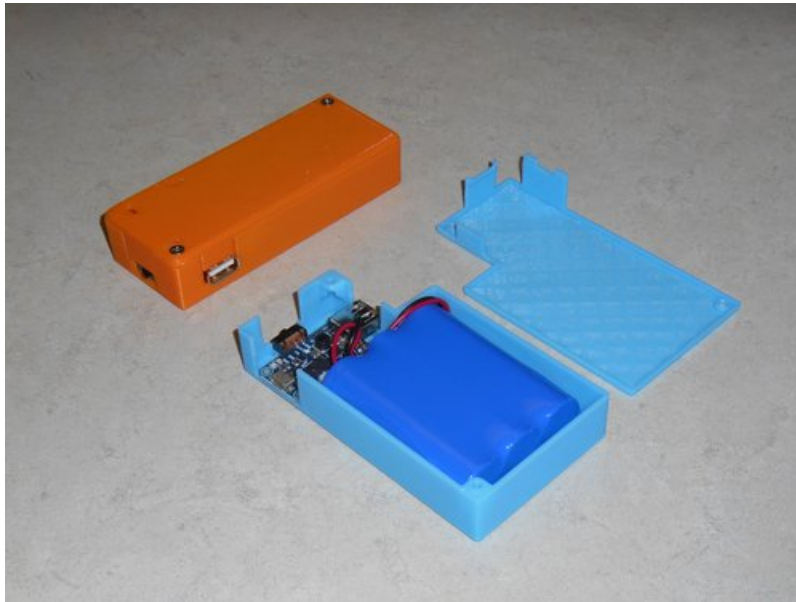


Printy Boost: Reimagining a Classic Adafruit Kit

Created by Chris Young

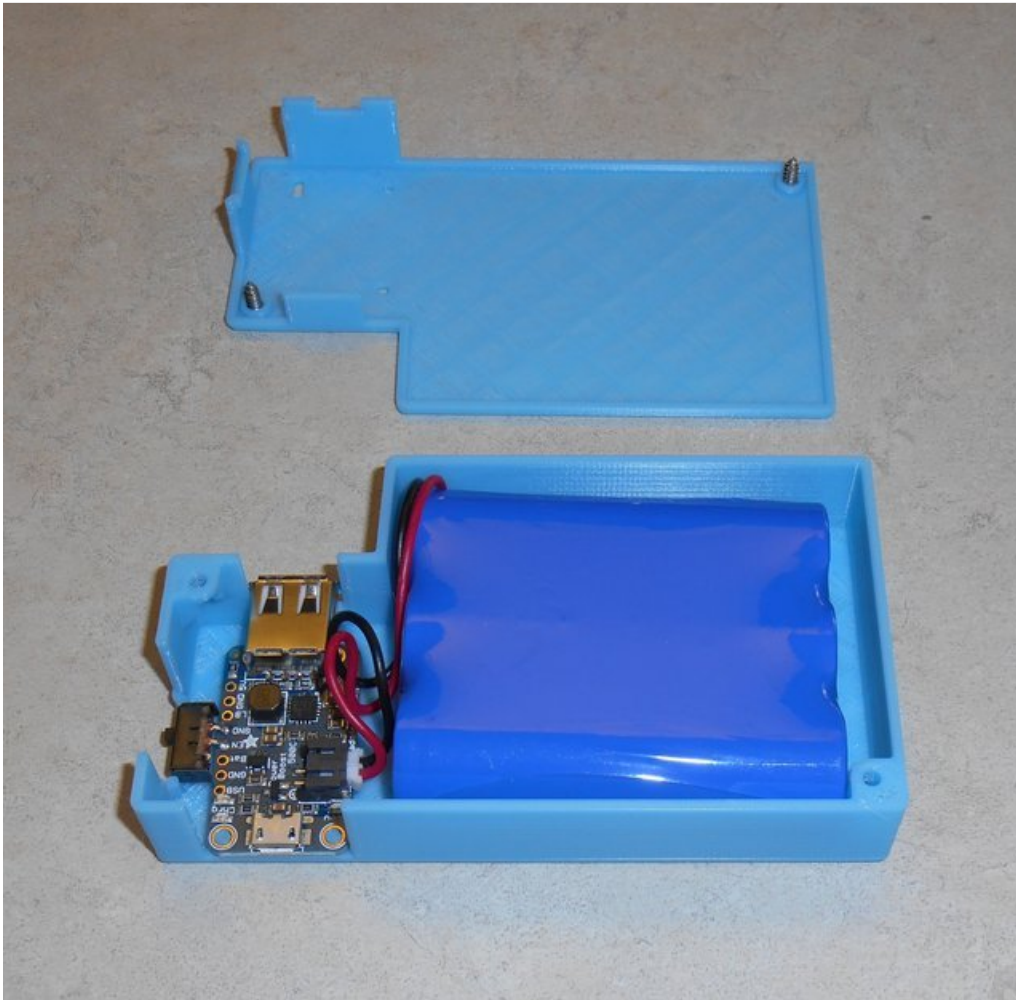


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Overview



One of the oldest, most famous, and beloved items in the Adafruit store is the legendary [Minty Boost Kit](https://adafruit.it/jja) (<https://adafruit.it/jja>). It consists of a battery holder for AA batteries, a charging circuit, USB connector and it all fits neatly into an Altoids tin box. That box is the reason for the “Minty” in the name. You use it to recharge your cell phone or other mobile device when you don’t have a charger handy.

While it is still a great project for beginners and is often recommended for someone who wants to learn some soldering skills or get started with a fun and useful project, it’s technology is a little bit dated.

I recently added a Power Boost 500C in a Lipo battery to one of my existing electronics projects which already had a very nice enclosure. However the enclosure did not have room for the power boost or the battery. It’s so happens I have a new 3-D printer so I was anxious to make a new enclosure for my entire project and make room for the battery. It got me to thinking that I could have just kept the original enclosure and made a specialized box just for the Power Boost 500C and a battery.

Then it struck me... I was reinventing the Minty Boost with more modern components. Many makers have a warm spot in their heart for Altoids boxes. We’ve had to engineer our projects just so they would fit in the box. However the more modern way is to 3-D print enclosure precisely the size that you need them. A reimagined product needs a new name. Rather than the Minty Boost I came up with the name Printy Boost. Once I had the name, the whole project was irresistible and took on a life of its own.

