



How To Use A Multimeter

Every fixer should know their way around a...

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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: Measuring Voltage](#)

[Part 3: Measuring Resistance](#)

To learn how to use your multimeter to make advanced measurements such as current and capacitance, [check out this guide](#).

TOOLS:

[Digital Multimeter](#) (1)

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.
- ① 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.

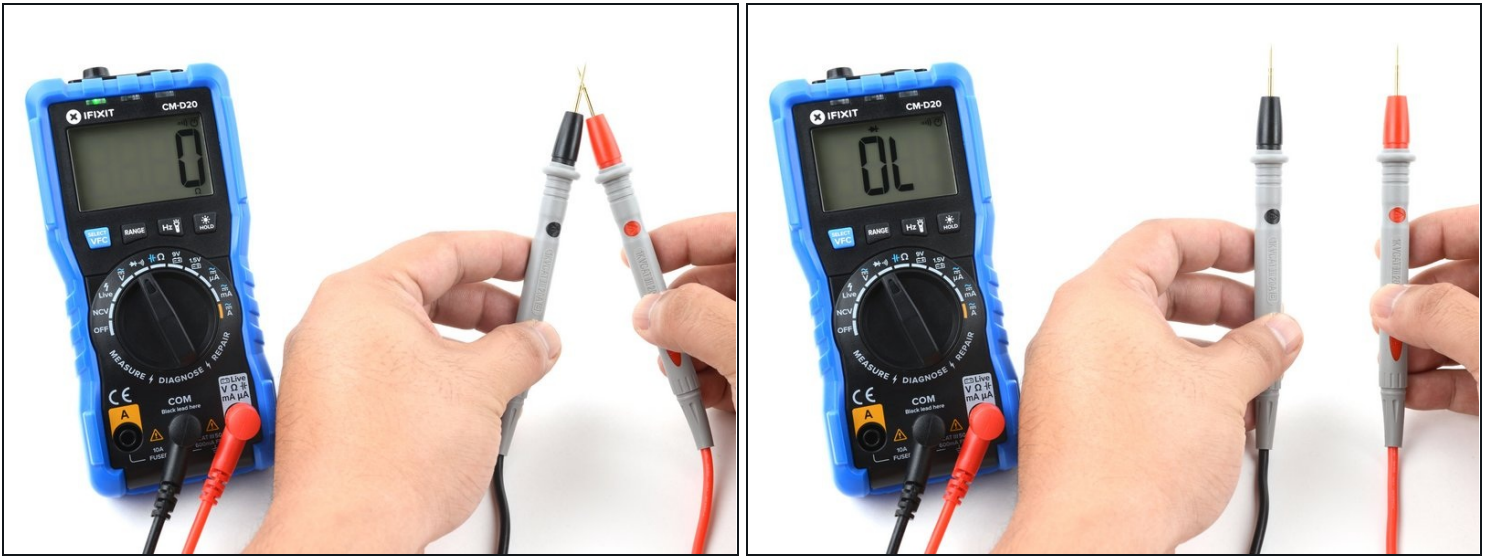
- Plug the black probe into the **COM** port on your multimeter.
- Plug the red probe into the port labeled with a **V symbol** (in this case, the right port).

