Audio FX Remote Control

Created by Phillip Burgess
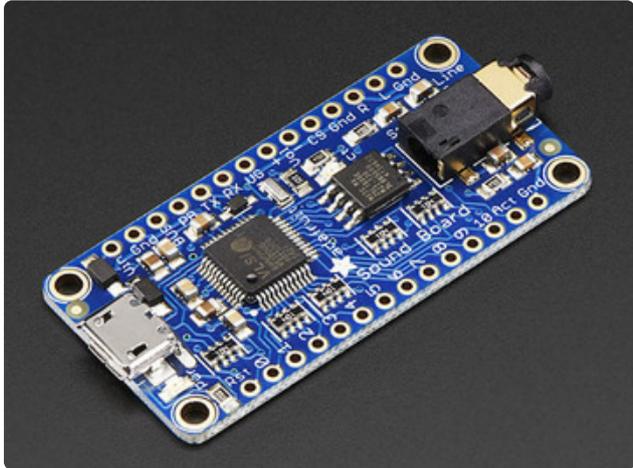

https://learn.adafruit.com/audio-fx-remote-control

Last updated on 2024-06-03 01:36:06 PM EDT

Table of Contents

Overview

Press a button, make a sound. The Adafruit Audio FX Sound Board (http://adafru.it/2133) makes custom audio projects as easy as they can be!

Sometimes, **press a button, make a sound over there** would be just the thing. This project shows how to add a wireless remote control to the Audio FX Board. It's great for Halloween pranks, cosplay outfits and other shenanigans, or maybe you want to design the whoopee cushion of the future.

Parts List:

- Adafruit Audio FX Sound Board **(http://adafru.it/2133)** — original or version with integrated amplifier. **(http://adafru.it/2210)**
- 3 x AAA (http://adafru.it/727) or 3 x AA (http://adafru.it/771) **battery holder** with switch, or a USB battery pack (http://adafru.it/1959)
- RF receiver **(http://adafru.it/1096)** (**momentary** type — this is important — **not** the latch or toggle type!)
- Keyfob RF **remote control** (4-button (http://adafru.it/1095), 2-button (http://adafru.it/1391) or 1-button (http://adafru.it/1392) type)
- Breadboard and/or Perma Proto.

Also Required:

- **74HC04** hex inverter IC. Adafruit does not sell this component, but online electronics shops like DigiKey and Mouser have it available. (A 74HC14 can also work, if that's easier to acquire — exact same pinout.)
- **0.1 µF capacitor.**
- **Amplifier/Speaker.** For a project like this it's sometimes simplest to use an existing "MP3 player speaker," but we do offer various amplifiers, speakers and battery options if you need to create a fully custom design. A new version of the board with a built-in amplifier (http://adafru.it/2210) greatly simplifies this!
- **Wire, solder and soldering paraphernalia.**
- Perhaps an **enclosure** and **other parts...**

This is **not** a "follow me exactly" project...you'll almost certainly be adapting it to your own situation! **Read through the whole guide first** so you have a better idea of exactly what parts you'll require for your own version.


Wiring

For a "quickie" project — something you'll hide in a pumpkin or lawn ornament for Halloween night and then dismantle afterward to use in other projects — assembling the components on a breadboard will usually suffice.

Portable use, including costumes, requires something both smaller and more rugged. We'll get into that on the next page, but you'll still want to read here how the parts go together...

For breadboard use, you'll need to solder header pins to the Audio FX board. These are included in the package.

