NEIL SQUIRE SOCIETY'S

Makers Making Change

Learning Resources Switch Modification

INTRODUCTION

This document details the process of converting a Learning Resources toy into a low cost assistive switch.

 Instructions by Derrick Andrews

BEFORE YOU BEGIN

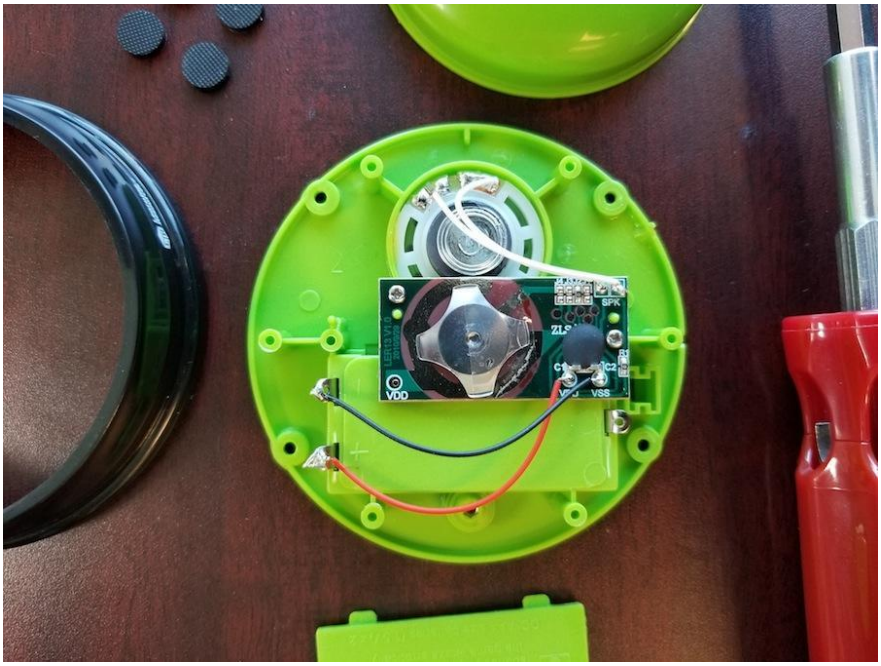
This document assumes you are already familiar with basic hand tool usage, including the use of multimeters (for continuity) and soldering. You'll also need the tools listed below, to complete the procedures throughout:

1) Phillips Screwdriver, Medium.
2) Soldering iron & rosin core solder
3) Stranded Wire
4) Utility knife
5) Multimeter (optional, but handy for testing electrical connections)

PROCEDURE

We'll begin by peeling off the small black rubber feet that hide the screws holding the switch toy together.

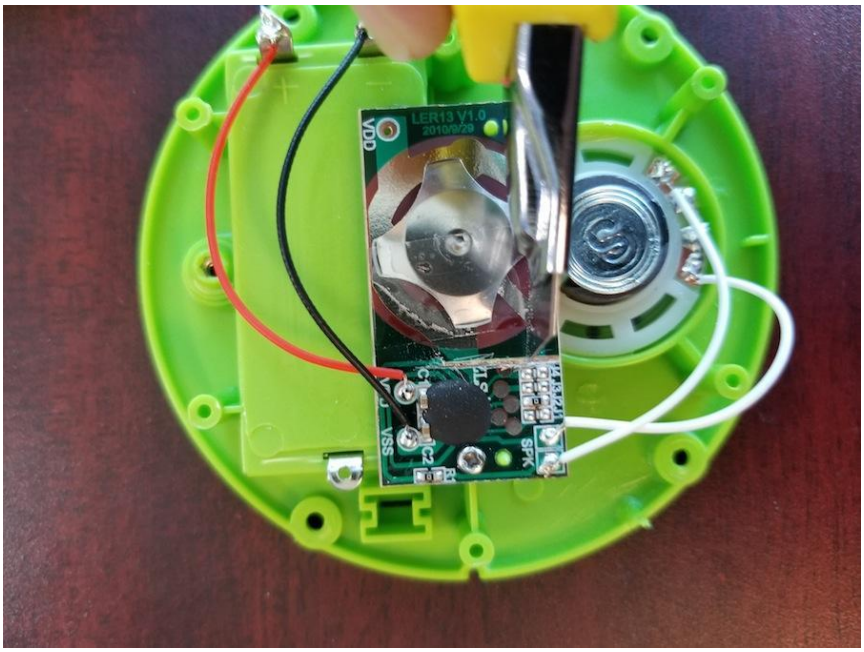
Don't discard these, as we'll be re-attaching them after the modification is complete.



