Voltage divider and Potentiometer

ME 120
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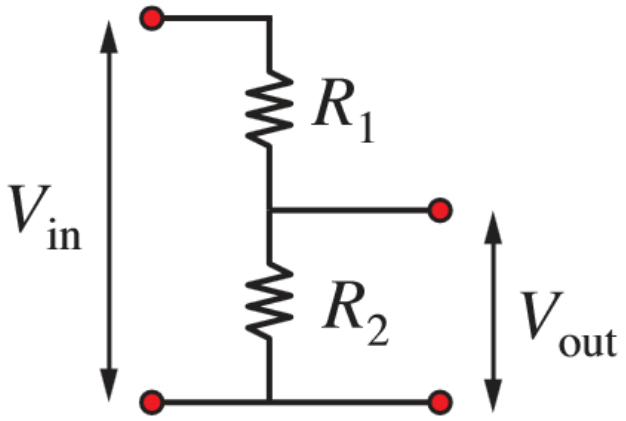
Voltage Divider Definition



- The input voltage is applied across R_1 and R_2

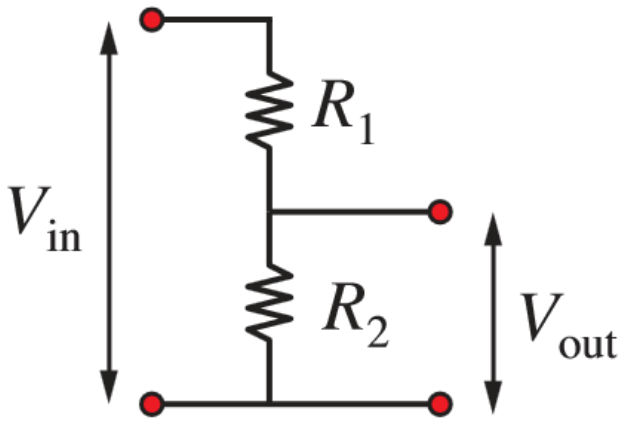
$$V_{in} = I(R_1 + R_2)$$

- The output voltage is the voltage drop across R_2

$$V_{out} = IR_2$$

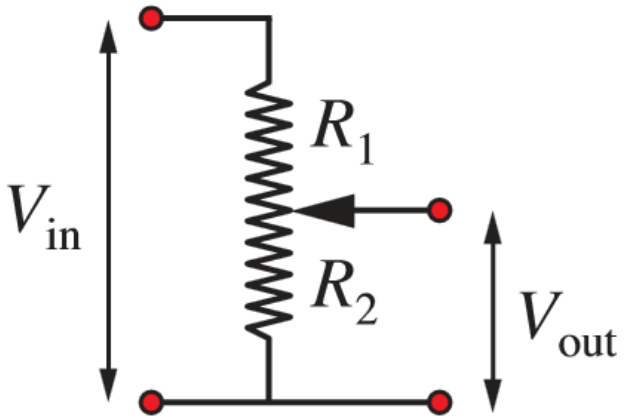
$$\boxed{V_{out} = V_{in} \frac{R_2}{R_1 + R_2}}$$

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

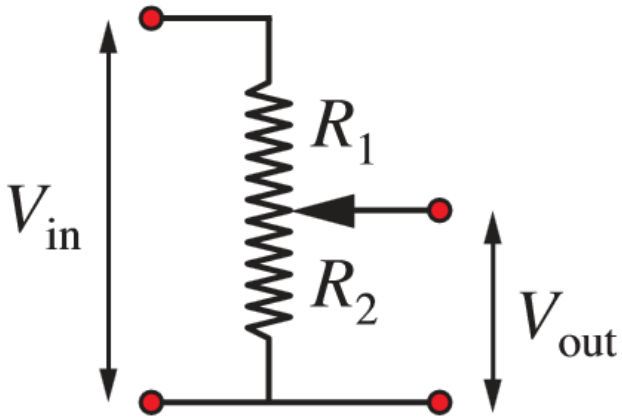
Potentiometer Definition



- 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.

