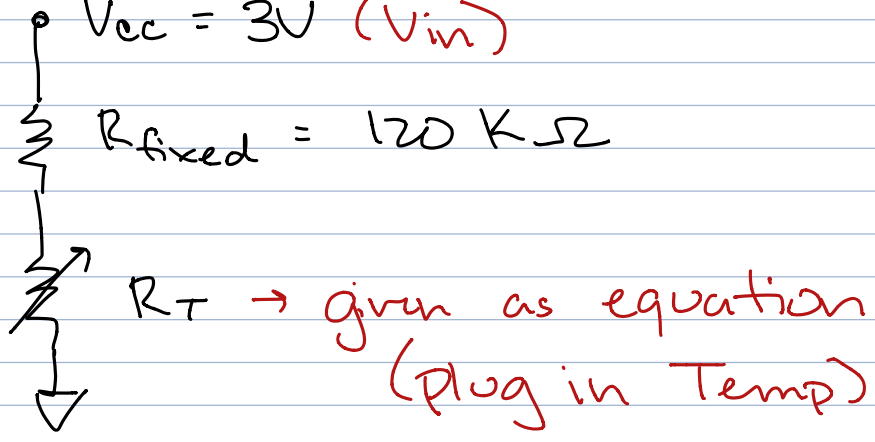
★ Nyquist thm.

Sampling freq. ≥ 2 · max signal freq.

$$\Omega_s \geq 2\Omega_{max}$$

★ Thermistor (Voltage Dv.)



$$V_{out} = \frac{R_T}{R_T + R_f} \cdot V_{in}$$

★ Max/Min will be determined by the equation, so always solve for both bounds to be sure.

★ Buffer: Optimized or Not?

Sample Size = 12 bits → 1.5 B

Not optimized	Optimized.
Assign 2B of memory per sample	keep exact 1.5 B per sample.

ADC Converter:

★ Review DAC
★ check eq. %

→ watch units

→ quantization = error = resolution
↳ can use in something other than Volts (see quiz)

The embedded microcontroller runs at clock speed of 10MHz and spends 240 cycles to process each sample. Total data acquisition time is 0.2 ms and sampling frequency is 40 Hz. In addition, every 1,024 samples the controller is running the FFT analysis which takes 15,000 instructions. What is the ratio of average processing time (including data acquisition time) and sampling interval Ts? $T_s = \frac{1}{40} = 0.025$

$$\left[\left(\frac{240 \text{ cycles}}{10 \text{ MHz}}\right) \cdot 40\right] + 0.2\,\text{ms} + \left[\frac{\left(\frac{15000}{1024}\right) \cdot 40}{10 \text{ MHz}}\right]$$

$$= 0.96\,\text{ms} + 0.2\,\text{ms} + 0.059\,\text{ms} = 1.219\,\text{ms}$$

$$\Rightarrow \frac{1.219\,\text{ms}}{40} = 0.030475\,\text{ms}$$

$$\Rightarrow \frac{0.030475\,\text{ms}}{25\,\text{ms}} = 0.001219$$

★ maybe wrong? dunno.

★ answer → shouldn't run in real time