LabVIEW Tests Automotive Dash Electrical System On Assembly Line

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Category:
Automotive

Products Used:
FP-1000 RS-232 Network Module
(8) FP-AI-100 Analog Input Module
(2) FP-RLY-420 SPST Relay Module
FP-PWM-520 PWM Output Module
(14) FP-TB-1 Universal Terminal Base
FieldPoint™ Bus Extender Cable
(4) DIN Rail (26 inch)
LabVIEW™ Graphical Programming Software

The Challenge:
To provide a user-friendly, multi-configurable test station for quickly testing electrical components and connections from the cab/dash of a vehicle to firewall connectors. The station must identify problem circuits immediately so that a technician can repair and test them while the cab/dash progresses down a fast-paced assembly line.

The Solution:
BBT created a multi-channel test station to test the electrical components and connections while still on the assembly line using National Instruments LabVIEW and FieldPoint components.

Abstract
The Cab/Dash Electrical System Test Station is designed to test all electrical connections and components from the dash to the firewall before the cab is attached to the chassis. These components include all switches that have corresponding firewall connections—the headlight switch, turn signals, ignition switch, etc. Besides being capable of testing switches from the dash, the Cab/Dash Electrical System Test Station tests the connections to and the functionality of all gauges in the dash. Using this station while the cab is still separated from the chassis simplifies the final troubleshooting of the vehicle because all electrical problems within the cab are resolved before the marriage of the cab and chassis.

Station Design
Environmental requirements and function drove the station’s hardware and software design. Rugged hardware was selected to ensure reliable functionality in a harsh assembly-line environment. The station includes 10 analog-input FieldPoint modules, two relay modules, and one pulse-width modulator module housed in a sealed enclosure that is attached to a movable framework structure. This framework structure easily moves with the cab down the assembly line. A cabinet that houses a computer, printer, and a 12-volt/100-amp power supply is also attached to the framework creating a complete mobile system. On top of the cabinet is a large flat panel screen that is easily visible from inside the cab during testing. A four-button control wand is included that the operator will bring inside the cab while testing to drive the test application.
The stations movable framework structure is the interface from the electrical circuits of the cab to the service cart. The yellow four-button control wand is used by the operator to complete the simple test sequence.

The service cart, consisting of a computer, printer, a 12-volt/100-amp power supply, and a large flat panel screen, is attached to the framework creating a complete mobile system.

We were challenged to make every aspect of the software for this application dynamically configurable. To achieve this flexibility, we used a mapping algorithm to determine the FieldPoint channel that drives each test panel indicator. This algorithm determines the number of switch test screens that are required and the number of gauge test screens needed. Between tests, operators can change test parameters and the appearance of each test screen. They can save several configurations and recall them instantly during testing. This flexibility allows operators to configure the test station to conform to individual testing styles, resulting in maximum efficiency for each operator.
Our choice of FieldPoint made the test station easily re-configurable for any type of cab/dash. By using three different FieldPoint module types (FP-AI-100, FP-RLY-420, and FP-PWM-520), we ensured the required functionality for testing even the most complicated cab/dash electrical configuration. The FieldPoint configuration for each of the test stations is the same, allowing for maximum channel count use. The FieldPoint Explorer configuration utility allows the operator to verify each channel’s input value before the Cab/Dash Electrical System Test Station software is executed. Once connections are verified, the test station software configures quickly, and the test station is ready for full-speed cab/dash testing.

Once the station is in operation, the operator uses a four-button control wand to complete the test sequence. The operator can learn the simple test sequence within the first few tests performed. The station dynamically notifies the operator of switches that make proper contacts and controls gauges that help the operator determine if they are properly working and wired. When the test is complete, the operator can print a report showing what gauges and switches have passed and which have not been tested. This report is kept with the vehicle for final testing when the vehicle is completely assembled.

**Results**

Our cab/dash station is installed and operating on several assembly lines. The installation time for each station depends upon how quickly each signal can be mapped and connected to the FieldPoint enclosure. Typically, custom interface cables are required between the cab/dash and the enclosure — with several types of cabs/dashes being tested, this customization for each station is unavoidable. Once interface cables are created, the remaining configuration can be completed within hours.

As a result of this test station, the time required for testing entire cabs/dashes including connecting all interface cables before testing and disconnecting after testing averages about two minutes. The reliability of the station has gained the confidence of its operators, and faulty switches or gauges are quickly replaced and retested before the cab/dash continues down the line. In short, the Cab/Dash Electrical System Test Station is helping automotive plants produce better-quality vehicles while shortening their production time.