



# Circuits Curriculum

## Soldering Troubleshooting

**Problem: Your night light is not turning on.**

- Do you have your batteries installed correctly?
- Is the switch on the battery case in the “on” position?
- Did you cover the light sensor? Remember the LED only turns on in the dark.
- Is your Microchip installed in the socket?

**Problem: Students are having trouble soldering.**

Make sure their irons are ‘tinned.’ This usually happens when people start soldering, but it’s good to keep an eye out for this if a student’s iron is not working properly. The tinning process is simple: melt solder onto the tip of the iron till its covered then clean it off with the brass sponge. The tip should now be nice and shiny. If an iron is old or poorly kept it may require a more dexterous cleaning. Using ‘Tip Tinner’ also helps for this process.

**Problem: A student is having trouble or is nervous about the process.**

A good way to help them start is to hold the solder for them while they hold the iron. Working together, do a solder joint or two and then let them progress to holding the iron and the solder themselves.

**Problem: Your Night Light will not turn on AND the microchip is getting very hot.**

- **First:** Turn the Night Light off and remove the batteries immediately.
- Is the Microchip installed with the correct orientation? The little circle on the chip should be on the same side as the the little notch on the socket. To fix this just pop the chip out and put it back in the correct way. Be careful to not bend the legs of the microchip. Using a skinny screw driver, or the tip of a pen, pry out the chip.

- Are the battery wires installed correctly? Red to PWR and Black to GND. If they were installed incorrectly you need to unsolder them and re-solder them into the correct spots. To do this, apply heat with your soldering to the pad, turning the solder there liquid, and pull out the wire. Do this for both pads. There is a chance now that while the wire was removed from the pad there is still enough solder in the pad to fill the hole. Don't worry, to put the correct wire in a pad like this is easy. Just add a little solder to your iron's tip, place it on the pad, and when the solder becomes liquid carefully press the wire into it. The holes on these pads are extra large for this reason. Once the metal part of the wire is inserted into the pad remove the iron and hold the wire in place till the solder cools and becomes solid. The wire may get a little warm during this process. Alternatively you can use a solder sucker to remove the solder from the hole.
- Are there are large blobs of solder or unclipped leads connecting pads on the circuit board that shouldn't be connected? These are called shorts and cause the circuit to not work. This happens frequently where the socket is soldered to the circuit board as those connections are very close together. It helps to have a blank unsoldered board on hand for reference.
- If there are any shorts caused by unclipped leads, just cut all the excess leads off the board.
- If there are any shorts caused by solder (also know as solder bridges) you will need to remove the excess solder with your soldering iron. Simply take your soldering iron and with a clean tip just run it between the two bridged pads. The solder should stick to the iron and after one or two strokes the solder bridge should be cleared.
- If there is a very large amount of solder on a pad you can also use a solder sucker. Start by depressing the spring for the solder sucker, it should lock in place. Next place your iron on the large glob of solder. While your iron is pressed against the glob of solder, turning it liquid, place the solder sucker directly on top of the glob and press the trigger button. The spring should release, creating suction that has sucked up the large glob of solder. If this was successful you can remove the iron and there should be a lot less solder on the pad. Try not to place the iron on the circuit board longer than 5 seconds.

*If you have tried all of the above and it is still not working, try the steps below:*

**Problem: Your microchip is not hot, but it is still not working.**

- Look very closely at your microchip. Are any of the legs bent inward, preventing them from making connection with the socket? If so, remove the microchip, fix the legs, and carefully place it back with the correct orientation.
- Sometimes a Microchip can be programmed incorrectly. If everything looks like it should be good but your circuit is still not working, then remove your Microchip and try another one. Preferably this will be a Microchip from a circuit that works.
- If your circuit still does not work, try a new pair of batteries.
- After all of that, if your circuit still does not work, double check all components are soldered in the correct places, especially look out for the LED. If after all of that it still doesn't work, don't worry! Sometimes its best to just come back to something like this a day or a week later with a fresh pair of eyes. You just learned to solder and that's awesome!