Two "tiny" breadboards side-by-side allow access to both the audio jack and USB port on the Audio FX board. Alternately, a "full-size" breadboard could be used, if sufficient space is left between components, so cables can fit in both ends.
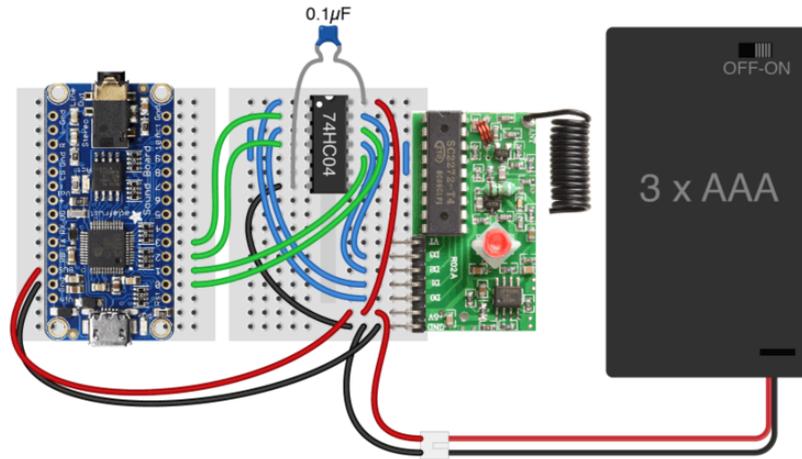
The audio board uses "active low" inputs for buttons, but the RF receiver produces "active high" outputs. That's just one of those things…they were designed by different people at different times for different tasks.

Adding a **74HC04** chip between the two "inverts" the signal, so they're speaking on the same terms.

Adafruit doesn't offer this part, but it's one of the most common logic chips out there…if you're blessed with a local electronic parts store, or have a circle of hobbyist friends, they might have one. Otherwise it can be sourced online from distributors like DigiKey, Mouser or Jameco. A 74HC14 works just as well, if that's easier to acquire. Pinout is identical.
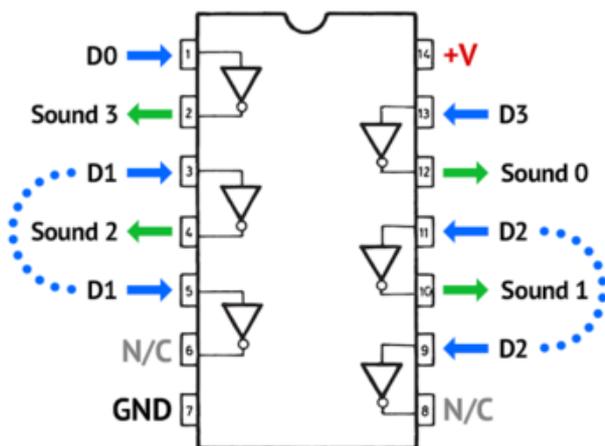
The 74HC04 has six inputs and six outputs. Face-on, with the "bite" at the top, notice that each input pin is always directly above its corresponding output pin. They're not turned around on the other side of the chip. Also, the two sides are not aligned, due to the power pins at opposite corners.

We're only using four of the six inputs. But it's vitally important that the unused inputs are not left "floating" (unconnected) — it's not destructive, but can make the circuit fail to work until fixed! Notice the two short blue wires in the diagram at the top…these connect two of the "real" inputs to also go to unused input pins, so they're not left floating. The unused outputs don't need any connection, that's fine.

The RF receiver outputs don't correspond to buttons in the order you'd expect. Remote button "A" goes to D3, "B" to D2, "C" to D1 and "D" to D0. We compensate for this in the wiring, reversing the order so it's more intuitive when assigning sound filenames to button numbers.

Normally we're fans of lithium-polymer batteries for projects, but in this case it's **not a good fit**. The receiver requires at least 4 Volts, a little more than LiPo batteries provide. Three alkaline cells provide 4.5 Volts total…AAA cells will keep it running for many hours, or AAs can be substituted for even longer run time. You can also power it from a USB battery pack (but not a USB cable to a computer…that makes the audio board go into "flash drive" mode).

Power users who are adamant about having a rechargeable LiPo battery could use a PowerBoost 500 Basic (http://adafru.it/1903) or 500 Charger (http://adafru.it/1944), but for the majority of users the alkaline batteries are perfect…simple, inexpensive, and the battery case even provides a power switch.

To hear noises, you'll need a speaker…

I love these little "impulse buy" portable MP3 speakers you sometimes find in drugstores. Not the loudest thing, but they'll do for many tasks.