Step 3



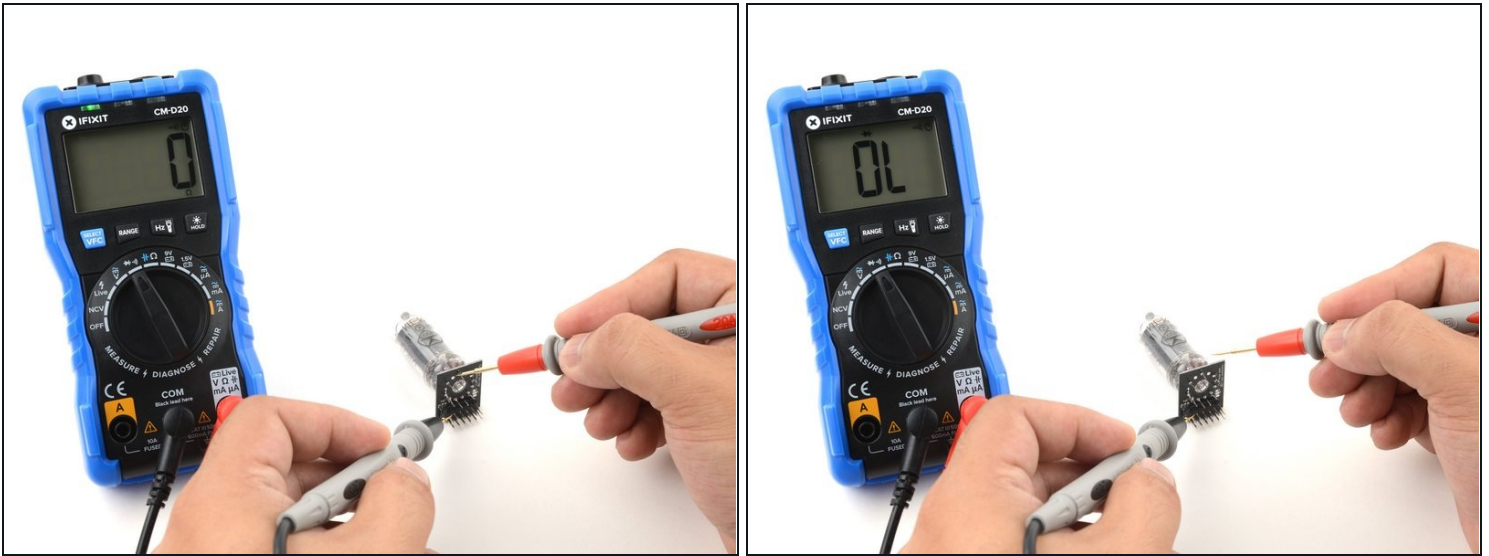
- Switch on your multimeter, and set the dial to continuity mode (indicated by an icon that looks like a sound wave).
- ① Not all multimeters have a dedicated continuity mode. If yours doesn't, that's okay! Skip to [step 6](#) for an alternate way to perform a continuity test.

Step 4



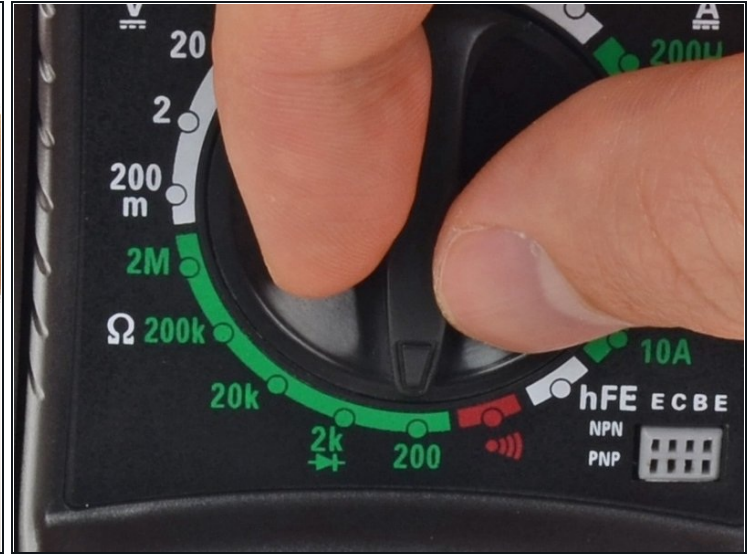
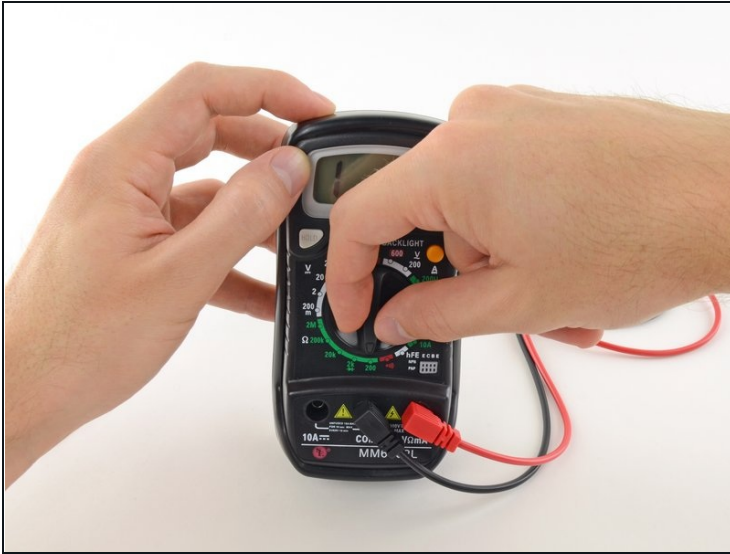
- ① The multimeter tests continuity by sending a little current through one probe, and checking whether the other probe receives it.
- ① If the probes are connected—either by a continuous circuit, or by touching each other directly—the test current flows through. The screen displays a value of zero (or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

