LAB 5 – RTD Lab PREP

3.35 (1)

RTD – We will be using a simulator box with ~~RTD simulator box~~ with a slide switch

– It changes resistance as you change the switch.

IN114

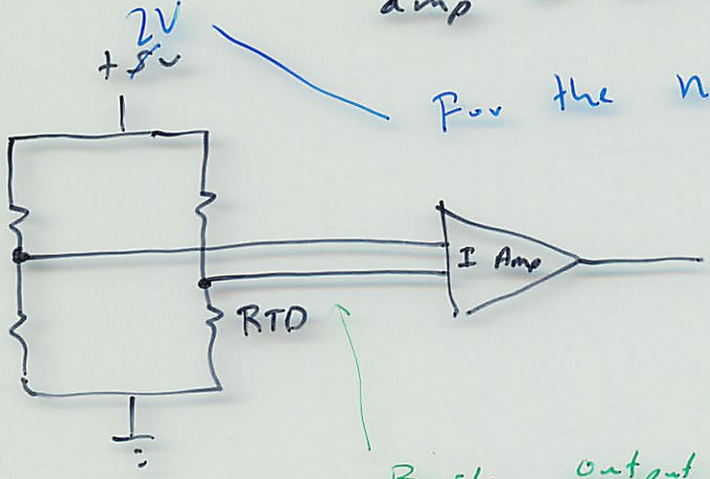
– The amp used to measure the voltage difference across the bridge.

Procedure

– Calculate RTD R @ 0° & 100°C

– Place them in a bridge & calculate bridge output for these inputs.

– Place these numbers into an instrumentation amp & set up for ± 5V.



For the new RTD simulator need 2V as it cannot source current with 5V.

Bridge output range

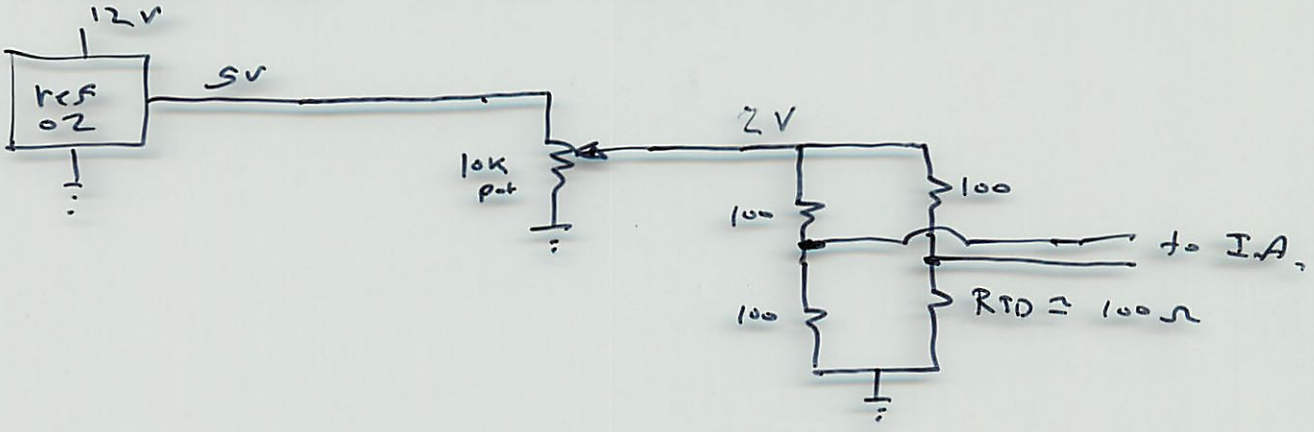
0°C = 0V

100°C = 404mV

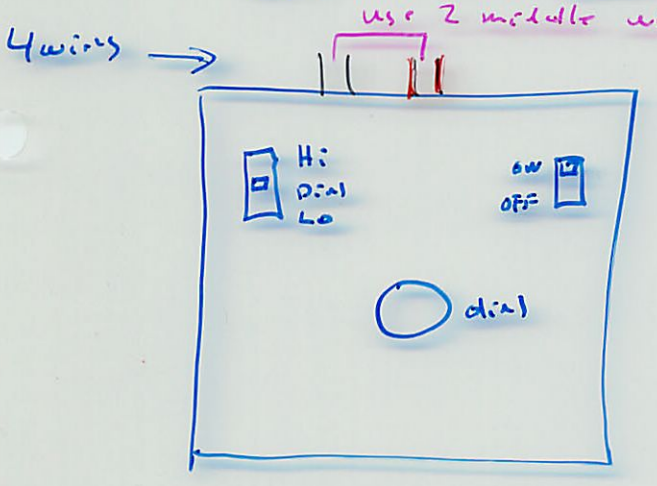
$$\therefore \text{Gain} = \frac{\Delta I_{A\,out}}{\Delta \text{Bridge Out}} = \frac{\Delta V_{out}}{\Delta V_{in}}$$

New RTD Simulator 2008

- Need to feed 2V into bridge rather than 5V (too much current to sink)



- make sure you turn the RTD Simulator OFF to save the 9V battery life.



