

This document presents a comparison of SLICE specifications to the applicable performance requirements contained in sections 4, 8 and 10 of the current SAE J211.

4. Data Channel Performance Requirements

It is important to note that SAE J211 covers the entire data channel, not just the data acquisition system. SAE J211 defines the "Data Channel" as follows:

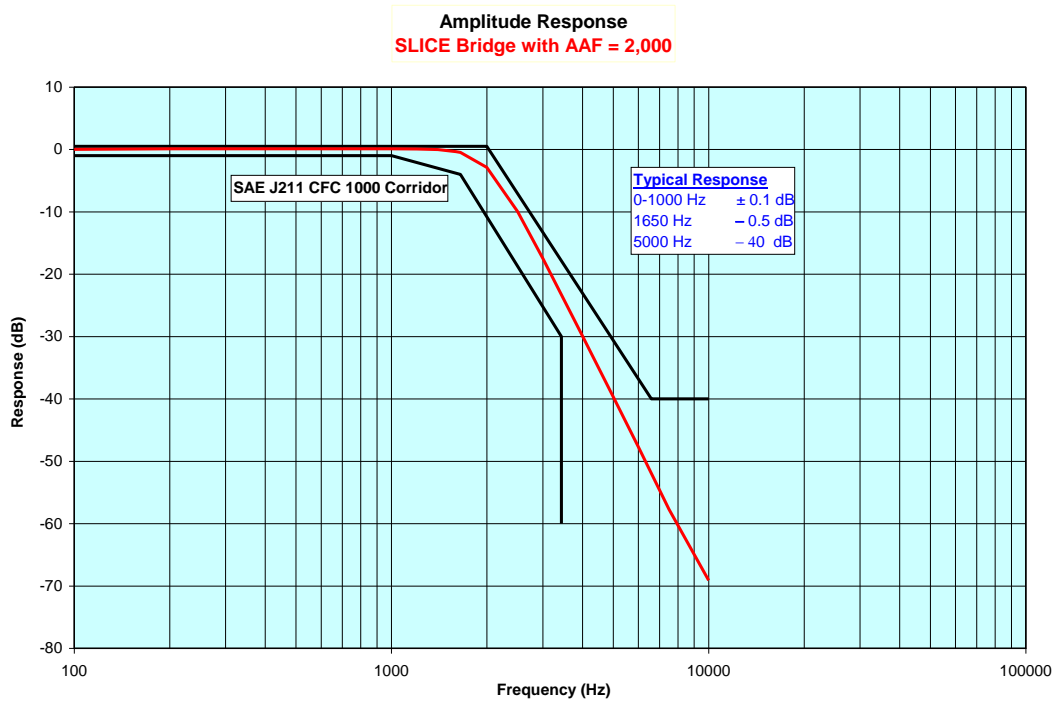
"All of the instrumentation from and including a single transducer (or multiple transducers whose outputs are combined in some specified way) up to and including any analysis procedures that may alter the frequency content or the amplitude content or the timing of data. It also includes all cabling and inter-connections."

The following table presents SLICE specifications compared with SAE J211 requirements and does not include information regarding the performance of sensors, cabling and non-DTS post-processing software. Please contact sensor manufacturers and software vendors for additional information to evaluate complete data channel performance.

