

**BUILD A MODEL ELECTRICAL SYSTEM****OBJECTIVE**

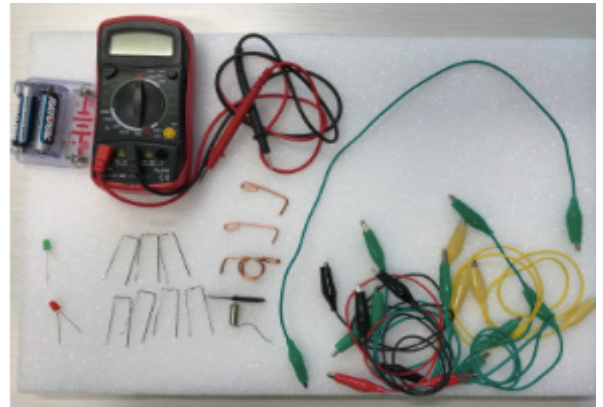
To build a model electrical system with a main bus and master switch, an avionics bus and avionics master switch, and a starter motor with its own switch.

MATERIALS (PER GROUP)

- Ten (10) alligator leads (available on Amazon - 30 for about \$11)
- One (1) sheet of florist foam (approximately 1" x 12" x 18")
- Seven (7) greening pins (or similar metal pin; metal must be exposed or insulation removed)
- Three (3) 2"-long pieces of 12 gauge (or thinner) solid copper wire
- One (1) small electric drone motor (with propeller)
- Two (2) LED bulbs
- Two (2) AA batteries
- Battery holder with leads for two AA batteries (pack of 6 available on amazon for \$7)
https://www.amazon.com/dp/B07BXZQVVK/ref=cm_sw_em_r_mt_dp_U_EZhuCbMT06BY1
- Multimeter capable of reading 2000u amp (available on Amazon for about \$11)

ASSEMBLY AND PREPARATION**1**

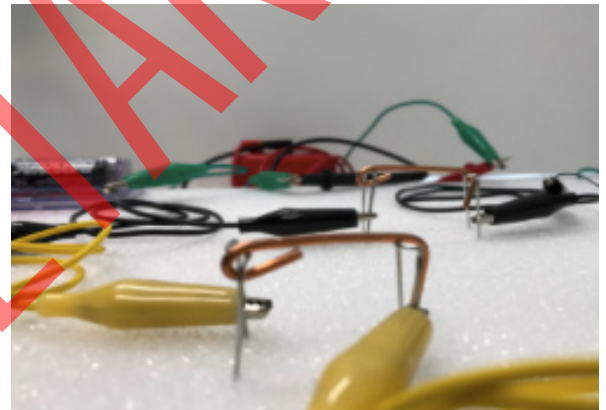
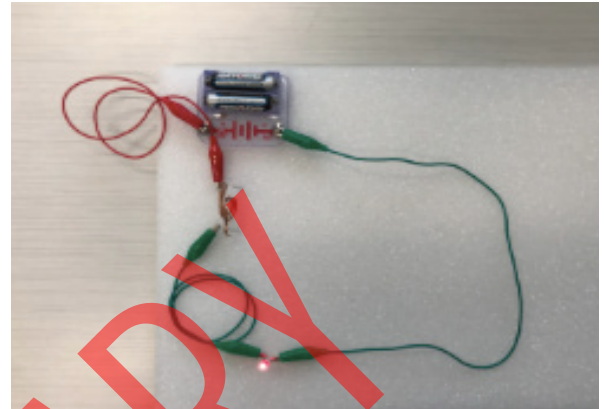
Collect all required materials.





