



# Fix-It Felix Jr. Hammer with Sound FX

Created by Ruiz Brothers



<https://learn.adafruit.com/fix-it-felix-jr-hammer>

Last updated on 2022-12-01 02:49:26 PM EST

# Table of Contents

<b>Overview</b>	<b>5</b>
<ul style="list-style-type: none"><li>• <a href="#">3D Printed Cosplay Props With Audio FX</a></li><li>• <a href="#">The Golden Hammer</a></li><li>• <a href="#">Prerequisite Guides</a></li><li>• <a href="#">Parts</a></li><li>• <a href="#">Tools</a></li><li>• <a href="#">Fix-It Felix Jr. Costume</a></li></ul>	
<b>Circuit Diagram</b>	<b>8</b>
<ul style="list-style-type: none"><li>• <a href="#">Wired Connections</a></li><li>• <a href="#">Battery Power</a></li></ul>	
<b>Upload Audio</b>	<b>9</b>
<ul style="list-style-type: none"><li>• <a href="#">Source Your Samples</a></li><li>• <a href="#">File Formats</a></li><li>• <a href="#">Copy Audio Files to Audio FX Board</a></li><li>• <a href="#">Full Details on Copying Audio</a></li></ul>	
<b>3D Printing</b>	<b>10</b>
<ul style="list-style-type: none"><li>• <a href="#">3D Printed Parts</a></li><li>• <a href="#">Material</a></li><li>• <a href="#">Supports &amp; Orientation</a></li><li>• <a href="#">Post-Processing &amp; Finishing</a></li></ul>	
<b>Wiring</b>	<b>12</b>
<ul style="list-style-type: none"><li>• <a href="#">Parts</a></li><li>• <a href="#">Power Wires for Audio FX Board</a></li><li>• <a href="#">Connect Wires to Audio FX</a></li><li>• <a href="#">Connect Audio FX to Power</a></li><li>• <a href="#">Test Power Circuit</a></li><li>• <a href="#">Amplifier Wires</a></li><li>• <a href="#">Amplifier Wiring</a></li><li>• <a href="#">Connect Amplifier to Audio FX</a></li><li>• <a href="#">Circuit Checkpoint</a></li><li>• <a href="#">Pushbutton Wires</a></li><li>• <a href="#">Wire Pushbutton + LED</a></li><li>• <a href="#">Add Resistor to LED</a></li><li>• <a href="#">Speaker Wires</a></li><li>• <a href="#">Wire Button LED to Power</a></li></ul>	
<b>Assembly</b>	<b>22</b>
<ul style="list-style-type: none"><li>• <a href="#">Install Speaker into Head</a></li><li>• <a href="#">Install Head into Neck</a></li><li>• <a href="#">Install Neck into Base</a></li><li>• <a href="#">Install Base into Rod</a></li><li>• <a href="#">Install Rod into Handle</a></li><li>• <a href="#">Install Button to Handle</a></li><li>• <a href="#">Connect Speaker to Amplifier</a></li><li>• <a href="#">Connect LED from Button to Power</a></li><li>• <a href="#">Connect Pushbutton to Audio FX</a></li><li>• <a href="#">Test Final Circuit</a></li><li>• <a href="#">Turning it On/Off</a></li></ul>	

- [Recharge Battery](#)



---

# Overview



## 3D Printed Cosplay Props With Audio FX

In this tutorial, we'll use an Adafruit Audio FX Mini sound board, amplifier and speaker to add sound effects to a prop for cosplay! The lessons and steps used in this guide can be used applied to any prop. In this project, we designed and 3D printed Fix-It-Felix' Golden Hammer from the Disney movie, Wreck-It-Ralph.

The Adafruit Audio FX sound board is very easy to use – There's no programmer required! Simply plug in microUSB from the board to your computer and it shows up like a USB flash drive. Drag & Drop WAV or OGG sound files!



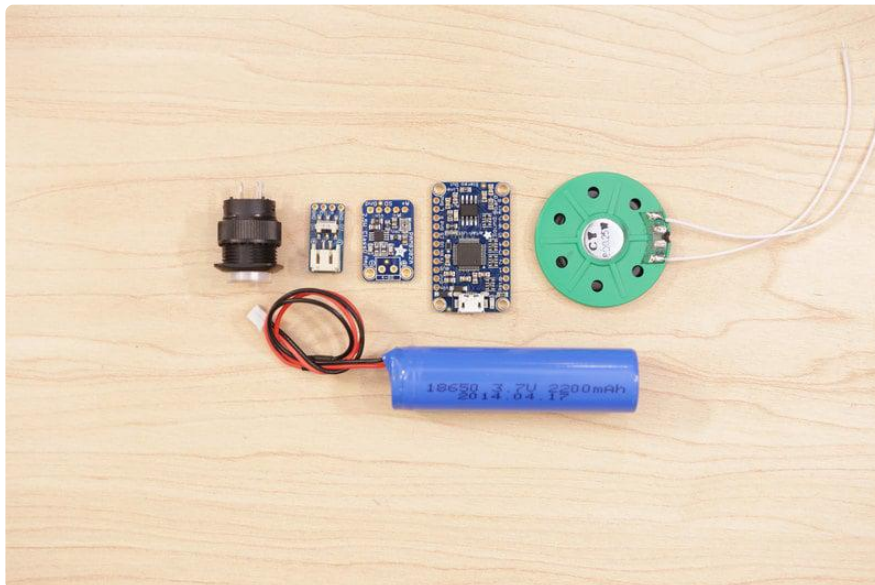
# The Golden Hammer

We designed the hammer optimized for 3D printing and electronics. A pushbutton is mounted to the handle and triggers an array of sound effects, each time it's pressed. The speaker is mounted to the head of the hammer, while the battery and breakout boards are fitted inside the handle. There's six total pieces that snap together. Each part is hollow and requires no support material. 3D print the parts yourself or send the files to a service like 3DHubs to have them 3D printed and shipped to you.

## Prerequisite Guides

We suggest walking through the following guides in order to get a better understanding of the components. If you're new to soldering and electronics, be sure to check out the soldering tutorial.

