
Capacitance Meter with Arduino

Objective:

Measure the value of unknown capacitors using an Arduino by calculating **charge or discharge time**.

Components Required:

- Arduino Uno
- Known resistor (precision resistor, e.g., 10kΩ or 100kΩ)
- Unknown capacitor to be measured
- Jumper wires & breadboard

Circuit Overview:

- The capacitor is connected in series with a known resistor.
- Arduino charges or discharges the capacitor through the resistor.
- It measures the **time it takes** for the voltage across the capacitor to reach a certain level using its **analog input**.
- Using the formula:

$$C = tR \cdot \ln(V_{\text{target}} / V_{\text{start}})$$

the capacitance is calculated.

Working Principle:

- Arduino sets the capacitor pin **HIGH or LOW** to begin charging or discharging.
- It then **measures the time** it takes for the voltage to reach a threshold.
- This time, along with the known resistor value, helps compute the capacitance.

Use Cases:

- Testing unknown or unmarked capacitors
- DIY component testers
- Educational experiments in electronics labs

Limitations:

- Accurate for **low to medium value capacitors** (in nF to μ F range)
 - Not ideal for very small or very large capacitances without adjustments
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