# General Settings for Slow Control Monitoring

- Aim: Set up and start the continuous slow-control monitoring
  - Configure VIs and target computer to meet the general scheme
  - Check how readings and alarms appear on the monitor
- Slow control data monitor
  - `https://confluence.its.virginia.edu/display/General/Subsystems+Page`
  - For not only the target system but also the beam, the detectors, etc.
  - Astrid, Hugo, Paul and I had a meeting last Friday, to discuss how to stabilize server processes
- Plans
  - Server software (this week)
    - Move all server processes from `e1039gat1` to `e1039scrun`
    - Confirm that all server processes keep running after expected/unexpected shut downs
  - Data-monitor interface (next week)
    - Set up a dedicated computer+display in the control room
    - Try to launch the interface programs

# Temperature Measurements

- To read the 8 sensors in the cave:

  https://confluence.its.virginia.edu/display/twist/To-do+list+at+NM4

  - Measure relative changes at the magnet corners due to beam
    - Mainly to correlate the temperatures to the quench threshold

    Thanks to Dustin for explanations
  - What is the temperature accuracy that we need?
    - For example: $\delta_T \sim 1$ K at $T \lesssim 4$ K with 1 Hz?
- Device candidate:
  USB DAQ (MCC USB-202) with Thermocouple (Omega Type T)
  - Achievable accuracy? Estimate in next pages
  - How to read it out? Where to put USB-Ethernet converter or USB repeater?
- Alternative method:
  Use MCC E-TC with long compensation wire from slow-control rack??
  - Less radiation, fewer replacements
  - Better measurement accuracy
  - Simpler readout
  - Cost: https://www.omega.com/en-us/temperature-measurement/temperature-wire-and-cable/thermocouple-wires/p/EXTT-TX-WIRE
    - $150 for 500 ft
    - 8 of 50 ft are enough?

# MCC USB-202 for TC

- Voltage-Temperature relation of TC Type T
  - https://jp.flukecal.com/Thermocouple-Temperature-Calculator

| mV | −6.26 | −6.2 | −6.0 | −5.0 | −4.0 | −3.0 | 0.0 | +1.0 | +2.0 |
|---|---|---|---|---|---|---|---|---|---|
| °C | −269 | −253 | −229 | −167 | −123 | −87 | 0 | 25 | 49 |

- Spec of MCC USB-202
  - https://www.mccdaq.com/usb-data-acquisition/USB-200-Series.aspx
  - Range: $\pm 10$ V, 12 bits
  - Sampling rate: 100k/s at max
  - Accuracy: $\delta_V$ (mV) = 9.8e-4 * $V$ (mV) + 11 $\Longrightarrow$ 11 mV @ $|V| < 100$ mV
  - No CJC sensor is built in
- Considerations needed
  - Calibrate the voltage offset (11 mV)? Time stability? Device difference?
  - Set up CJC?

