

# A Compiler and Tester for Smart Transducers based on the IEEE 1451 Standard

*Wei Liu, Wai Sing Poh\* and Darold Wobschall\**  
Electrical Engineering Department  
State University of New York at Buffalo  
332 Bonner Hall, Buffalo, New York 14260 USA

\*Esensors, Inc  
4240 Ridge Lea Rd.  
Amherst, NY 14226 USA

## Summary

A compiler was developed for generating the Transducer Electronic Data Sheets (TEDS), an essential part of the newly developed IEEE 1451.0 open standard for smart transducers. The lack of a compiler for the complex, partially binary TEDS has severely limited the use of the standard previously in spite of the clear virtues of having a universal digital data standard for all sensors and actuators, thus allowing inter-changeability (plug and play) between all manufacturers. A TEDS interpreter is also provided.

In addition, a testing system and a simulation Transducer Interface Module (TIM) which tests and analyzes the TIM through a RS232 serial port was developed. It has three channels and calibration was demonstrated for the temperature channel.

## Motivation and Description

The IEEE 1451 smart transducer protocol standard supported by the National Institute of Standards and Technology (NIST) is considered the leading protocol candidate for being adopted as a universal standard for the US and possibly worldwide [1,2]. Because the standard is intended to apply to nearly all transducers, it is of necessity complex. The complexity of the precedent standard (IEEE 1451.2) and the lack of a simple method for generating and reading the TEDS has greatly inhibited its adoption. The TEDS compiler developed here (Fig 1) is designed to allow simple data entry by the design engineers, with default values provided where needed. A TEDS interpreter is provided which allows the TEDS data to be quickly retrieved and understood. A simple calibration routine for linear transducers is provided so that data can be displayed in the desired engineering units (Fig. 2).

A test program, which operates over the Internet was also developed. It verifies that the TIM under test is compliant with the IEEE 1451 (Dot 0) protocol. Both the TEDS and the transducer read/write operations are tested. It is based on TIMS with a serial interface (e.g. RS232). Since the data of most TIMS, including wireless, can easily be converted into serial format, the tester has wide applications. It was tested with a 3-channel TIM (Fig. 3). Sample TEDS data is shown in Fig. 4.

We believe that this compiler and tester will encourage much wider adoption of the IEEE 1451 standard.

1. K. Lee and M. Reichardt "Open Standards for Homeland Security Sensor Networks", IEEE Instrumentation and Measurement Magazine, Dec. 2005
2. S. Y. Yurish, "IEEE 1451 Standard and Frequency Output Sensors: How to Obtain a Broad-Based Industry Adoption?" *Sensors & Transducers Magazine (S&T e-Digest)*, Vol.59, Sept 2005