- [Adafruit Audio FX Mini Sound Board \(\)](#)
- [Collin's Lab: Soldering \(\)](#)



## Parts

You'll need the following parts in order to build this project.

- Adafruit Audio FX Sound Board - [16MB \(http://adafru.it/2341\)](http://adafru.it/2341) or [2MB \(http://adafru.it/2342\)](http://adafru.it/2342)
- Adafruit Mono Amp - [PAM8302 \(http://adafru.it/2130\)](http://adafru.it/2130)

- 80hm 1/4W [Plastic Speaker](http://adafru.it/1891) (<http://adafru.it/1891>)
- [JST Switch Breakout](http://adafru.it/1863) (<http://adafru.it/1863>)
- [16mm Momentary Pushbutton](http://adafru.it/1445) (<http://adafru.it/1445>) or [Pushbutton LED](http://adafru.it/1479) (<http://adafru.it/1479>) & Resistor
- [2200mAh Cylindrical Battery](http://adafru.it/1781) (<http://adafru.it/1781>)
- [Adafruit Micro Lipo Charger](http://adafru.it/1904) (<http://adafru.it/1904>)

## Tools

The following tools and supplies will be needed to complete the build.

- [3D Printer](#) () and [Filament](#) ()
- [Soldering Iron](#) () and [Solder](#) ()
- [Wire](http://adafru.it/2001) (<http://adafru.it/2001>) and [Wire Strippers](http://adafru.it/527) (<http://adafru.it/527>)
- [Helping Third Hand](http://adafru.it/291) (<http://adafru.it/291>) / [Panavise Jr.](http://adafru.it/151) (<http://adafru.it/151>)
- [micro USB cable](http://adafru.it/592) (<http://adafru.it/592>)



## Fix-It Felix Jr. Costume

I actually got this idea from [Kirby G](#) (). He put together an [instructables](#) () tutorial with a list of things he got off amazon, such as the hat, t-shirt, gloves and tool belt. The gloves and tool belt are different but there's so many to choose from that the variety is fine. The patches for the hat and t-shirt are 3D printed in ninjaflex filament. Here's a list of the things I got from amazon:

- [Lids Blue Hat – Adjustable](#) ()

- [Dickies Blue Short Sleeve T-Shirt \(\)](#)
  - [Yellow Leather Gloves \(\)](#)
  - [Leathercraft Tool Belt \(\)](#)
  - [Sketchers Khaki Shoes \(\)](#)
- 

## Circuit Diagram

3d\_printing\_circuit-diagram.png

## Wired Connections

The circuit diagram above shows how the components will be wired together. This won't be 100% exact in the actual circuit but it's a very close approximation.

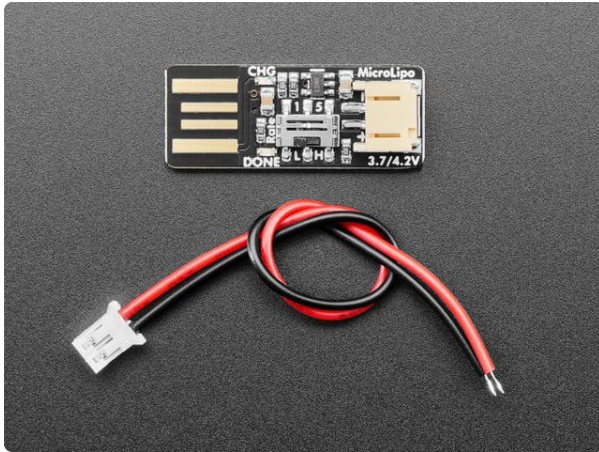
- SW from JST Breakout to Positive on Adafruit Audio FX
- GND from JST Breakout to GND on Adafruit Audio FX
- Pin 0 from Adafruit Audio FX to Pushbutton
- G from Adafruit Audio FX to Pushbutton
- VIN from Adafruit Audio FX to VIN on Audio Amplifier
- GND from Adafruit Audio FX to GND on Audio Amplifier
- L from Adafruit Audio FX to A+ on Audio Amplifier
- GND from Adafruit Audio FX to A- on Audio Amplifier
- GND from Speaker to GND on Audio Out of Audio Amplifier
- Positive from Speaker to Positive on Audio Out of Audio Amplifier

## Battery Power

The circuit will be powered by a 3.7V 2200mAh Lithium ion cylindrical battery via JST connection. The battery plugs directly into the Switched JST-PH 2-pin breakout board.

We didn't include a battery charger on-board, so to recharge the battery, disconnect it and use a Micro Lipo charger with your computer or USB wall charger

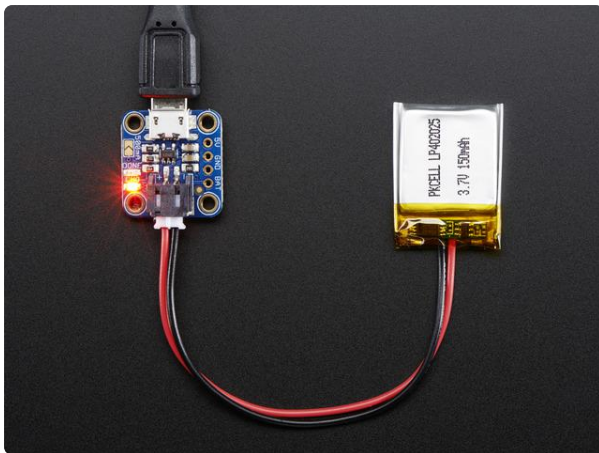




### Adafruit Micro Lipo - USB Lilon/LiPoly charger

Oh so adorable, this is the tiniest little lipo charger, so handy you can keep it any project box! Its also easy to use. Simply plug in the gold plated contacts into any USB port and a...

<https://www.adafruit.com/product/1304>



### Adafruit Micro-Lipo Charger for LiPo/Lilon Batt w/MicroUSB Jack

Oh so handy, this little lipo charger is so small and easy to use you can keep it on your desk or mount it easily into any project! Simply plug it via any MicroUSB cable into a USB...

<https://www.adafruit.com/product/1904>

---

## Upload Audio

### Source Your Samples

I suggest searching the internet for sounds. Depending on your project, you'll have to figure out where to find them, or make them yourself.

