WHEATSTONE BRIDGE

BY JAKE CLATTERBUCK

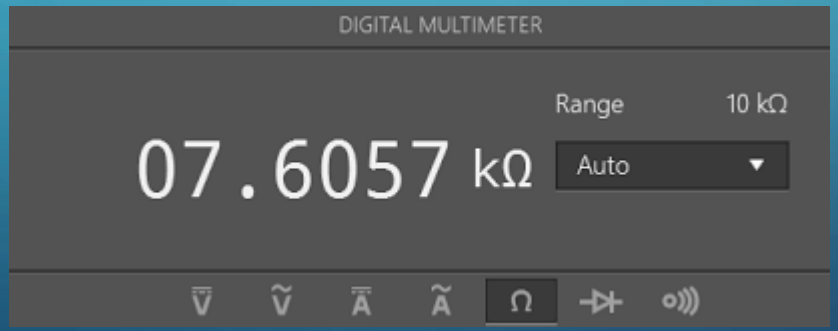
OBJECTIVES

- To learn about two-terminal resistive sensing devices such as the thermistor and photoresistor
- To learn about basic observation of senor signals
- To gain experience working with the Wheatstone Bridge circuit

THERMISTOR

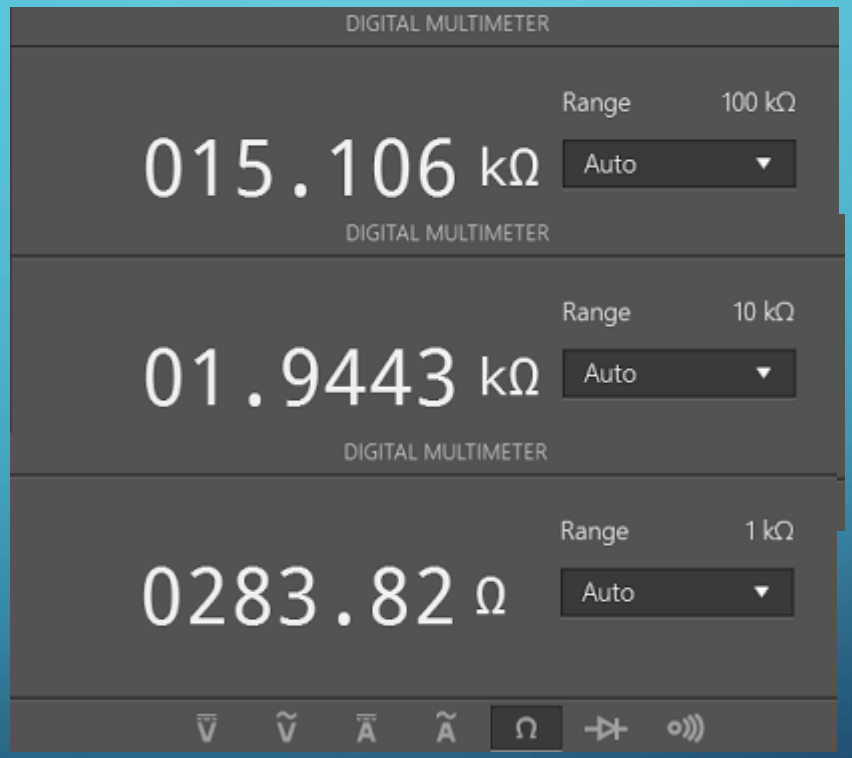
- Resistance of the element changes with heat (decreases with heat)
- Room temperature:

- Squeezed:

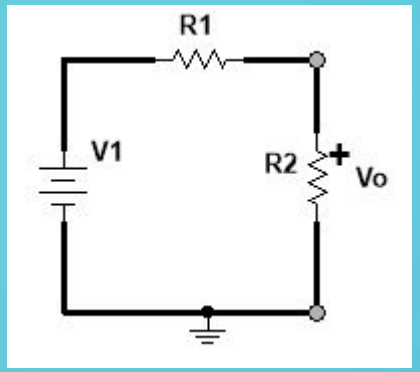


PHOTORESISTOR

- Resistance of the element changes with light exposure (decreases with light)
- Covered in darkness:
- Room lighting:
- Flashlight shining:



VOLTAGE DIVIDER



- A voltage divider was set up to test both resistors in a circuit
- V1 was set to 5 volts
- For R1 a 10k ohm resistor was used
- R2 was either the photoresitor or the thermistor
- Vo measurements are as follows

VOLTAGE DIVIDER VOLTAGE OUTPUTS

- Thermistor Room Temperature:

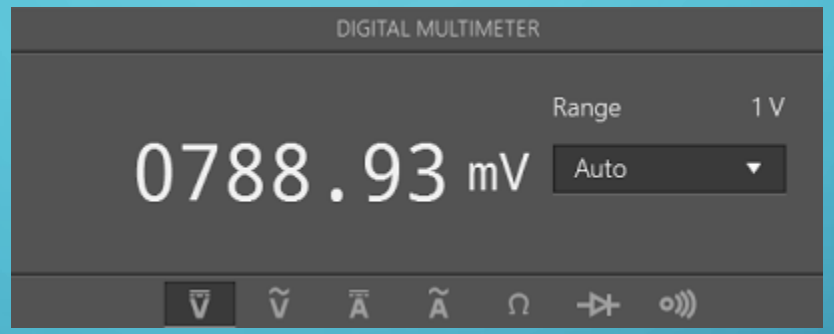
- Thermistor Squeezed:

- P=IV, V=5, I=Vo/R
- Power calculated as Vo*5v/R: (2.46*5)/10485 = 1.17mW < .125W
- Power calculated as Vo*5/R: (2.06*5)/7606 = 1.35mW < .125W

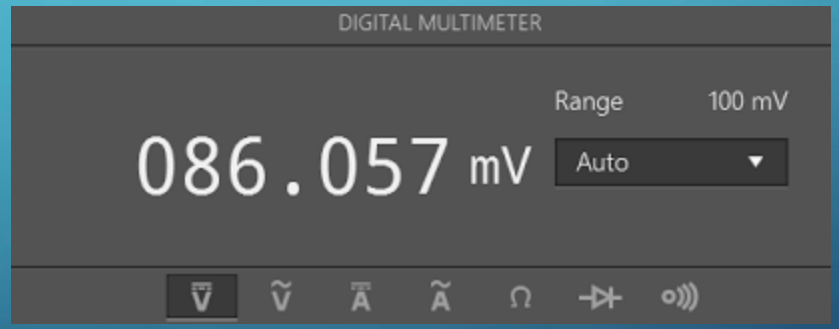
VOLTAGE DIVIDER VOLTAGE OUTPUTS

- Photoresistor covered:

- Photoresistor room light:

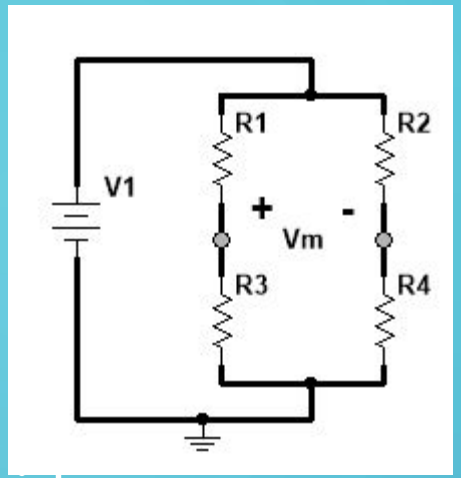


- Photoresistor flashlight:



- Power calculated as previously shown respectively: 1.0mW, 2.0mW, 1.5mW

WHEATSTONE BRIDGE



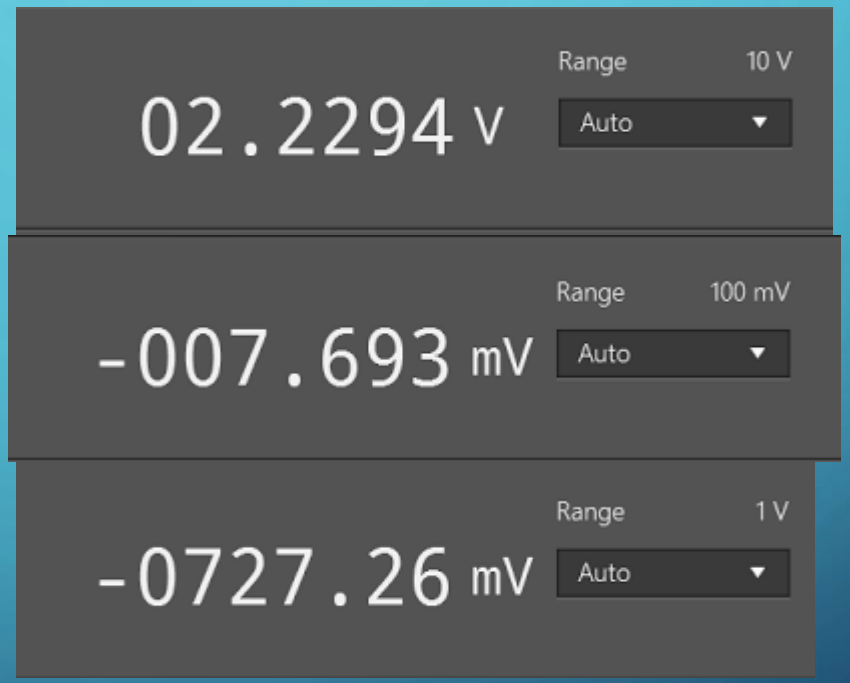
- R1 is either the photoresistor or thermistor
- R2 is a potentiometer
- R3 and R4 are both either 10k or 4.7k ohm resistors
- With the sensing resistor in it's natural room state, the potentiometer was adjusted until Vm = 0. The sensing element's environment was then changed to see the effect on Vm without changing the potentiometer.

WHEATSTONE THERMISTOR TRIALS

- Room temperature with 10k
- Squeezed temperature with 10k
- Room temperature with 4.7k
- Squeezed temperature with 4.7k

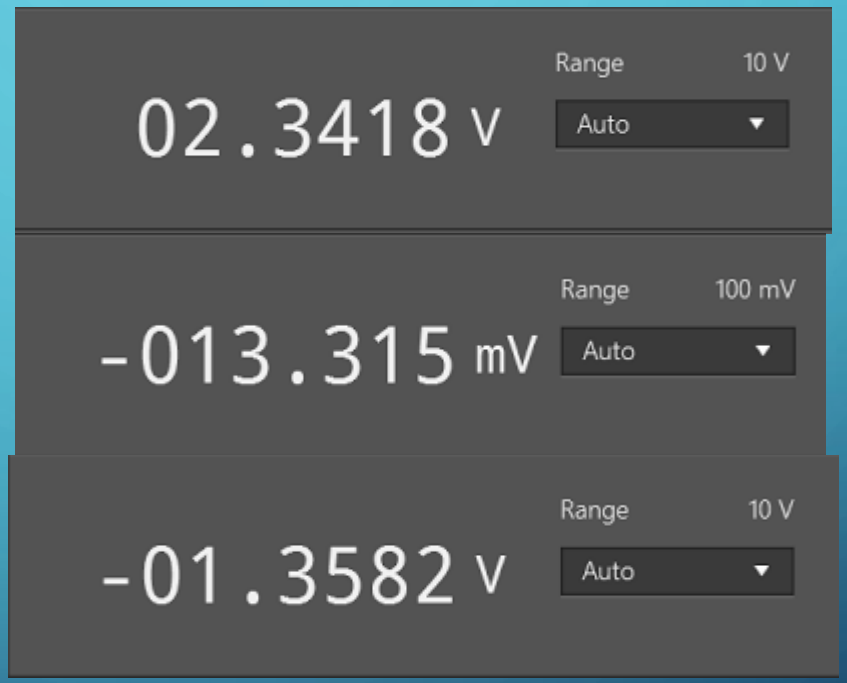
WHEATSTONE POTENTIOMETER TRIALS

- Covered lighting with 10k
- Room lighting with 10k
- Flashlight with 10k



WHEATSTONE POTENTIOMETER TRIALS

- Covered lighting with 4.7k
- Room lighting with 4.7k
- Flashlight with 4.7k



CONCLUSIONS

- When the resistance of the element changes, the wheatstone voltage swings one way or the other with the potentiometer at a set value.
- The wheatstone bridge can therefor be used to sense changes in a resistive element.