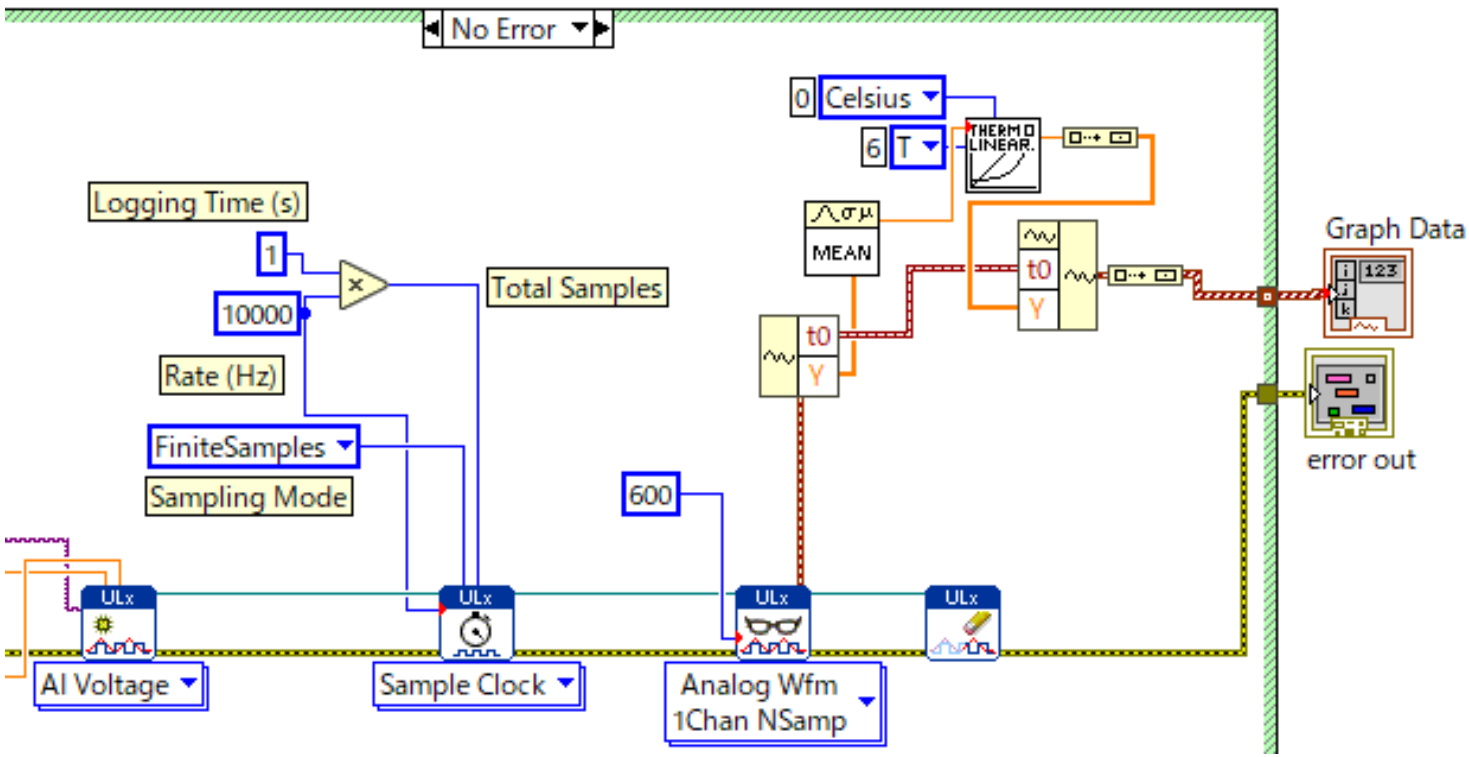
- For reference: Spec of MCC E-TC with Type T
  - Range: $-270$...400 °C
  - Accuracy: 0.817 °C @ $-200$ °C, 0.339 °C @ 0 °C
  - Sensors for the cold junction compensation are built in