Sorry, I can't offer the samples I used for my golden hammer here due to copyright issues. Don't want to get ourselves in trouble now do we!

### File Formats

The Adafruit Audio FX mini sound board will support audio files in WAV or OGG format. I highly suggest using the OGG format because it will make the file size of your samples very small – This is especially necessary if you're using the Audio FX board with 2MB of flash.

## Copy Audio Files to Audio FX Board

Easiest part of this project! Connect a microUSB cable from the Audio FX board to a USB port on your computer. The Audio FX board shows up exactly like a USB flash drive. Before you drag and drop your audio samples to the drive, you'll have to name them with a special title. The Audio FX board reads the file name and figures out what type of trigger method to use. For this project, since I'm using just one button to trigger several samples. I named them the following:

- T00NEXT0.ogg
- T00NEXT1.ogg
- T00NEXT3.ogg
- T00NEXT4.ogg

## Full Details on Copying Audio

Please walk through and read the guide on copying audio to the Adafruit Audio FX board. If your project uses several buttons or special trigger methods, you can find out all the details and capabilities of the Adafruit Audio FX board there. Just click on the button below to pull it up!

[Copy Audio to FX Board](#)

## 3D Printing



## 3D Printed Parts

Download and 3D print the parts on your 3D printer. If you don't have access to a 3D printer, you can send the STLs files to a service like [3DHubs.com](https://3dhubs.com) ()

## Material

I used a golden colored PLA from [MeltInk3D](https://meltink3d.com) (). This could be printed in any color, but printing it in gold avoided having to spray paint it. If you're new to 3D printing, I suggest using PLA because it's the easiest material to print with. It doesn't require a heated bed and prints on most FDM 3D printers.

## Supports & Orientation

I designed the parts to print without needing any support material. They are already oriented in the correct orientation to 3D print, so you can print them as is. They should be positioned in the center of the bed.

You can decide whether you need a raft, glue stick, blue paint, etc. I printed my parts on a glass heated bed.

ffh-head.stl	The speaker hits in here. The part connects to the neck.	
ffh-neck.stl	This part connects to the base.	
ffh-base.stl	This part connects to the rod.	
ffh-cap.stl	This is a cover that snaps onto the bottom of the handle.	
ffh-rod.stl	One end has a coil that twists onto the bottom of the base. The other end snaps onto the top of the handle.	

ffh-handle.stl

The pushbutton, battery and electronics all fit inside the handle.

[Download STLs from Pinshape](#)

[Download STLs from Youmagine](#)

[Download STLs from Thingiverse](#)

[Download Fusion 360 Source](#)

## Post-Processing & Finishing

I didn't do any finishing techniques on this project, but you totally can! The parts don't have much detail, so they should be relatively easy to sand, spray paint and smooth.

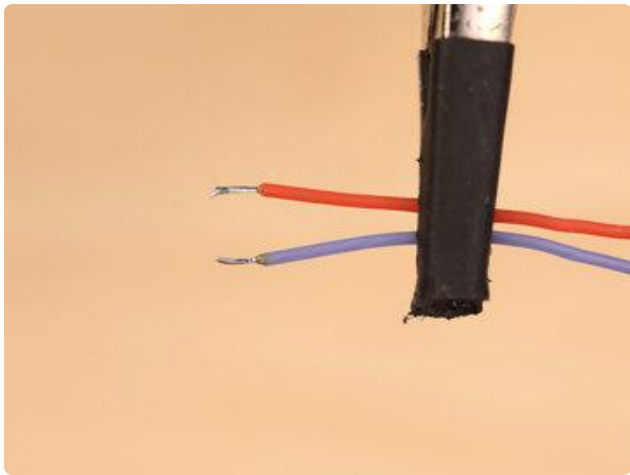
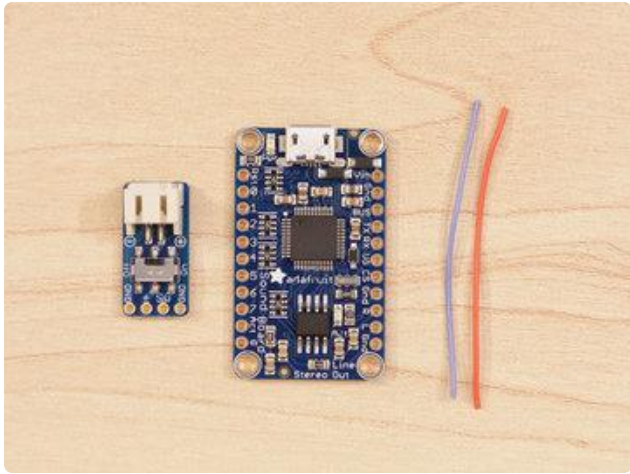
---

## Wiring



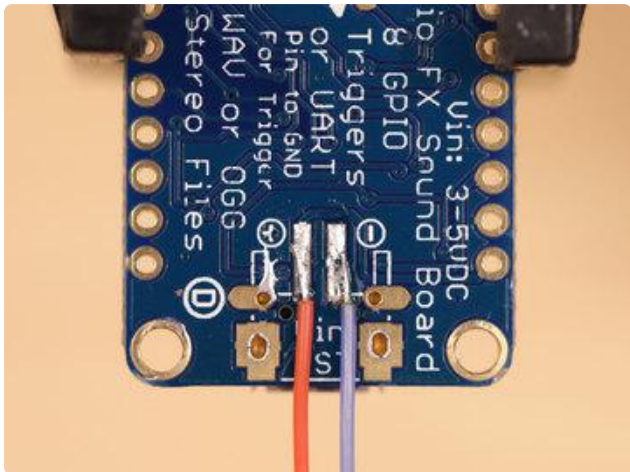
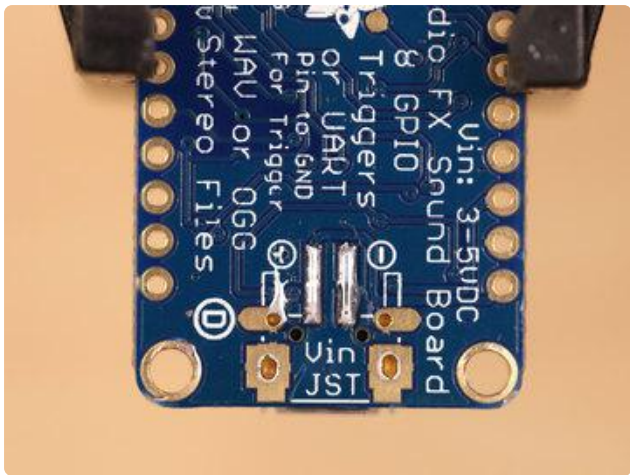
### Parts

Before we start, make sure you have all the components and proper tools to build this project. There's a full list in the overview page. If you haven't already, copy the audio files to the Adafruit Audio FX board.



