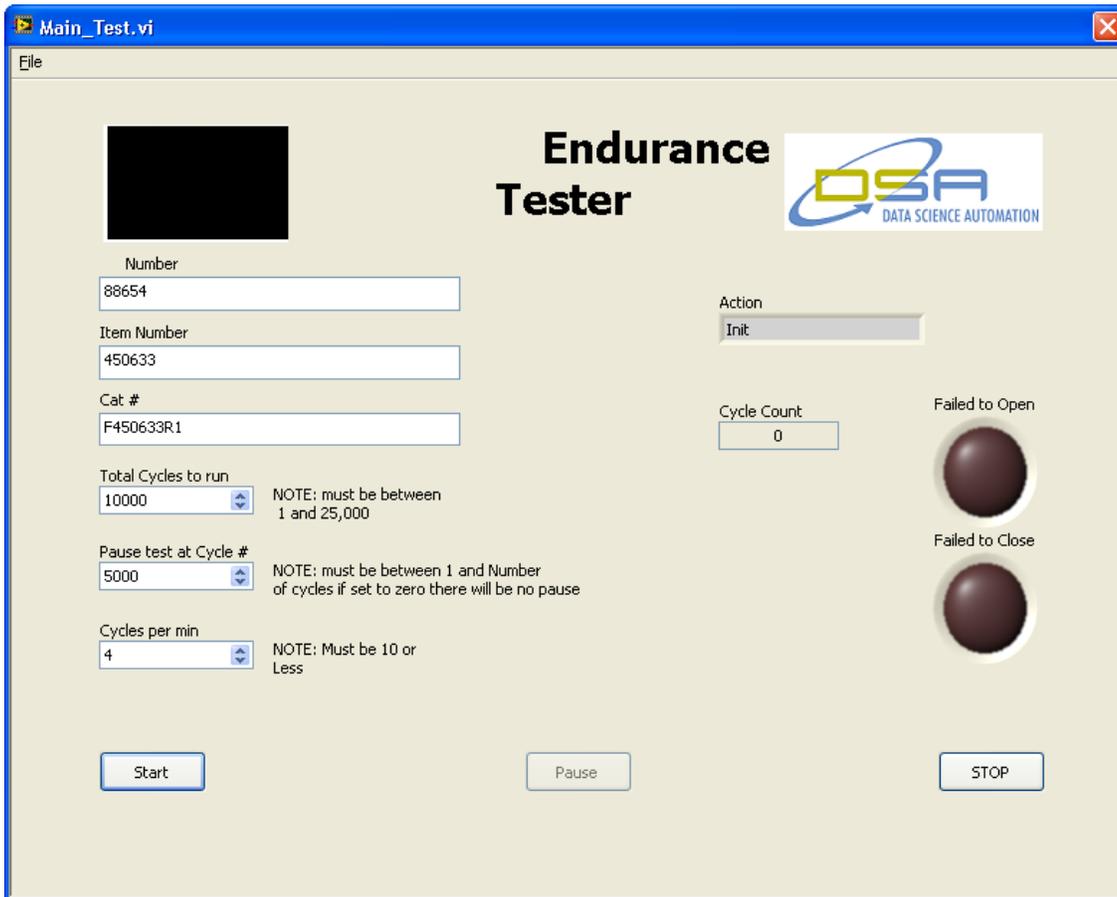


Figure 2 Main Panel

This screen also provides fields for the operator to enter a number of cycles for the test and a cycle number where the test will pause for manual measurements. The input controls for total number of cycles coerces the field value to between 1 and 25,000, inclusive.

If the cycle to pause control is set to zero, the application will run until it reaches the total number of cycles or a fault occurs. If the control to pause at cycles is set to a number less than the total number of cycles to run, the application will pause at that cycle and disconnect the power to the breaker to allow the operator to perform any sort of manual test that might be required. While paused, the operator can reset the pause control to a new number between the present count and the total number of cycles to run before restarting the test.

The control for the number of cycles per minute can be adjusted up to 10 cycles – a setting which is limited by the time it takes to mechanically reset the spring release in the breaker by the onboard motor operator. The front panel has two large indicators that when illuminated red can be seen from across the room for showing failure status of the breaker.

Once the test is started using the start button the cycle count increment with each complete cycle. Note that the software only considers the cycle as “complete” if both parts of the cycle finish without faults. The first part of the cycle resets the breaker trip spring with the motor operator and close the contacts. The second part of the cycle triggers the shunt trip and disconnect the contacts.

The operator may pause the test at any time using the pause button. The test can only be restarted after entering comments in the operator comment window (Figure 3).

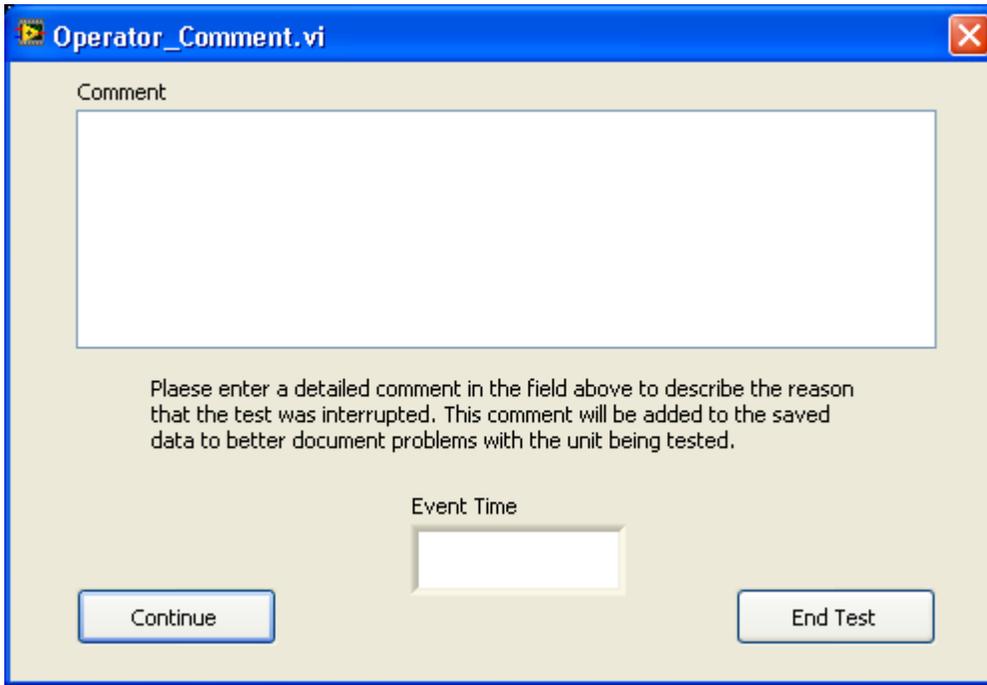


Figure 3 Comment Window

The Result

Using LabVIEW software and National Instruments CompactDAQ, Data Science Automation was able to provide their customer with a flexible application that can be expanded for other breaker families and additional units with easy modifications to the application and hardware. In addition, it saves the data in unique files that are traceable to the breaker associated with the results.