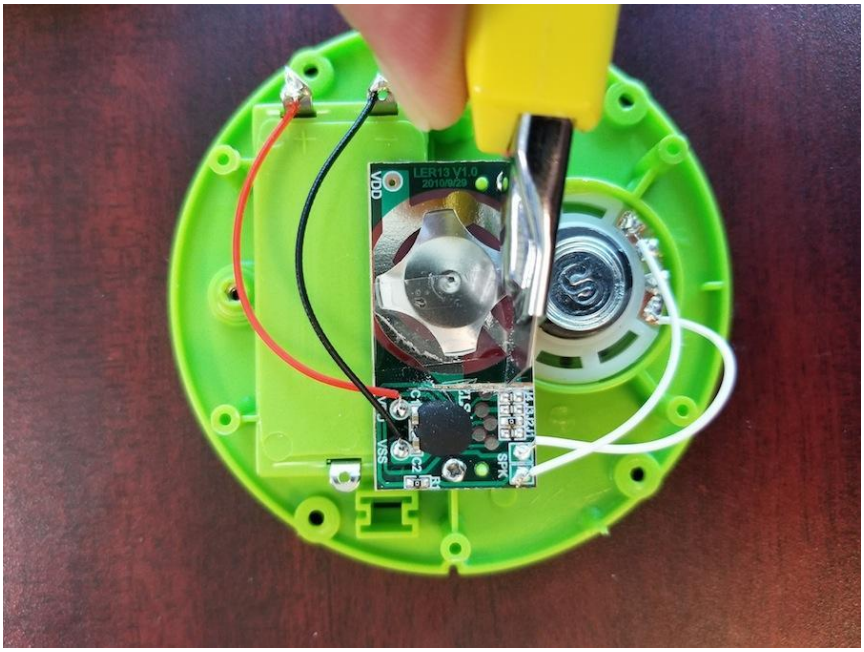
Lift away the key button cap and support ring. Also set these aside to put back later. Locate the traces that connect to the switch. These appear as green lines on the circuit board that connect to the metal membrane in the center. These will be cut in the next step.

Draw the blade across the trace, being sure to cut through the copper, until you can see the brown circuit board material underneath.

If you aren't sure if you’ve through, draw the blade firmly through the same groove several times until the groove widens.

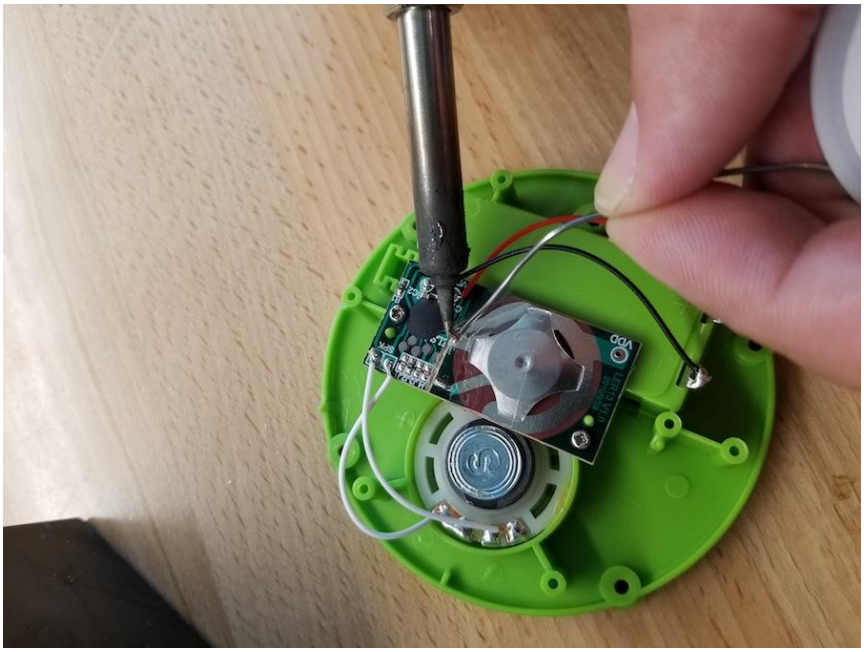


Dragging the tip of the cutter sideways can help widen the groove, making the cut board more visible.