Bigger is better though…you can turn the volume down on a too-big speaker, but a too-small speaker will always be too small.
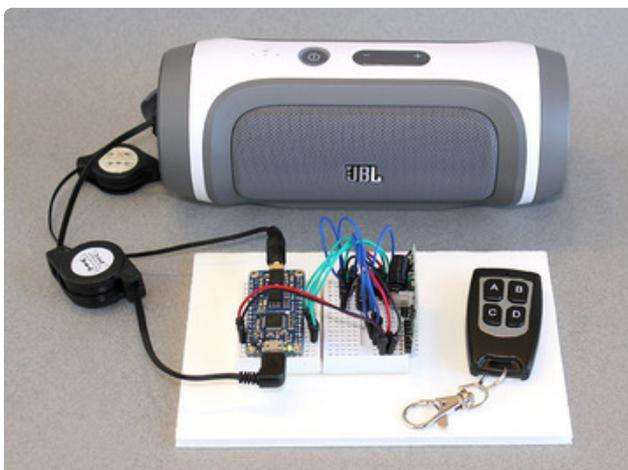
Some higher-end portable speakers include a phone charging port…you can use this to power the circuit over USB, eliminating the AAA battery pack.

These speakers are expensive, and you may understandably be hesitant to leave them out in a yard display!

We also now have a [version with an integrated 2 x 2W amplifier (http://adafru.it/2210)](http://adafru.it/2210), so it's easy to add your own speaker(s). If you need something super custom, perhaps for an oddly-shaped space like inside a prop or costume, we do have various [audio amplifiers (https://adafru.it/e2r)](https://adafru.it/e2r) and [speakers (https://adafru.it/e2s)](https://adafru.it/e2s) in the shop. These can connect directly to the R, L and Gnd pins on the audio board.

[Read the Audio FX Sound Board Guide for directions on loading and triggering sound files. (https://adafru.it/e8Q)](https://adafru.it/e8Q)

Although the Audio FX board supports up to 11 triggers, the remote control only provides four. This is not as limiting as it may seem...the guide linked above explains how to cycle through multiple files for each trigger.

Troubleshooting

A green light on the Audio FX board indicates it's receiving power. A red light means it's currently playing a sound.

If the circuit fails to work, it's usually one of two things:

- A wonky connection on the breadboard. Try moving wires to other socket holes, or replacing the jumper wires. If it's really temperamental and only works with some wiggling, you may need to solder up a more robust circuit...we get into that on the next page.
- Incorrect wiring on the 74HC04 chip, such as floating inputs, or inputs in the wrong order. Refer to the pinout earlier on this page.

If it still refuses to work, remove the 74HC04 from the breadboard and try triggering sounds manually with a jumper wire between one of the trigger pins and GND. If that doesn't work, it may simply be a file naming problem. Refer to the guide linked above for directions.

If it seems to be a problem in the circuit, you can post on the [Adafruit Forums (https://adafru.it/cer)](https://adafru.it/cer) and we'll do our best to assist. It's helpful if you can provide clear photos of your wiring, and describe the symptoms as thoroughly as possible.

Changing the Send/Receive Address

These remote devices all operate on the same frequency. If you have several, they can interfere and trigger sounds at the wrong time.

On the back of the RF receiver board, and also inside the remote control fob (you'll need to pry it open and remove the batteries and circuit board), there are three rows of blank copper pads that can be bridged with solder to assign a different "address" to the remote and receiver. **The exact same combination must be set on both boards.** 8 pads allows for 256 different addresses...I just picked a combination at random.
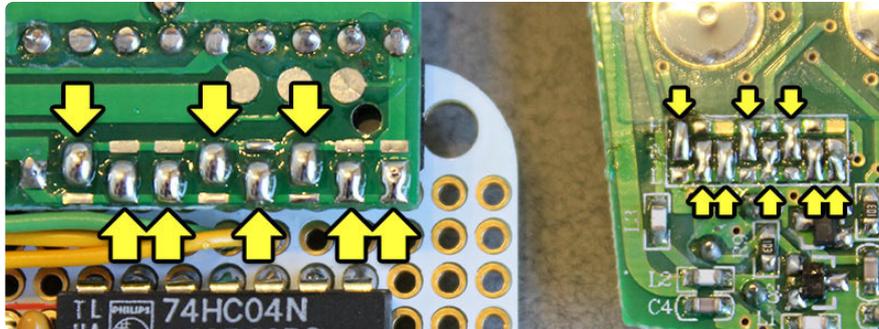
This is harder than it looks! Especially on the remote fob, the pads are very tiny. I've soldered a few things in my time, and it still took me three tries and solder wick to get it right. So you may want to avoid doing this unless you're certain the default address is a problem and also have some patience and ninja soldering skills.

