Capacitor

A capacitor is constructed using aluminum sheets, demonstrating how two plates create an electrostatic field when connected to a power source.

The flow of electrons charges the plates, creating an electric field that stores energy; initial capacitance measured is around 50 to 60 picofarads. Increasing plate surface area and reducing the distance between plates can improve capacitance, allowing for more electron storage.

Dielectric material (like distilled water) between the plates further enhances capacitance, achieving up to 2.5 microfarads.

A breakdown of an electrolytic capacitor reveals it consists of metal films with dielectric material; proximity affects performance.

Voltage limits are crucial; exceeding them risks sparking and damaging the capacitor. Reversing polarity in electrolytic capacitors can also cause failure.

In DC circuits, the voltage across a capacitor cannot change instantly due to the need for electrostatic field buildup; current changes immediately instead.

Capacitors stabilize output voltages in power supplies and can be used with resistors to generate specific signals like square waves.

In AC circuits, capacitors exhibit capacitive reactance, which is resistance based on frequency. Lower capacitance or frequency results in reduced current flow.

The formula for capacitive reactance allows for building filters that manage frequency ranges effectively.

Connecting a microwave motor demonstrates phase shifts caused by inductive loads that strain power grids; adding a parallel capacitor compensates for this effect.