

Making Bit Error Rate Measurements on ISDN Telephone Equipment Using LabVIEW

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The Challenge: Developing an automated test platform to test the performance of Integrated Services Digital Network (ISDN) channel units in a digital loop carrier (DLC) system. **The Solution:** Using National Instruments LabVIEW to perform bit error rate (BER) testing on the Litespan system ISDN channel.

Alcatel USA is a leading manufacturer of telecommunications equipment worldwide. The Access Systems Group, located in Petaluma, CA, develops the Litespan access platform, a fiber-optic (SONET)-based digital loop carrier (DLC). A DLC carries telephone traffic beyond the normal copper pairs of wires that originate in the phone company central office.

One of the channel units in Litespan provides for ISDN service. ISDN is a telephone scheme designed to enhance public telecommunications networks worldwide by using much of the existing telecommunications infrastructure. Unlike the traditional voice band public switched network, ISDN provides simultaneous voice and data transmission over existing telephone lines. As a result, a single ISDN subscriber line carries many types of traffic – voice, data, fax, and more.

Testing the Cards

The Litespan system ISDN channel unit requires that a variety of tests be performed as a part of the manufacturing process, the most important of which is the BER. Based on previous experience in other applications, LabVIEW was the logical choice for our task.

To perform the test, a pseudo-random data pattern is transmitted from one end of the system, then looped back to the source for analysis. Data passes through

the wireline simulator, which simulates the wire itself and impairments such as power line noise (60 Hz), harmonics of power line noise, and so on. The ISDN channel unit is required to perform to standards over predefined “local loops” (the twisted pair of wires connecting a telephone to the phone company central office). We used a wireline simulator with a GPIB interface and a bit error rate test (BERT) tester to ensure that the card performs up to specifications. The Alcatel USA Litespan system and the Motorola EVK (ISDN evaluation board) are serial RS-232 controllable devices.

Data Flow

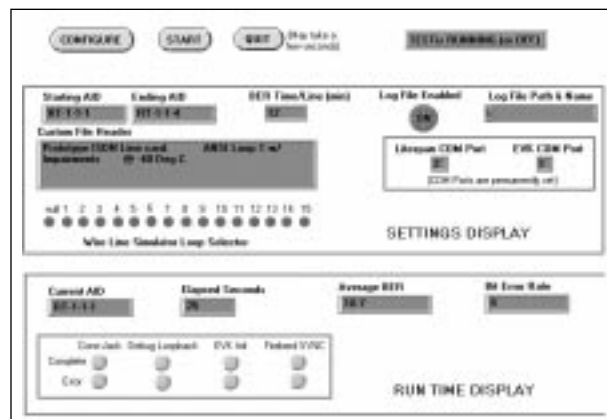
The bit stream from the Fireberd 6000A BERT tester is input to the Motorola EVK where it is transformed (D to A) into a pulse amplitude modulated (PAM) signal for transport over the digital subscriber line (DSL) or twisted pair.

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We performed all the setup, control, analysis, and data logging with LabVIEW. The GPIB driver for the wireline simulator and the serial drivers for the EVK and Litespan are custom drivers written by Alcatel USA.

Results

By using LabVIEW, we developed a comprehensive test solution in a relatively short period of time. The duration of each test is 12 minutes with 16 ANSI-defined loops and four ISDN lines per channel unit. Because several channel units are



Alcatel USA uses LabVIEW to test its Litespan system in a short time frame.

tested over a range of temperatures, testing can span several days.

Allen Klein, a Alcatel USA Engineer in the Litespan Hardware Qualification Group, added functionality to the program so that the tests could run for days and even over the weekend. This functionality greatly enhanced the test platform and development productivity.

After the deployment of the LabVIEW test application, the design engineers have moved on to other projects, but we have easily added functionality required by the HQG Test Engineer. Enhancement and modification are easy because of the graphical programming language of LabVIEW. The development of other LabVIEW components proved even more fruitful than expected, because we can take advantage of them in other test applications. LabVIEW was the right development environment to use for addressing all our needs. ▸

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