



# How To Use A Multimeter

Learn to use a multimeter to test voltage, resistance, and continuity.

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## INTRODUCTION

Every fixer should know their way around a [multimeter](#), which has just north of a zillion uses for testing electronic components and circuits. Follow along to master the three most basic functions of a multimeter.

[Part 1: Testing Continuity](#)

[Part 2: Testing Voltage](#)

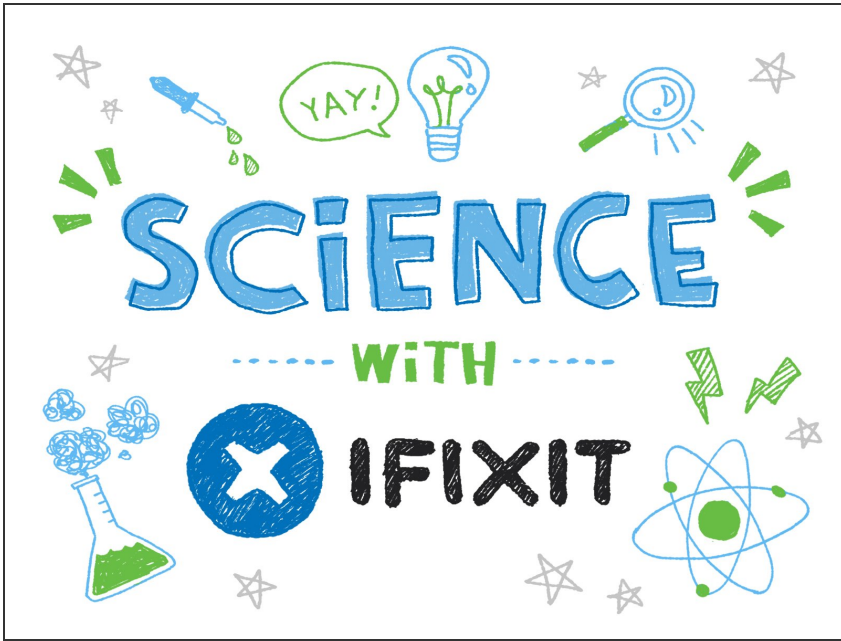
[Part 3: Testing Resistance](#)



### TOOLS:

- [Digital Multimeter](#) (1)
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## Step 1 — Testing Continuity



- A continuity test tells us whether two things are electrically connected: if something is **continuous**, an electric current can flow freely from one end to the other.
  - If there's no continuity, it means there is a break somewhere in the circuit. This could indicate anything from a blown fuse or bad solder joint to an incorrectly wired circuit.
- ❗ Continuity is one of the most useful tests for electronics repair.

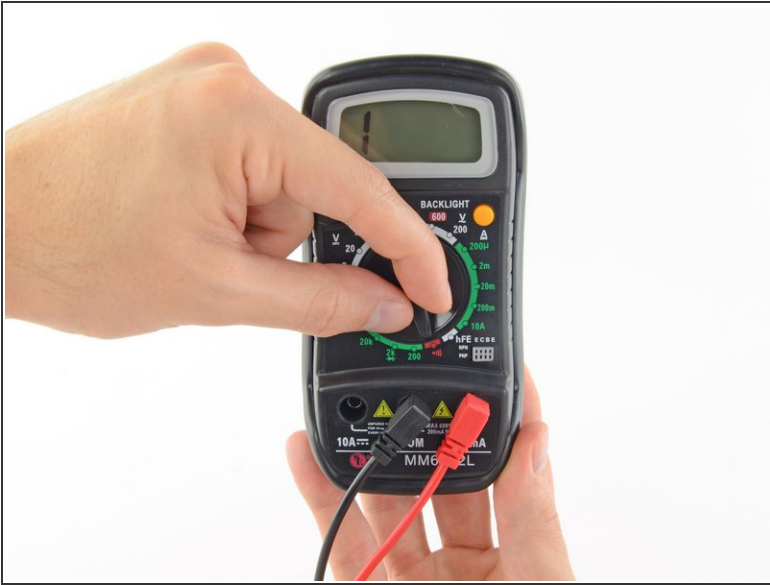
## Step 2



⚠ To begin, make sure no current is running through the circuit or component you want to test. Switch it off, unplug it from the wall, and remove any batteries.