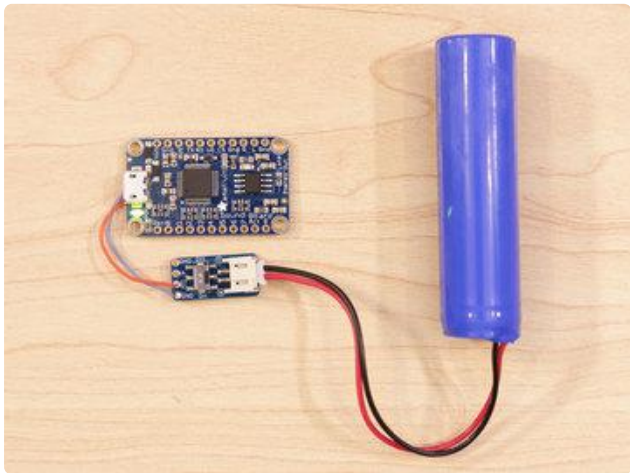
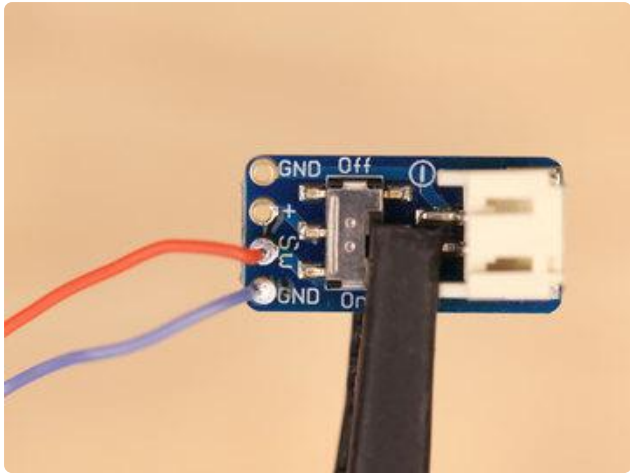
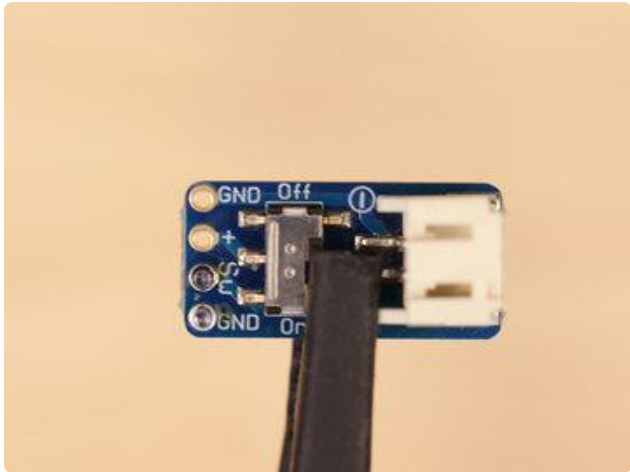
## Power Wires for Audio FX Board

OK, let's start by preparing some wires for connecting the JST switched breakout to the Adafruit Audio FX board. I suggest using 30AWG silicone cover wires because it's thin, flexible and high quality wire. I used two different colored wire, blue and red, to help tell the connections apart. Cut two pieces, about the length of the audio FX board. Then, use wire strippers to remove some insulation from the tips of each wire. Next, tin the exposed tips by applying a small amount of solder – this will make it easier to connect and prevent the stranded wires from fraying.



## Connect Wires to Audio FX

Now that we have our wires, let's connect them to the Adafruit Audio FX board. I suggest securing the board to a panavise jr. or helping third hands – This will keep things steady while we solder. Secure upside down, so the bottom of the board is facing up. Then, apply some solder to the two pads with the negative and positive labels. Now you can heat up the pads with the tip of the soldering iron and stick the wires onto each pad. Blue for negative, red for positive.

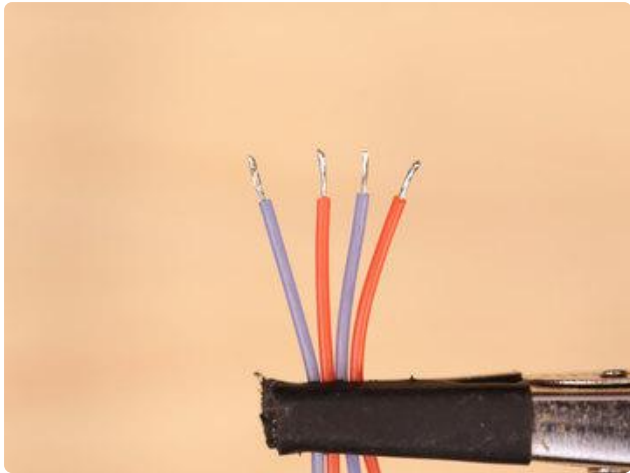
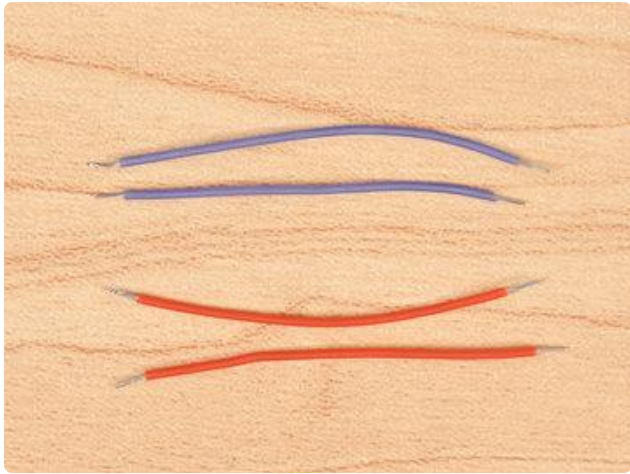


## Connect Audio FX to Power

Next, connect the wires from the Adafruit Audio FX board to the JST switched breakout. Secure the JST switched board and tin the two GND pins and the SW pin with solder. Now, connect the positive wire to the SW pin and the negative wire to one of the GND pins.

