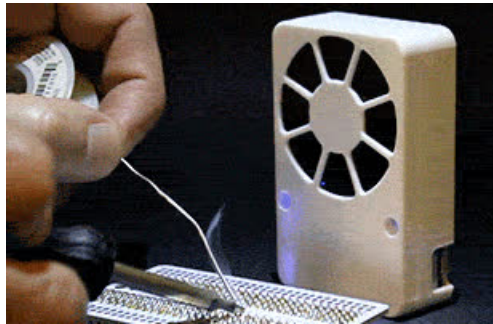




USB Rechargeable Mini Solder Fume Extractor

Created by Phillip Burgess

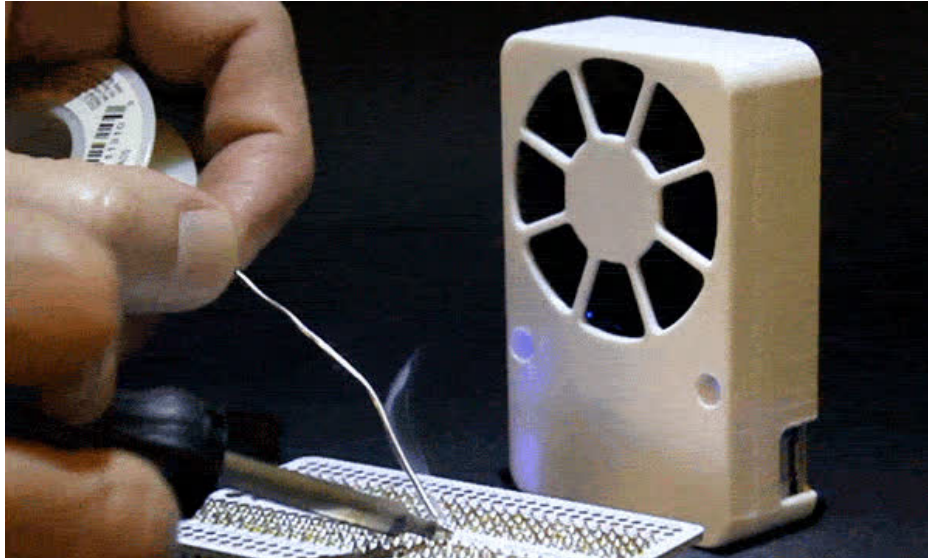


Last updated on 2018-10-31 03:32:23 PM UTC

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Overview



A portable solder fume extractor is a popular “maker” project...there are countless guides from Instructables, Make: and elsewhere. Most use two 9 Volt batteries and a voltage regulator inside an Altoids tin.

In this tutorial we'll update this classic project with **current materials and processes**: a lithium-polymer battery, **USB charging** and a perfectly-fit **3D-printed** case.

Placed close to your work, the fume extractor pulls away smoke when soldering. This makes a great companion to our [USB Rechargeable Cordless Soldering Iron \(https://adafru.it/lmC\)](https://adafru.it/lmC) project. A single microUSB charging cable keeps all your portable electronics tools topped off!

Parts from Adafruit:

- [PowerBoost 500 Charger \(http://adafru.it/1944\)](http://adafru.it/1944) lithium-polymer boost converter. This project requires the **500 Charger** specifically, *not* the 500 basic, nor the 1000 Charger. The case is specifically designed around this size.
- [500 mAh Lithium Polymer battery \(http://adafru.it/1578\)](http://adafru.it/1578). Again, the project is very specific to this one size; no substitutions.
- [Breadboard-friendly SPDT Slide Switch \(http://adafru.it/805\)](http://adafru.it/805).