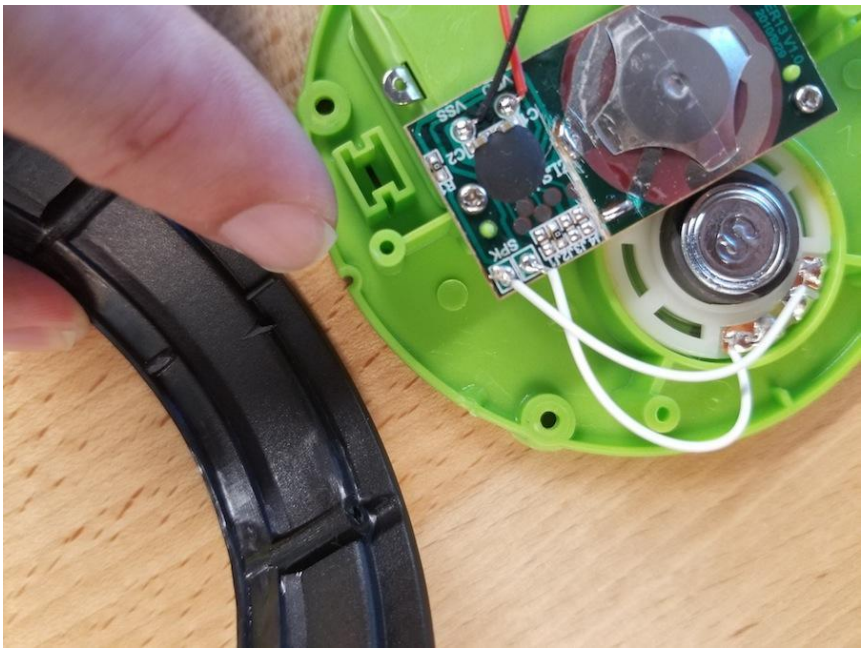


Repeat the cutting and widening with the other trace.

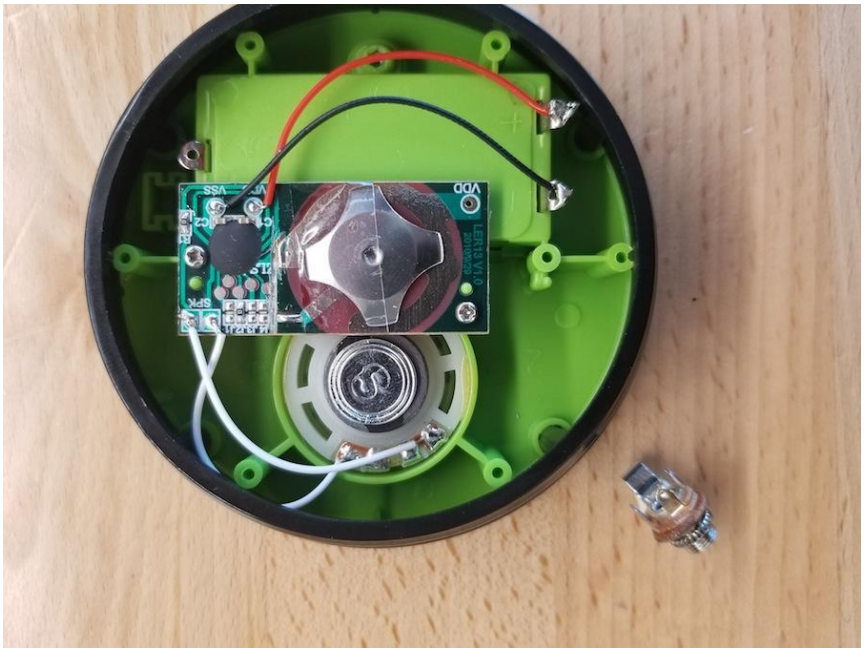
Gently scrape the green plastic film from the ends of the traces going to the switch.
If this isn't completed properly, solder won't stick to the traces, and you may not get a proper electrical connection to the switch.