## Test Power Circuit

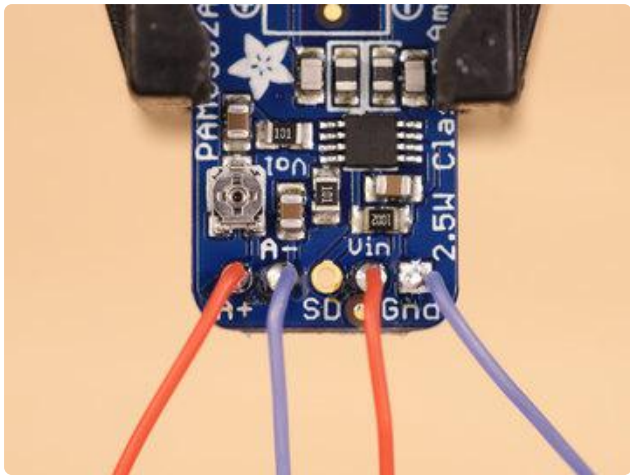
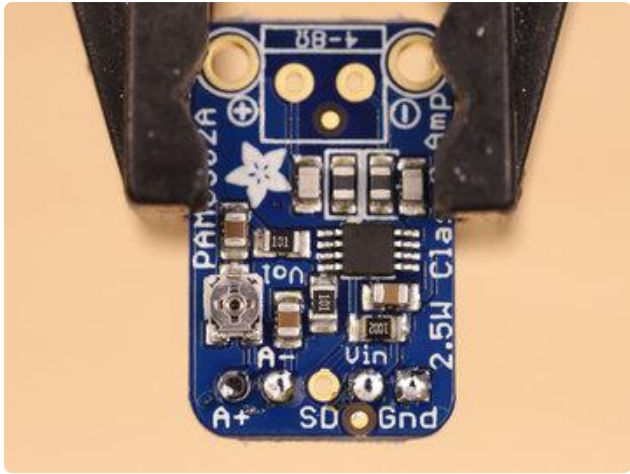
OK, now that we have our JST switched breakout wired to the Adafruit Audio FX board, we should test it out. Grab the JST connector from the 2200mAh battery and plug it into the female JST connector on the JST switched breakout. You should be able to power it on using the tiny on/off switch. The green LED from the FXboard will turn on as soon as you flip the switch. If it's all good, disconnect the battery and set aside.



## Ampilifer Wires

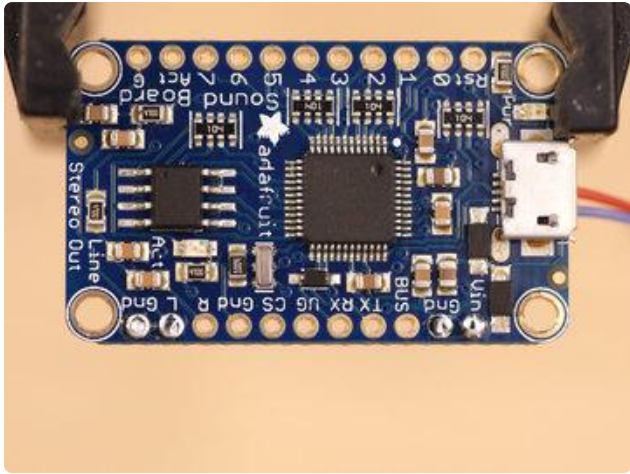
Next up, we'll work on connecting the audio ampilifer to the Adafruit Audio FX board. We'll need a set of wires, four in total, to connect them. Just like we did for the power wires, cut, strip and tin the tips of each wire. They can be the same length. Tip: Bundle wires on one arm of the helping third hands to quickly tin.





## Ampilifer Wiring

Once wires are ready, let's go ahead and secure the amplifier to the panavise jr. or helping third hands. Again, I suggest tinning pins before soldering in wires. Then, solder in the four wires to the A+, A-, VIN and GND labeled pins on the amplifier.



## Connect Amplifier to Audio FX

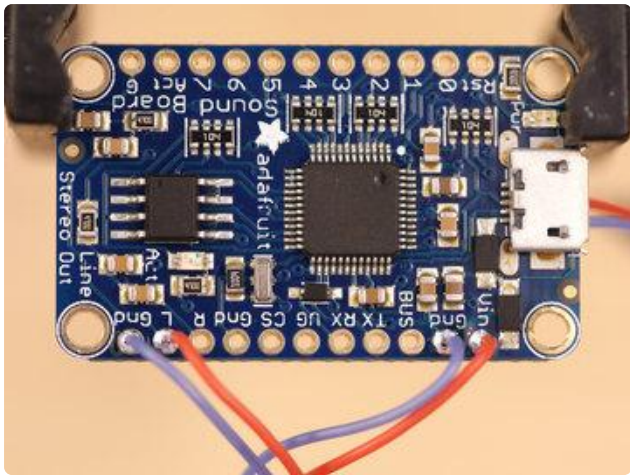
Now we can connect our amplifier to the Adafruit Audio FX board. I suggest tinning the pins on the Audio FX board first – Notice a trend here. Ok, here's the following connections you'll need to make:

