Signal Conditioners and Electronic Products for Use with TEDS "Smart Sensors"

- Retrieve sensor specific information upon command
- Automate spatial coordinate bookkeeping tasks
- Reduce set up time for multi-channel testing
- Obtain sensor tag number or route location automatically
- Write location and calibration information to sensor memory

About TEDS

IEEE P1451 is an emerging standard defining the architecture and protocol for compiling and addressing non-volatile memory that is imbedded within an analog measurement sensor. Once programmed, the data resident to the sensor's memory can be downloaded and utilized in an automated test scenario. The stored, digital information has been labeled with the name TEDS, standing for "Transducer Electronic Data Sheet".

The ability of storing information particular to the sensor in which the TEDS resides provides many advantages. Multi-channel tests are expedited by permitting sensors to communicate their calibration value, location, and spatial coordinates, which are then utilized by the data acquisition equipment. Route data collection for machinery condition monitoring and predictive maintenance requirements may benefit by having sensors provide their route location and calibration value for interpretation and use by the data logging equipment. Intelligent signal conditioning equipment may interrogate sensors for their calibration value and automatically normalize their output signals.

The potential of TEDS promises to expedite multi-channel testing, route data collection and routine measurement tasks. In addition, bookkeeping and paperwork requirements are reduced while maintaining conformance to ISO 9001 and QS 9000 standards.

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TEDS Theory

TEDS, "Transducer Electronic Data Sheet", is non-volatile memory within a sensor that is utilized for storing information about that sensor. The manufacturer of the sensor stores, into this memory, initial information such as manufacturer name, sensor type, model number, serial number, and calibration data. Memory space allocation permits the user to add additional information such as channel ID, location, position, direction, tag number, etc. The sensor operates in a "mixed mode", i.e. analog or digital fashion. In the digital mode, the information stored in memory is downloaded. In the analog mode, the sensor functions normally, as a measurement device. A suitable TEDS signal conditioner is used to access the memory digitally, over the same wires ordinarily used for analog measurement signal transmission. Once the data has been transferred from the sensor,

the memory circuit is switched out and the sensor resumes normal analog operation.

A TEDS sensor may be used with a conventional signal conditioner however, there would be no access to the memory. A conventional sensor may also be used with a TEDS signal conditioner however, there would be no TEDS functionality. For universal applicability, the architecture of this technology has been defined by IEEE P1451 Smart Transducer Interface Standards. By conforming to a universal standard, any TEDS sensor will be capable of being addressed by any TEDS signal conditioner, regardless of manufacturer. PCB Piezotronics, Inc. and The Modal Shop, Inc. are actively participating on committees, which are defining the TEDS standards IEEE P1451.3 and IEEE P1451.4. In addition, PCB® and The Modal

Shop have already developed products which comply with the proposed standards and have provided more than 1000 channels of TEDS enabled sensors and signal conditioners for working installations throughout the world.

Benefits of TEDS include reduced bookkeeping errors, automatic sensor location identification, elimination of required cable tracing, reduced test set-up time, reduced paperwork, and conformance to ISO 9001 and QS 9000 calibration record-keeping requirements. Furthermore, the potential of the TEDS sensor architecture may help extend data acquisition across communication networks and the worldwide web.

TEDS Technology as Applied to ICP® Sensors

The TEDS memory circuit is built into the ICP® sensor alongside the conventional signal conditioning circuitry. This memory is comprised of 64+64+256=384 bits of memory. The first 64 bits are programmed at fabrication time and include an 8 bit family code and a 48 bit address code. The next 64 bits are the "write once" or PROM segment that is programmed by the sensor manufacturer. This segment includes information such as manufacturer name, model number, and serial number. The next 256 bits are the Electronically Erasable Programmable Read Only Memory segment, or EEPROM, which can be programmed by the user to include information such as location, orientation, sensitivity, last calibration date, etc. A diode isolation scheme facilitates the switching between the ICP® sensor circuit and the TEDS circuit. When the sensor is forward biased, with its conventional positive excitation voltage, it will function as a normal measurement device and output its analog meas-

The TEDS memory is addressed by a negative bias voltage.
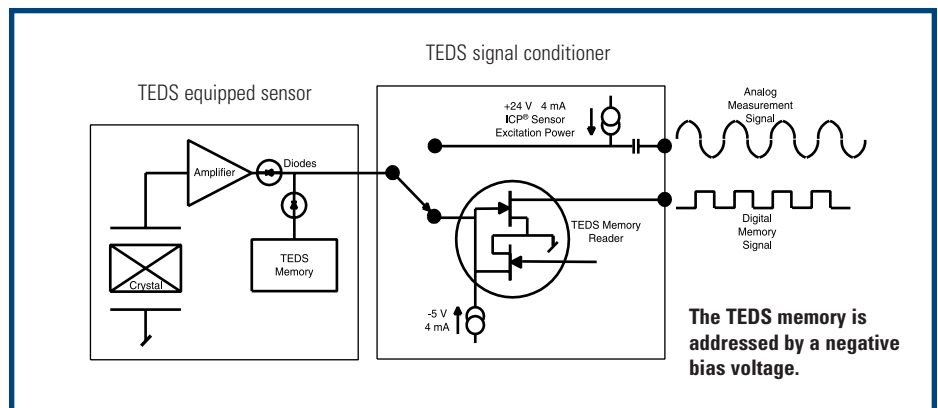
urement signal. When the sensor is reversed biased, i.e. exposed to a negative voltage, the TEDS memory becomes accessible. The TEDS signal conditioner serves to generate the reverse bias, or negative going voltage pulses. These pulses interrogate the memory whose content is then transmitted via the same two wires, back to the signal conditioner and then across an RS-232 interface to the controlling PC. The data is then available within the PC for view-

ing, printing or archiving in a typical spreadsheet or database fashion.