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

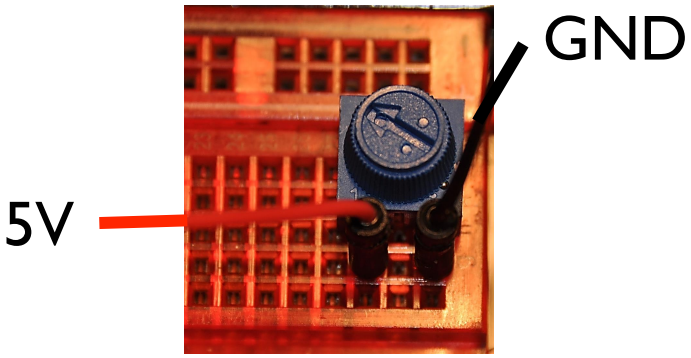
Potentiometer Application



- 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

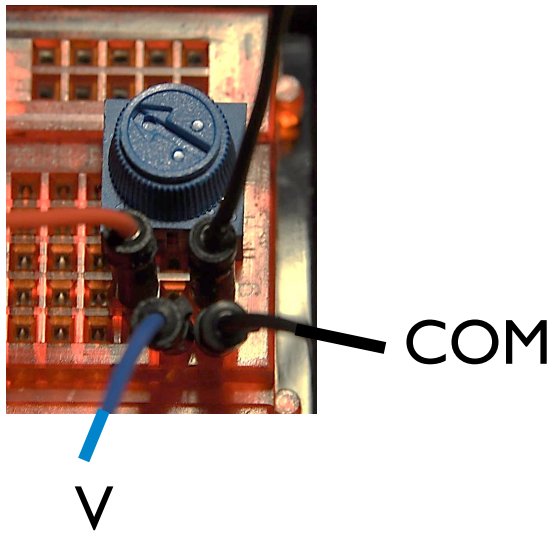
Potentiometer Measurements and Plot

Providing power:
Connect two wires from the potentiometer to your Arduino board.



Measuring voltage:

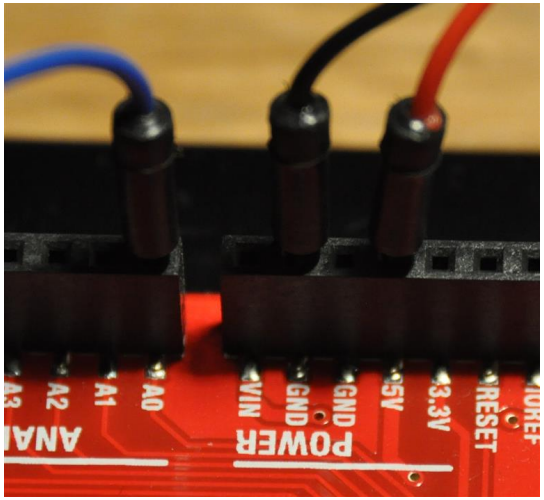
- The ground outer pin is connected to the COM of the multimeter.
- The middle pin is connected to the positive lead of the multimeter.

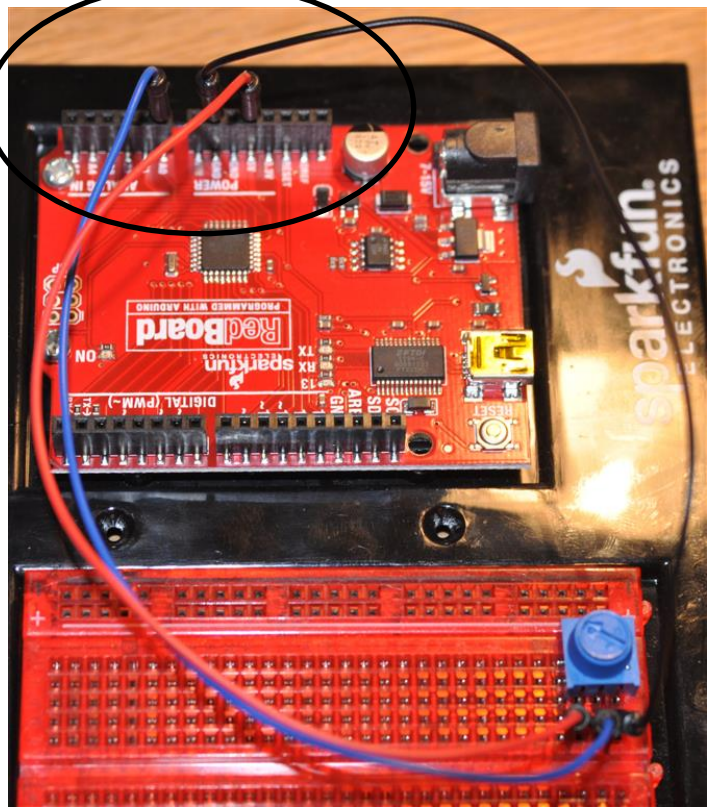


Plot results for different knob positions in excel

Arduino as a Multimeter: Circuit

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





Arduino as a Multimeter: Program

```
void setup() {
  // initialize serial communication at 9600 bits per second:
  Serial.begin(9600);
}

// the loop routine runs over and over again forever:
void loop() {
  // read the input on analog pin 0:
  int sensorValue = analogRead(A0);
  // print out the value you read:
  Serial.println(sensorValue);
  delay(1);        // delay in between reads for stability
}
```