Also Required

Adafruit does not stock some of these items — they must be sourced elsewhere:

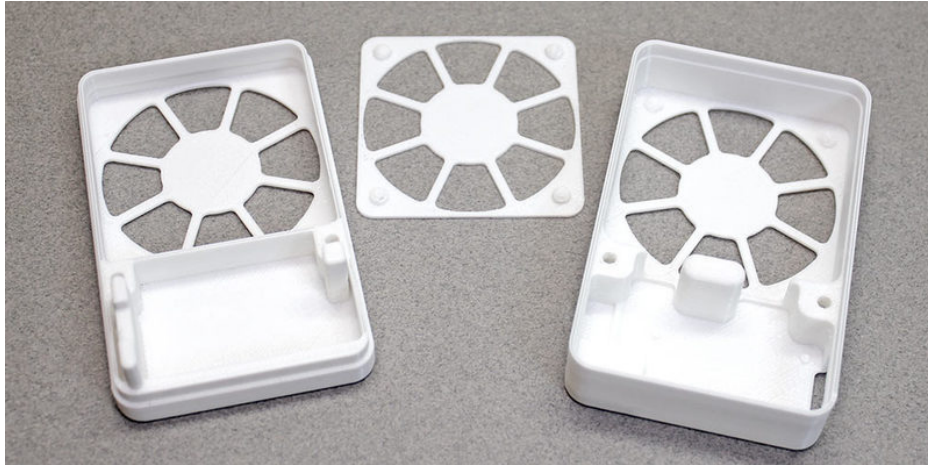
- **5 Volt DC fan, 50mm square x 10mm deep.** I used [Digi-Key part #259-1576-ND \(https://adafru.it/lmB\)](https://adafru.it/lmB) (Sunon “MagLev” #ME50100V1-000U-A99). Not the cheapest fan, but this one provides a good balance between *airflow* (CFM) and *static pressure* (the fan’s ability to move air through filters or other obstructions).
- **2 (two) #4-40 x 1/2 inch pan head machine screws** and matching **nuts** (M2.5 x 12 mm might also work).
- **Activated carbon filter:** smoke extractor refill such as **Weller WSA350F** or **MCM Electronics #21-7961**. Each sheet can be cut into 4 refills for our mini extractor.
- **Soldering iron and related paraphernalia.**
- **3D printer**, or use a service like Shapeways or 3Dhubs.com.

3D Printing

Let's start with the printing first. You can assemble the electronics (on the next page) while the printer runs the job.

<https://adafru.it/lpE>

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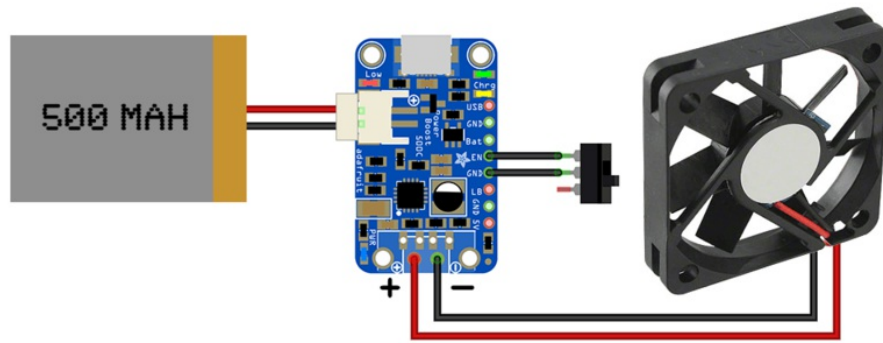


There are three parts (each in a separate .STL file): the case front and back, plus a thin separator that keeps the filter from pressing into the fan blades.

The case front and back measure 84 by 53 millimeters, while the separator is 50 mm square. For **tiny printers** like the M3D or Printrbot Play, print each piece as a **separate job**.

“Normal” quality (0.2mm layer height), 25% infill works well. Both PLA or ABS are fine, in whatever color makes you happy. With a light or transparent color, the PowerBoost status LEDs show through.

