

# Voltage divider and Potentiometer

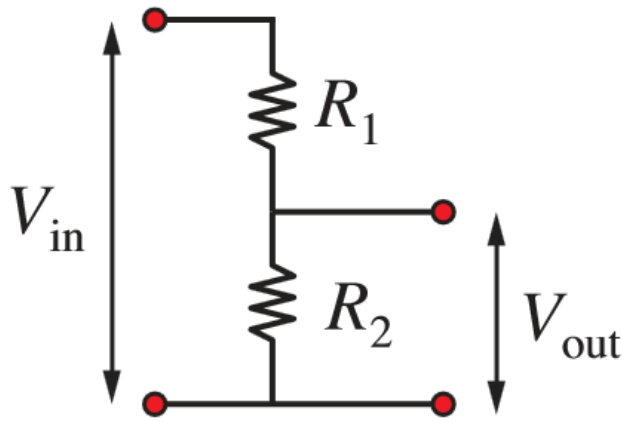
ME 120

Mechanical and Materials Engineering

Portland State University

<http://web.cecs.pdx.edu/~me120>

# Voltage Divider Definition



- The input voltage is applied across  $R_1$  and  $R_2$

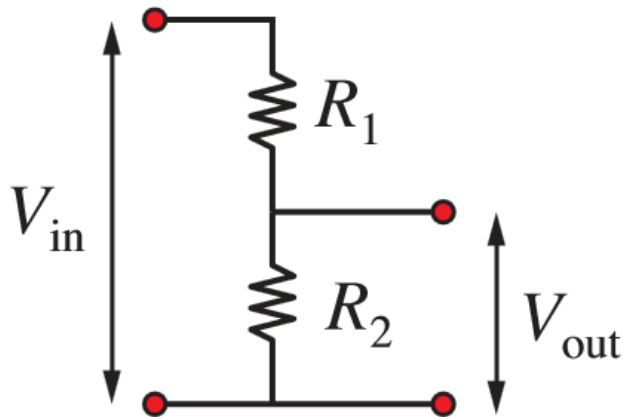
$$V_{in} = I(R_1 + R_2)$$

- The output voltage is the voltage drop across  $R_2$

$$V_{out} = IR_2$$

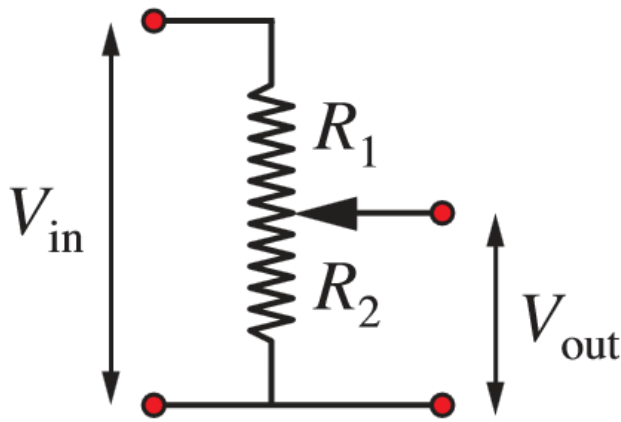
$$V_{out} = V_{in} \frac{R_2}{R_1 + R_2}$$

# Voltage Divider Application



- The voltage divider is a passive component used to reduce the amount of voltage.
- For example, we could use a 9 V battery to supply a 5V power

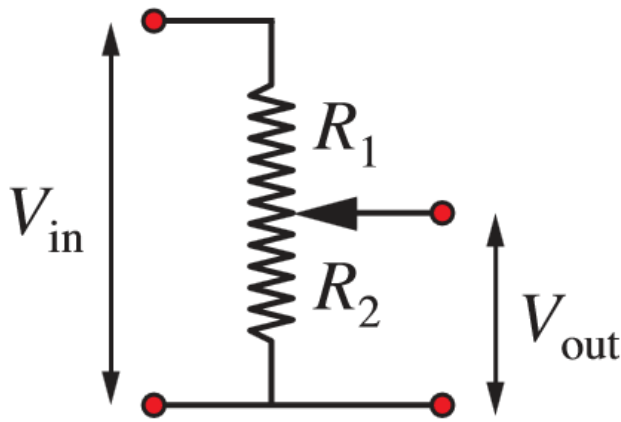
# Potentiometer Definition



- A potentiometer is a voltage divider that allows adjustment of  $V_{out}$ .
- The wiper is in contact with the surface of the resistor and is controlled by a knob.

$$V_{out} = V_{in} \frac{R_2}{R_1 + R_2}$$

# Potentiometer Application

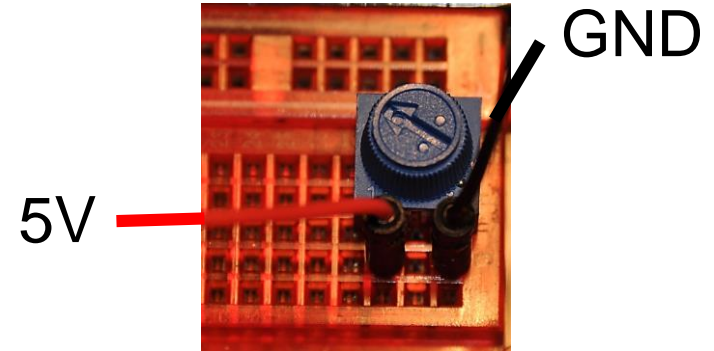


- Potentiometers are used to adjust the level of analog signals (for example, controls on audio equipment)
- Rarely used to directly control significant amounts of power ( $> 1$  W).
- Widely used wherever adjustments must be made during manufacturing