Being quite small, the TEDS circuitry adds little to the weight of the sensor and as such will not degrade sensor performance. This also permits the TEDS circuitry to be added to virtually any ICP® sensor. Excluded are only the smallest sensors where there is simply no additional space to accommodate TEDS.

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Model 481A Multi-Channel Signal Conditioner, with 104 TEDS Option

For ICP® and Charge Output Pressure, Force, and Vibration Sensors

- Simultaneously condition up to 16 input channels
- Daisy-link multiple racks for up to 256 channels
- Apply gain, filtering, integration, and switching

Rack Mountable

Series 442 Sixteen-Channel Modular Signal Conditioner

For ICP® Sensors

- Unity or selectable gain
- Unfiltered or selectable pre-filter

16-Channel ICP® Input Module

Model 443B Dual-Mode Amplifiers

For ICP® and Charge Output Vibration Sensors

- Integrates to velocity and displacement, with frequency response to 1 Hz
- Digitially-set sensitivity normalization
- Selectable low and high pass filtering

Rack Mountable

Series T422E In-Line Charge Converters

Store and Recall TEDS Data for Sensor which is Attached

- Convert high-impedance charge signals into low-impedance voltage signals
- Operate with ICP® sensor signal conditioners or readout devices which have an ICP® sensor input
- Variety of gains and input ranges

In-Line TEDS Adaptors

Store and Recall TEDS Data for ICP® Sensor which is Attached

- Model 070A70 - Epoxy-sealed, BNC connectors
- Model 070A71 - Hermetically-sealed, 10-32 coaxial connectors

Model 400A75 TEDS PDA

Read and Write to TEDS "Smart" Sensors Using Palm™ Personal Digital Assistant (PDA)

- English and SI units
- Includes fully functional Palm™ PDA with 8 MB of RAM, HotSync® communication hardware, cable, and installed software to read and write to all PCB® TEDS sensors

Supports All PCB TEDS Sensors

Model 400A76 TEDS Sensor Interface Kit

Read and Write TEDS Data in Sixteen IEEE TEDS Templates and Three LMS® International Templates

- Operates on Windows PC via RS-232 port
- Kit consists of a 100-7158-20 RS-232 hardware interface dongle, TEDS read/write software, and cable assembly
- Transducers supported include accelerometers, microphones, charge amplifiers, and microphone preamplifiers
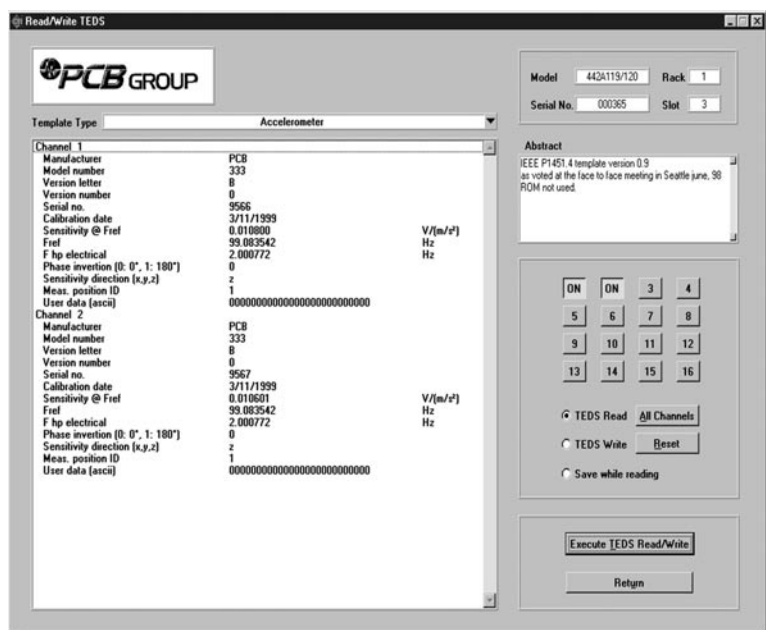
TEDS System Software

The TEDS read/write software permits download and upload of information through a familiar windows user interface.

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ISO 9001 CERTIFIED   A2LA ACCREDITED to ISO 17025

The Electronics Division of PCB® Piezotronics, Inc. specializes in the development, application, and support of signal conditioners, cables, and accessories for a wide variety of sensor interfacing requirements. This product focus, coupled with the strengths and resources of PCB, permits the Electronics Division to offer timely response to client's needs, exceptional customer service, 24-hour technical assistance and a **Total Customer Satisfaction** guarantee.

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