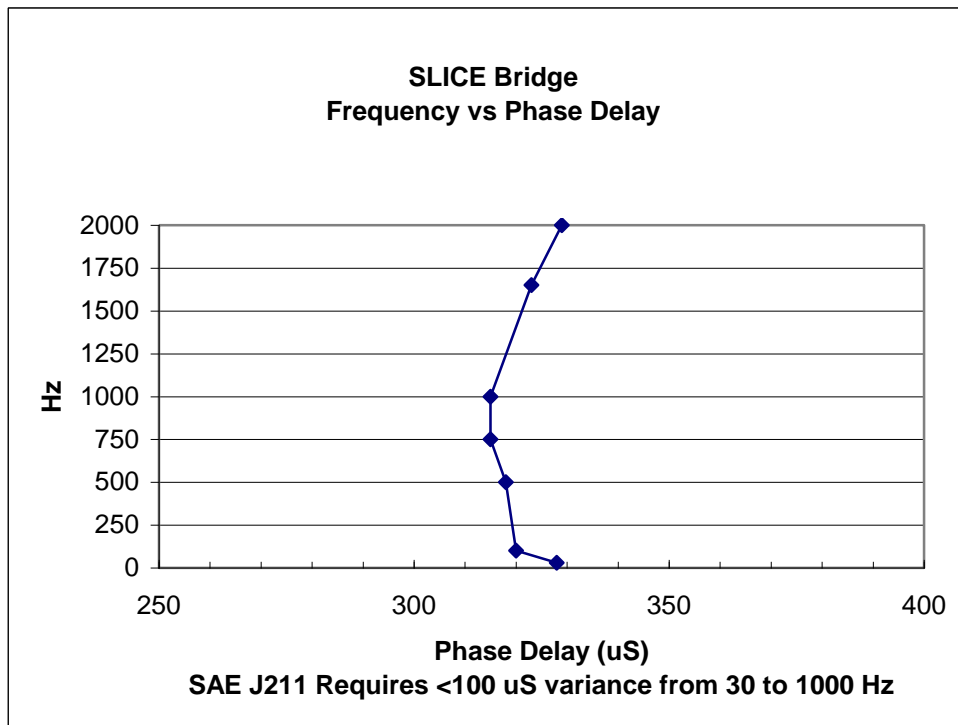
Slice and SAE J211 Compliance

Description	SAE J211 Requirement	SLICE Bridge Specification
4.1) Linearity Error	$\leq 2.5\%$ of full scale measured between $F_L - F_H$ Hz (including instrumentation).	0.2%. Every channel fully tested.
4.2) Amplitude Against Frequency	The frequency response shall lie within limiting curves given in Figures 1 & 2.	Hardware and Software filters fall in the middle of the limiting curves. See CFC1000 graph below.
4.3) Phase Delay Time	Shall not vary by more than 100 μ S from 30 to 1000 Hz.	$< 50 \mu$ S from 30 to 2000 Hz. See plot below.
4.4.1) Time Base	At least 1/100 second resolution. Error < 0.1 mS.	< 0.1 mS resolution. < 0.1 mS error. Tested with square wave generator connected to sensor inputs.
4.4.2) Relative Time Delay	< 1.0 msec between all channels and < 0.1 msec between channels used together in a calculation.	< 0.1 msec between all channels. Tested with square wave generator connected to sensor inputs.
4.6.1) General	A data channel shall be calibrated at least once a year against reference equipment traceable to known standards. This can be accomplished for example by an electrical signal of known amplitude simulating the output signal of the transducer which allows a check to be made on the gain of the data channel, except the transducer. Calibration against reference equipment shall not introduce an error $> 1\%$.	Data channels are designed for easy periodic calibration. DTS offers yearly on-site or local calibration using equipment traceable to known standards. Calibration equipment is better than 0.1%.
4.6.4) Calibration of Frequency Response	Determined by measuring output signals with a known input signal from DC to 3 KHz.	Response is measured from DC to 10 KHz using sine wave generator connected to sensor inputs.

4.2) Amplitude Against Frequency



4.3) Phase Delay Time – Typically <20 μS from 30 to 2000 Hz

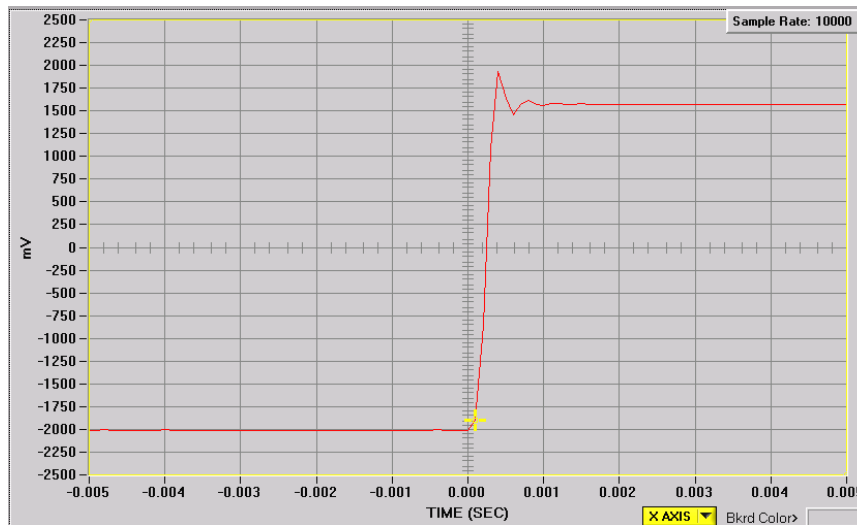


8. Digital Data Processing
10. Time of Contact

Description	SAE J211 Requirement	SLICE Bridge Specification
8.1) Presample Filtering	At or above CFC 1000.	9-pole Butterworth adjustable from 50 to 45000 Hz. Automatically set based on sampling rate. Class 1000 response can be achieved with the hardware filter alone if desired.
8.2) Sampling Rate	Minimum 10K samples/sec/channel	20K samples per second (sps) per channel.* Presample filter automatically adjusts to support all available sampling rates.
8.3) Resolution	12-bit minimum and the least significant bit <0.2% of full scale.	16-bit. Least significant bit typically 0.005% of full scale.
8.4.1) Digital Filtering	CFC 600 and 1000 must meet corridors in section 4. CFC 60 and CFC 180 must meet specific corridors.	DTS software uses the 4-pole "phaseless" Butterworth filter algorithm supplied by NHTSA.
8.4.2) 8.4.3) Scaling and Zeroing	A check of accuracy must be applied to every channel before every test and applied to the scale factor. Zero level should be adjusted post test to equal a normalized, stable pre-test zero level for the transducer.	Shunt emulation is used to check scale factors. Zero levels are automatically adjusted post test to achieve a stable pre-test zero level for the transducer.
10) Time of Contact	Determined within ± 0.5 msec.	± 0.1 mS See graph below.

* Maximum sampling rate varies by the total number of channels in a SLICE Stack. 20000 sps is supported from 3 to 18 channels in each stack. 10000 sps is supported in all SLICE configurations.

10. Time of Contact



Step wave connected to event input and data channel.

Additional Performance Information

DTS uses a 100 Hz square wave signal to check step input response and overshoot.

- 100 Hz square wave signal calibrated to ± 1000 mV
- Recorded at 10,000 samples per second with a 2,900 Hz anti-alias filter setting
- No software filtering

Requirements:

Amplitude accuracy better than 0.3%

Overshoot less than 13% (typical 10%)