# Potentiometer Measurements

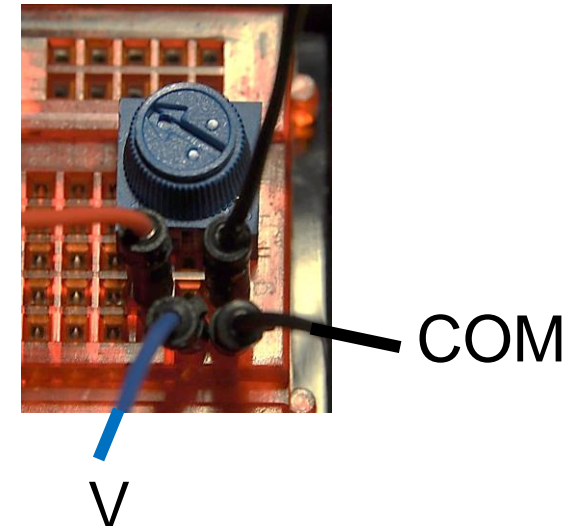
## Providing power:

Connect two wires from the potentiometer to your Arduino board.



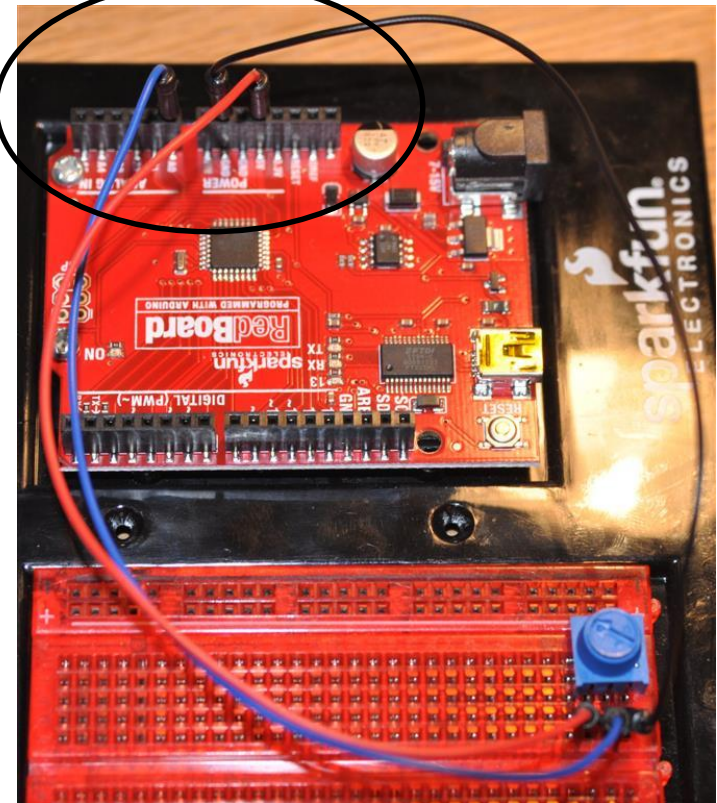
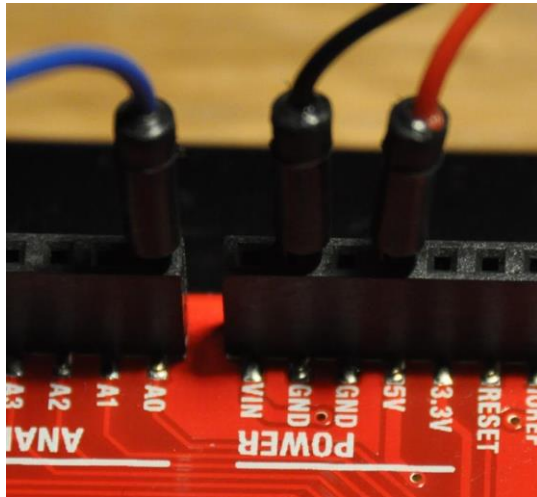
## Measuring voltage:

- The ground outer pin is connected to the COM of the multimeter.
- The middle pin is connected to the positive lead of the multimeter.



# Arduino as a Multimeter: Circuit

The middle pin is now connected to the analog input 0 of the arduino board.



# Arduino code for potentiometer

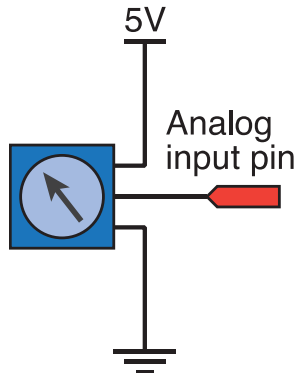


# Analog input

## `analogRead(pin)`

- ❖ Reads the voltage on an analog input pin
- ❖ `pin` – an integer that specifies the analog input channel: 0 to 5. `pin` can also be referred to by name as A0, A1, A2, A3, A4 or A5
- ❖ Returns an `int` in the range 0 to 1023 (for an Arduino Uno)

## Example: Read a potentiometer



```
void setup() {  
    Serial.begin(9600);  
}  
  
void loop() {  
    int reading;  
    reading = analogRead(A0);  
    Serial.println(reading);  
}
```