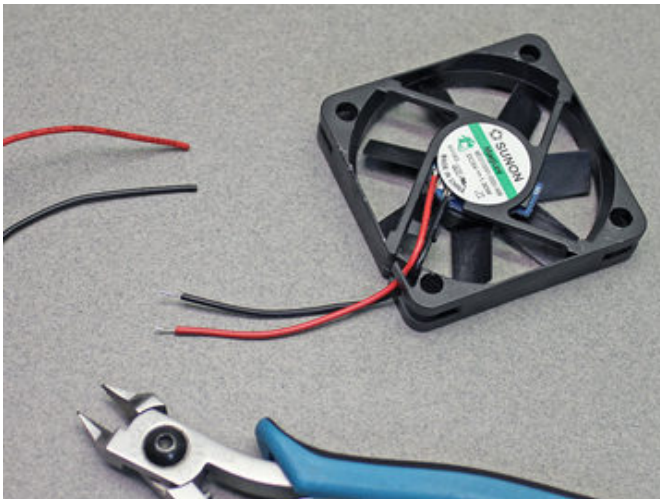
Soldering



This is a simple soldering project with just a few connections required. We know you're eager to get started, but don't rush into it...most importantly, *do not* install the USB jack on the PowerBoost! We'll be wiring to the PowerBoost *directly*.

DO NOT install the USB jack on the PowerBoost!

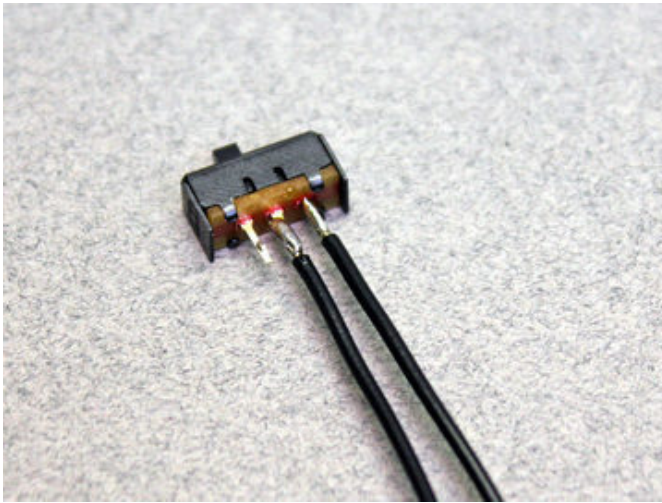
Fan



Cut the fan wires to about 2 inches (50 mm) long. Strip a little insulation and tin the ends of the wires.

Don't discard the cut wires! They're long enough that we can reuse one or both for the next step...