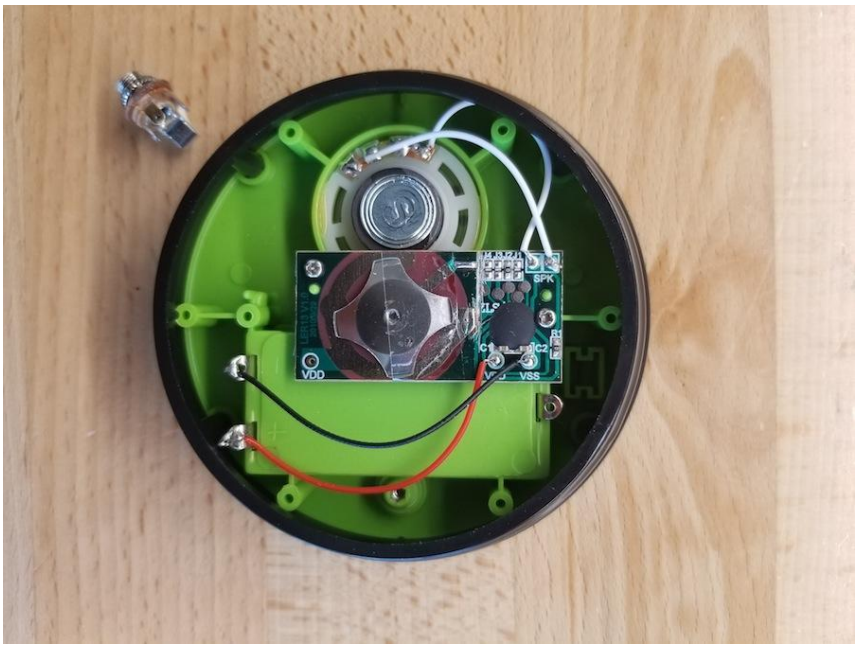
Solder the prepared wires to the scraped switch traces. Make sure the solder doesn't bridge, or touch, the traces going to the IC, which is the round black dot you see on the circuit board .



Note the notch in the bottom case. You'll need to ensure the corresponding protrusion on the support ring fits into this notch when re-assembling. Otherwise, the case won't go back together properly.

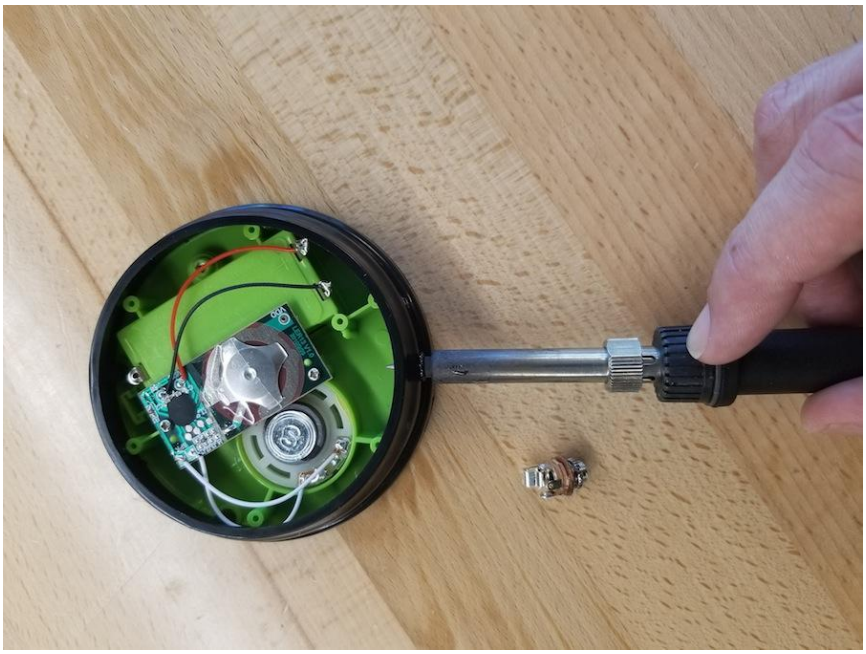


The above photo shows the side location where the jack will be installed.
Note there is a plastic ridge in the support for the screws, so the hole should be placed at least 9mm away from the edge of this ridge.



