Can You Imagine . . .

. . . a low-cost, digital accelerometer that improves the performance of triggering devices for automobile air bags.

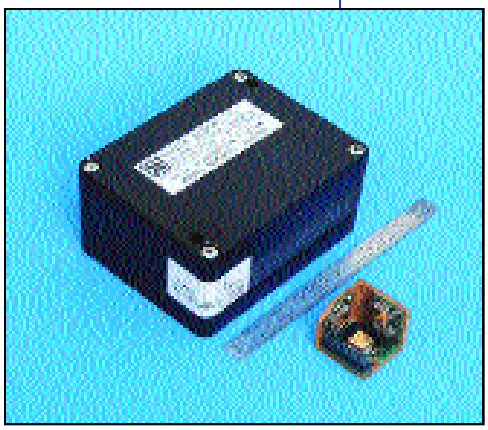
ACCELEROMETERS FIND A HOME IN AUTO AIR BAGS

CHRYSLER USES THESE ACCELEROMETERS FOR AIR BAG TRIGGERS IN FIVE CAR MODELS.

Although the seat belt is the first line of defense in a car accident, air bag systems offer additional protection during frontal impacts of sufficient force. As an integral part of car safety, air bags continually undergo improvements to provide state-of-the-art protection for drivers and passengers.

Until about two years ago, "ball-and-tube" devices triggered most air bags. A collision jolted a ball that traveled down a tube to activate an electrical signal, triggering the air bag. However, a light-impact collision sometimes caused the device's mechanics to inflate unnecessarily or prevented the air bag from working later in a high-impact collision.

A low-cost digital accelerometer from Silicon Designs, Inc. (Issaquah, WA), overcomes these problems. This miniature accelerometer forms the basis of a crash sensor that is superior to the mechanical devices found in previous air bag designs. It rejects certain patterns of vibration, reducing the chance of unnecessary inflation or system malfunction. Silicon Designs has signed a licensing agreement with TRW, Inc., which sells the accelerometers to a large percentage of the automotive industry. Today, Chrysler uses these accelerometers in five car models.



■ Silicon Designs' data acquisition system, pictured above, uses several miniature accelerometers, and has been used in automotive suspension testing.

The accelerometer's other uses include motion detection, active suspension, and aircraft flight control. For example, some racing cars use it to monitor acceleration and cornering, and General Motors Corporation used it in an automotive suspension monitoring system at its proving ground. It may also prove useful in aircraft flight control, because an autopilot system needs an accelerometer to sense changes in the direction (right and left movement) and altitude (up and down movement) of the aircraft.

The radiation-hardened accelerometer was developed with BMDO funding for research in kinetic energy vehicles. Because of its ability to measure changes in velocity, it is well suited to navigate and guide these vehicles, as well as act as the fuzing. In addition, the accelerometer is being put to work in the safe-and-aim device for the BMDO-funded PAC-3, an extension of the Patriot missile family. It costs half as much as current designs for contact fuzes used in the high-speed missiles.

ABOUT THE TECHNOLOGY

The digital accelerometer consists of two chips assembled in a single integrated circuit package: a sensory chip and an integrated electronics chip. The sensory chip contains two micromachined, capacitive sense elements that change their capacitance in response to acceleration. The integrated electronics chip measures the change in capacitance and converts it to a digital pulse output stream. Overall, the accelerometer is low-power (1.0 milliamps at five volts direct current) and operates over a wide temperature range (–55 to +125˚C). It has been designed for high-volume production at low cost.