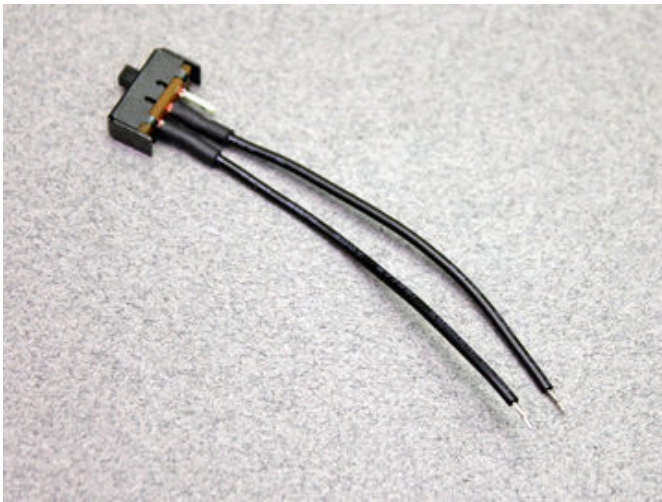
Switch



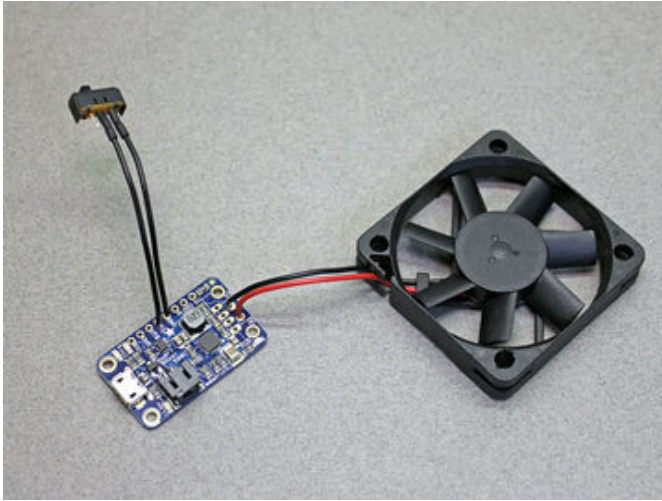
Tin the legs of the switch and strip & solder two wires: one goes to the middle pin, the other goes to either of the two outer pins; the third pin is not connected. Then trim the wires to about 2 inches long and strip & tin the ends. You can use the wire leftover from the prior step.

For later reference: the switch is “off” when moved to the two-wires side.

Optional but recommended: heat-shrink tubing reinforces these connections so they won't break off later. Use it if you got it!



PowerBoost Board



Solder the wires from the fan and switch as shown in the circuit diagram at the top of this page.

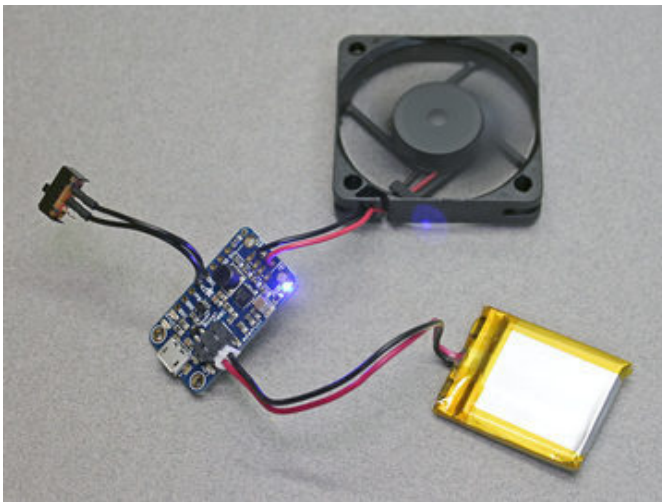
The two wires from the switch connect to the **EN** and adjacent **GND** pin on the PowerBoost board. The order does not matter; either wire can go to either pin.

The wires from the fan solder to the + and – terminals near the end of the PowerBoost board. (*Not* the mounting holes!)

After soldering, trim any protruding wires from the underside of the board. We need it sitting **as flat as possible** inside the case later. You also shouldn't have big gloppy solder joints...clean it up if you do, try to get a fairly smooth underside.

Trial Run

That's all the soldering! Let's give it a test before putting everything inside the case.



Plug in the LiPoly battery into the PowerBoost and flip the switch to the “on” position. You should get a blue LED on the PowerBoost board and the fan should start blowing.

If no blue LED or fan: check the switch position (remember, the two-wires side is “off”). Or the battery may simply need to be charged. Plug in a microUSB charging cable (to a powered USB hub or phone charger) and allow it to top off. It's

okay to test the fan and power switch while charging.



Check the sides of the fan...on one face should be an arrow indicating the airflow direction. Confirm that the fan is in fact blowing in this direction...if not, you may have the + and – wires reversed.

Do not continue until you have a working circuit.

If everything works, you're done soldering and can switch off your iron.

Assembly and Use

You should have a 3D-printed case (3 pieces) and a working circuit and battery at this point.