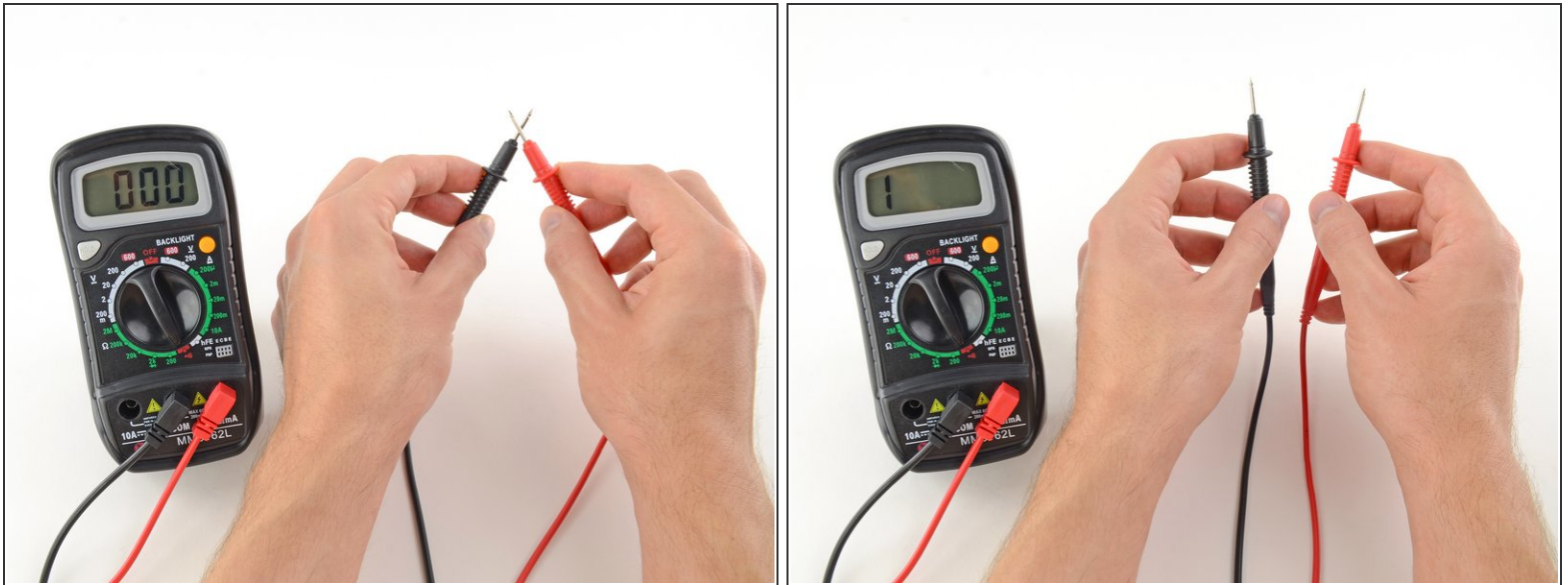
- Plug the black probe into the **COM** port on your multimeter.
- Plug the red probe into the **VΩmA** port.

### Step 3



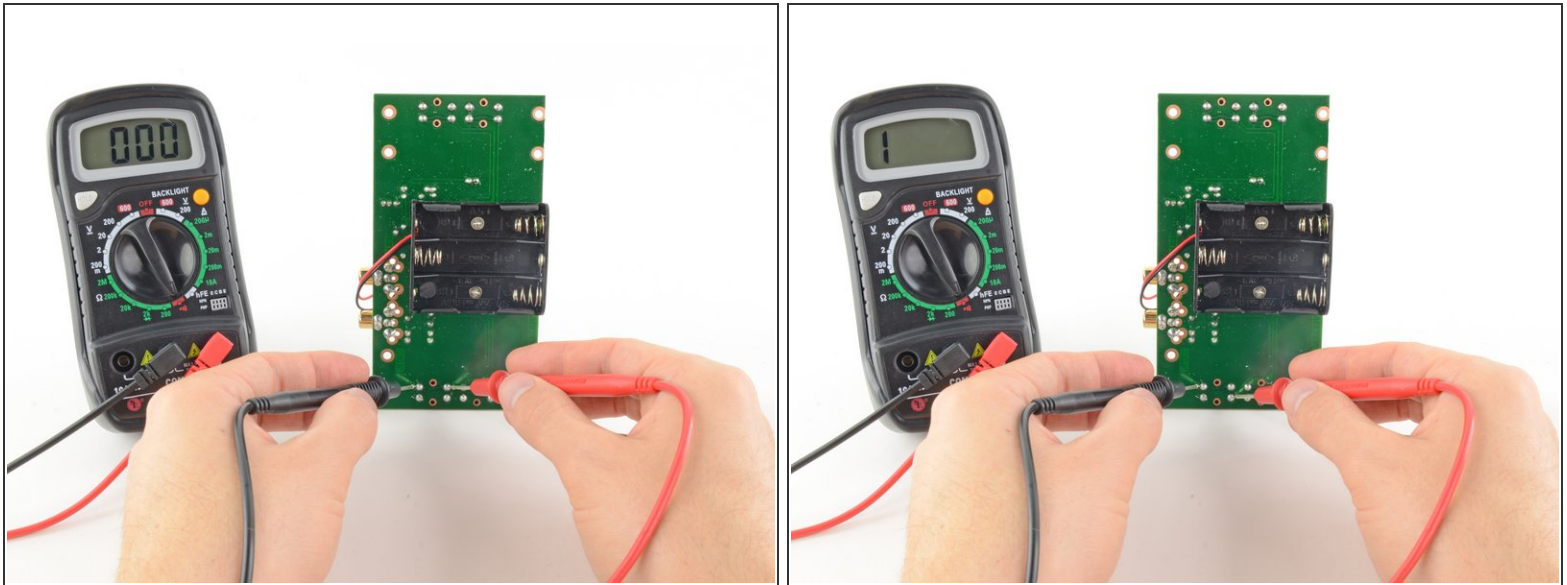
- Switch on your multimeter, and set the dial to continuity mode (indicated by an icon that looks like a sound wave).
- ① Not all multimeters have a dedicated continuity mode. If yours doesn't, that's okay! Skip to [Step 6](#) for an alternate way to perform a continuity test.

