In-Vehicle Brake Testing on Trucks
using the WaveBook™

A major original-equipment manufacturer (OEM) of truck braking systems requires a portable data acquisition system that enables the verification of lab tests in the field. Such in-vehicle road tests are critical to developing quality systems that conform to federal transportation specifications. They are also useful for assisting customers in diagnosing system issues.

Application Summary

As a supplier for the major truck manufacturers, the brake OEM is often called on-site to verify that its brake systems meet federal and contract specifications and to help truck manufacturers troubleshoot problems. To facilitate such troubleshooting, the OEM typically equips the truck braking systems under test with

Figure: *The in-vehicle test set-up*

strategically positioned pressure transducers, which measure everything from pedal pressure and individual cylinder pressure to pressure differentials among axles. In addition, the OEM obtains data on pressure waveforms and timing and evaluates it to assure even, adequate braking at all times.

Initially, the brake manufacturer's field-test system consisted of a "luggable" lunch-box-style computer, equipped with a plug-in data acquisition board. However, this solution was bulky, difficult to transport to test sites, and awkward to operate within the tight confines of an eighteen-wheeler truck cab. In addition, as the brake manufacturer refined its testing requirements and improved the dynamics of its brake systems, the board's 100-kHz A/D conversion rate was insufficient for the task. Another drawback of the original field-test system was its dependence on the luggable computer. Because field-testing is often performed on very short notice, test engineers were reluctant to use the luggable computer for lab applications, since there was no assurance that they would be able to complete lab tests without interruption. Consequently, use of the luggable computer was in effect confined to field-testing, which proved a drain on the test department's limited computer resources.

Potential Solution

The brake manufacturer first evaluated several high-speed boards as replacements for the original field-test system. However, while these would have eliminated the technical limitations of the original system, they would not have addressed the practical difficulties and space problems associated with using a luggable computer or a notebook PC equipped with a docking station.
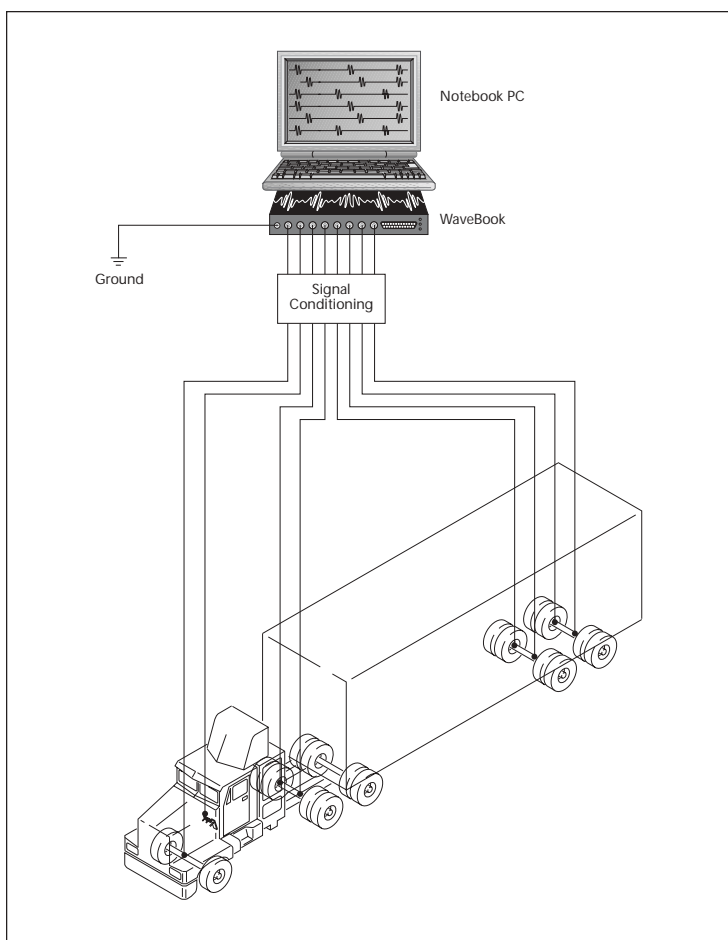
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IOtech's Solution

The brake manufacturer selected IOtech's WaveBook for its replacement field-test system. The manufacturer chose the WaveBook in part because its compact 8.5" x 11" x 1.375" size matches the typical form factor of notebook PCs, the manufacturer's preferred portable computer platform. The WaveBook's 125 Ksample/s per channel sampling rate—10 times faster than the original system's—was a further factor, as it addressed the manufacturer's fears regarding system obsolescence if faster sampling rates are required. The brake manufacturer was impressed as well by the WaveBook's expandability, which permits the addition of pressure transducers as necessary.

Another strong point was the WaveBook's ability to be powered by a variety of sources. Because the unit can operate from any 10 to 30 VDC source or from an included AC power adapter, it is ideal for both the manufacturer's in-vehicle truck tests and lab tests.

Connectivity also figured in the manufacturer's selection of the WaveBook for its new in-field brake test system. The WaveBook's eight BNC inputs simplify system hook-up, eliminating the need for special cabling.

Finally, the brake manufacturer was pleased with the WaveBook's ability to operate from either a notebook or desktop PC. This enables its simple connection to virtually any available computer, making it easier for test personnel to get maximal use from limited computer resources.

Conclusion

The WaveBook's high-speed sampling, convenient BNC inputs, DC operability, and light weight make it a unique portable solution. Also, because it is external to the controlling computer, it is ideal for field-service applications, where system flexibility and expandability are often important issues.

WaveBook Series

The WaveBook™ series of portable and desktop digitizers offer multi-channel waveform acquisition and analysis for portable or laboratory applications. All WaveBook models include 8 built-in channels expandable up to 72 channels of voltage, accelerometer, microphone, strain gage, thermocouple, position encoder, frequency, high voltage, and other signal types. For applications beyond 72 channels, up to four WaveBooks can be combined within one measurement system, for a total capacity of 288 channels. WaveBooks are available with either an Ethernet or parallel connection to a PC.

Features

- PC connection via Ethernet, parallel, PC-Card, or PCI card
- 1 µs/channel scanning of any combination of channels
- Expandable up to 288 high-speed channels
- SYNC connection allows multiple units to measure synchronously
- Add up to 224 lower-speed thermocouple channels

- DSP-based design provides real-time digital calibration on all channels
- Single and multichannel analog triggering with programmable level and slope
- Digital TTL-level and pattern triggering
- Pulse trigger and external clock
- Programmable pre- and post-trigger sampling rates
- Sixteen 1-MHz digital inputs
- Operable from AC line, a 10 to 30 VDC source, such as a car battery, or optional compact rechargeable battery module

Using WaveView software's spreadsheet-style interface, you can easily set up your application and begin taking data within minutes of connecting your hardware, with no programming required.

Included Software

- WaveView™ for *Out-of-the-Box™* setup, acquisition, and real-time display*:*
  - Scope mode for real-time waveform display
  - Logger mode for continuous streaming to disk
- eZ-Analyst™ for real-time spectrum analysis
- Export data in third-party formats
- Includes drivers for Visual Basic®, Delphi™, C++ for Windows®; DASYLab®, and LabVIEW®
- ActiveX/COM development tools

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