Fan



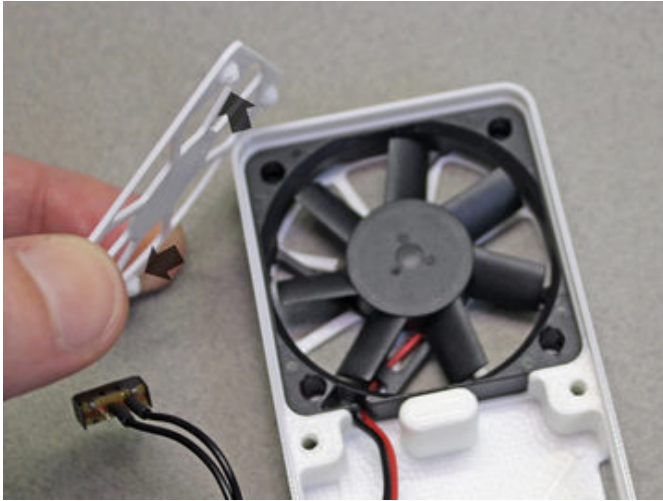
We'll start with the **back** piece of the case. This is the slightly thicker of the two case halves.

You should see four bumps that line up with the mounting holes of the fan. If there's no bumps, you have the front piece...set that aside for now, start with the back.

Line up the fan so the wires lead into the lower cavity.



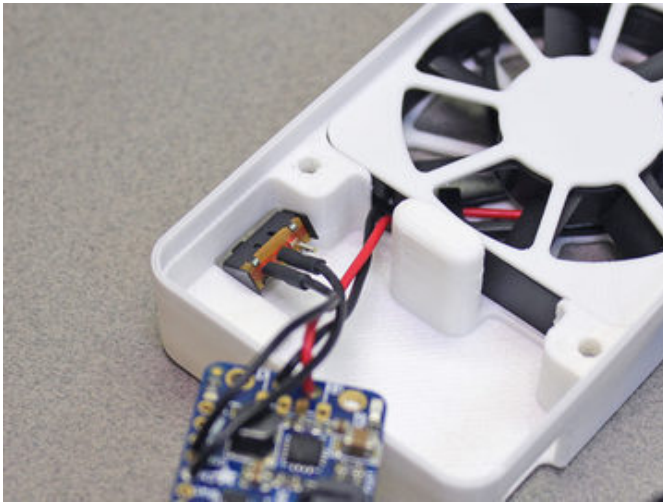
Check the fan's airflow direction arrow, make sure it's pointing front to back. We're installing in the back of the case.



The thin separator piece then installs atop the fan. This also has alignment bumps, which should face down against the fan. When everything's pressed into place, it should fit flush with the raised screw holes just below it.

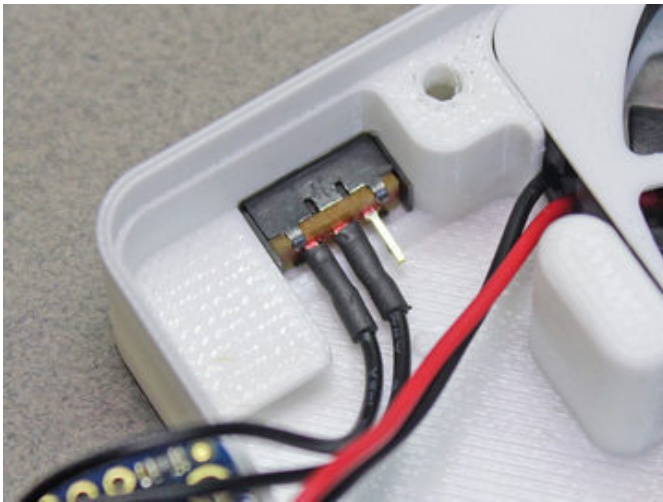


Switch

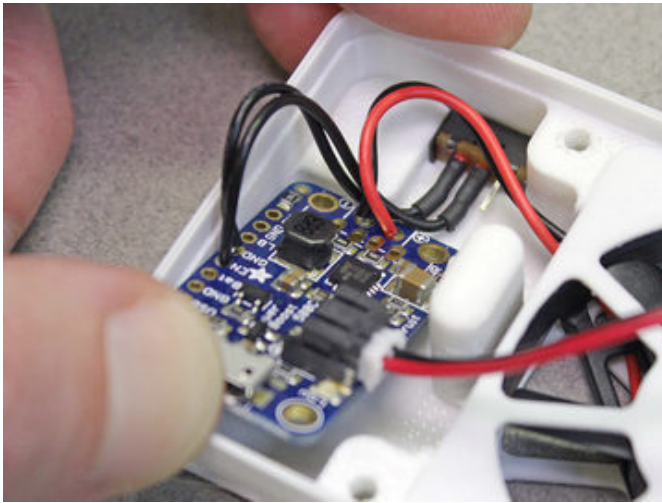


Push the switch through the small opening on the side of the case. This will be a tight fit and you may need to press with a pen barrel or other tool. Once the switch lever is through the hole, the back of switch should then pivot down and click into place.

