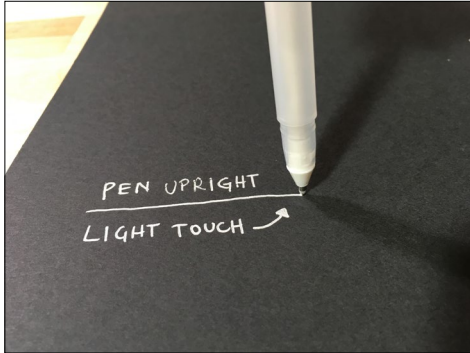


## Troubleshooting Pens & Circuits

Having problems getting pens or drawn circuits to work?  
Follow our troubleshooting guide below!

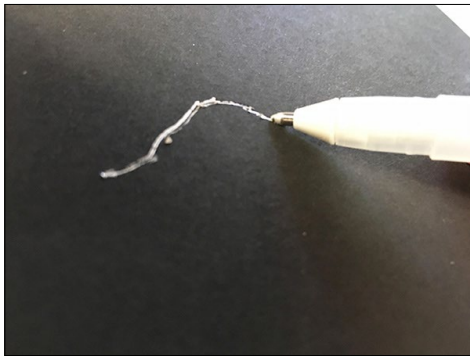
Troubleshooting is a great skill for kids to learn. See our coaching tips at the bottom.



### Getting Ink to Flow

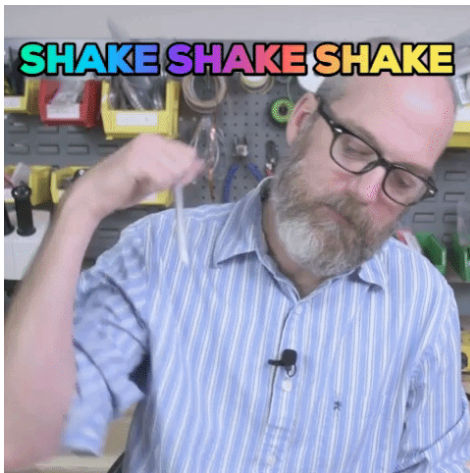
Pressing hard and holding the pen at an angle will NOT work.  
Instead:

- Hold pen upright
- Use a light touch
- Let ink flow like paint



### Clogged Tip

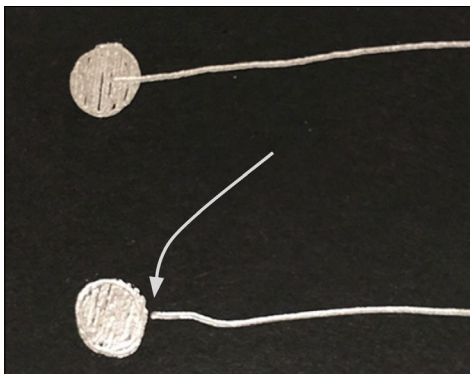
Sometimes dried ink gets stuck around the pen tip and prevents a smooth flow.  
To fix, drag the pen while rotating the tip, which will deposit the dried ink on your paper.



### Silver Settling

If you've followed the tips above but the ink doesn't flow, give the pen a few vigorous shakes holding it from the back and shaking it back to front.

< [CLICK IMAGE TO VIEW ANIMATION](#)

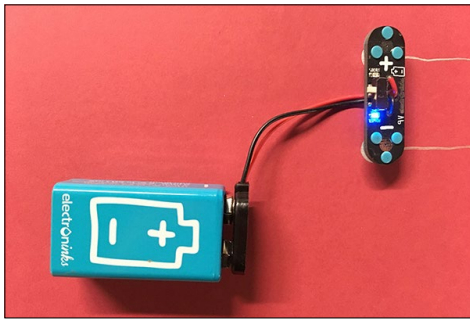


### Circuit Problems? Redraw Your Line

The most common reason circuits don't work is that the drawn lines have a break somewhere, creating an open circuit.

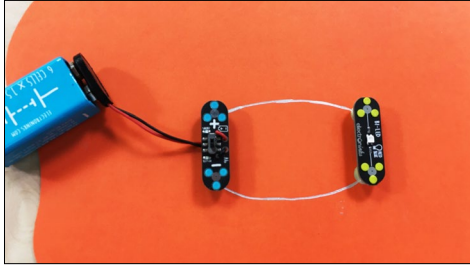
Often, these breaks occur where lines meet the round pads (see image on left) which can be hard to see.

It's a good idea to draw over your lines as a first step to make sure you have enough conductive ink to complete the circuit.



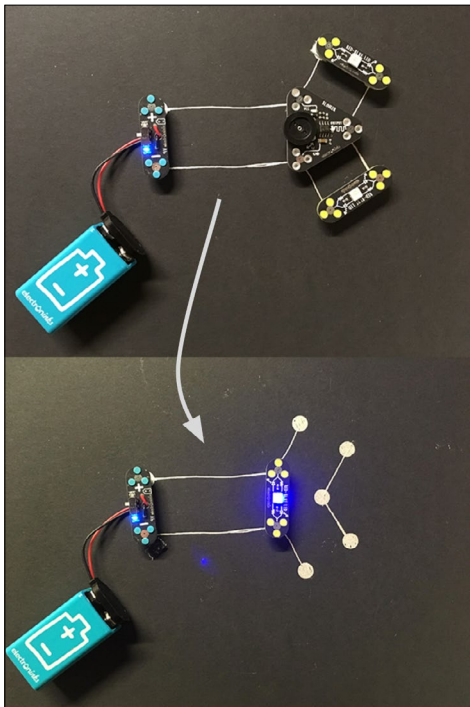
## Battery On?

Make sure the switch on the battery module is turned on or you won't get any power. The blue light glows when it's on.



## Paper Problems

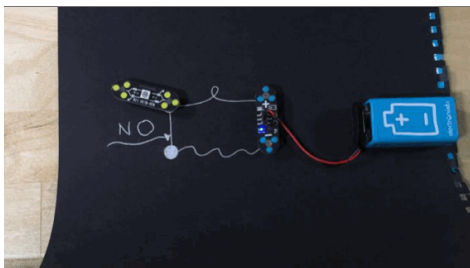
If you're *sure* you have drawn your circuit correctly and it still doesn't work, it's possible that the paper you're using has high resistance. Try printer paper or card stock - some cheap papers (with visible fibers) can be hard to get to work, especially on humid days.



## Start by Simplifying the Problem

It's hard to troubleshoot something complicated all at once. See if you can isolate one thing at a time to test.

In the image to the right, you can see that the top circuit isn't working. A good first step illustrated in the bottom half is to isolate the first section, from the battery to the first two drawn pads. Here the LED lights up, so we know that the battery and the first two lines are working. Then we can move on to the next two lines, and continue on from there.



## Don't Draw BETWEEN Feet of a Module

Electric current is lazy! If you draw between the feet of a module, the current will sneak under instead of lighting the light, turning the motor, or doing whatever work you want it to do.

Easy fix: Take scissors and cut any lines between the feet to break that line.

< [CLICK IMAGE TO VIEW ANIMATION](#)

## Teach Kids to Troubleshoot

Running into problems is good! It's your opportunity to teach kids (or adults!) how to troubleshoot - this is what real engineers do.

Here are some tips:

1. Resist! Don't step in and show them the answer or fix the problem. You may find this difficult to stand, but do it for them 😊
2. Instead, ask questions. Lead them to follow their own path of inquiry
3. Have students teach each other to get past roadblocks
4. Coach them to think logically, to follow a circuit (or a problem) from start to finish