  Investigation 32

Energy Storage in Capacitors

Capacitors are a common electronic component used in a variety of circuits and devices. Everything from audio equipment to power supplies to sensors takes advantage of the unique energy-storing capability of the capacitor.

Preliminary Observations

Why doesn't the light bulb in the instructor's demonstration RC circuit immediately turn off when disconnected from the battery? Which elements of the circuit affect how much energy is stored in the capacitor?

Procedure

1. Discuss and decide what variable(s) you will test.
   * Use the same circuit your instructor did for the Preliminary Observations, using a resistor in place of the light bulb.
   * Estimate the time constant for the RC circuit you are constructing and adjust your data collection parameters to suit that time constant.
2. Create a procedure for your investigation.
   * Your purpose is to propose a model to describe the relationship between the variable you are measuring and the energy stored in the capacitor.
   * Include the measurement equipment you will use.
   * Decide how much data or observation to take in order to have enough information to satisfy your purpose and stand up to questioning by your peers.
3. Carry out the investigation and record your data and observations. Make sure all group members have access to the data.

Analysis

Examine your graphs and perform any calculations that are needed to determine the energy stored in the capacitor. Use curve-fitting tools or linearize your graph(s) to develop a model that shows the relationship between the energy stored in the capacitor and the variable(s) you measured.

Extensions

1. Investigate how capacitors are used as energy storage in different applications such as AC power supplies and camera flashes.
2. Create a circuit that charges a capacitor using solar or wind energy and then uses the energy for lighting a bulb, running a motor, or some other purpose. Explain how this combination of renewable energy and a storage capacitor can address some of the challenges that are posed by renewable energy sources.