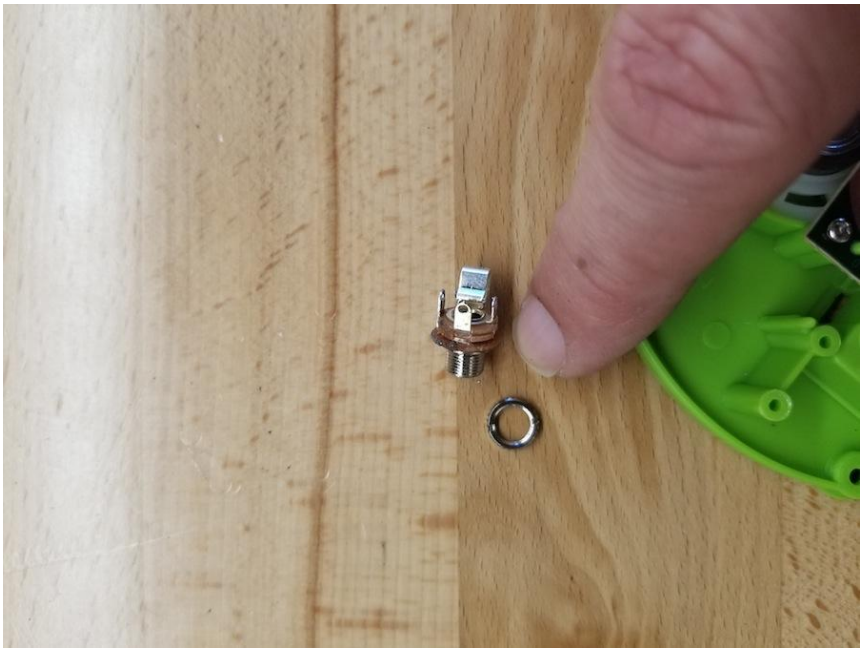
An easy way to get two ready made wires for the jack, is to just desolder the red and black battery wires. As the battery isn't being used for this application, the wires won't be needed for power.

A close up of the switch jack showing the solder lugs. We will be soldering the switch wires to the two solder tabs on either side of the largest protrusion on the jack. This protrusion is actually a switch itself, but we won't be using it for this application.



Create a 6mm diameter hole in the black plastic surround ring. The easiest way to achieve this, is using the hot tip of a soldering iron to simply melt your way through. You may also use a drill if you wish to avoid the smell of burning plastic. Vertically, the hole should be located halfway up the ring. Horizontally, the hole should be between the unused speaker and battery terminals. Make sure the ring is correctly aligned and sitting on the base before you determine placement.

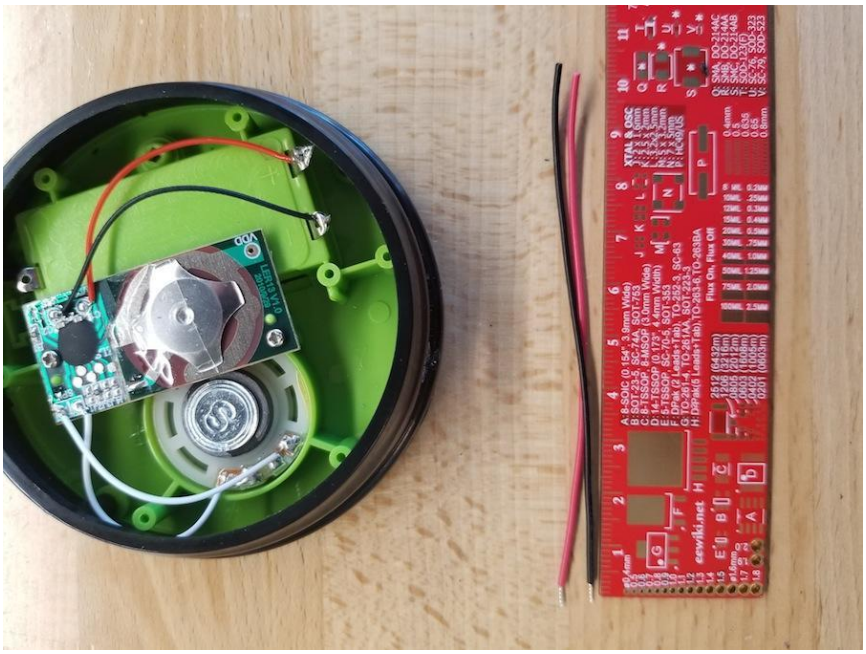
If you melted a hole through the case, slice off the ring of hardened plastic that formed when you pushed the soldering iron through. If the opening needs to be widened slightly, you can gently spin tip of the knife blade in the hole, to scrape away excess plastic.



If the jack came with a support ring already screwed on, you'll need to remove it prior to mountain the jack. Keep this ring, as you will need to thread it back on at the end of the next step.

Push the threaded side of the jack into your newly created hole. If it doesn't fit, go back two steps and continue the hole enlarging process.