# VIs for MCC USB-202

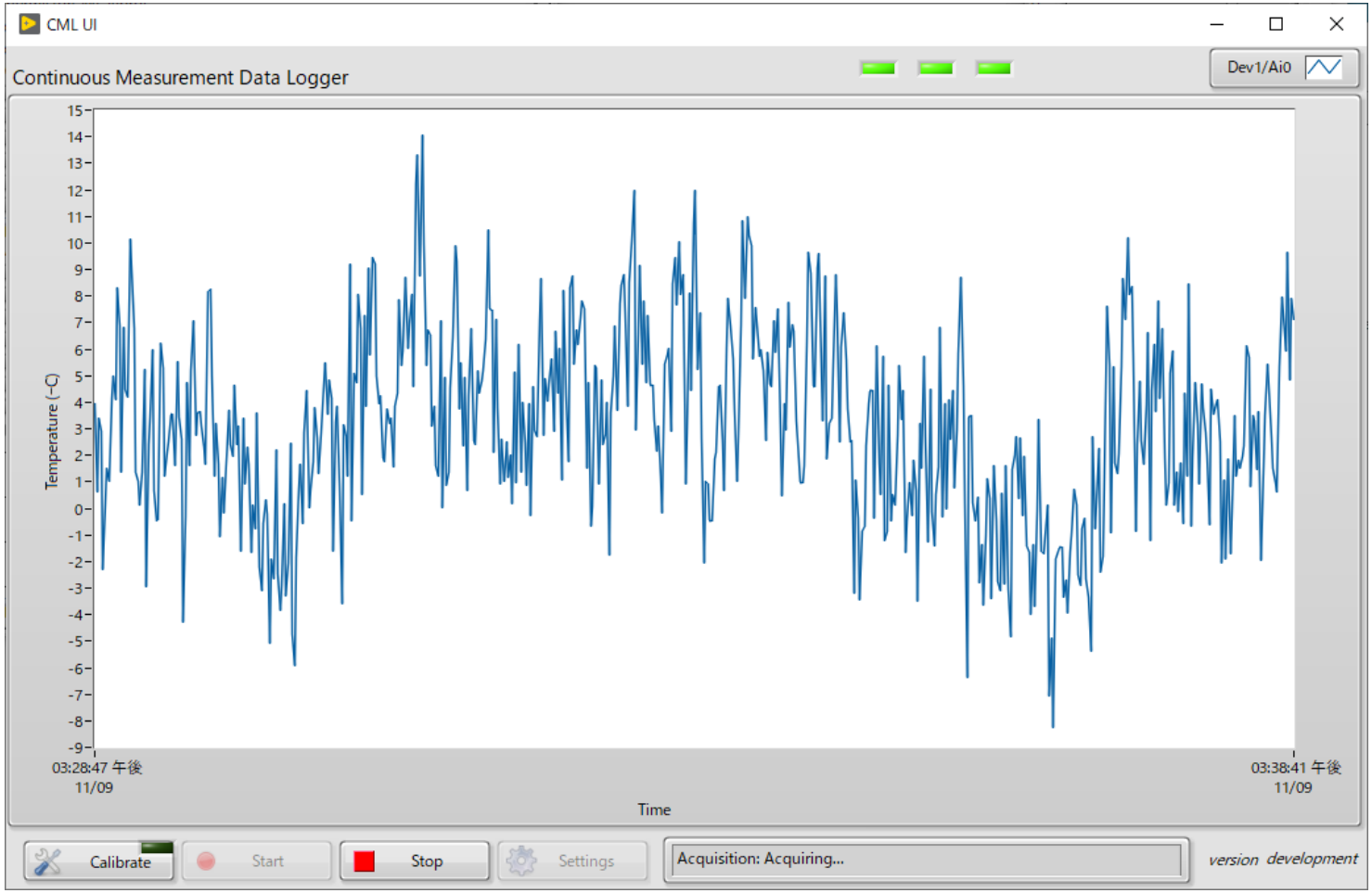
- Based on the module made by Josh:

  `https://github.com/uva-spin/Temperature-Pressure-VIs/tree/main/Delacor_Complete/js5mv_10272020/ThermistorCML`

- Changes in `Acquire.vi`
  - Readout rate = 10k samples are read out and averaged per second
  - V-T conversion, using `Convert Thermocouple Reading.vi`



- Test measurement @ room temperature
  - With 10k samples averaged. For 10 minutes




  - Deviation $\sim \pm 5\ ^\circ\mathrm{C} \Longleftrightarrow \pm 0.2\ \mathrm{mV}$
  - Offset $\sim 3\ ^\circ\mathrm{C} \Longleftrightarrow 0.1\ \mathrm{mV}$

- Another test measurement @ room temperature
  - With 1k samples averaged. For 10 minutes