Step 5



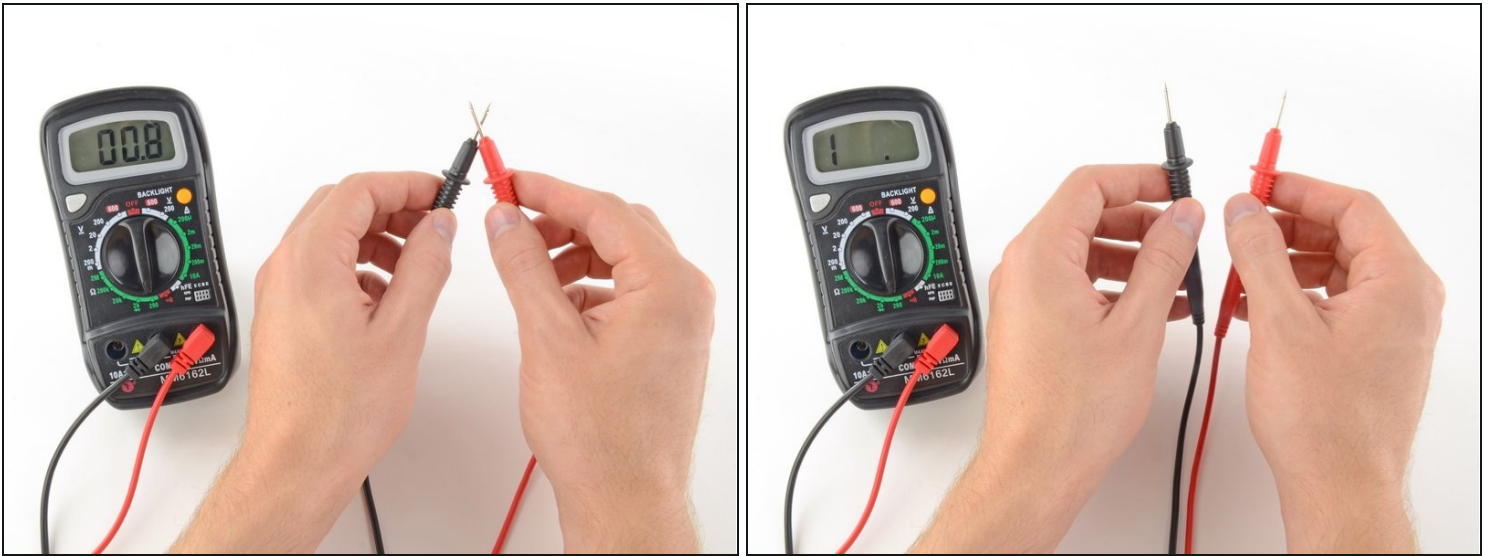
- To complete your continuity test, place one probe at each end of the circuit or component you want to test.
- ① As before, if your circuit is continuous, the screen displays a value of zero (or near zero), and the multimeter **beeps**.
- ① If the screen displays 1 or OL (open loop), there's no continuity—that is, there's no path for electric current to flow from one probe to the other.
- ① 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.
- To check for this, reverse what the probes are touching and check for continuity. If the multimeter shows continuity, then it's possibly a diode.

