Happy Chewbacca Mask

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https://learn.adafruit.com/happy-chewbacca-mask

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Table of Contents

Overview 3
Mask Teardown 4
Circuit Diagram 14
Build the Circuit 15
Prepare Audio Files 28
Rebuild the Mask 30
Be a Happy Chewbacca 40
Overview

Electronic talking toys are fun, but the same old sound loops can get pretty repetitive after a while. This guide will show you how to swap out the original sound board for an Audio FX Sound Board loaded up with lots of your favorite sounds. You'll need a specific mask to follow along exactly, but these principles can be applied to nearly any toy designed to trigger a sound effect. Or, add a speaker and switch to the mix to give a voice to any prop or costume.

You'll reuse the mask's existing jaw switches and speaker, while upgrading it with a WAV/OGG audio FX board, amplifier, rechargeable battery system, and a power switch.

You'll keep the USB port of the audio FX board accessible for recharging the battery and updating the sound files whenever you like. You can even use the selector switch to choose from different banks of sounds.

You'll need:

- Star Wars Chewbacca Electronic Talking Mask
- Audio FX Mini Sound Board 16MB (http://adafru.it/2341)
- Mono 2.5W Class D Audio Amplifier (http://adafru.it/2130)
- Lithium Ion Polymer Battery - 3.7v 500mAh (http://adafru.it/1578)
- Tactile On/Off Switch with Leads (http://adafru.it/1092)
- Lilon/LiPoly Backpack charger (http://adafru.it/2124)
- Rotary selector switch such as this () and a knob ()
- Small Philips screwdriver
- Soldering iron and solder
- stranded wire (26AWG gauge) (http://adafru.it/1970)
You'll be disconnecting the original sound board from the mask, so if you'd like to continue using these sounds with your upgraded mask, make a high quality digital recording of them with a good microphone before proceeding.

Mask Teardown

Grab your tools and get ready to open up Chewbacca's face. First, unscrew the eight screws from the back of the mask.
Pop out the inner mask section and set it aside.
Look at how the mechanism works when you rotate the jaw — a pair of plastic cam press two momentary switches, triggering the sound — then remove the jaw and press the switches to activate the sounds.
Remove the battery compartment outer cover, then unscrew and remove the battery holder lid, you won’t need it anymore, unless you want to reuse it and the battery holder for another project later.

Inside of the mask, unscrew the center plastic bracket above the speaker, and remove the bracket, this allows the circuit board to be pulled free.
Use your diagonal cutters to cut the two wires connected to the battery holder.

Pry out the inner battery pack holder by lifting it off of the peg to which it had previously been screwed. Set it aside, you won’t need it anymore (but keep it and the lid, because free AAA battery holder!)
Cut the two yellow speaker wires at surface of the original circuit board, then strip a bit of insulation from their ends so you can solder them to the Audio FX board later.
Flip over the mask's original circuit board and clip the red, black, and blue wires that from this side (these are the ones that connect the limit switches). Set aside the board, you'll no longer need it -- but it'd be fun to circuit bend later!
Your mask is now ready for a brain transplant.

Circuit Diagram

Click to enlarge!
Build the Circuit

Fire up your soldering iron and get ready to build the circuit.

To charge the 500mAh battery more quickly, you can set the LiPoly backpack to charge at a higher rate. Solder a small blob on the charger rating pad set on the bottom of the board that bridges the connection.

Cut the trace on the LiPoly backpack that connects the two switch holes, then solder the leads of the tactile switch to these holes. Orientation does not matter, so either wire in either hole will work.
The LiPoly backpack will be connected directly to the Audio FX board (this is not how it is shown in the circuit diagram for visual clarity).