## Step 4



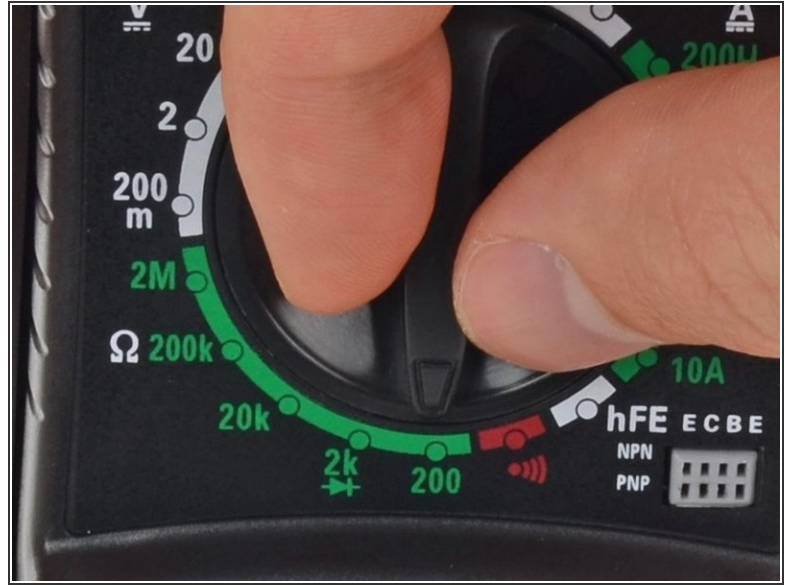
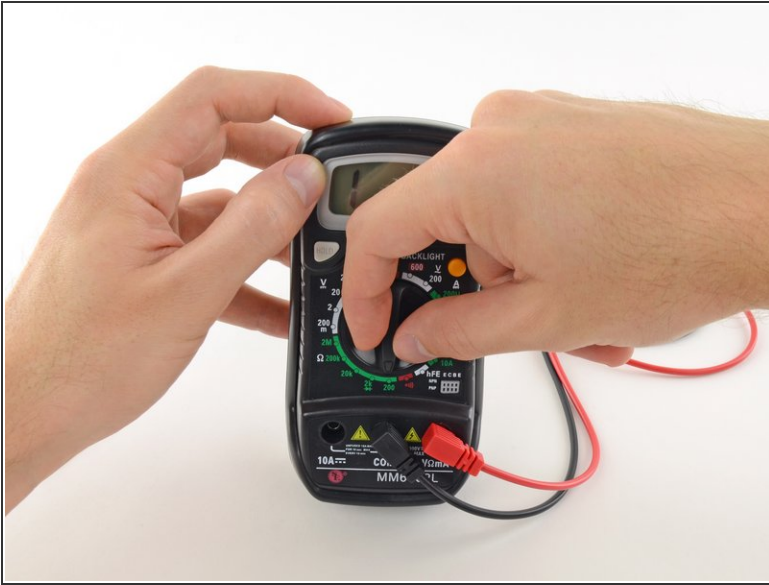
- The multimeter tests continuity by sending a little current through one probe, and checking whether the other probe receives it.
- If the probes are connected—either by a continuous circuit, or by touching each other directly—the test current flows through. The screen displays a value of zero (or near zero), and the multimeter **beeps**. Continuity!
- If the test current isn't detected, it means there's no continuity. The screen will display 1 or OL (open loop).