The two-wires side of the switch is the “off” position... you can orient this either way as suits regional custom (e.g. shown here in the American “off=down” orientation).

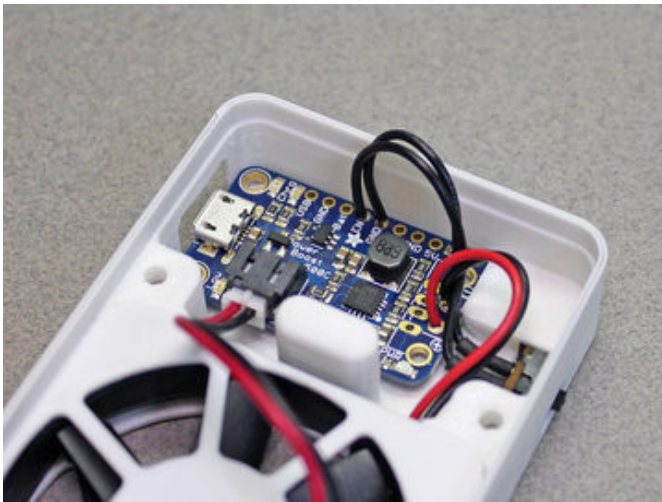


PowerBoost



A notch in the case holes the fan-wires end (not the USB end) of the PowerBoost board, which then pivots down into place.

There are some little bumps to temporarily hold the board, but no screws...the two halves of the case are carefully designed to hold each piece in position from all sides.

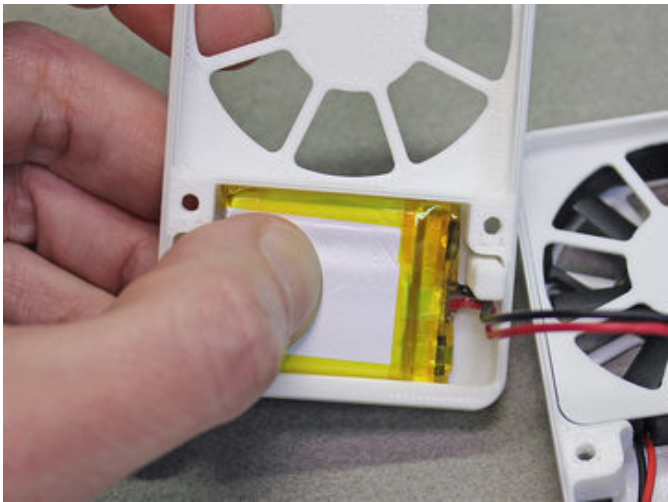


Battery

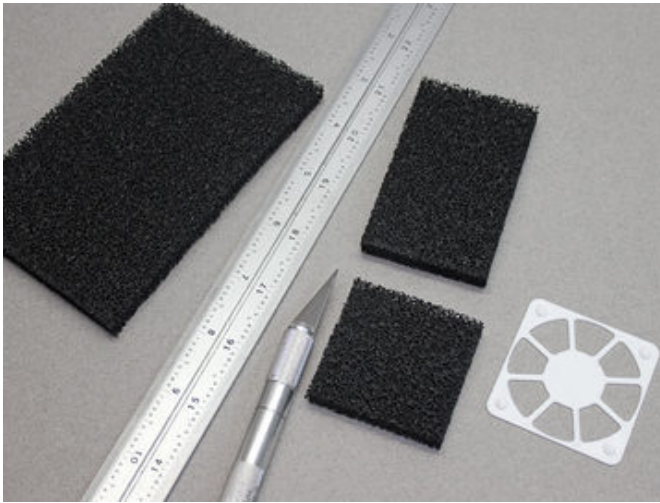


Using the **top half** of the case now...