Step 6 — Test for continuity (alternate method)



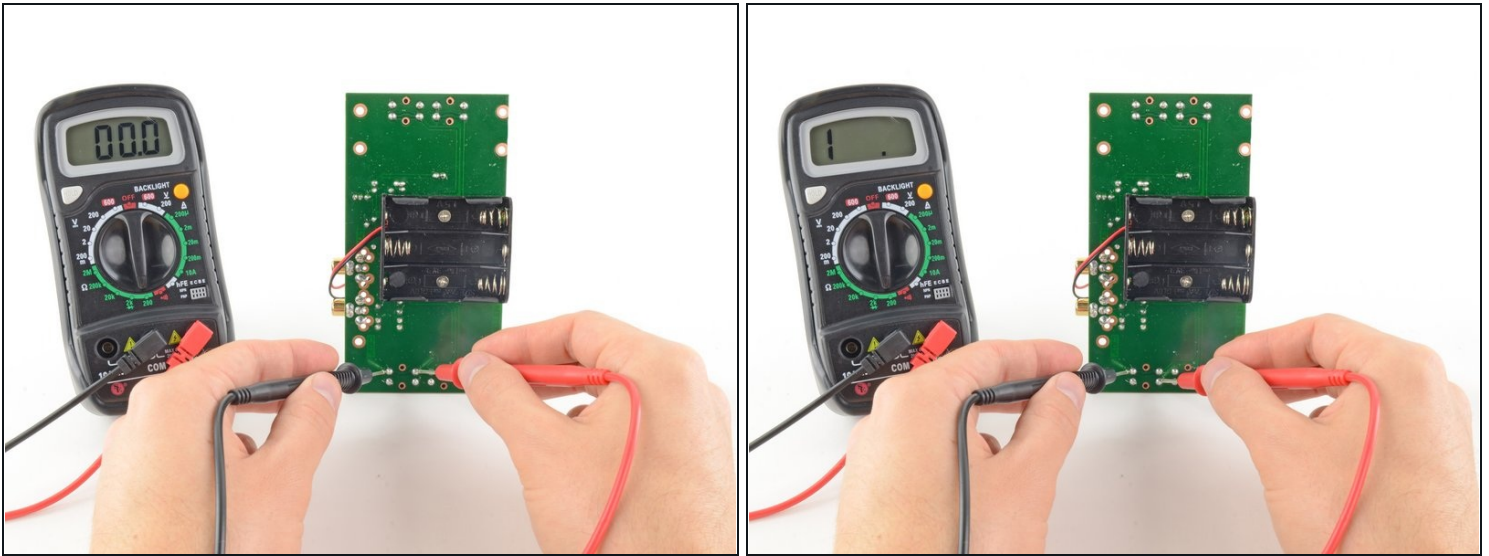
- ① If your multimeter doesn't have a dedicated continuity test mode, you can still perform a continuity test.
- Turn the dial to the resistance mode.
 - If your multimeter has manual ranging, set the resistance to the lowest setting.
- ① Resistance is measured in ohms, indicated by the symbol Ω .

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.
 - ① 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.