## Step 5



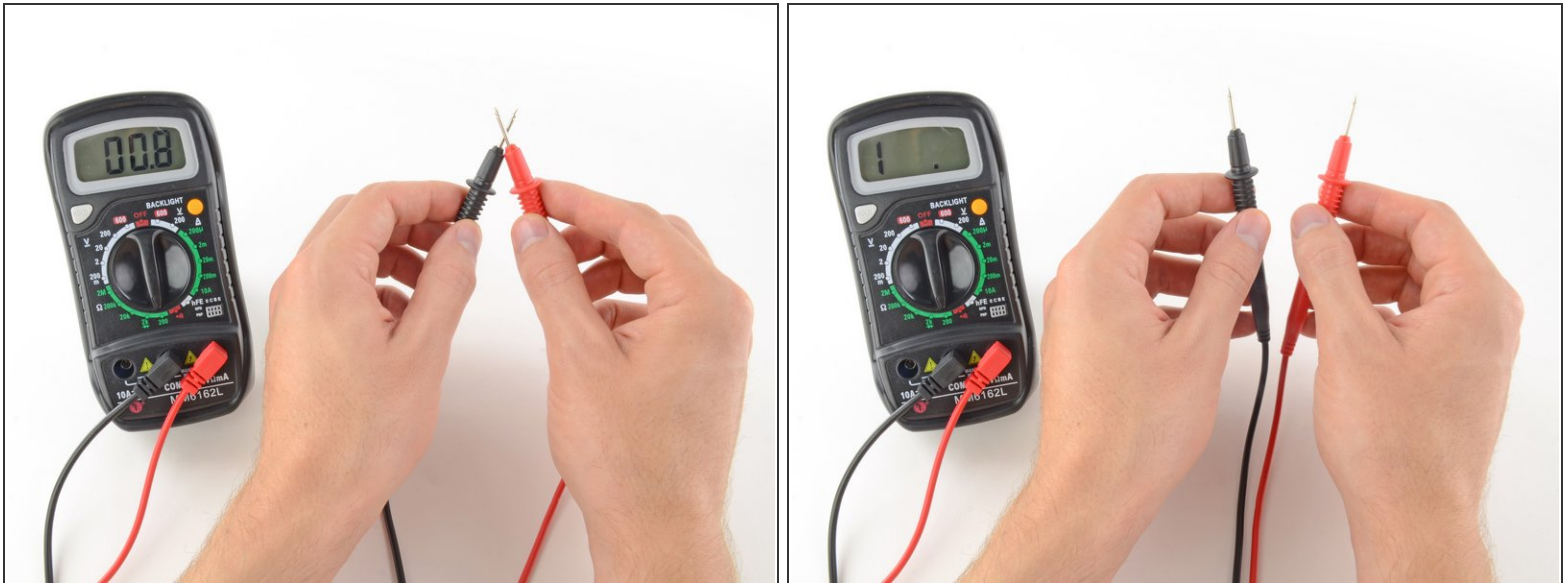
- To complete your continuity test, place one probe at each end of the circuit or component you want to test.
  - As before, if your circuit is continuous, the screen displays a value of zero (or near zero), and the multimeter **beeps**.
  - If the screen displays 1 or OL (open loop), there's no continuity—that is, there's no path for electric current to flow from one probe to the other.
- i** Continuity is non-directional, meaning it doesn't matter which probe goes where. But there are exceptions—for instance, if there's a diode in your circuit. A diode is like a one-way valve for electricity, meaning it will show continuity in one direction, but *not* in the other.

