



## Microsoft Uses NI LabVIEW and PXI Modular Instruments to Develop Production Test System for Xbox 360 Controllers

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### Industry:

Consumer Goods, Electronics

### Product:

LabVIEW, Modular Instruments, Oscilloscopes/Digitizers, PXI/CompactPCI

### The Challenge:

Developing a comprehensive, low-cost production test system for the Microsoft Xbox 360 wired and wireless controllers.

### The Solution:

Using a flexible, automated test system based on Microsoft Windows XP, Microsoft SQL Server, National Instruments LabVIEW, and NI PXI modular instruments to test the functional performance of the Xbox 360 controller, both wired and wireless versions.

### Designing Powerful Controllers for a New Generation of Gaming

In 2001, Microsoft deployed a PXI-based end-of-line functional test system for the original Xbox controller using [NI LabVIEW](#) and [PXI modular instruments](#).

The system tested device communication and monitored data packets at the bit level to verify that all controller-functional messages were within specification. The system also monitored signals at the chip level to analyze the electrical signals for parameters such as rise/fall times, minimum/maximum voltage levels, and current draw.



Microsoft uses PXI and LabVIEW to ensure a quality gaming experience with the Xbox 360.

In May 2005, Microsoft announced its latest innovation for digital entertainment and gaming, the Xbox 360, along with a new line of Xbox 360 wired and wireless controllers. The Xbox 360 wired controllers use a versatile, low-cost USB interface to communicate to the main game console. With the USB interface, the system easily accepts additional peripherals such as dance pads and steering wheels. The Xbox 360 controller-functional test system needed to perform similar tests to those of the original Xbox controller test system, but demanded higher-performance signal capture to qualify the signal integrity of the new controller and ensure a high-quality user experience. With the latest NI modular instruments, including the [NI PXI-5124 12-bit, 200 MS/s digitizer](#), we met the increased functional test requirements for the Xbox 360 controller. Using the LabVIEW graphical development environment, we created more than 100 tests, implemented Ethernet communication, and incorporated a data storage interface to our Microsoft SQL Server database.

### PXI Modular Instruments for Design Validation and Production Test

Using PXI instrumentation and LabVIEW, we built the test system in our Xbox 360 controller design validation lab and recently deployed it to our production line. During the validation and production cycle, the following NI PXI-based modular instruments provided us with a broad range of measurement functionality:

[PXI-5124](#) high-resolution digitizer for USB communication interface analysis  
[PXI-4472](#) dynamic signal acquisition module for vibration feedback motor analysis  
PXI data acquisition modules for general-purpose analog I/O measurements  
[PXI-6509](#) digital I/O module for general-purpose I/O control

We rapidly adapted the test system capabilities to meet our requirements for both the validation lab and production test by taking advantage of the broad range of PXI functionality, PXI modularity, and the PXI software-centric measurement approach.

The [PXI-5124 high-resolution digitizer](#) is a key component in the Xbox 360 controller end-of-line functional test system. The 200 MS/s real-time sampling rate and 12 bits of resolution on the PXI-5124 digitizer helped us verify the signal integrity of the USB communication between the controller and the Xbox 360 console with confidence. The high-resolution input and high-speed sampling rate are important features that make the digitizer a low-cost, quality solution – and a better option compared with higher-cost and lower-resolution oscilloscopes – to capture, monitor, and analyze the Xbox 360 controller USB signals, audio signals, and serial data signaling.

### **NI LabVIEW Interfacing with Microsoft SQL Server, TCP/IP, and ActiveX Controls**

Functional test is a key component to any production line. The challenge in developing a production line functional tester is to package as many parallel test scenarios as possible within the given production cycle time. With the new functional test system for the Xbox 360 controller, we implemented a test strategy that resulted in a 100 percent increase in our test throughput per test station.

We used [LabVIEW](#) to run multiple tests in parallel to maximize test coverage during the given production cycle time, and we used the LabVIEW Database Connectivity Toolkit to connect to our Microsoft SQL Server database to store every unit under test (UUT) parameter. As each Xbox 360 controller rolls off the production line, each completed test sends more than 110 data parameters to the dedicated Microsoft SQL Server for post-test analysis to implement future production line and device enhancements. Using the integrated TCP/IP and support for embedded ActiveX controls in LabVIEW, we communicated to the USB and wireless controllers through our custom interfaces. Overall, LabVIEW helped us develop an optimized end-of-line production test system for the Xbox 360 controller with data storage to our Microsoft SQL Server, communication through TCP/IP, and programmatic interaction with ActiveX controls.

### **Microsoft Sees Results Using NI LabVIEW and PXI Modular Instruments**

At Microsoft Corporation, we developed a versatile validation and end-of-line production test system for the Xbox and Xbox 360 controllers using Microsoft Windows XP, [LabVIEW](#), and [PXI](#). With the PXI-based system, we can achieve reliable production line testing and store all parameters to our Microsoft SQL Server. Using the high resolution input and high sampling rate of the [PXI-5124 digitizer](#), we acquire our test signals with 12 bits of resolution at data rates up to 200 MS/s, which provides a low-cost automated test system. Finally, using the power of the PC, we continue to easily upgrade and maintain our system today and for future development.

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