A+ from Amp to L pin on Audio FX

A– from Amp to GND on Audio FX

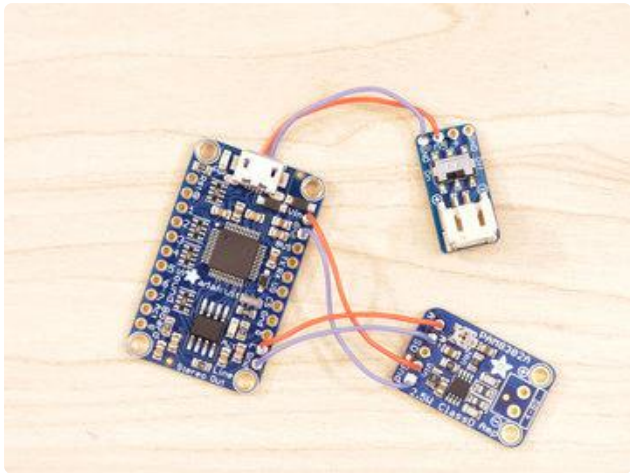
VIN from Amp to VIN on Audio FX

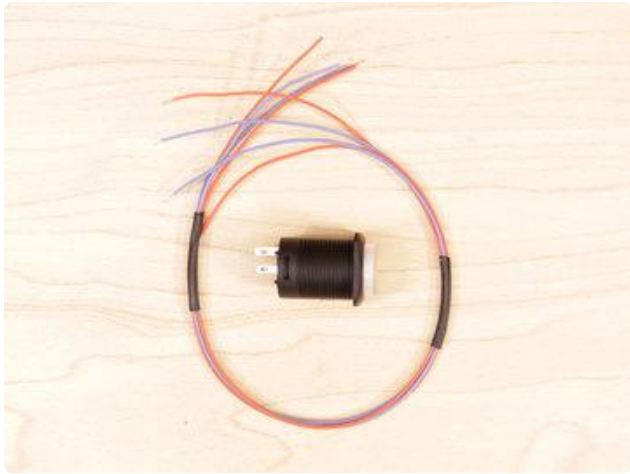
GND from Amp to GND on Audio FX



## Circuit Checkpoint

Woohoo! Look at the circuit and appreciate our work :-). So far we have our JST switched breakout and Amplifier wired to our Audio FX board. Check point!



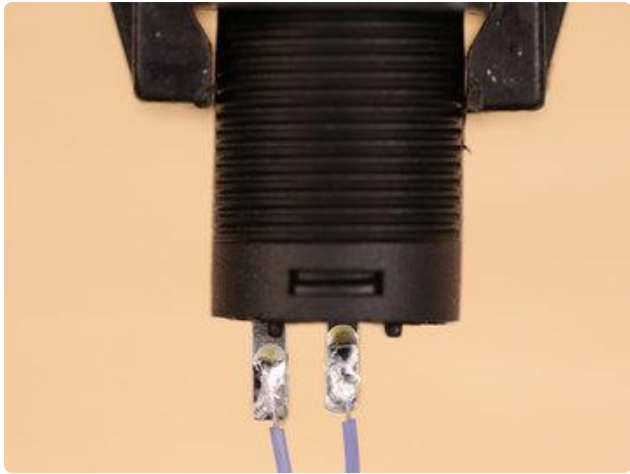


## Pushbutton Wires

Our pushbutton is up next! We will need two wires if you're using a regular pushbutton. In this project, my pushbutton has an LED, so I needed four wires.

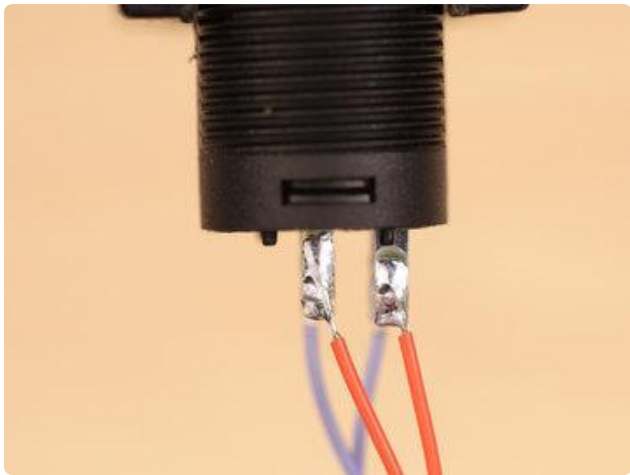
Depending on your project, you'll need to figure out how long the wires need to be. For the hammer, I needed them to be fairly long – 5 inches was enough. Then, cut, strip, and tin the tips of each wire. After that, tin the leads of the pushbutton by adding some solder.





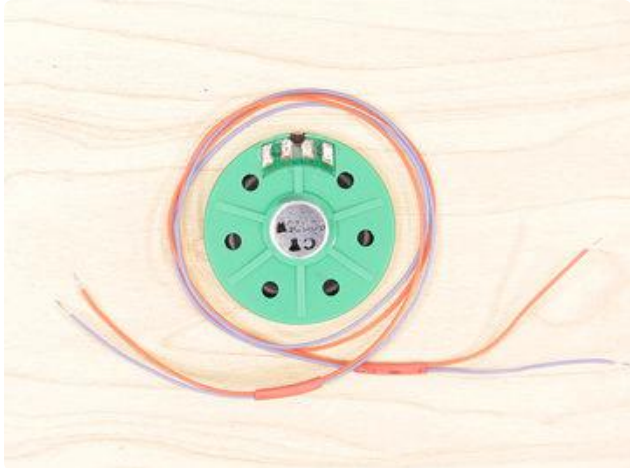
## Wire Pushbutton + LED

A regular pushbutton doesn't require specific polarity, so you can freely choose which lead to be positive and negative. Since my pushbutton has an LED, polarity matters – luckily the LED has a positive and negative label right on the pushbutton. So, depending on your project / pushbutton, wire them accordingly.



## Add Resistor to LED

A current limiting resistor is required to prevent the LED from blowing out. I used a 220ohm resistor inline with the wire and the positive lead.



## Speaker Wires

Now it's time to work on the speaker. The thin speaker most likely comes with wires already connected. I found they weren't long enough for this project, so I removed them by heating up the pads on the speaker and pulling them off. Since the speaker is being mounted to the head of hammer, the wiring needed to be long enough to reach the Audio FX board in the handle. It ended up being pretty long, like 6-7 inches in length. This will vary from prop to prop, so take some measurements! Remember, it's better to have the wires be too long rather than too short!