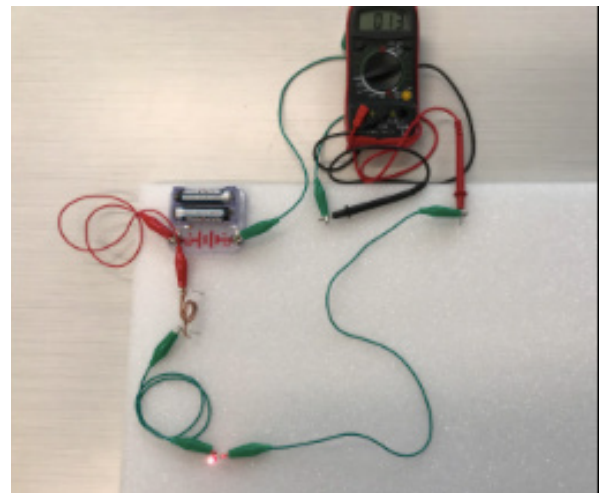
2

Build a simple circuit with light and switch. Place the batteries in the battery holder. Connect one alligator clip to the negative terminal. Attach the clip on the other end of the wire to the negative (flat) side of an LED pin. (Note that the LED pins are polarity specific. If the LED does not illuminate when the circuit is completed, try reversing the LED pin connections.) Attach the alligator clip from a second wire to the other side of the LED pin. Next, create the switch using one of the three copper wires. Create a simple loop in one end of the wire and bend the other end of the wire at a 90-degree angle. Place a greening pin through the loop and secure the pin to the foam. Be sure the copper wire is touching the greening pin. Secure a second greening pin to the foam so that the 90-degree bend in the wire can rest on it. This creates the switch. Lifting the bent end of the wire so that it does not touch the greening pin will break the circuit and stop electricity from flowing. Resting the bent end of the wire on the greening pin completes the connection and closes the circuit. Attach the second alligator clip from the wire that connects to the LED to one greening pin. Use a third wire to connect to the other greening pin and the positive terminal on the battery holder. The light should illuminate while the switch is closed. Opening the switch should turn the light off.



3

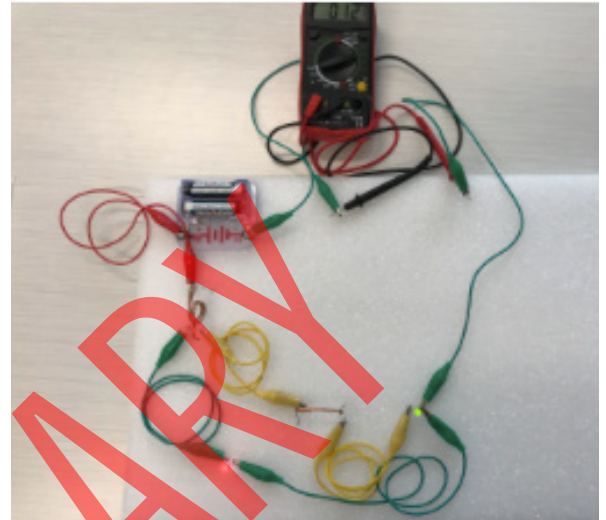
Add an ammeter (multimeter) to the circuit. Set the ammeter to 2000u amp. Connect the wire that runs from the negative battery terminal to the negative (black) wire on the ammeter. Use an additional wire to connect one side to the positive (red) wire on the ammeter. Connect the other end of the wire to the LED. The circuit should be complete, and you should be able to see a load on the ammeter. As you continue adding items to the circuit in upcoming steps, note the change in the load.





4

You can think of what you've created so far as the main electrical bus in an aircraft. Now you're going to create an avionics bus. Like the avionics bus in an aircraft, it must have its own switch to isolate sensitive electronics from power surges. Use the adjacent image as a guide. Based on what you've learned about building electrical circuits so far, connect a second switch and additional LEDs that will serve as a model avionics bus. Be sure to watch how the additional load affects the ammeter.



5

Complete your model by adding a motor with its own switch. Be sure to place the motor on the same circuit as the master switch, but provide it with its own switch as well, using the third piece of copper wire. This is the equivalent of having the master switch "on" and the ignition "on" in order to start the engine in an airplane.