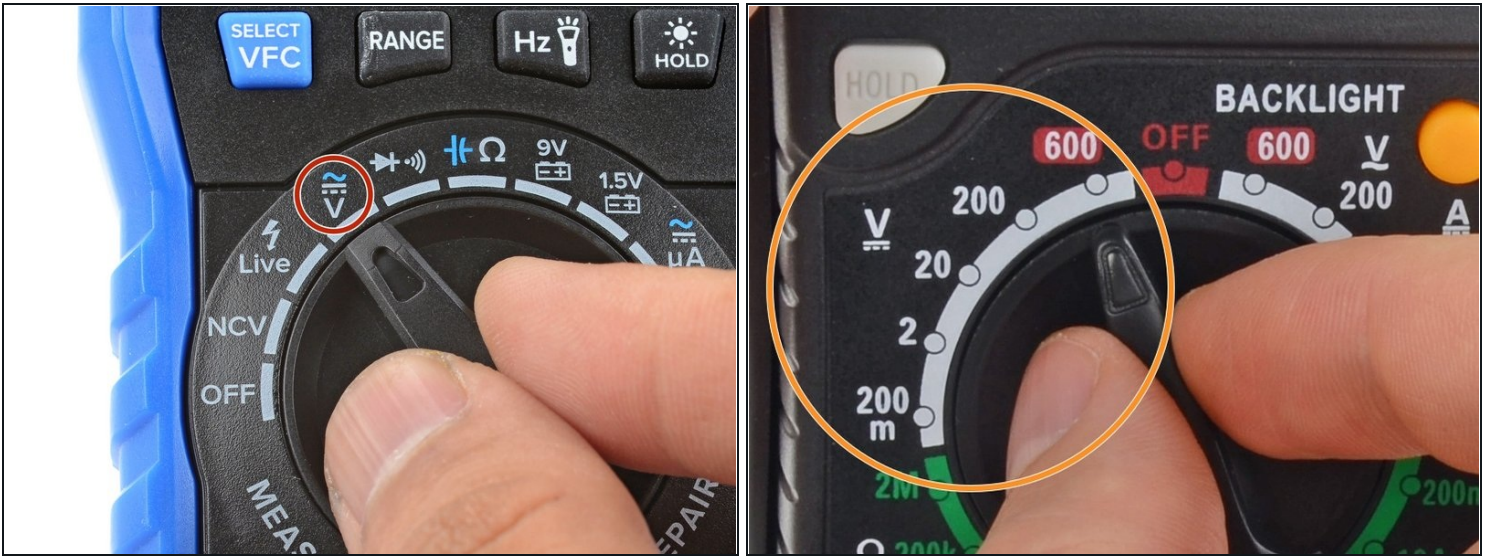
Step 9 — Measuring voltage



i The next four steps will show you how to measure voltage.

- Plug the black probe into the **COM** port on your multimeter.
- Plug the red probe into the port labeled with a **V symbol** (in this case, the right 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).
- 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.
- ① Your multimeter may be auto-ranging or manual ranging. An auto-ranging multimeter (such as the iFixit multimeter) will automatically determine the best measuring range. All you have to do is set what kind of measurement you want to take.
- ① If your multimeter is manual ranging, you'll also 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 — Auto-ranging voltage measurement



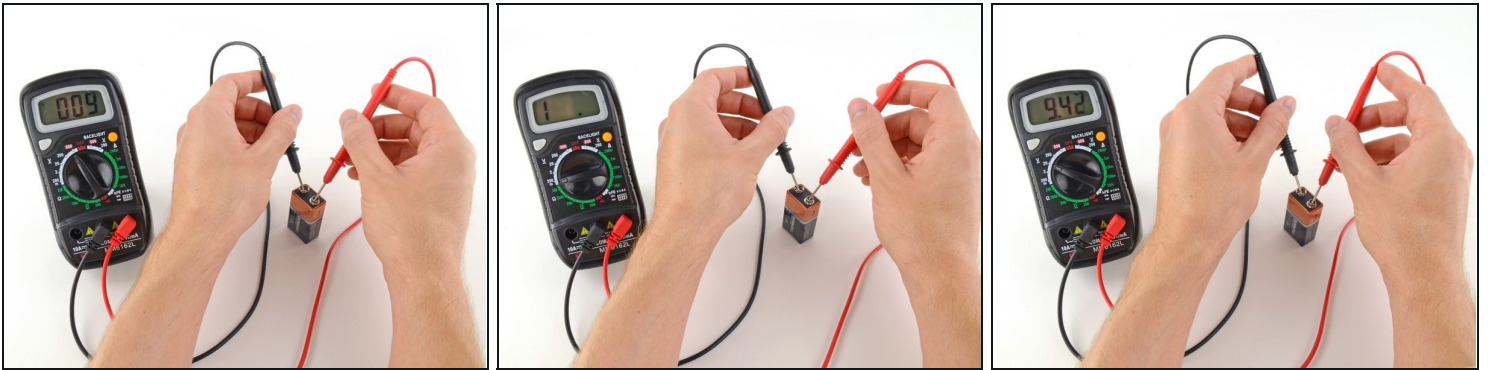
① If your multimeter is manual ranging, skip to the next step.

- Place the red probe on the positive terminal, and the black probe on the negative terminal. The multimeter will display the measured voltage.

① Reversing the probes won't do any harm; it just gives a negative reading.

- Skip the next step, which describes how to measure voltage using manual ranging multimeters.

Step 12 — Manual ranging voltage measurement



① Follow this step to measure voltage with a manual ranging multimeter.

