

WiNG nodes instrument response

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1 A priori facts

1. Instrument sensitivity = 0.425 V/ms^{-2} .
2. Instrument full scale RMS = 1.6 V.
3. Instrument records in 24-bit.
4. The instrument has a phase accuracy of $< 5\mu\text{s}$ from 0-400 Hz. No phase correction is required.

For an N-bit instrument, the recording range is:

$$-2^{N-1} \text{ to } 2^{N-1} - 1 \quad (1)$$

The peak-to-peak voltage of an instrument can be calculated from the full-scale RMS value by:

$$V_{peak} = V_{rms} \times \sqrt{2} \quad (2)$$

2 WiNG node instrument correction

$$V_{peak} = 1.6\text{V} \times \sqrt{2} = \pm 2.263\text{V} \quad (3)$$

$$\text{Bit recording range} = -2^{23} \text{ to } 2^{23} - 1 \quad (4)$$

$$1\text{bit} = \frac{V_{peak}(= 2.263\text{V})}{(2^{23} - 1)} = 2.6977 \times 10^{-7} = \text{'descale factor'} \quad (5)$$

$$\text{Voltage} = \text{raw bit data} \times \text{descale factor} \quad (6)$$

$$\text{Acceleration} = \frac{\text{Voltage}}{\text{Sensitivity}(= 0.452)} \quad (7)$$

The descale factor can be found in the Channel Set Headers (bytes 17 to 20) of the SEGD file. The maximum recordable signal is:

$$\text{Max. acceleration} = \frac{2.263}{0.425} = 5.3\text{ms}^{-2} \quad (8)$$