Break off a section of three header pins that came with the backpack, place them on the top of the Vin, Gnd, and BUS pins of the Audio FX board and solder them in place from the underside. The longer end of the pins should be pointed up from the Audio
FX board. Fit the LiPoly backpack on top of the Audio FX board so BAT corresponds to Vin, G to Gnd, and 5V to BUS, then solder the pins to the backpack.
Solder a 2" length of red wire to the header pin that's protruding from the LiPoly backpack's BAT header pin, this will be used to power the amplifier. Loop the wire around the pin before soldering for a stronger connection.

Prepare to connect the class D amplifier to the Audio FX board by twisting together one end each of two 2" lengths of black wire. Solder this twisted end of the pair of wires to GND on the Audio FX board, as seen in the circuit diagram. Connect the other end of one of these wires to the GND of the amplifier as indicated on the circuit diagram.
Now, solder the red wire connected to the LiPoly backpack to the VIN of the amplifier.
Next, you'll attach the amplifier to the Audio FX board. Solder two header pins into the Audio FX board’s L and GND pins. Then, fit the amplifier’s A+ to L and A- to Gnd respectively and solder them in place.

You’ll reuse one of the mask’s the momentary switches and wiring to trigger the sound files. Either will work, I chose the red wire. This red wire will be connected to the rotary switch so that different sound banks can be selected by turning the knob.
Based on knob placement, you may need to extend the length of the momentary switch wire by grafting on an additional length of wire and then soldering and heat shrinking the joint.

After extending it, strip a 1/2” piece of insulation from the free end of the red wire, then wrap it around the common center post of the rotary selector switch, then solder it in place.

Prepare the wires that will connect the rotary switch positions to the triggers on the Audio FX board. These should be about 8” in length to route through the mask to a knob position in the upper left of the mask back. Prepare as many wires as you want to use sound banks, up to eight, by trimming a small bit of insulation from their ends. Next, solder a wire to each of the rotary switch lugs you want to use, then insulate each of the connections with heat shrink tubing.
Fit a piece of tubing around the bundle of wires to keep them together more neatly, no need to heat shrink it.
Solder each wire to its corresponding position on the Audio FX board, then trim the excess from the other side.
Strip a bit of insulation off of the free end of the black wire you previously clipped from the original circuit board, slip a piece of heat shrink tubing over it, and solder it to the other black ground wire you soldered (as a twisted pair) to G on the Audio FX board, as seen in the circuit diagram. Cover the joint with the tubing and heat shrink it.
Strip the ends of the mask’s two yellow speaker wires and solder them to + and - on the amplifier. Orientation does not matter, so connect either wire to either hole.
Plug the battery JST connector into the JST connector on the LiPoly backpack. Click the tactile switch on and off to make sure you’re getting power to the board — the LEDs should light up. Now, carefully open Chewbacca’s jaw (he won’t mind) and you’ll hear the test sound file that is factory programmed onto the Audio FX board.
Next, you’ll prepare your own audio files for use.
Prepare Audio Files

This guide [https://learn.adafruit.com/adafruit-audio-fx-sound-board/overview](https://learn.adafruit.com/adafruit-audio-fx-sound-board/overview) covers the use of the Audio FX sound board in depth, so it's a good idea to have a look at it.
before you continue.

Download or record the sound files you want to use with your mask. Audacity is a great, free audio editing program you can use to prepare the files. This guide won’t cover the basics of Audacity, so you may want to check out some tutorials online first. Open a sound file into Audacity, and then set the sample rate to 16-bit, and mix the track down to mono, in case it isn’t already. You should also trim off any excess silence from the head and tail of the sound. Use the normalize filter on every sound file you process in order to get a consistent volume from each sound you use on the mask.

Export your sound file as a .WAV, paying special attention to naming the file. The Audio FX board has a number of different tricks up its sleeve for playback, all of which are based upon file naming conventions. Look here [https://learn.adafruit.com/adafruit-audio-fx-sound-board/triggering-audio](https://learn.adafruit.com/adafruit-audio-fx-sound-board/triggering-audio) for the nitty gritty details. You’ll use either the RANDOM or NEXT playback methods for the mask. Files will be named with a prefix to pick the sound bank, such as T01, followed by the word RAND or NEXT followed by a number from 0-9, and ending with the .WAV file extension. Each bank chosen with the selector switch will be named with either the RAND or NEXT naming convention, not both.

