BIOMEDICAL INSTRUMENTATION LABORATORY
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LAB 2: SENSORS

Experiment 1: Piezoelectric Sensor

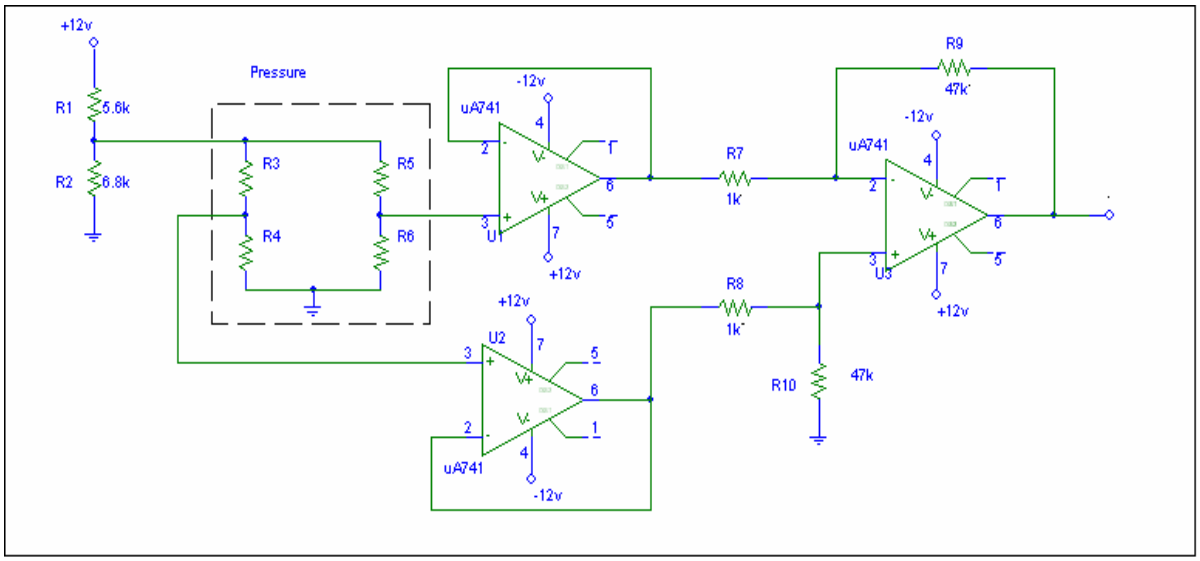
The property of piezoelectricity is that when you deform the shape of the film a charge is induced, which can be modeled as a capacitance in parallel with a resistance. In the present design, we sense the deformation of the film due to touch forces. The output from the sensor is buffered (using the voltage follower) and then amplified using two op-amps.

Questions:

1) Using the current circuit design, test the output by touching the film. Is the output bi-polar or unipolar?
2) Based on the output of the amplifier, what would the typical un-amplified output of the sensor be?
3) Change the time constant using the various resistance values. How does this affect the output?
4) Why does the input to the sensor need to be buffered?
5) What are examples of typical medical applications in which this sensor can be used?

Experiment 2: Pressure Transducer

The design of the system incorporates the pressure transducer and a differential amplifier. The pressure transducer is indicated by the wheatstone bridge (shown in the black, dashed box) in the schematic below. The initial voltage divider is necessary to reduce the voltage of the supply to the pressure transducer. The output of the pressure transducer is put through a buffer and the difference between the two is amplified.



Questions:

1) Apply positive and negative pressure to the blow-tube and observe the output. Describe what you see!
2) What is a Wheatstone Bridge? Describe its function and application in a differential pressure transducer.
3) Design and ON/OFF switch for an instrument using this pressure transducer.