## Step 6



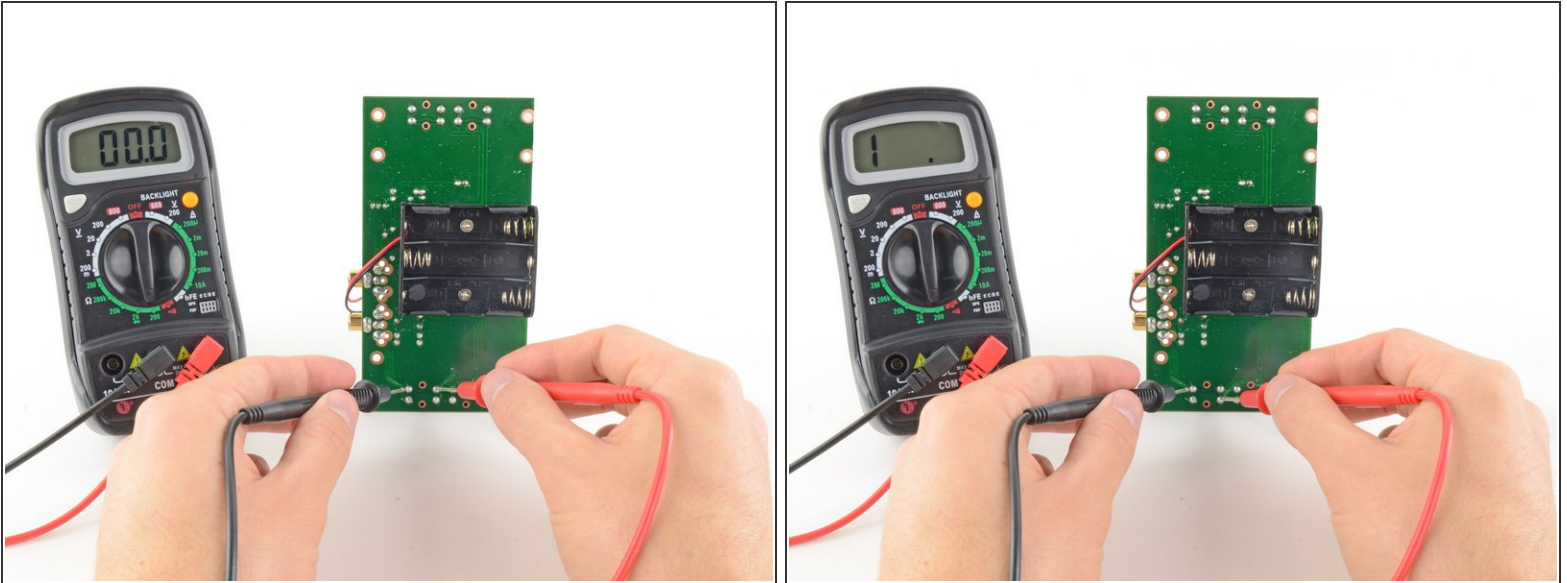
- If your multimeter doesn't have a dedicated continuity test mode, you can still perform a continuity test.
- Turn the dial to the lowest setting in the resistance mode.
  - ❗ Resistance is measured in ohms, indicated by the symbol  $\Omega$ .

## Step 7



- In this mode, the multimeter sends a little current through one probe, and measures what (if anything) is received by the other probe.
- If the probes are connected—either by a continuous circuit, or by touching each other directly—the test current flows through. The screen displays a value of zero (or near zero—in this case, 0.8). Very low resistance is another way of saying that we have continuity.
- If no current is detected, it means there's no continuity. The screen will display 1 or OL (open loop).

## Step 8



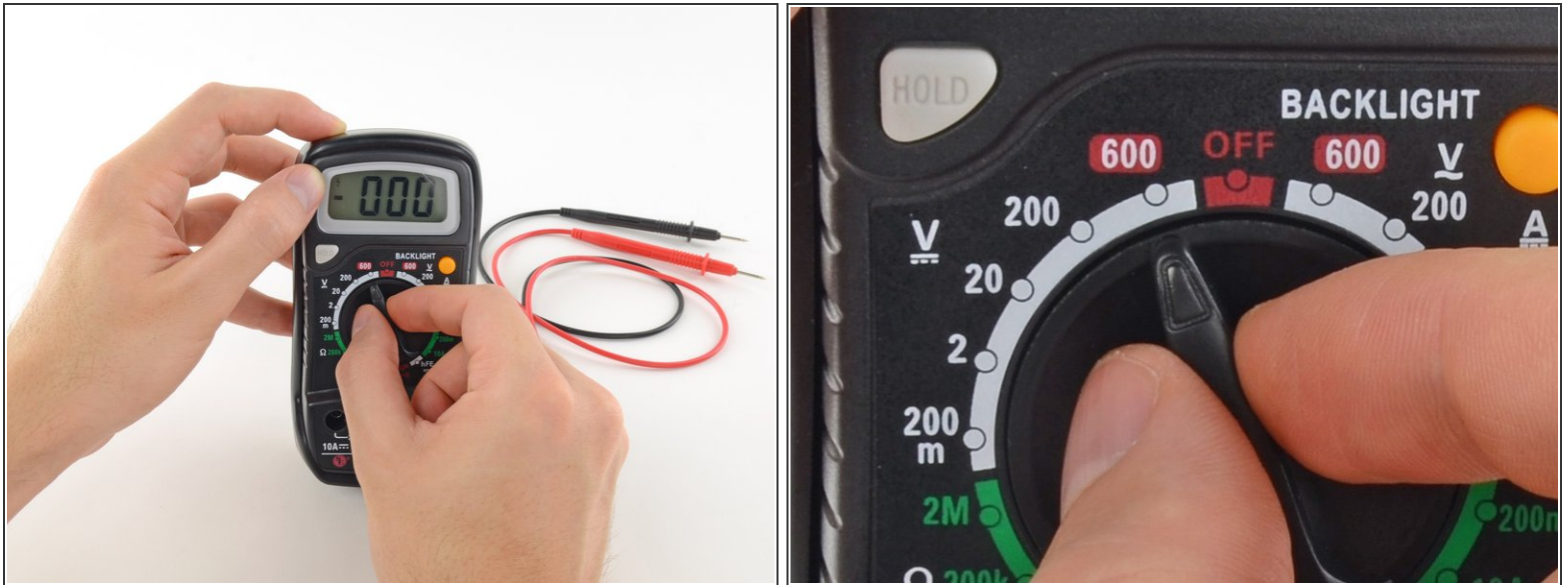
- To complete your continuity test, place one probe at each end of the circuit or component you want to test.
  - ❗ It doesn't matter which probe goes where; continuity is non-directional.
- As before, if your circuit is continuous, the screen displays a value of zero (or near zero).
- If the screen displays 1 or OL (open loop), there's no continuity—that is, there's no path for electric current to flow from one probe to the other.

