DTS factory calibration is comprised of visual examination, voltage and frequency measurements, and numerous data collection runs on automated test equipment. Several calibration factors in the hardware's module information file (MIF) are updated and rechecked including excitation, gain, internal calibration source and redundant analog-to-digital (A/D) accuracy. Tests are performed using NIST-traceable Hewlett Packard/Agilent digital multimeters (DMMs) and function generators; the results are checked for conformance with SAE J211/ISO 6487 where applicable. All TDAS PRO, TDAS PRO LAB, and TDAS G5 products are calibrated at the time of manufacture; full calibration of all data channels is recommended by DTS and required on a yearly basis for conformance to SAE J211. The procedures outlined below are performed as applicable to each specific product.

Internal Visual and Mechanical Inspection. Exterior surfaces and connectors are examined for evidence of damage or deterioration. The cover is removed and internal assemblies are inspected for damage or deterioration including burnt or overheated wires and components, broken hardware, and foreign material. Battery capacity is tested and the battery is replaced if necessary.

System Voltages. Power supplies and reference voltages are verified with firmware diagnostic functions. The battery voltage measurement circuit is also verified and the compensation factor in the MIF is updated as necessary.

Calibration Source. The performance of the internal calibration source is verified at several points by setting the voltage level with firmware commands, then verifying the output with a DMM at the signal terminals of an input channel. Performance with sensor loading is verified by setting the output level and monitoring the result with the internal A/D converter using firmware commands. Basic and sensor loading compensation factors are determined and the values in the MIF are updated as necessary. This is the heart of the TDAS calibration. In real-world usage, all data recorded by the TDAS are scaled based upon measured gains using the internal calibration source during the pre-test calibration routine.

Excitation Sources. Excitation sources are tested at applicable settings under nominal and rated load conditions. The DC voltage and AC ripple are measured with a DMM at the TDAS sensor connector. The values in the MIF are updated as necessary. Additionally, it is verified that each voltage source turns on properly with an overload applied, and recovers from a momentary shorted load.

Amplitude Accuracy. Each allowable gain setting is verified at several input levels on each channel. A precision DC signal source is applied and the actual gain is calculated from the A/D converter response.

Shunt Check Options and Switching Circuits. With 350 ohm balanced bridges connected to all channels, diagnostic tests are run to confirm expected bridge deflection on each channel with each available shunt option.

Frequency Response. Using a 100 Hz sine wave, amplitude is normalized then measured at many higher frequencies. Amplitude versus frequency is recorded and compared to specified performance limits. An SAE J211 filter algorithm is applied to the raw data and the result is plotted against the SAE J211 corridor for a Class 1000 system.

Time Base. Precision, low-frequency square waves are applied and zero crossing times are analyzed.

Event Timing Accuracy. An event signal is applied simultaneously as a signal shift is applied to all analog channels.

Channel-to-Channel Skew. Channel-to-channel time skew is quantified by applying a 100 Hz square wave at 60% of full scale to all input channels, collecting data, then analyzing the data. Step input overshoot is also assessed.

Sensor ID. Sensor ID performance is verified on all channels.