Here’s a look at how this will work in practice: Let’s say selector switch position 1 is for choosing Pee-Wee Herman sounds. (Good choice, right?! What can I do, I’m from the 1980s.) We have three sound files named T01RAND0.WAV, T01RAND1.WAV, and T01RAND2.WAV. They’ve been uploaded to the Audio FX board (more on that later). With the selector set to position 1, the jaw switch on the mask will ground the Audio FX pin #1 to which it is connected and thus the Audio FX board will play back files starting with the name T01. Since the files in this sound bank have the RAND keyword in them, the Audio FX board will choose a random file of the three available and play it.

Then, you could go on to, oh, I don’t know, sample the Chewbacca Mask Mom audio from the internet, and save out five individual sound files named T02NEXT0.WAV - T02NEXT4.WAV and upload these to the Audio FX board. Now, when the selector switch is in position 2, wearing the mask and opening your mouth could result in the very meta moment wherein the Chewbacca mask exclaims “It’s not me making that sound IT’S THE MASK!!!”. Each time the board is triggered it will play the next sound in order. You may continue on in this fashion creating as many collections of sounds as you have selector switch positions wired to your Audio FX board.

Now that your sound files are prepared, press your circuit’s tactile switch to turn it off, and then plug in your Audio FX board to your computer with a micro USB plug. The board will show up as a drive, just like a USB key. Here are more details, [https://learn.adafruit.com/adafruit-audio-fx-sound-board/copying-audio-files](https://learn.adafruit.com/adafruit-audio-fx-sound-board/copying-audio-files) Simply drag-and-drop your audio files to the board’s memory. You can now eject the disk and disconnect it from the USB cable.

Try out your circuit by turning it on, setting the selector switch to the different...
positions corresponding to your sound files, and pressing the jaw limit switch. Success!

Rebuild the Mask

If you find that the chin rest inside Chewbacca's jaw is getting in the way (this may have been sized for kids...) you can unscrew it now.

Position the Audio FX board with it’s upper left mounting hole over the masks screw hole that originally held the plastic bracket you removed earlier. Use that original screw to screw the board securely to the mask. The USB port on the Audio FX board will still be accessible for file transfer and battery charging.
Tuck the battery underneath the board. It should sit nicely there, but you can use some double stick foam tape if you like to be sure it won't rattle around later.
Route the tactile switch so that it'll be accessible through the former battery compartment when the lid is open.

Next, you'll mount the selector switch. Use your diagonal cutters to remove the small plastic vent tab from the inner mask’s upper left hand vent hole.
Push the threaded shaft of the selector switch through this hole from the inside, and then screw it in place with the supplied nut.

If the wiring gets twisted up, sping the mask to untwist it. (Sort of like Spin the Bottle, except with more Wookie face and less kissing.)

You can then place the selector knob on the shaft.
Reattach the jaw, making sure to fit the return spring end into its place.

Press the mask back together, being mindful not to pinch any of the wires.

Screw in the eight Philips screws.
Now, push the tactile switch wiring back in and stick it in place with some double-stick foam tape (I'm using a temporary loop of gaffers tape in this example).

Note how you can access the USB port, and see the LED light up when the mask is powered on. You can go ahead now and snap the battery compartment cover back in place. Your mask is assembled and better than ever.
Be a Happy Chewbacca

You can now wear your mask around everywhere and say unexpected, non-Wookie things to the delight of everyone! Turn the selector knob when they seem bored or annoyed and amaze them with the whole new collection of funniness.

When not in use, turn off the switch to conserve battery power. When you want to charge it, simply plug it into the a USB cable connected to a computer or wall charger. And, don’t forget, you can easily swap out the sounds for new ones whenever you desire.

Remember, "It's not me making the noise, it's the mask!"