- we set Lo = 0°C
  Hi = 100°C
- default is a Platinum RTD with $\alpha = 0.00385$
- fine dial just rotate
- course dial - push & rotate.

Demo: 1) Set to Lo & measure 100Ω on DMM

2) Set to Hi & measure R_T on DMM

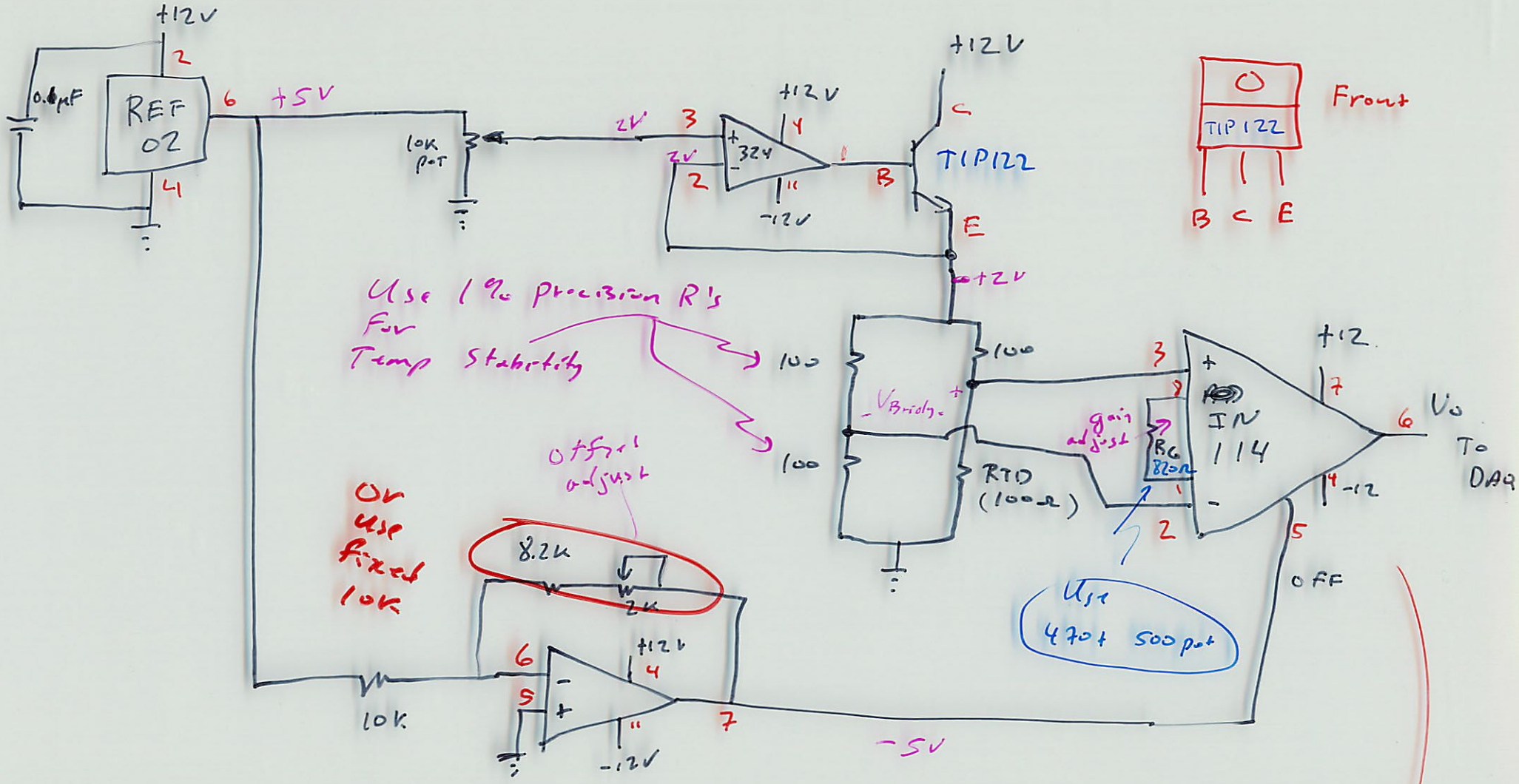
$$R_T = R_0(1 + \alpha T)$$

T = °C

$$= 100\Omega(1 + 0.00385 \cdot (100-0))$$

$$= 100(1.385) = \boxed{138.5\Omega}$$

Lab 5 - Circuit



$A_V = -1$

$$V_{BRIDGE} = V_S \left(\frac{R_{TD}}{R + R_{TD}}\right) - V_S \left(\frac{R}{R + R}\right)$$

