Experiment 2: RTD Sensor

(tbc 1/14/2012)

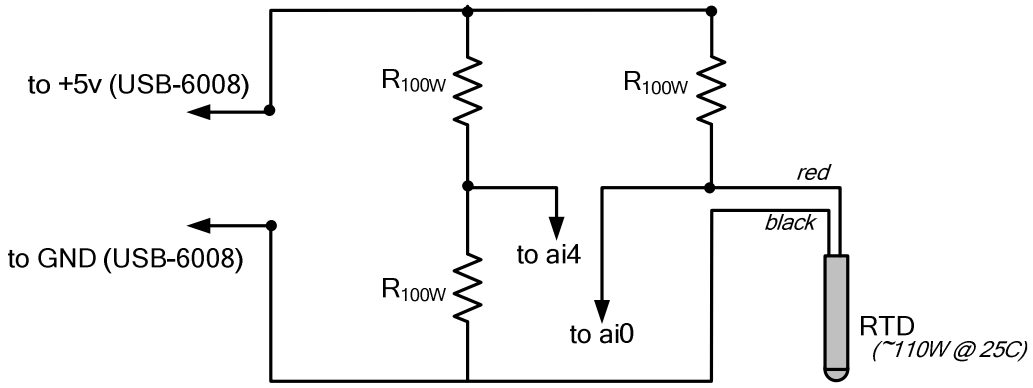
Main Task:

Build an RTD circuit to measure temperature (to within $\pm 2°C$).

Name: _____ **Date** _____

1. RTD circuit _____
2. Labview data acquisition program _____
3. Temperature Calibration Curve _____
4. Temperature test _____

1. The RTD Circuit.



a. The 5 volts source can be obtained from the DIGITAL side of the USB-6008 device

b. Use $R = 100\ \Omega$ and connect only different colored wires of the RTD in the circuit. (Use a circuit breadboard to implement the circuit.)

2. The Labview program.

a. Include **[Express]→[Execution Control]→[While loop]**. (Include everything below into the **[while loop]** window.)

b. Import **[Express]→[Input]→[DAQ Assistant]** block. Choose [**analog input]** → **[voltage]** → **[ai0]**

- **Max** = **0.5 volts**
- **Min** = **0 volts**
- **acquisition mode** = **continuous**
- **samples to read** = **10**
- **rate** = **100 Hz**

c. Import **[Express]→[Signal Analysis]→[Filter]** block.

- **Infinite Impluse Filter** = **selected**
- **Type** = **Lowpass**
- **Topology** = **Butterworth**
- **Order** = **3**
- **Cutoff Frequency (Hz)** = **1**

d. Import **[Express]→[Signal Manipulation]→[from Dynamic Data]** block. Choose the "**single scalar**".

e. Import **[Express]→[Signal Manipulation]→[to Dynamic Data]** block. Choose "**single scalar**".

f. Import **[Express]→[Arithmetic & Comparison]→[Formula].**

- **Input X1, label = v**
- **Formula = v**

g. Include the following control blocks: **[Waveform Chart], [Indicator].**

h. Match the wiring as shown in Figure 1.

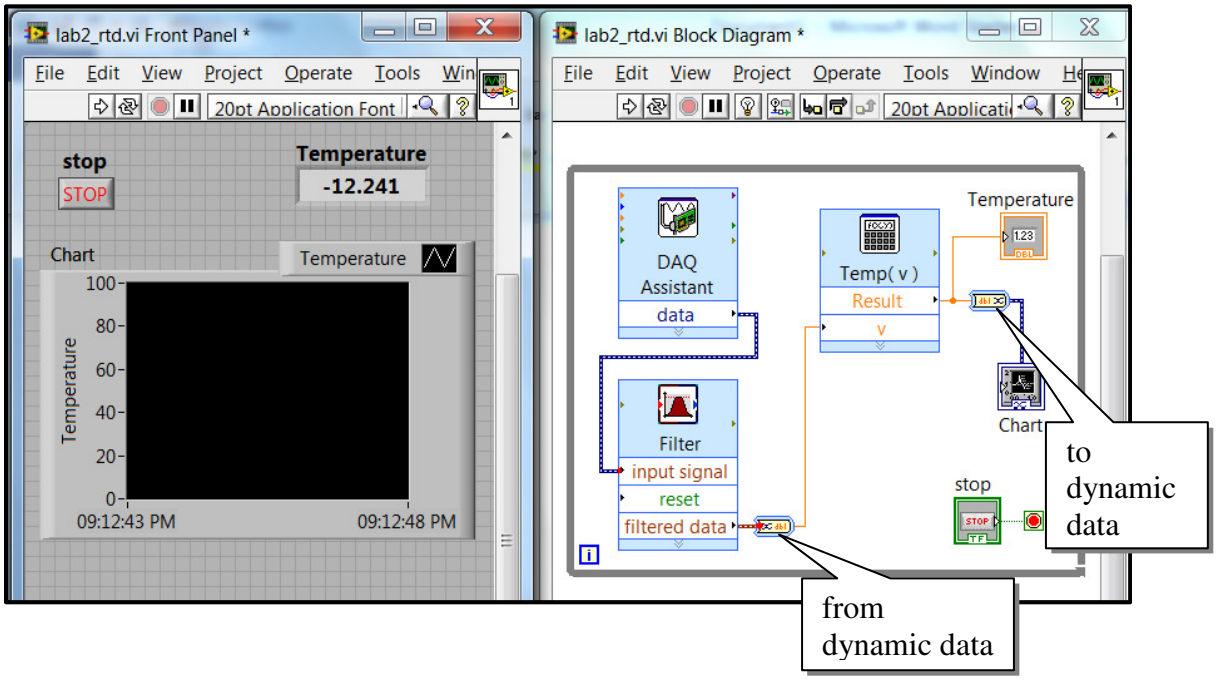


Figure 1. Labview program.

3. Temperature Calibration Curve.

a. Using a digital thermocouple, record the voltage readings corresponding to temperature readings at approximately 10^{o}C intervals. (see Table 2 as example)

Table 1.

Temperature (°C)	Voltage (volts)
0	
25	
50	
75	
100	

b. Obtain a curve fit (2nd order polynomial fit) of temperature as a function of voltage using Excel.

Formula:

c. Modify the entry in the "**Formula**" block using the conversion formula obtained in step 2.

d. Test the obtained **RTD VI**.