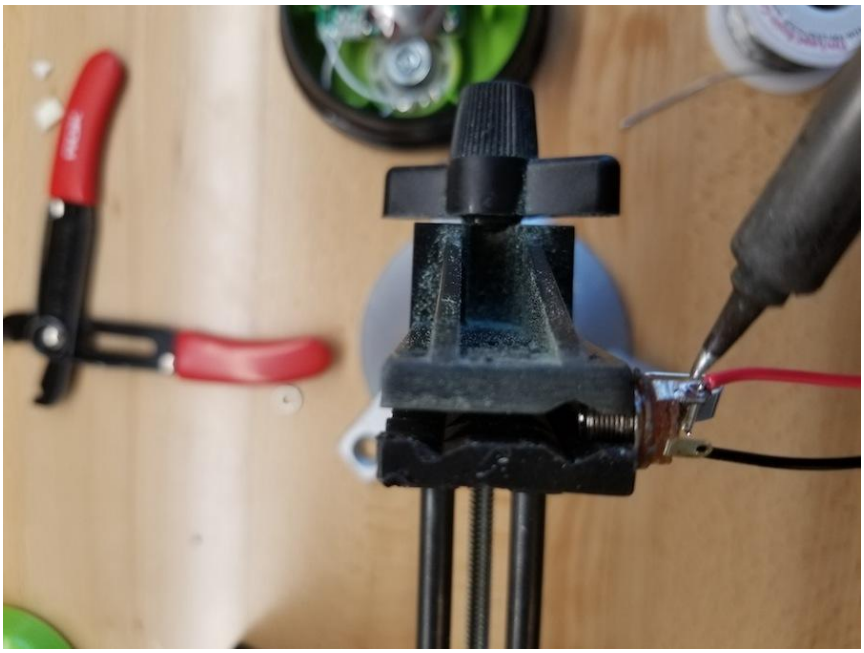
Thread on the support ring until jack is firmly in place and wiggle free.



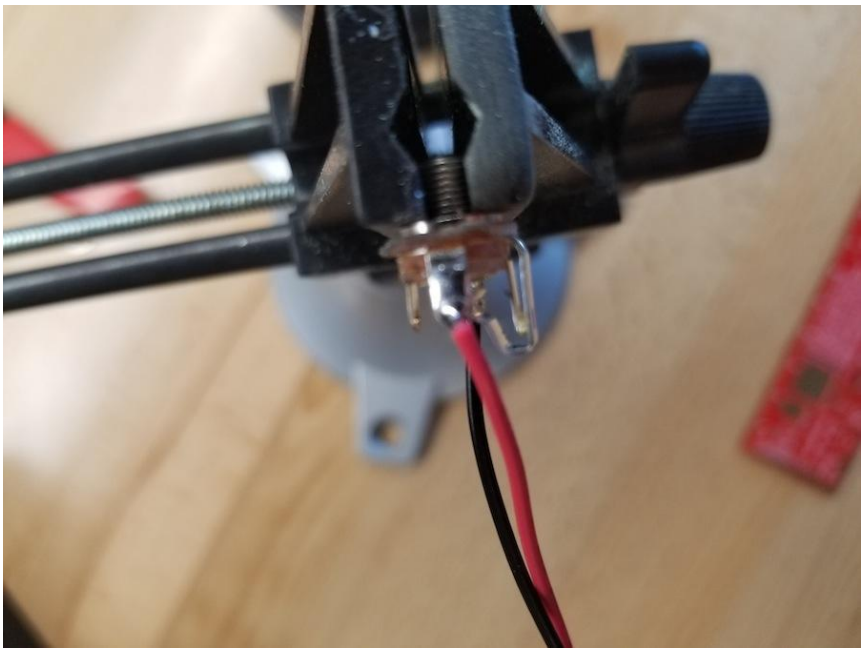
To connect the switch to your jack, you'll need to prepare a couple of wires. One trick, is simply re-use the red and black battery wires, by de-soldering their ends with a hot soldering iron.
If you choose to do this you can skip the next couple of steps.

Strip the ends of your wire using a wire cutter. Be careful not to nick the wire strands, as this weakens the wire.

Using your soldering iron, pre tin the wire ends with a small amount of solder. This keeps the wire strands from separating, and makes them easier to solder to the jack.