## Step 9 — Testing Voltage



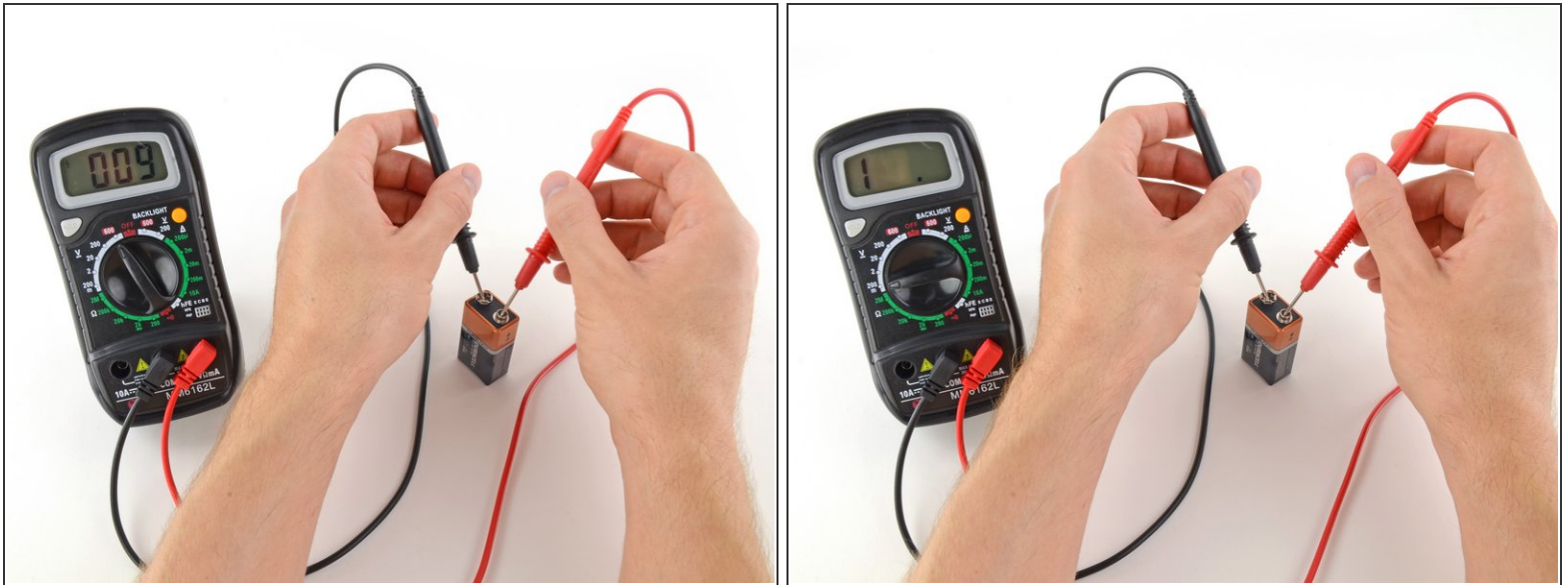
- Plug the black probe into the **COM** port on your multimeter.
- Plug the red probe into the **VΩmA** port.

