

**THE  
A-TEAM**

**LAB 4**

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# Pressure Sensor Model Activity

## Shareable Content Object (SCO)

Initial measurements

- $R_1 = 1.228 \text{ k}\Omega$
- $R_2 = 1.46 \text{ k}\Omega$
- $R_3 = 13.42 \text{ k}\Omega$
- $R_3 = 1.491 \text{ k}\Omega$

R1



R4

R2

R3

R1



R2



R3



R4



## Post-Activity Questions

1. In the above procedure, what factors could have an effect on the outcome (the resistivity of the bridge circuit)?

The amount of graphite in the mixture would affect the outcome as well as how much pressure is put on the bridge.

2. What is meant by the “reference” voltage or reference resistance of the Wheatstone bridge?

Reference voltage refers to the output by a DC power source.

Does this stay consistent? Why or why not?

Our guess is that it would not stay constant as pressure is applied to the bridge.

3. What determines the reference voltage / resistance?

When pressure is applied to the bridge, the space between the graphite molecules increases and the resistance would change with it. Output voltage would change.

4. What causes a change in resistance or voltage?

Current demand causes a change in the resistance or voltage.

5. Describe three (3) MEMS (Micro-electromechanical systems) that use a diaphragm pressure sensor.

HARMEMS Technology -- high aspect ratio micro-electromechanical systems technology is a proven technology for airbag sensing applications.

Surface Micromachining -- In surface micromachining, the MEMS sensors are formed on top of the wafer using deposited thin film materials. These deposited materials consist of structural materials that are used in the formation of the sensors and sacrificial layers that are used to define gaps between the structural layers.

Bulk Micromachining -- In bulk micromachining, the single crystal silicon is etched to form three-dimensional MEMS devices. This is a subtractive process in which the silicon in the wafer is specifically removed using anisotropic chemistries.

<http://www.freescale.com/webapp/sps/site/overview.jsp?code=SNSMEMSOVERVIEW>

6. How could this pressure sensor model be improved upon?

Better materials -- graphine instead of graphite for example.