

instruNet software Version $\geq 1.40.1.1$ contains a Calibration Options dialog that provides several calibration options, as described below. This dialog is accessed by pressing the Setup button in the Record page and then pressing the Calibration button. Programmatically, one accesses these fields via {netNum=0, devNum=0, modNum=1, chanNum=3, settingGroup = -21 = sgt_CalOptions, fieldNum = 1 to 8 (e.g. 5 = fldNum_CalOptions_CjcCalRate)}. For information on setting these fields programmatically, please see instruNet Application note #133. For information on setting these with instruNet Basic, please see Application Note #132.

CAL BUTTON: This popup controls the function of the Calibration button in the Network page. It is set to one of:

- a. Measurement - instruNet hardware is calibrated when the Network Calibrate button is pressed.
- b. Bal Gages - instruNet hardware is calibrated and all strain gages and load cells are balanced when the Network Calibrate button is pressed.
- c. Bal Bridges - instruNet hardware is calibrated and all bridges (i.e. strain gages, load cells, and pots) are balanced when the Network Calibrate button is pressed.
- d. Bal VDividers - instruNet hardware is calibrated and all voltage dividers are balanced when the Network Calibrate button is pressed.

"Balancing" involves reading the voltage across a sensor and placing it into the "Vinit" field within the Constants settings area. This is done to establish a zero point from the sensor, and should be done when the sensor is not receiving a stimulus.

CAL ON DIGI: If set to On, the instruNet hardware is automatically calibrated when the user presses the Start button and begins to digitize.

CAL ON WARM: If set to On, the instruNet hardware is automatically calibrated 10minutes and 25minutes after the instruNet software is first run.

AUTO CAL RATE: This field (to access, click Record tab, Setup button, Calibrate button) sets the rate that instruNet measurement electronics is automatically calibrated, in units of minutes. A full calibration occurs if not digitizing, and a less intensive thermal drift only calibration, described below, occur if digitizing. For example, if this field is set to 5, then instruNet hardware is automatically calibrated every 5 minutes. If set to 0, the Auto-Calibrate feature is disabled. The minimum rate is .016 minutes. The primary error from the measurement electronics is an offset voltage of approximately 2uV/C that occurs at the analog voltage measurement input amplifier. This means you will get an offset error of approximately 2uV for every 1 degree C that the amplifier IC heats up. It heats approx 5C above ambient (air around instruNet box) when first turned on and stabilizes after 1hr or so. From here, the IC temperature changes as the room temperature changes (e.g. a 5C increase in room temperature will increase the IC temperature by 5C, which could add voltage measurement offset error of 10uV). When Auto Cal is run, this error is eliminated to 0uV. During digitizing, an abbreviated version of auto-calibration takes place, as described below.

AUTO-CALIBRATION WHILE DIGITIZING

instruNet can automatically calibrate out thermal offset drift errors (e.g. 2uV offset error per 1C change in i100 box temperature) while digitizing (requires iNet32.dll $\geq 1.40.1.1$). These errors are proportional to the temperature change since the last auto-calibration. For example, if we calibrate the i100 at 25C (i100 box temperature), and later the box temperature is 29C, then the Voltage inputs will produce measurement errors between -8uV and +8uV ($2\text{uV/C} \times 4\text{C} = 8\text{uV}$). In many cases; this is not a problem; yet with strain gages, load cells and thermocouples; this could be an issue. In order for this auto-calibration of thermal offset errors (to zero error) while digitizing to operate, all the 40/4KHz analog filters must be off on all channels within the i100xx box being calibrated; and, there must be at least 6ms of time between the total integration time and the sample period. For example, if one digitizes 4 channels with 4ms integration each (16ms total), they would need a sample period of at least 20ms to support this feature. To see which channels are set up for auto-calibrate offset drift while digitizing, set up your recording, press the START button to digitize for several seconds, press STOP, enter "calibrate reportOn" in the BASIC page, press EXECUTE, and view the listed channels. If your list is empty, make sure your AUTO CAL RATE field is >0 , make sure all 40/4KHz filters are off, and make sure at least one channel has a range $\leq \pm 80\text{mV}$ (large ranges are not affected).

AUTO-CALIBRATE UPON COMMAND

For information on forcing the calibration with DasyLab, please instruNet application note #106. If programming, see AN#133. One line of program code can tell the instruNet hardware to auto-calibrate.

CJC CAL RATE: This field (to access, click Record tab, Setup button, Calibrate button) sets the rate that instruNet hardware automatically reads the temperature of the cold junction compensation sensor, in units of minutes, which is used for thermocouple measurements. If set to 0, this feature is disabled. The minimum rate is 0.016 minutes. Reading the cjc sensor can occur while digitizing at slow $<1\text{KHz/sec}$ speeds and when the sum of the integration time is less than 40% of the sample period. If the iNet hardware reads the screw temperature (i.e. does a CJC calibrate), and the screw then drifts by X degrees before the next CJC cal, one will incur a thermocouple measurement error by that amount (since the software subtracts the screw terminal temperature when calculating the thermocouple temperature).