- 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 precise reading. Here the multimeter reads 9 volts. That's fine, but we can turn the dial to a lower range to get a more precise.
- 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.

① With the range set correctly, we get a reading of 9.42 volts.

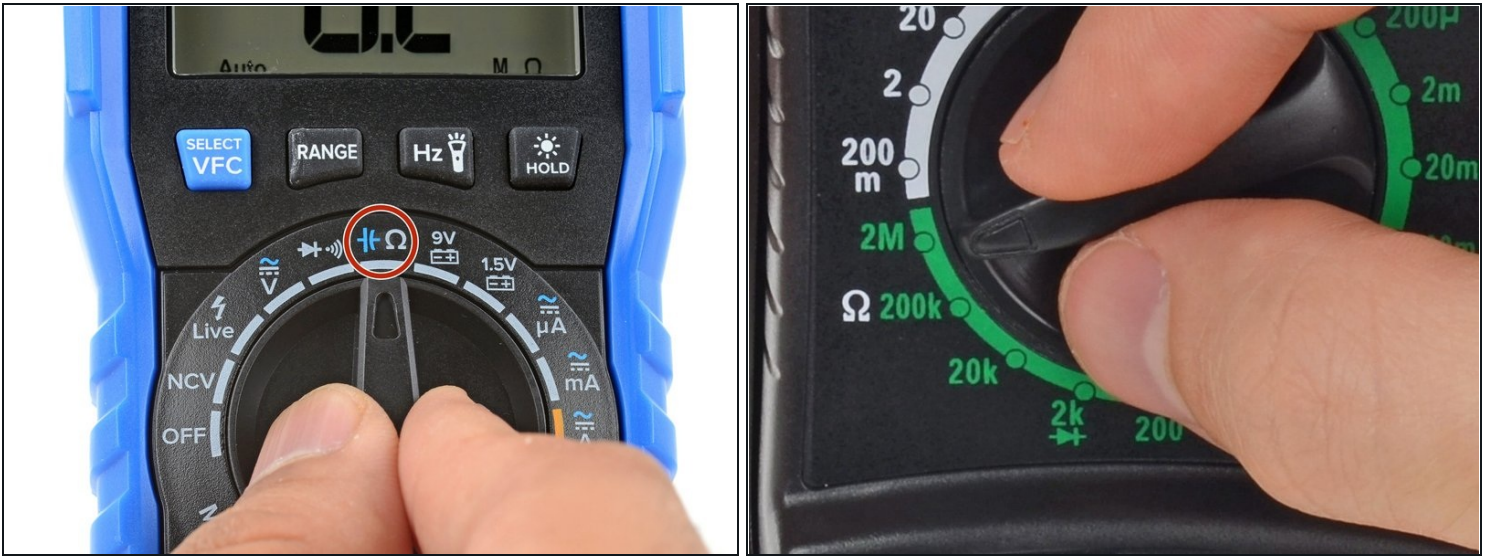
① Reversing the probes won't do any harm; it just gives us a negative reading.

Step 13 — Measuring resistance



- ⓘ The next three steps will show you how to measure resistance with your multimeter.
- **To begin, make sure no current is running through the circuit or component you want to measure.** Switch it off, unplug it from the wall, and remove any batteries.
 - ⓘ Remember that you'll be measuring the resistance of the entire circuit. If you want to measure an individual component such as a resistor, measure 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 port labeled with **an Ω symbol** (in this case, the right port).

Step 14



- Switch on your multimeter, and set the dial to resistance mode.
 - ① Resistance is measured in ohms, indicated by the Ω symbol.
- ① The iFixit multimeter is auto-ranging, meaning it will automatically determine the best measuring range.
- ① If your multimeter is manual ranging, 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 measure.
 - ① It doesn't matter which probe goes where; resistance is non-directional.
 - If your multimeter is manual ranging:
 - If your multimeter reads close to zero, the range is set too high for a good measurement. Turn the dial to a lower resistance range.
 - 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.
 - ① The other possibility is that the circuit or component you are measuring doesn't have [continuity](#)—that is, it has infinite resistance. A non continuous circuit will always read 1 or OL on a resistance test.
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