Capacitors in series and in parallel. **For circuit projects 164 and 165** **Name**_____

1. Build the circuit and draw the circuit diagram using standard, electrical symbols (they are drawn on each circuit element).
2. Calculate the Capacitance before and after the capacitors are added.
3. Describe in words how the behavior of the circuit changed as you added capacitors and why that happened?

FOR CIRCUITS 296 AND 252.

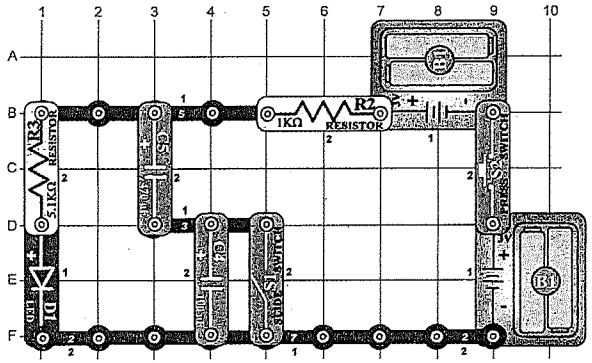
4. Build the circuit and draw the circuit diagram using standard, electrical symbols (they are drawn on each circuit element).
5. Describe in words how the behavior of the circuit changed as you added capacitors and why that happened?

☐ Project #164 Capacitors in Series

OBJECTIVE: To compare types of circuits.

Turn on the slide switch (S1), then press and release the press switch (S2). The LED (D1) becomes bright when the 470µF capacitor charges up with the press switch on, then the LED slowly gets dim after you release the press switch.

Now turn off the slide switch. Repeat the test with the slide swtich off; you'll notice the LED goes out much faster after you release the press switch. The much smaller 100µF capacitor (C4) is now in series with the 470µF and so reduces the total capacitance (electrical storage capacity), and they discharge much faster. (Note that this is opposite to how resistors in series work).

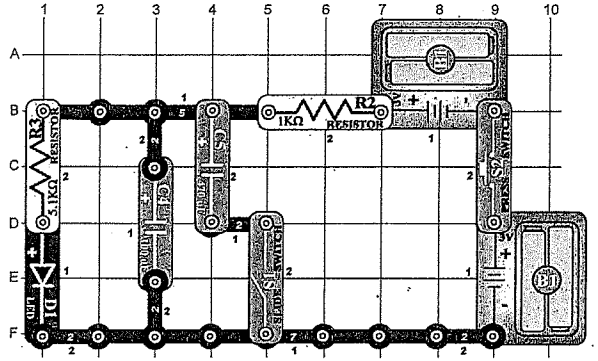


☐ Project #165 Capacitors in Parallel

OBJECTIVE: To compare types of circuits.

Turn off the slide switch (S1), then press and release the press switch (S2). The LED (D1) becomes bright when the 100µF capacitor charges up with the press switch on, then the LED slowly gets dim after you release the press switch.

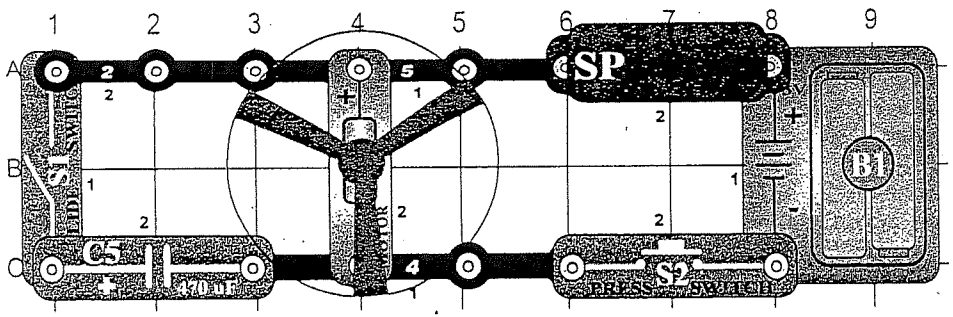
Now turn on the slide switch and repeat the test; you'll notice the LED goes out much slower after you release the press switch. The much larger 470µF capacitor (C5) is now in parallel with the 100µF and so increases the total capacitance (electrical storage capacity), and they discharge much slower. (Note that this is opposite to how resistors in parallel work.)



Project #296

Quieting a Motor

OBJECTIVE: To show how capacitors can filter out electrical disturbances.



Place the fan on the motor (M1) and turn off the slide switch (S1). Press the press switch (S2) and listen to the motor.

As the motor shaft spins around it connects/ disconnects several sets of electrical contacts. As these contacts are switched, an electrical disturbance is created, which the speaker converts into sound.

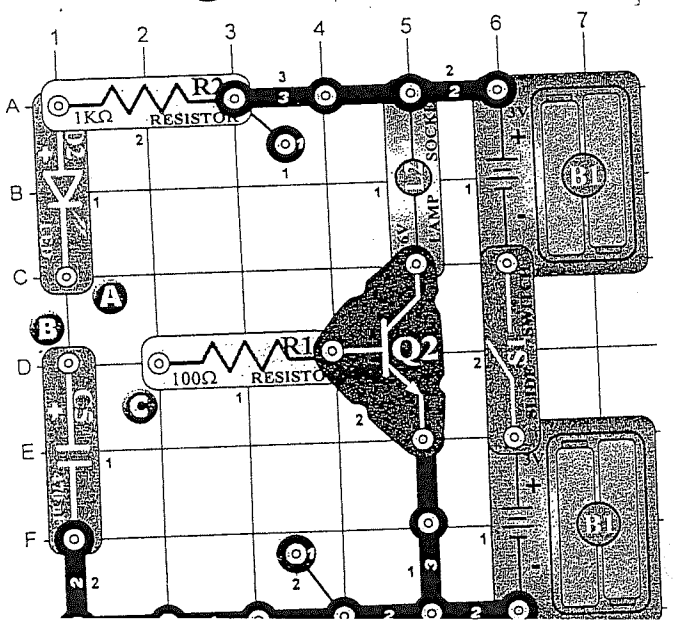
Turn on the slide switch and push the press switch again. The fan spins just as fast, but the sound is not as loud. Capacitors, like the 470µF capacitor (C5), are often used to filter out undesired electrical disturbances. If you replace C5 with one of the other capacitors in your set then the sound will not be changed as much.

WARNING: Moving parts. Do not touch the fan or motor during operation. Do not lean over the motor.

Project #252

Storing Electricity

OBJECTIVE: To store electricity in a capacitor.



Turn the slide switch (S1) on and connect points A & B with a 2-snap wire. The green LED (D2) will flash and the 470µF capacitor (C5) will be charged with electricity. The electricity is now stored in the capacitor. Disconnect points A & B. Connect points B & C and there will be a flash from the 6V lamp (L2).

The capacitor discharges through the resistor to the base of the NPN transistor (Q2). The positive current turns on the transistor like a switch, connecting the lamp to the negative (–) side of the batteries. The light will go out after the capacitor discharges, because there is no more current at the base of the transistor.