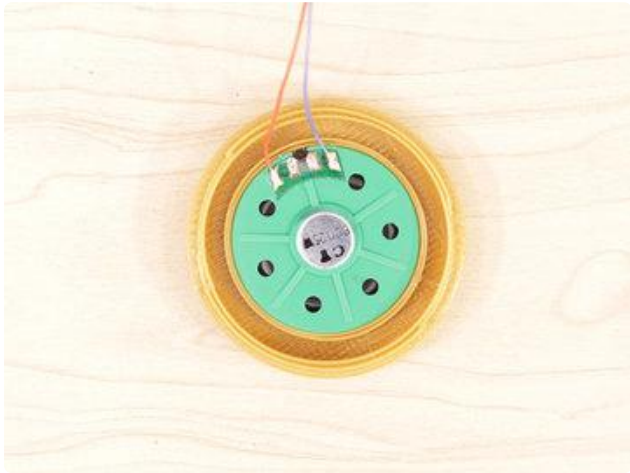
## Wire Button LED to Power

I didn't think speakers needed specific polarity, but there was a positive and negative symbol printed on the pads, so I followed them accordingly.

OK, now we have our speakers ready to wire into the amp. Before we do however, we'll need to assemble the 3D printed parts. This project is a bit special, because we can't wire all of the components before mounting them to some of the 3D printed parts. This is because if we did, we wouldn't be able to fit the components through the 3D printed rod. So if your prop has similar features, you'll need to think about that.

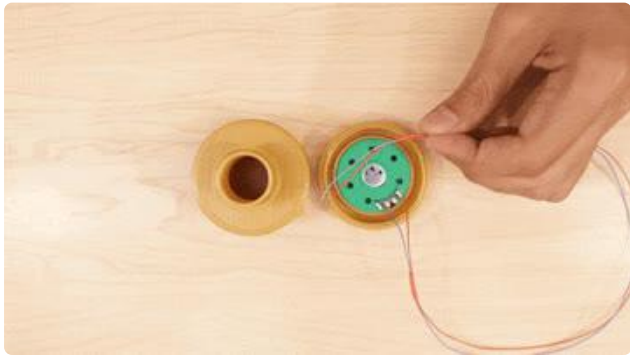
---

# Assembly



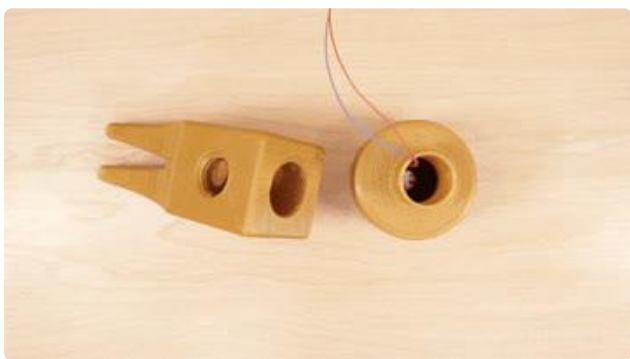
## Install Speaker into Head

On to assembly! The speaker should snap fit into the cover/cap of the hammer. If it's too tight or too loose, you'll have to either use a filing tool to open up the cavity, or glue it in place. Eitherway, that's one of the caveats of 3D printing – tolerances tend to vary from printer to printer, slicer to slicer. If it does fit, well then you're just won the maker lottery! :-)



## Install Head into Neck

Next, we'll need to grab the two wires from the speaker and thread them through the neck of the hammer. The cover/cap of the hammer has to be installed in a certain way – There's a little groove along the lip of the cover. The neck of the hammer has a nub on the edge that snap fits into the groove of the cover. This helps keep the two pieces connected together, but allows you to remove if you need.



## Install Neck into Base

Now we can thread the wires from the speak through the base of the hammer. The smaller cylinder from the neck of the hammer simply fits into the hole in the hammer base. These should have a pretty tight fit.



## Install Base into Rod

OK, next we'll need to thread the wires from the speaker through the rod. Notice the rod has a coil only on one end? That end actually twists onto the bottom of the hammer base. Pretty cool huh? Just make sure you thread the speaker wires through the right end and twist the parts and fully tighten.



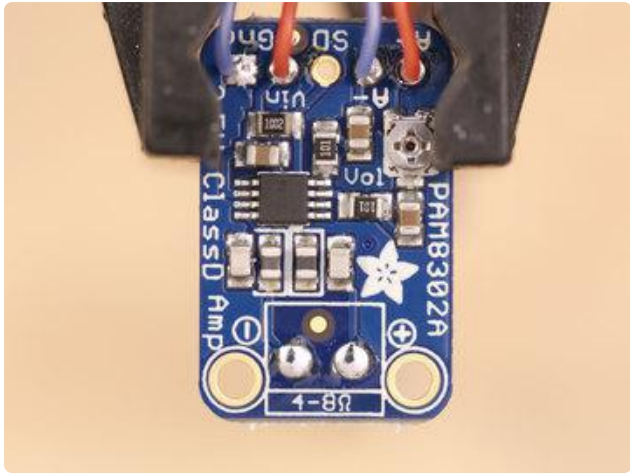
## Install Rod into Handle

Now we can thread the speaker wires through the handle. That's lots of threading! The end of the rod without the coil snaps into the side of the handle with a hole on the end. The other hole (the one on the flat side) is actually for the pushbutton. Make sure the speaker wire comes out from the handle.



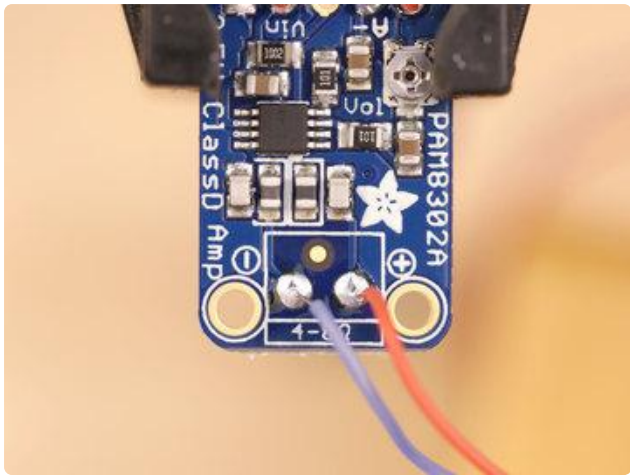
## Install Button to Handle

Let's install the pushbutton into the handle. First, guide the wires from the button into the hole and pull them through so they come out from the bottom opening of the handle. Press the pushbutton down until it's flush with the surface of the handle.