(V_S = 2V; R = 100Ω)

$$R_{TD} = R_o + R_o \alpha T$$

when $\alpha = 0.00385$

$$V_{DAQ} = A \cdot V_{BRIDGE} + V_{OFF}$$

$$G = 1 + \frac{50k}{R_G}$$

$R_G = 820\Omega$

Pre lab

$R_0 = 100 = R_C$

$\alpha = 0.00385$

4a) $R_T = R_0(1 + \alpha T)$

$R_T = 100(1 + 0.00385\,T)$

for $T = 0\,^{\circ}C$ $\quad R_T = 100$

for $T = 100\,^{\circ}C$ $\quad R_T = 138.5$

inverse transfer fnc for lab is

$$T = \frac{R_T - 100}{0.385}$$

4b) $V_B = V_S \cdot \frac{R_T}{R_C + R_T} - \frac{V_S}{2}$ $\qquad V_S = 2V$

100 to 138.5 Ω

$$= 2 \cdot \frac{R_T}{R_C + R_T} - 1 = \frac{2R_T}{100 + R_T} - 1$$

inverse transfer fnc for lab is

$$R_{TDT} = R_T = \frac{2 + 2V_B}{(2 - 2V_B)} \times 100 \; R_C$$

4c) $R_G = \frac{50K}{A-1}$ $\qquad A = 62$

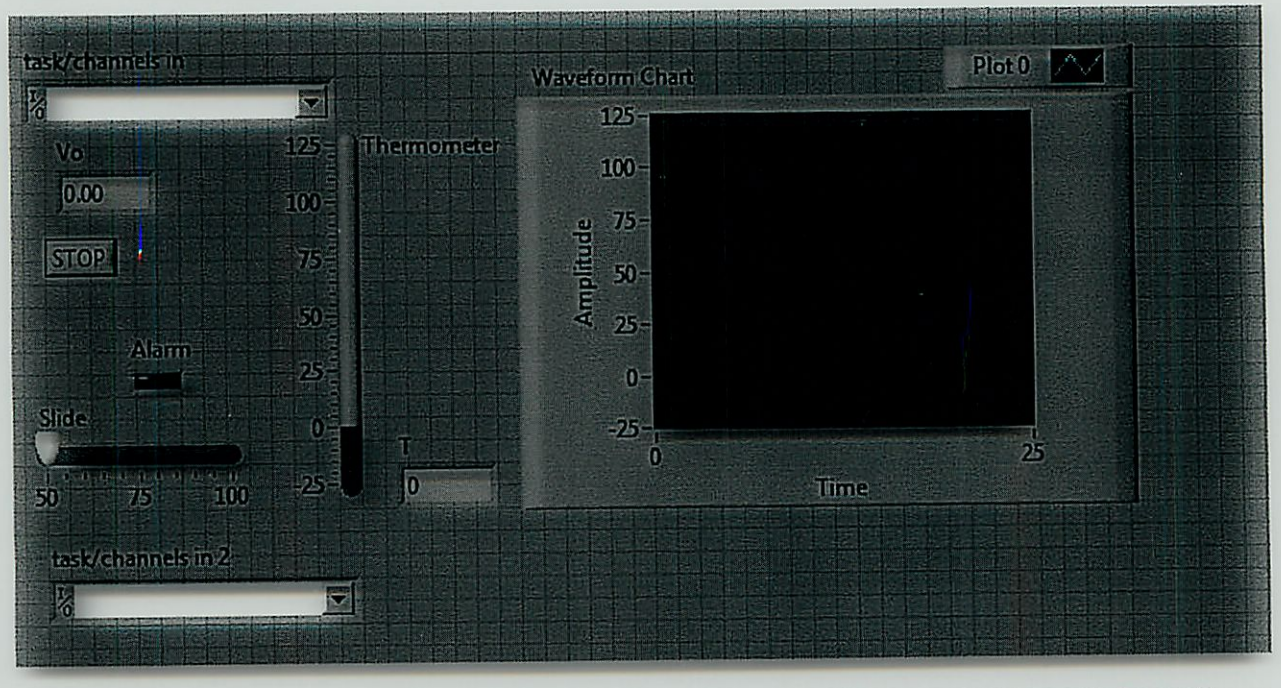
$R_G = \frac{50K}{62-1} = 820\,\Omega$

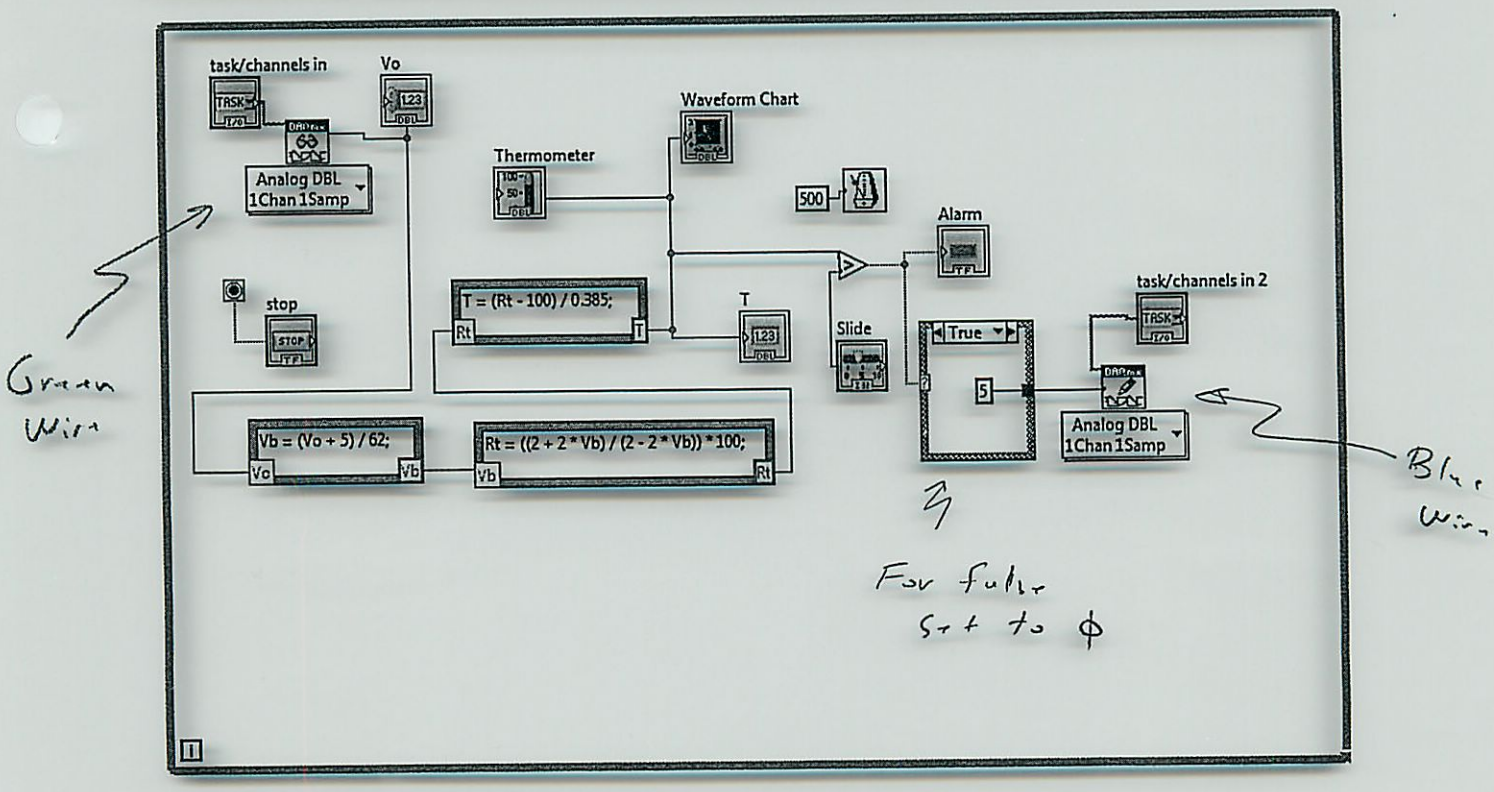
$V_O = 62V_B - 5V$

inverse transfer fnc for lab is:

$$V_B = \frac{(V_O + 5)}{62}$$

Lab 5 2012 Handout





Green Wire

Blue Wire

For fuller set to ϕ