B&B Technologies Uses NI PXI to Test Avionics Systems

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The Challenge: Finding an adaptable test platform capable of testing a wide variety of avionics products and components prior to shipping, as well as troubleshooting and verifying systems in the field.

The Solution: Using a PXI-based system that contains a variety of measurement devices for stimulus and response testing, communications interfaces, and a variety of GPIB-controlled power supplies.

Developing a Flexible, Modular Platform
B&B Technologies, Inc. (BBT) developed a flexible modular platform for testing avionics components of a helicopter-based anti-submarine warfare system. We selected PXI because it is expandable and can house many types of instruments, communication, and switching modules. The advantage of using National Instruments PXI modules is that we can synchronize them through the PXI backplane. This advantage proved invaluable because we could easily synchronize the arbitrary waveform generator, the oscilloscope, and a multifunction data acquisition board to perform complex data acquisition procedures with a common clock and trigger between several different instruments.

Functional Testing on Avionics Equipment
We designed the Test Adapter Test Station (TATS) to test on a variety of avionics equipment for manufacturers. The TATS test set consists of two major elements – the core test set and the interchangeable test adapter (ITA). The core test set is a rack containing switching devices, instruments, and power supplies.

Finding a Flexible Testing Platform
The key to flexibility is providing a means of connecting all the instruments to all the devices. We used a Mac Panel interface, which mounts nicely in front of a rack-mounted PXI chassis, to connect them to the devices. With this interface, the test set connects to different devices with no changes to the core test set.

Rapid Development and Accuracy with NI Solutions
We chose NI LabVIEW because of its rapid development time, large instrument driver selection, and high level of compatibility, connectivity, and features. It has the flexibility, speed, and power to perform serious tasks, yet is much quicker to code and easier to debug than text-based languages.

We selected NI PXI measurement modules for all our data acquisition, digital testing, and stimulus signals because of their accuracy and the built-in synchronization capability embedded in PXI. This synchronization tool includes an MIO board (PXI-6071), an arbitrary waveform generator, an oscilloscope (NI PXI-5112), a digital I/O board (NI PXI-6527), a multimeter, and a counter/timer board. With this combination of instruments, we test and generate almost any type of signal in a single PXI chassis.

We also used an NI PCI-GPIB board for communicating with power supplies, a four-port RS-485/422 module for communicating with equipment, and an NI MXI-3 board for connecting the PXI system to an industrial computer.

Cutting Costs and Development Time with NI Software and Hardware
With LabVIEW, we reduced programming and development time by more than half compared to Visual C++ development.
compared to Visual C++ development. Using PXI saved us approximately $20,000 (USD) per system when compared to a VXI system. The complete package of drivers and examples shipped with the NI products saved weeks of development and testing time.

The resulting TATS system is flexible enough to thoroughly test different avionics components, such as aircraft power supplies, system computers, operator interfaces, and displays. The core test set includes multiple analog and digital instruments to inject signals. It also takes measurements and provides serial ports with 1,553 buses to communicate with the aircraft components. The next phase of development includes standardizing their

testing platform with this modern, off-the-shelf platform. The relatively low additional cost to test new devices is the key to this successful test platform.

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