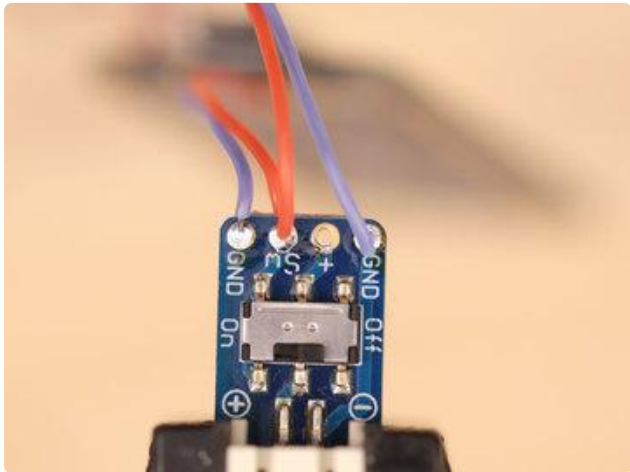
## Connect Speaker to Amplifier

Now that we our 3D printed parts mostly assembled, we can move onto connecting the remaining components together. Here, we're connecting our wires from the speaker into the amplifier. Positive to positive, negative to negative.

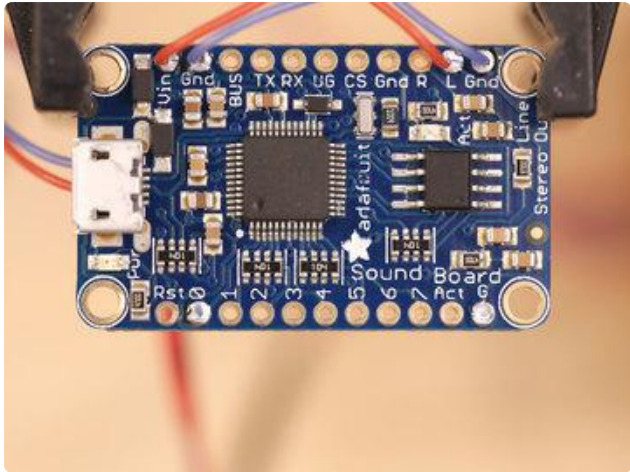


## Connect LED from Button to Power

If your pushbutton features an LED, you'll need to connect the wires from it to the JST switched breakout. I found soldering the positive wire to the SW pin a bit tricky because the power wire from the Audio FX board is already in there, so you'll need to be cautious it doesnt come out when you solder both in. Luckily, the JST breakout has two grounds so you can use the remaining ground for the negative wire of the LED.

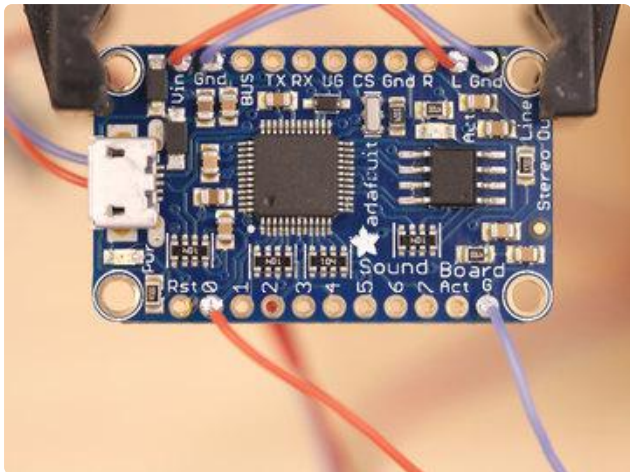






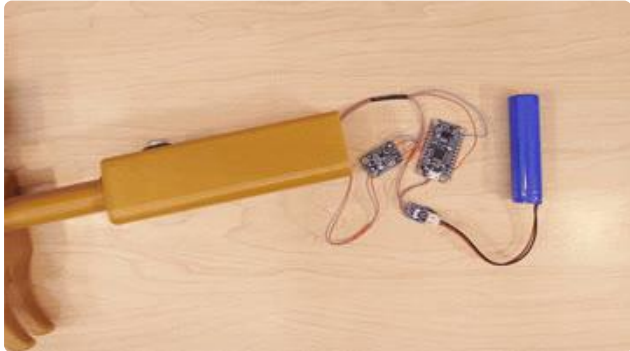
## Connect Pushbutton to Audio FX

All that's left to wire is the two from the pushbutton to the Audio FX board. One needs to go to the pin labeled #0 and the other to GND. The pushbutton can be wired to any of the 10 numbered pins, but since we named our audio files with a 00, it needs to go there. If you do wire it to a different number, you can easily rename the file to reflect the pin number.



## Test Final Circuit

Now we can do a final test and see if everything works! Grab the JST connector from the battery and plug it into the female JST port on the JST switched breakout. Flip the switch on and press the pushbutton to trigger the audio samples. If everything went well, you'll hear some sound effects! Woohoo! All that's left to do now is to (carefully) stuff all of the components into the handle. I didn't get a photo of this because it's kinda hard to see. But, one thing I did use is mounting putty / tack to stick the components in place. You could also use double sided foam tape or glue – whatever you prefer. The end cap for the handle simply snaps into the bottom. Easy!



## Turning it On/Off

I made sure to keep the JST switched breakout close to the end cap so I can easily get to it and turn it on/off. Depending on your setup, you'll need to figure out how you'll get in and out of the prop.

## Recharge Battery

The 2200mAh battery should last an hour or more depending on how much you trigger the audio samples. Once the battery is depleted, you can recharge it using an [Adafruit Micr Lipo charging breakout](http://adafru.it/1904) (<http://adafru.it/1904>). Connect a microUSB cable to a power source (like a computer or 5V power brick) and plug it into the breakout.

