In contrast to other automotive safety features such as seat belts, which can be periodically checked for proper operating condition, in-vehicle airbags may be stored unchecked for years before being used. Because lives depend upon airbag systems being ready to deploy in an instant, rigorous airbag testing is critical.

Application Summary

One of the most important components of an airbag system is the ignitor, which generates the explosion that forces the airbag out of its storage compartment when a specific amount of force is applied to a vehicle. This simple device must operate flawlessly. If the triggering mechanism detects the force improperly, the airbag can falsely deploy or fail to deploy; if the trigger is late in responding, the airbag fails to prevent potential injury. A leading manufacturer of airbag ignitors ensures that its ignitors work properly by having research engineers examine the ignitor's response time and trigger detection mechanism during the unit's design and test phase.

Until recently, the engineers subjected ignitor designs only to laboratory tests, which they measured with a digital storage oscilloscope (DSO). For most of these tests, the engineers connected a DSO to a desktop PC via its RS-232 port so that they could store, analyze, and report their data in a third-party data acquisition software package running on the PC. For tests that required multiple data channels, the engineers found that the DSO had limited memory depth and input channels. To circumvent the input-channel limitation, the engineers linked multiple DSOs together. Besides being a costly and awkward solution, the daisy-chained DSOs could not provide simultaneous triggering. Furthermore, the engineers had difficulty correlating the data acquired from the DSOs.

Potential Solutions

The engineers evaluated two PC-based data acquisition solutions. They first considered a rack-mounted system. Although the engineers considered this solution preferable to daisy-chaining DSOs, they eventually decided against it because it was not sufficiently portable for in-vehicle testing. The second solution was a 1-MHz A/D plug-in board, which the engineers planned to install in an industrial-grade, rugged "luggable" PC. However, this option was still too large and heavy for their requirements.
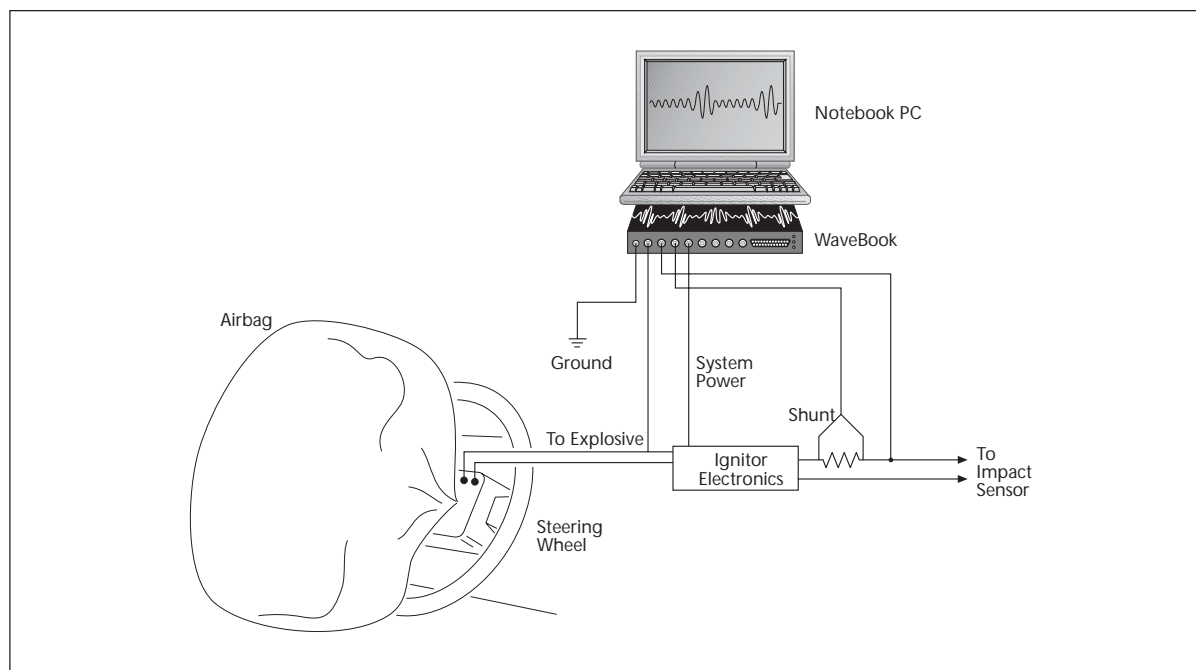
Airbag test set-up

IOtech's Solution

The engineers chose IOtech's WaveBook portable 1-MHz digitizer because it offered them the necessary speed, size, and ruggedness for this application. The engineers liked its light-weight, all metal construction and its ability to receive power from either an AC source for laboratory testing or from a DC source such as a cigarette lighter for in-vehicle testing. In addition, the engineers find that the WaveBook's ability to work with most notebook and desktop PCs – a big plus over plug-in boards

Other WaveBook features influenced the engineers' decision. The unit's BNC connectors permit them to save time and money by enabling them to re-use the BNC cables that they used with their DSOs. The WaveBook's wide-ranging software support allowed them to use the same third-party data acquisition software, sparing them the need to learn a new software package. They were also impressed by the WaveBook's multi-channel triggering, which eliminates false captures and quickly displays the data of interest, reducing the time needed for post-analysis data reduction and shortening the time required to generate reports.

Conclusion

The WaveBook 1-MHz digitizer is an ideal substitute for DSOs in many electro-mechanical applications. It provides the speed and channel expansion required for many applications, and because it links directly to the computer via a parallel port or PCMCIA slot, it can be connected to most computers.

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

eZ-Analyst™, WaveBook™, WaveView™, and *Out-of-the-Box*™ are the property of IOtech; all other trademarks and tradenames are the property of their respective holders.