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## What Has Changed with the Polynomial Conversion Method?

### Frequently Asked Question #14

#### Overview

There have been some important changes in regards the use of the second order Polynomial conversion method available for instrument channels. This FAQ will explain these changes and how it affects the function of the Zero Mode and the entry of the A, B and C Coefficients.

#### Changes

Beginning with version 2.1.4 of MultiLogger the following changes have been made to the second order Polynomial conversion method:

#### Zero Factor Usage

The Zero Factor for each type of instrument on each channel is now used in conjunction with the A and B polynomial coefficients. The Zero Factor is a magnitude shift value which is used to improve the resolution of the conversion entries, such as the Gage Factor for the Linear conversion method and the A and B Polynomial coefficients for the Polynomial conversion method. Most instruments use a Zero Factor of 1.0 (this is defined in the multilogger.ini file for each instrument listed in the [Gage Types] section) but some, such as vibrating wire instrumentation use a factor of 1000. The basic limitation addressed by the use of the Zero Factor is that the Campbell based dataloggers can only accept a multiplier with a maximum of 5 digits, but some instruments require more than 5 digits to accurately convert the raw data to engineering units. For example, a 2.5psi vibrating wire pressure transducer may have a factor of 0.000625psi per digit (digits represent frequency squared \*  $10^{-3}$ ), with the 5-digit limitation of the datalogger only a factor of 0.00062 (or 0.00063 with rounding) can be entered. The Zero Factor is used internally to divide the raw data and then multiply the factor, so for a Zero Factor of 1000 the actual Gage Factor entered in the program would be 0.625 (of course 2 more least significant digits may be included). This resolution limit is particularly problematic when using the Polynomial conversion method because typically the A coefficient (used to multiply the reading<sup>2</sup> result) is quite small, perhaps on the order of  $-2.0E-08$ , so without shifting the magnitude you would not be able to enter any effective resolution of the factor. In the case of a vibrating wire instrument with a zero factor of 1000 the actual A coefficient entered in the program would be 0.02 (with 3 more least significant digits if required). What does this all mean? **It means that beginning with MultiLogger version 2.1.4 you will enter polynomial coefficients AS REPORTED by the manufacturer.** Prior to version 2.1.4 it was required to multiply the A coefficient by the square of the Zero Factor (1,000,000 if the Zero Factor was 1000), and the B coefficient by the Zero Factor (1,000 if the Zero Factor was 1000) PRIOR to entering them in the channel configuration for the selected instrument.

#### Zero Mode Functionality

The Zero Mode will now report and enter the C Coefficient for each instrument channel which is configured to use the Polynomial conversion method. Prior to v2.1.4 the zero reading was always reported in terms of the raw data output of the instrument.

#### Test Mode Functionality

The Test Mode will continue to report only raw data output of the instruments, no conversion factors, neither Linear coefficients or Polynomial coefficients will be used to convert the raw data output.