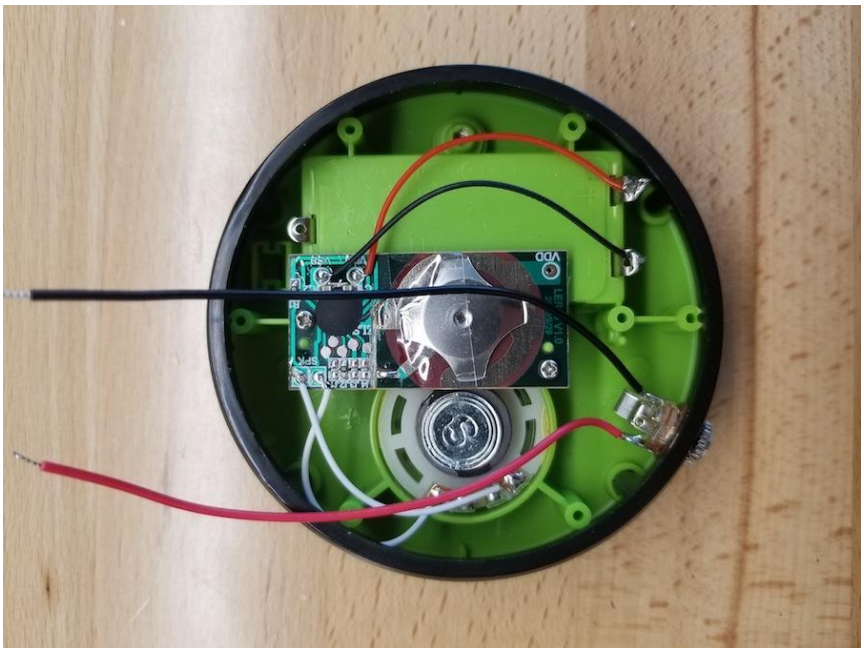


Solder the wires to the jack lugs. While the polarity isn't important, you will need to avoid soldering onto the (switched) lug that disconnects when a cable is plugged into it.
If you aren't sure, plug in a switch that you can keep pressed down (on). Then, using a multimeter set to continuity, test pairs of lugs with the meter probe tips. The meter should beep when the meter probe tips are touching the correct lugs to solder to.

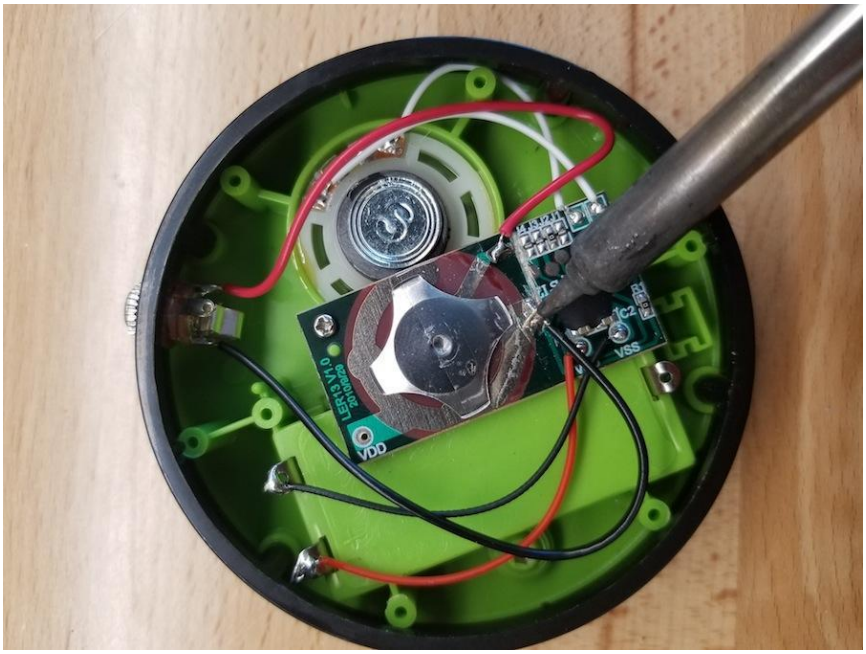


If you an expert with a soldering iron, you may be able to solder the lugs with the jack mounted in the plastic housing, but if you're like most of us, you'll find it easier to solder to the lugs if the jack is placed in a vice or pair of vice grips. Also, you won't risk melting the plastic switch housing with the soldering iron.