In addition to the Power Boost 500C, Adafruit also sells the Power Boost 1000C which is a slightly different size and configuration. Either of those chargers are capable of charging a variety of Lithium-Ion and Lithium Polymer batteries. The Adafruit store has 3 different sizes of each. With 2 different boards and 6 different batteries this could make for 12 different versions of the enclosure however 2 of the 3 lithium-ion batteries can use the same enclosure as can two of the 3 lithium polymer batteries. So that takes us down to just 8 varieties. The orange boxes on the left for the 1000C and the blue ones on the right are for the 500C.



We are including STL files for both the box and lid of all 8 varieties. We are also including source files from Blender 3D that were used to create the STL files so that you can customize them further if you would like. We will show you how to do that customization at the end of the tutorial.

Assembly

Preparing the Board

You have a choice of either the PowerBoost 500C or 1000C but be sure that you have the "C" versions which include a charger. Adafruit also sells PowerBoost devices that do not include the charger. Both of the PowerBoost boards have the ability to attach a toggle switch between the enable pin in the ground pin. Use the Breadboard Friendly SPDT Slide Switch shown on the right sidebar of this page. Cut off one of the outside pins. Bend the pins at 90° and solder them to the enable and ground pins and shown in this image. Try to position the switch flush with the edge of the board and at the same height of the board. Take special care that you are connecting to the proper holes. Using the wrong holes can cause a dangerous short. Also make sure that the switch is oriented as shown in the image. Otherwise the switch will not line up correctly with the opening in the enclosure.

The unit on the left is the 1000 version. The unit on the right is the 500 version.



Solder on the female USB B connector which comes with the Power Boost boards. Trim the pins of the connector and the switch as closely as possible to the underneath side of the board.

Choose Your Battery

The following six batteries are compatible with either of the Power Boost boards.