The same notch-and-pivot motion holds the battery. It may be a little loose right now...that's okay, the other half of the case will secure it...*do not* add any tape or glue.

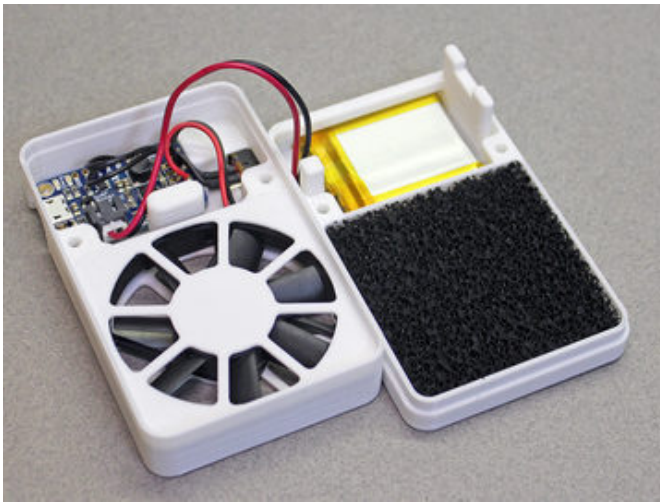


Filter

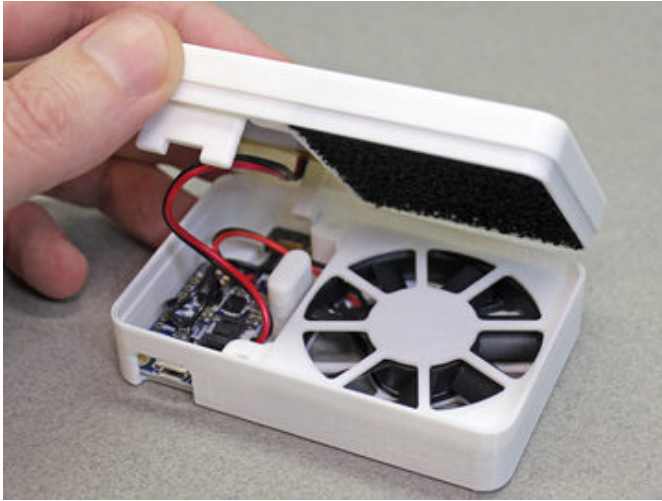


Using scissors or a straightedge and blade, cut a **50mm square** piece from the filter foam. You can borrow the separator piece for a moment as a template.

The foam then fits into the remaining void in the top case piece.



Closing the Case



The top and bottom halves press-fit together, with various protrusions on each side supporting components on the opposite side.

This requires a little patience, as the fan and battery wires will get into places you don't want them. If the case won't close all the way, there may be a pinched wire. Open it up, nudge and bend wires as needed, and try again.

If any of the protrusions break off during this step (especially the long narrow one supporting the switch), they can be glued back in place using 5-minute epoxy. Wait until its set firm before trying again.



Once the case closes correctly, drop two #4-40 nuts into the hexagonal pits on the back of the case, then catch these with two #4-40 x 1/2 inch screws inserted from the front.

Using and Charging

If printed with a translucent or light-colored filament, you can see the PowerBoost status LEDs:

A **red LED** means the battery is very low — below 3.2 Volts.

The nice thing about lithium-polymer cells is that you can top them off any time, low battery or not. Plug in a USB **microB** cable to a phone- or tablet-charging wall supply, or a powered USB hub. You'll see a **yellow LED** while charging, and a **green LED** when full. A full charge may take about an hour.

You *can* use the fan while plugged into USB, but it may charge a little more slowly.

With a full charge, the fan will run *at least an hour*, perhaps close to 90 minutes before the battery cuts out.