## Step 10



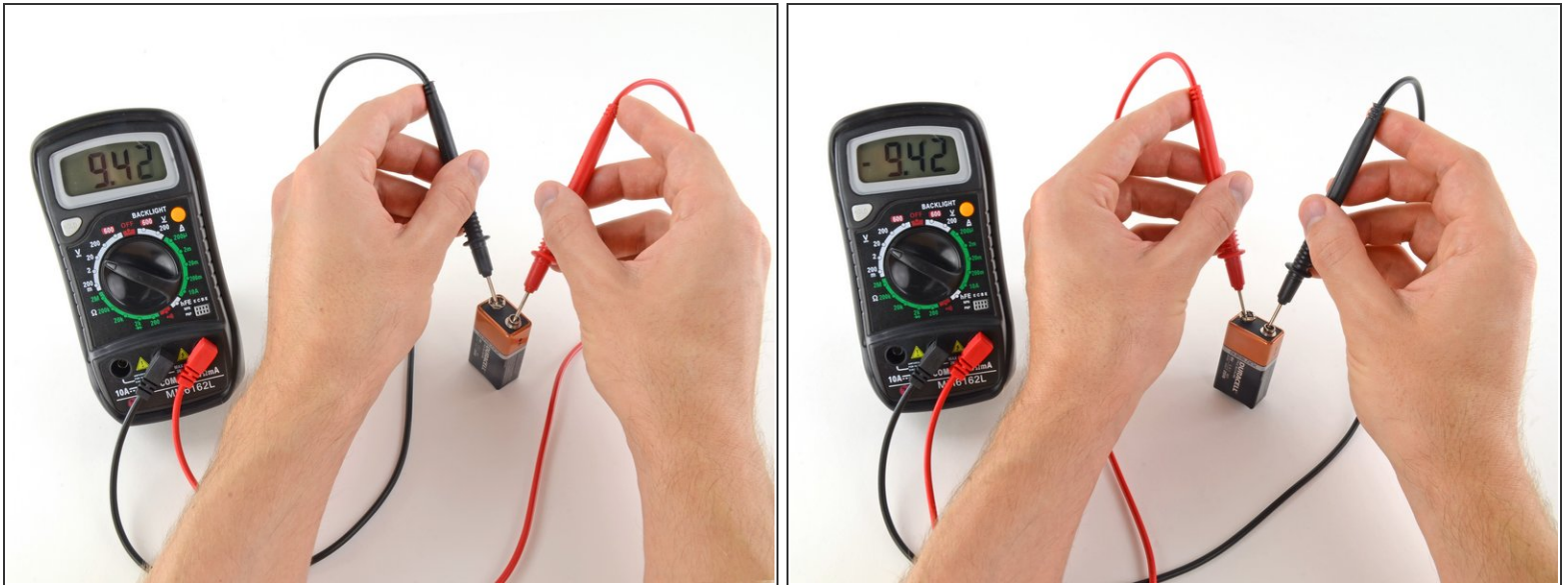
- Switch on your multimeter, and set the dial to DC voltage mode (indicated by a V with a straight line, or the symbol  $\text{V}_{\text{DC}}$ ).
- ① Virtually all consumer electronic devices run on DC voltage. AC voltage—the kind that runs through the lines to your house—is considerably more dangerous, and beyond the scope of this guide.
- Most multimeters are not autoranging, meaning you will need to set the correct range for the voltage you expect to measure.
  - Each setting on the dial lists the maximum voltage it can measure. So for example, if you expect to measure more than 2 volts but less than 20, use the 20 volt setting.
  - If you're not sure, start with the highest setting.

## Step 11



- Place the red probe on the positive terminal, and the black probe on the negative terminal.
- If your range was set too high, you may not get a very accurate reading. Here the multimeter reads 9 volts. That's fine, but we can turn the dial to a lower range to get a better reading.
- If you set the range too low, the multimeter simply reads 1 or OL, indicating that it is overloaded or out of range. This won't hurt the multimeter, but we need to set the dial to a higher range.

## Step 12



- With the range set correctly, we get a reading of 9.42 volts.
- Reversing the probes won't do any harm; it just gives us a negative reading.