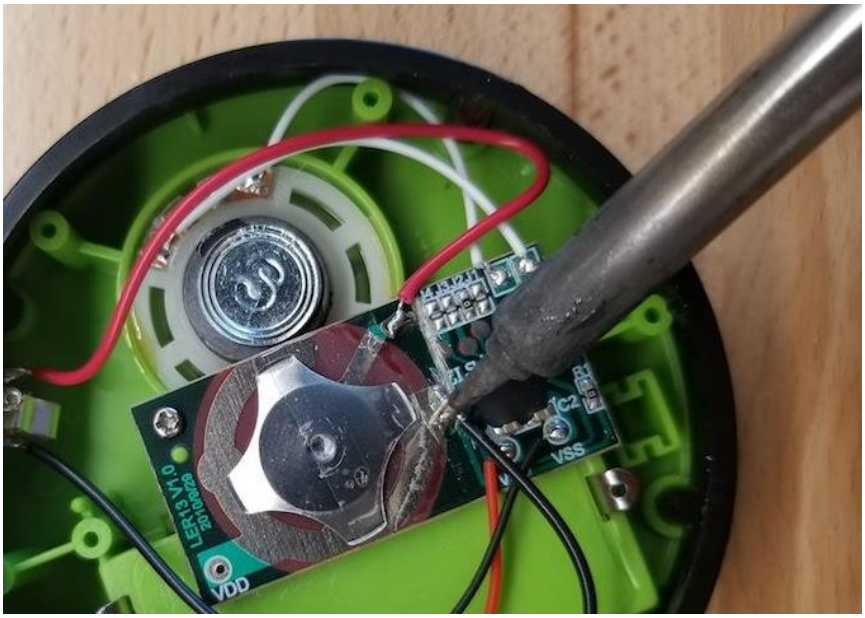
Mount the jack into the housing from the back side of the ring. Screw the knurled retaining ring onto the outside jack end, to secure it into place.



Rotate the black plastic housing ring to it's proper orientation and drop it down into place on the coloured plastic base piece.



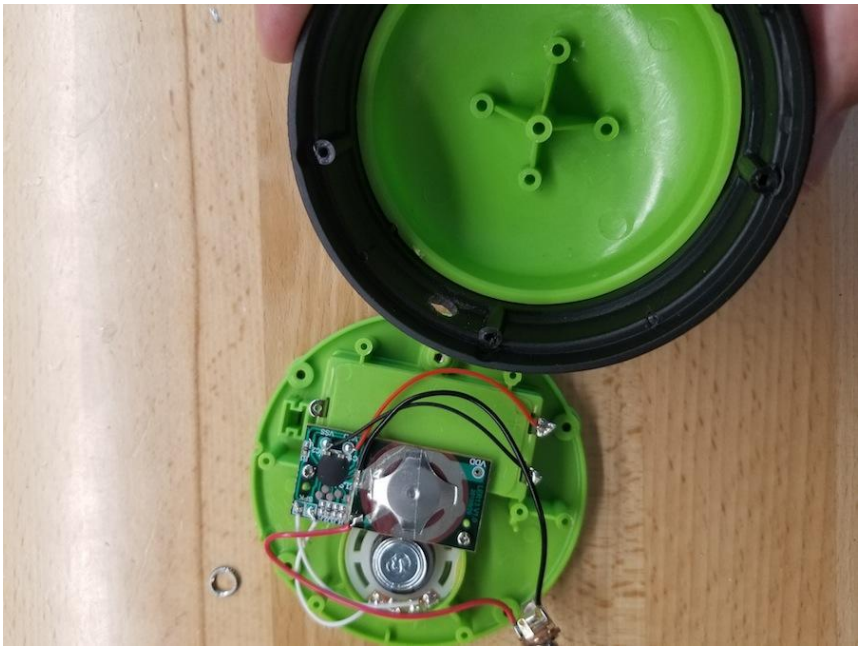
Tin each of the two scraped circuit board areas by heated them, and applying solder as you. Move the tip of the soldering iron in tiny circles to spread the solder.



Solder a jack wire to each of the the two freshly tinned circuit board areas. This completes the jack wiring connection to the switch.

Align the case ring to its proper orientation on the base, and drop it into place.

To return the button push dome, flip the the black plastic side ring upside down, and drop the dome into place. Make sure the alignment groove mates with corresponding alignment ridge. If they are misaligned, simply rotate the dome until they line up.



Flip the button dome and side ring together, gripping them both from the side, so the button dome doesn't fall out. If you find this part challenging, you can also use some Scotch tape on the outside, to hold the button dome to the ring. As you bring down the button and ring, use your other hand to push the jack through the side hole from the inside. Align the ring and button to the base.

With the button dome and side dome in place, screw the jack retainer nut into place. This will keep the jack from falling backwards into the case when a plug is inserted.

Return the screws, and tighten them lightly, until they are snug. Don't over-tighten, as is it very easy to strip plastic threads with metal screws.

Return the rubber feet to cover the screw holes, and screw. As a final step, remove all batteries (they will not be needed) and screw down the battery compartment lid.