TestStand and LabVIEW Automate Personal Help Button PCB Functional Testing


The Challenge: Replacing an outdated printed circuit board functional test system.

The Solution: Creating a National Instruments TestStand and LabVIEW-based functional test system, which decreased product test time by more than 60 percent.

Introduction
Lifeline Systems Inc., in Framingham, Mass., provides 24-hour personal response monitoring services to its subscribers, primarily elderly individuals with medical or age-related conditions, as well as physically challenged individuals. To summon assistance, a Lifeline subscriber presses a personal help button to initiate a call from the communicator, which connects the home telephone line to the Lifeline central monitoring facilities or a local community hospital.

Due to an ever-increasing population of elderly people and the company’s reputation for providing quality products and service, Lifeline increased its personal help buttons production by four times to make 200,000 units per year. The company’s existing functional test system was 10 years old and difficult to maintain. When the company hired a new contract manufacturer to assemble its printed wiring assemblies used in the personal help buttons, Lifeline asked Bloomy Controls, a National Instruments Select Integrator, to help create new printed circuit board (PCB) functional test software and provide test equipment to the contract manufacturer.

System Description
The contract manufacturer will use the test system for final build testing, while Lifeline will use the system for acceptable quality level (AQL) audit testing. The system must perform a variety of actions, including analog stimulus, analog measurement, digital I/O, serial communication, GPIB communication, and digital control signals. Custom signal conditioning, inside a TTI/Testron test fixture, decodes status bits and transmission rates during testing.

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Designing an Efficient Test System
The test system incorporates a standard desktop Pentium IV PC, which contains a National Instruments PCI-GPIB card that controls the external RF power meter and a National Instruments PCI-6025E multifunctional DAQ card. The DAQ card provides all analog inputs, outputs, and digital I/O for measuring mixed signal parameters, controlling signals for custom signal conditioning circuitry, and providing fixture control. The standard serial port built into the computer reads information from the decoder. Much smaller than the previous test rack, the new computer-based test system saves space on the production floor and makes the test system much more portable.

Designing a Flexible Software Architecture
Bloomy Controls helped to design a software architecture that would address Lifeline’s current and future personal help button testing needs. The software also needed...
to be versatile enough for Lifeline to apply the same system to various products. The system needed to contain a versatile test executive, user security administration, automatic database logging and connectivity, configuration management, and external control of test specification limits. To address these requirements, we selected National Instruments TestStand and LabVIEW for test management and test code development, respectively.

Using TestStand, Bloomy Controls developed a custom operator interface. The operator interface allows an operator to log in, load a selected TestStand sequence, and monitor the operation of tests in progress. The interface also provides a real-time log of pertinent information to the operator. After the test is complete, the operator can choose to print the report or save the log. In addition, all test data saves to Microsoft Access database for later analysis. Lifeline can also use this universal operator interface for various product lines.

With the operator interface completed, we concentrated exclusively on developing the product tests in LabVIEW, which simplified the process of programming and controlling the installed DAQ card, GPIB, and serial port. By modularizing and separating the operator interface sequence control from the individual LabVIEW test modules, Lifeline can concentrate on the sequence and test modules.

The Microsoft Access database, which stores all the test data, enables Lifeline engineers to develop detailed production yield reports, troubleshooting guides, lot control, and production reports – abilities the previous test system did not provide. The database also records all test information to include parameters, limits, test times, and pass/fail status in a polymorphic, multilevel database. We based the database design on the standard database field design provided with TestStand. We were able to easily add further customizations that are unique to Lifeline’s PCB test record keeping, including PCB assembly date and PCB manufacture date. Now, Lifeline can apply this database format to any PCB, regardless of the product.

Results

The new functional test system delivered significant time savings to Lifeline, reducing the personal help button PCB test time from 11 seconds to less than 4 seconds per unit. Because the universal TestStand operator interface could manage testing for other Lifeline products, the company only needs to train operators once on using the main interface. Besides time savings, the user-friendly system also delivered comprehensive datalogging of test data.

“Continuous improvement, contract manufacturer control, and lot traceability have been greatly simplified, thanks to our new test systems developed by Bloomy Controls,” said Elaine Fasoli Bailey, Lifeline Manager of Quality Assurance and Process Control.

Since the completion of the personal help button test system, Bloomy Controls has developed two other testers for Lifeline.

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