## Step 13 — Testing Resistance



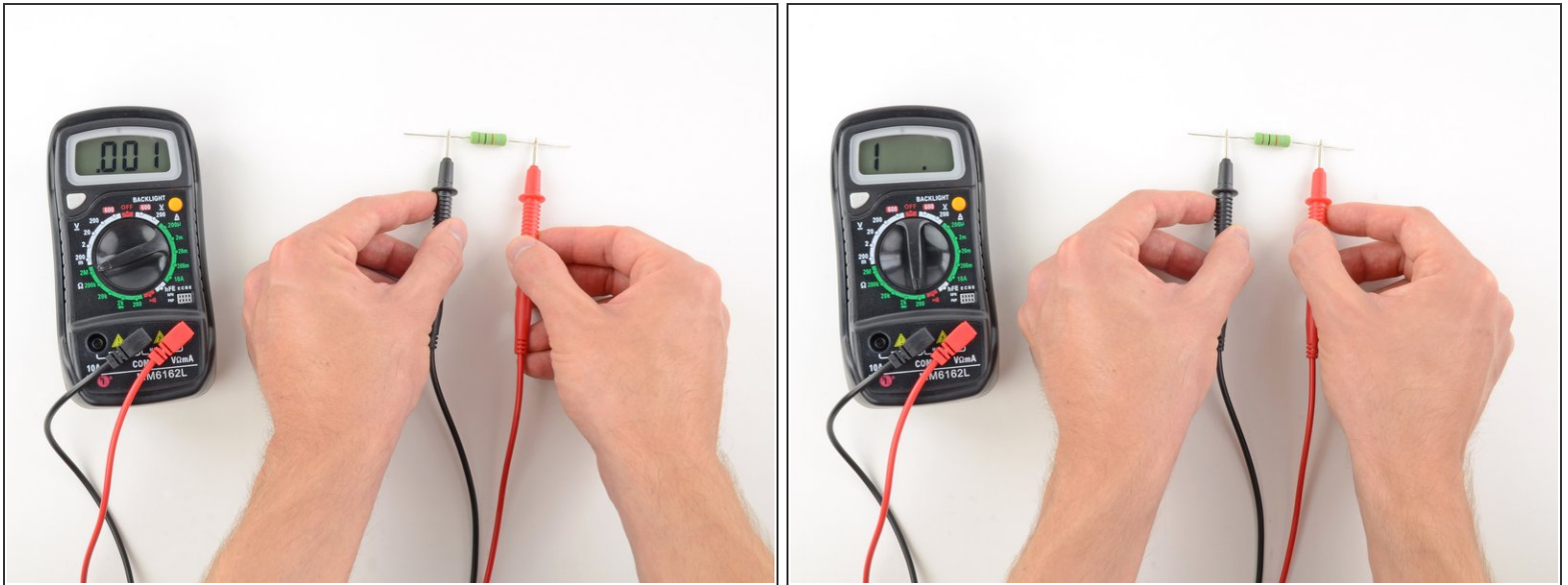
- To begin, make sure no current is running through the circuit or component you want to test. Switch it off, unplug it from the wall, and remove any batteries.
- ⓘ Remember that you'll be testing the resistance of the entire circuit. If you want to test an individual component such as a resistor, test it by itself—not with it soldered in place!
- Plug the black probe into the **COM** port on your multimeter.
- Plug the red probe into the **VΩmA** port.

## Step 14



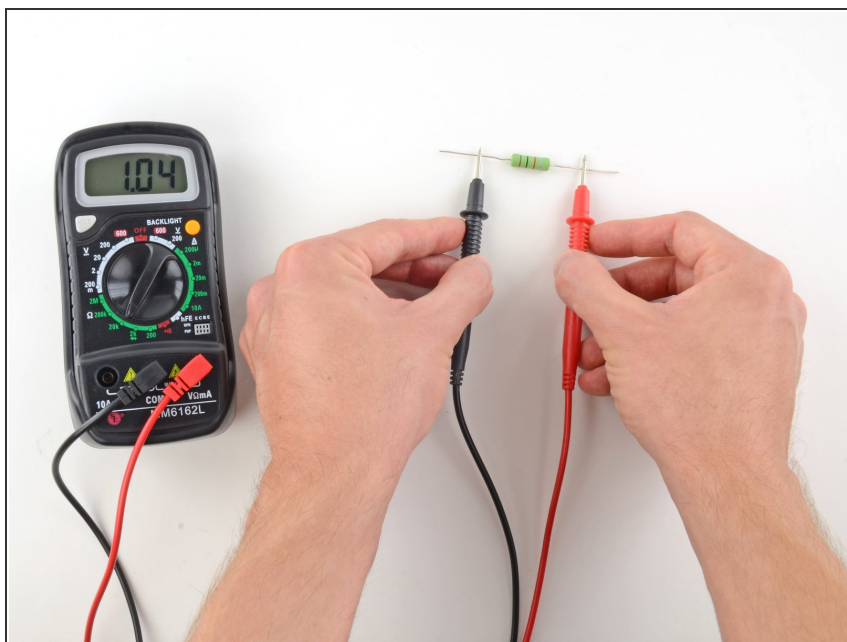
- Switch on your multimeter, and set the dial to resistance mode.
  - ❗ Resistance is measured in ohms, indicated by the  $\Omega$  symbol.
- Most multimeters are not autoranging, meaning you will need to set the correct range for the resistance you expect to measure. If you're not sure, start with the highest setting.

## Step 15



- Place one probe at each end of the circuit or component you want to test.
  - ❗ It doesn't matter which probe goes where; resistance is non-directional.
- If your multimeter reads close to zero, the range is set too high for a good measurement. Turn the dial to a lower setting.
- If you set the range too low, the multimeter simply reads 1 or OL, indicating that it is overloaded or out of range. This won't hurt the multimeter, but we need to set the dial to a higher range.
- The other possibility is that the circuit or component you are testing doesn't have [continuity](#)—that is, it has infinite resistance. A non continuous circuit will always read 1 or OL on a resistance test.

## Step 16



- With the multimeter set to a usable range, we get a reading of 1.04k ohms.