<input type="text"/>	2500 mAh Lithium Polymer Battery	6600 mAh Lithium Ion Battery	<input type="text"/>
<input type="text"/>	2000 mAh Lithium Polymer Battery	4400 mAh Lithium Ion Battery	<input type="text"/>
<input type="text"/>	1200 mAh Lithium Polymer Battery	2200 mAh Lithium Ion Battery	<input type="text"/>

The 1200 mAh battery uses the same box as the 2000 mAh Li-Po batteries use the same size box. Similarly the 2200 mAh fits easily in the 4400 mAh Li-Ion with room to spare. It didn't seem worth the effort to make a specialized box for the single cell variety.

Note that there are other smaller rechargeable batteries available in the Adafruit store which are not compatible with these boards. They cannot handle that amount of charging current and should only be used with chargers recommended on their product pages.

Download and Print

You can download the entire collection of files from Thingiverse or from GitHub in the links below. The files are organized in folders according to charger board and battery size. Each of the 8 varieties has an STL file for the box and a separate one for the lid. The original blender models are available as well in the distribution but you will not need them unless you intend to customize them.

Note: the files were updated 12/18/2015 to correct some scaling errors in the STL files. Some slicers can handle the originals but some had trouble loading files because they were 1000x too small.

<https://adafru.it/ijb>

<https://adafru.it/ijb>

<https://adafru.it/ijc>

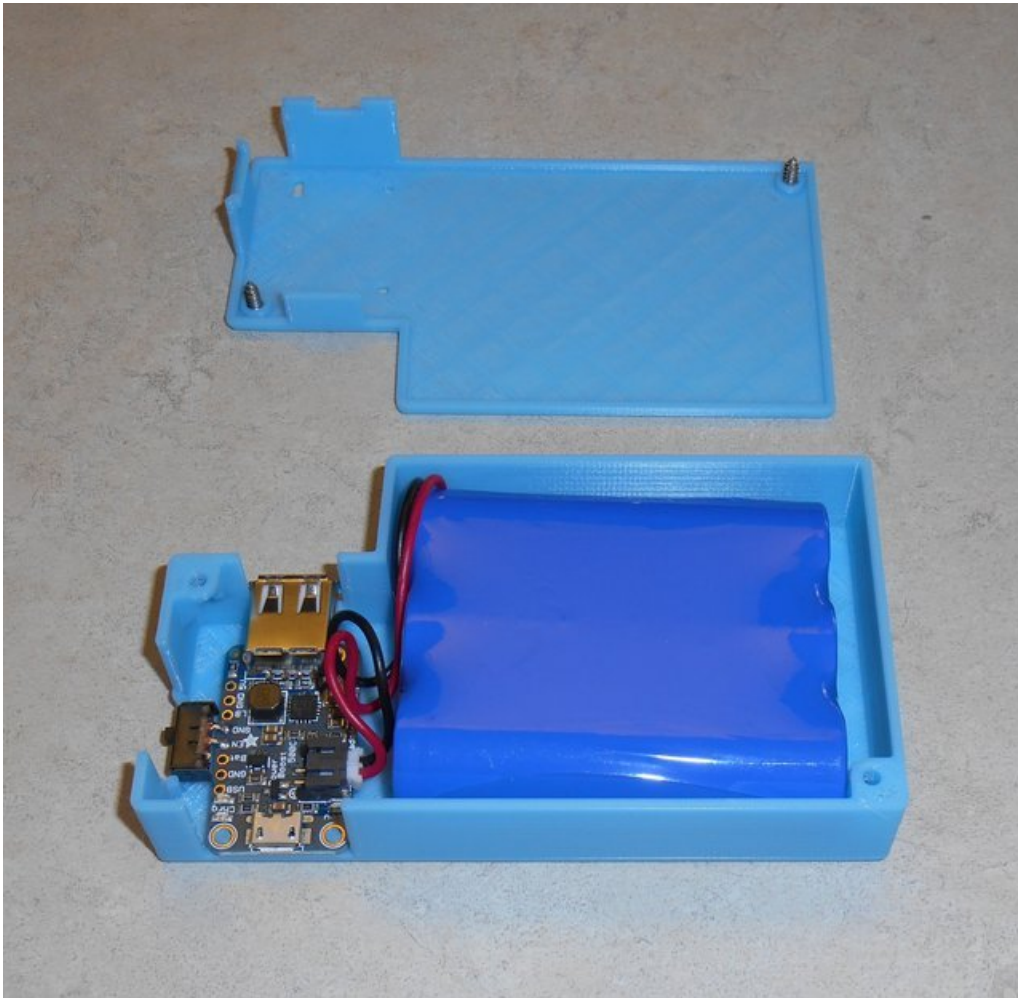
<https://adafru.it/ijc>

We printed all of our prototypes on a [Printrobot Metal Plus](http://adafru.it/2302) using PLA. We used Cura 15.04 to slice and print the objects. The largest of the boxes is 110 mm long (less than 4.5 inches) so it will fit on much smaller printers. We did not attempt ABS versions of the project but we have heard that ABS is more difficult to print something an exact size so you may have to tinker with it to get everything to fit.

The largest 6600mAh version took 2 hours 45 minutes and the smallest 2000mAh version took 1 hour 40 minutes and we were printing at a relatively slow speed on the Printrobot. Many printers will take less time.

The tiny holes in the lid that allow the power and charging LEDs to shine through can be a little bit troublesome printing on the first layer. If the outline of these holes will not stay in place, you can try changing your slicer settings to print the infill first and the shell afterwards.

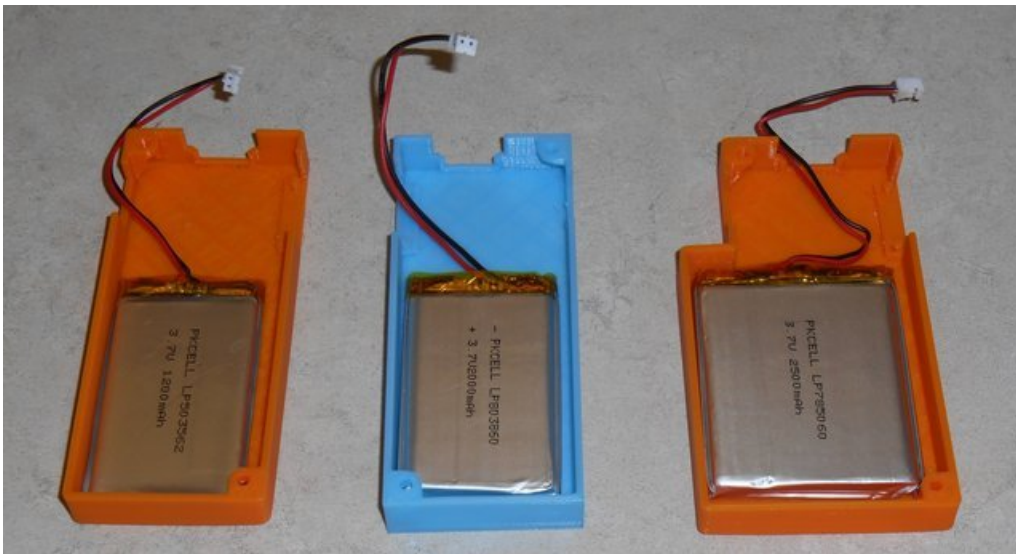
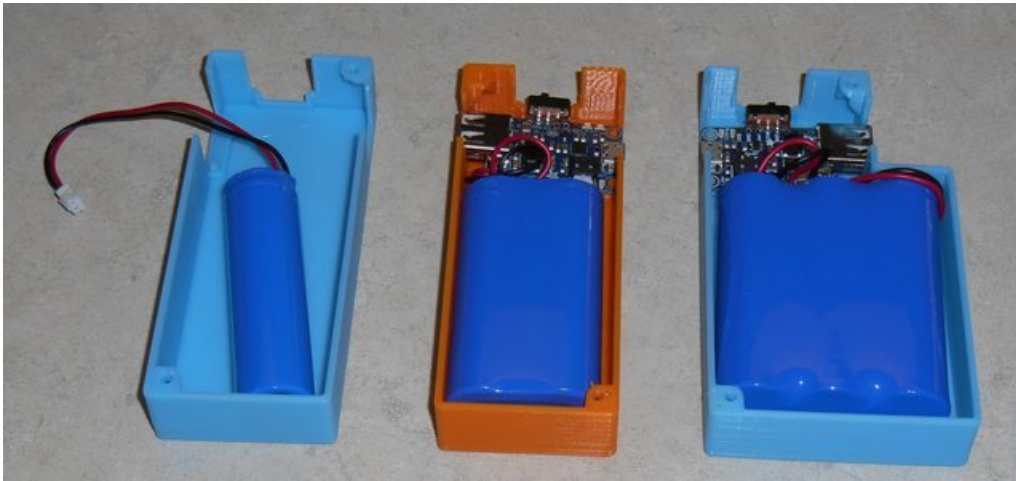
In the final page of this learning guide you will find some brief instructions on how to customize these boards from the original Blender files and how to export them as STL files.



