



EFFECTIVE SOLUTIONS FOR CONTROL SYSTEMS AND AUTOMATED TEST EQUIPMENT

Automating a Transmission Assembly Line Test Stand

Category:
Production Test

Products Used:
LabView™ Software
PC-DIO-24 Plug-in card
AT-MIO-16E-10 Multifunction data acquisition card

The Challenge: Automating a test stand on an automotive production line to perform quick, accurate, and repeatable function testing of automatic transmission components during assembly.

The Solution: Using LabVIEW™ and National Instruments' data acquisition (DAQ) cards to collect and analyze data from a transmission while communicating various test operations and results to a programmable logic controller (PLC).

Abstract/Introduction

Function testing during assembly is a common practice in the automotive industry, making assembly lines faster, more efficient, and pushing quality standards higher than they have ever been. In one particular assembly line there is a station, which tests the torque requirements and functionality of certain components in an automotive transmission. The existing method called for manual testing by an operator, using items such as a torque wrench and a custom function test box. This "single point" method is slow, inefficient, and produces little information about the characteristics of the part being tested. A few attempts were made to automate this station, but when they could not meet the requirements of the test, we were contracted to write a data acquisition solution using National Instruments' LabVIEW™ software.

Hardware Design

With National Instruments' plug-in DAQ cards already in place, LabVIEW™ software provided us with the power and flexibility to provide a cost-effective solution for automated testing of automotive transmission components. The LabVIEW™ based Human-Machine Interface (HMI) consists of three simple screens: the Main Screen, the Model Setup Screen, and the Deadweight Calibration Screen.

The *Main Screen* displays the torque, angle, and the other vital data collected during the seven-second test (Figure 1). This screen also displays pass/fail status, cycle counters, fault information, and a graphical representation of the data acquired by the DAQ card. A marquee lists useful information during failures of hardware faults, taking the guesswork out of troubleshooting.

The *Model Definition Screen* allows the engineer to create or edit the testing criteria for the different models assembled in this production line. File storage capabilities allow for different setups to be saved and re-loaded for each model.

The *Deadweight Calibration Screen* adds to the reliability of the system, providing a deadweight method for accurately calibrating the torque sensor through its entire range. This screen calculates the calibration curve and allows the user to set the parameters for the AutoCal feature.

AutoCal is a feature that was added after the customer saw the power and flexibility of the LabVIEW™ programming environment. The signal conditioner for the torque cell was modified so that the PLC could apply a shunt resistor to the sensor. We were called upon to program this feature to perform an automatic calibration of the torque sensor after so many cycles or failures or any other time the PLC requests it. The results are displayed on the Main Screen for a quick and effortless check as to the reliability of the data and the operation of the torque sensor.

Conclusion

The automation of this test stand produced dramatic results. The most important result being that the cycle time for the entire test was reduced to less than eight seconds. Also, by displaying torque, angle, and other data for the entire test cycle, LabVIEW™ helped identify misalignment problems associated with other stations on the assembly line. National Instruments' plug-in DAQ cards and LabVIEW™ software helped provide a powerful and reliable Graphical User Interface for this automated test stand.

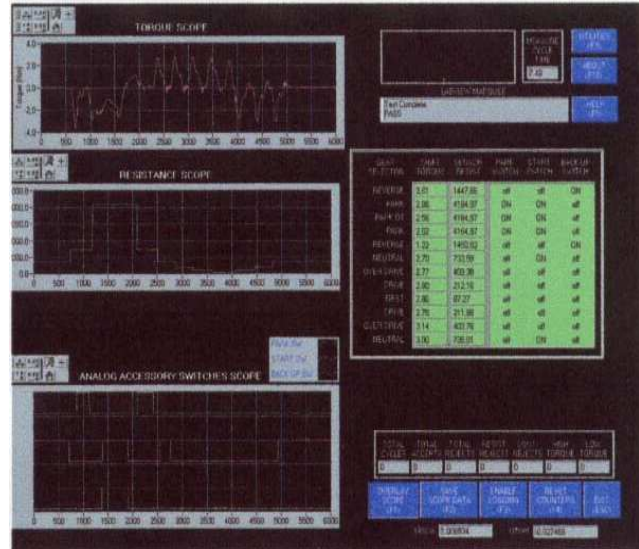


Figure 1: Main screen