Final Assembly

Attach the battery to the charger board using the JST connector. The board should snap into its location with the two tiny pins snapping into the mounting holes either side of the USB micro connector. The switch should fit neatly into its recess. The USB A connector should cradle into its slot as well.

The photos below show each of the six batteries in their respective size boxes. The only boxes are for the 1000C and the blue boxes are for the 500C. Note however that either board can use any of the six batteries. For the single cell 2200mAh Li-Ion and all three of the Li-Po batteries you may want to fasten them down with some tape.



Attach the lid using 2 flathead #4 screws about 5/8 inches long. We have used #4-40 machine screws (blunt tip in the image below) or #4-24 sheet metal screws (pointing tip below). We prefer the sheet metal screws because they are designed with threads that will cut into sheet-metal, wood, or plastic. The #4-40 machine screws were designed to be used with a properly sized nut. Their threads on the finer, shallower, and rounded so they are more difficult to use cutting into plastic unless you have a thread cutting tool. Machine screws might be easier to find and they do work but not as well.



Here is the completed device.



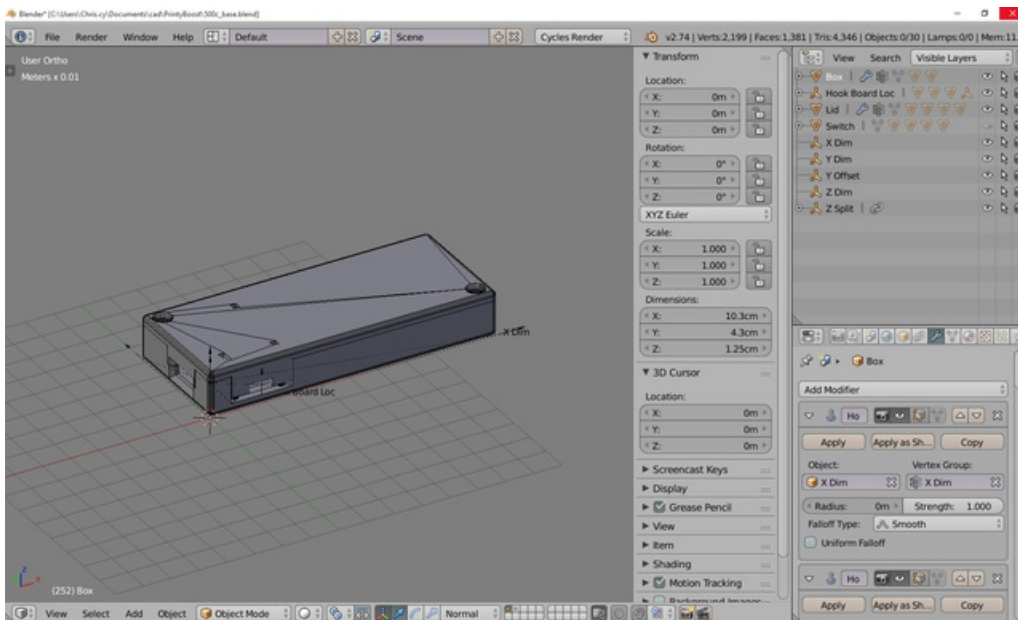
Plug a micro USB cable into the micro USB jack and connect it to a charger capable of delivering at least 500 mA or 1000 mA depending on which board you used. See the tutorials on the PowerBoost boards for more details. Plug your cell phone, mobile device, or electronics project into the USB A connector. When you turn the switch on, the blue power LED should light up.

Customization

As mentioned previously, the LED holes in the lids can be difficult to print and really are not that useful. The power LED is so bright it will shine through most PLA. Depending on your printer, plastic, and screws the tolerances may be different for you. For a variety of reasons you might want to go back to the original Blender files to customize the project.

We are currently working on a complete tutorial to be titled “Building Better Boxes with Blender” which will be a general tutorial on Blender 3-D aimed at someone with no CAD experience who wants to use it to create objects for 3-D printing. The notes we’re providing here will assume that you have a minimal knowledge of Blender and can make your modifications as needed.

There is a separate model for the Power Boost 500C versus the Power Boost 1000C. Both the box and the lid are included in the same file. When you load the file, your screen will look something like this...

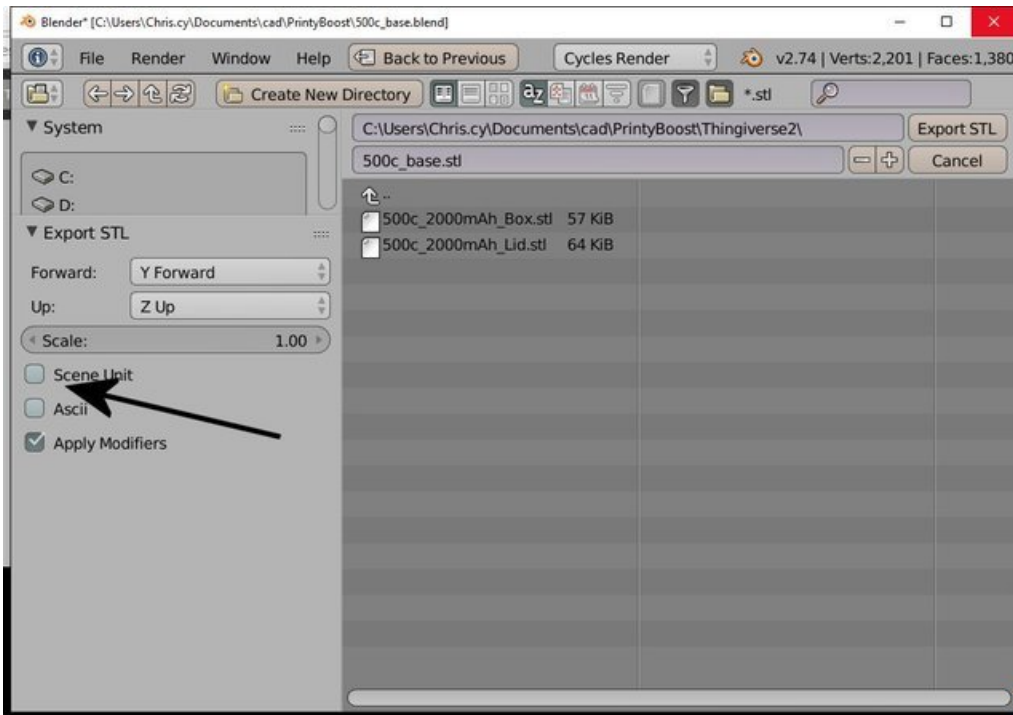


In the upper right corner is a window called the outliner. You can click on “Box” or “Lid” to select them. There are also “hook objects” which control the dimensions of the box. The dimensions are the same for the 500C versus 1000C except that the “X Dim” values should be negative for the 1000C version. Here is a table of the values for the various battery sizes.

Battery	X Dim	Y Offset	Z Dim
1200 or 2000mAh	103	43	15.5
2500mAh	103	55	15.5
2200 or 4400mAh	110	43	23
6600mAh	110	62	23

Below is a brief YouTube video that shows you how to modify these values and how to export the blender model as an STL file. In the second half of the video it shows you how to disable the modifiers to the lid that add the holes for the LEDs to shine through.

The video does not show this however be sure to uncheck the "Scene Unit" box when exporting STL from Blender. Otherwise there will be scaling errors when used with some slicing software. See the image below.



We are working on a complete tutorial on how this project was created step-by-step. Check back soon for future installments of "Building Better Boxes with Blender".