For Costumes

It might seem a strange application...why not make your own noises, and why do you need a remote control for something that's right on your person? A few reasons, actually...

- No matter how good you are at voice impressions or growly monster noises, they always sound terrible through a mask.
- The costume might be on another person who can't operate it themself...a small child, for example...or on a non-person, such as a dog with a talking collar like in the film Up.
- Costumes and wiring really don't mix well. Wires get pulled, solder connections break, sweat happens, and it's more complicated to put on.

To make this project wearable, the connections are all the same as before, it's just assembled differently...

- Everything needs to be soldered. Mostly for robustness, but also to make it smaller.
- If it's to be worn under a costume (rather than inside a prop item), an enclosure is essential. Even if you don't feel warm or damp, bodily humidity is always

present and a real problem. But don't use an Altoids tin...the metal enclosure will block the antenna from receiving!

Building It

Reducing the size of the circuit requires some careful planning, testing different positions and configurations before settling on a solution. Part of this depends on the size and depth of the enclosure you intend to use.
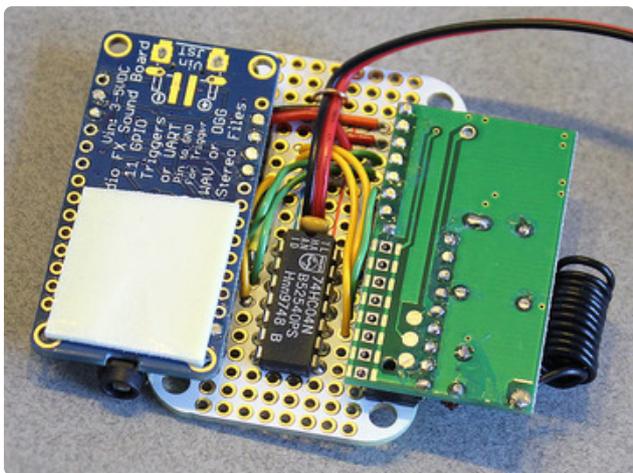
I used a "small mint tin size" Perma-Proto board, with the audio board and RF receiver installed "wing style" off the sides, face down to reduce overall thickness.

As installed, the audio board only has headers on triggers 0-3, so it can safely overlap the area used by the 74HC04 chip. Short wires connect the BUS and GND pins to the Perma-Proto power rails.

This arrangement is broad and flat, but yours might be different...maybe it fits better with the boards stacked tall and narrow.

In the photo above, the header pins on the RF receiver have been desoldered and replaced with straight ones. Desoldering can be a major challenge for novices...it's easy to damage the board. If you're not ready, that's okay, you don't have to build it exactly like this one! Keep the angled pins!

Found this nifty amplified speaker from Monoprice.com, with a belt clip and loops for adding a shoulder strap or lanyard. This made it easy to hang right in front of one's chest!

A standard 3.5mm audio cable connects between this and the Audio FX board.

As mentioned before, for custom-fitted jobs we have various audio amplifiers (https://adafru.it/e2r) and speakers (https://adafru.it/e2s) in the shop.

If you do opt for a custom design, I strongly suggest against putting speakers inside a mask. Exhaled breath is very moist and wreaks havoc on electronics! Mounting the speaker **on the chest** works perfectly well.

The circuit is mounted inside a plastic (not metal!) box (this one once held a bicycle tire patch kit). A piece of scrap plastic cut to size provides a base to which everything can be fastened with foam tape or hot glue…
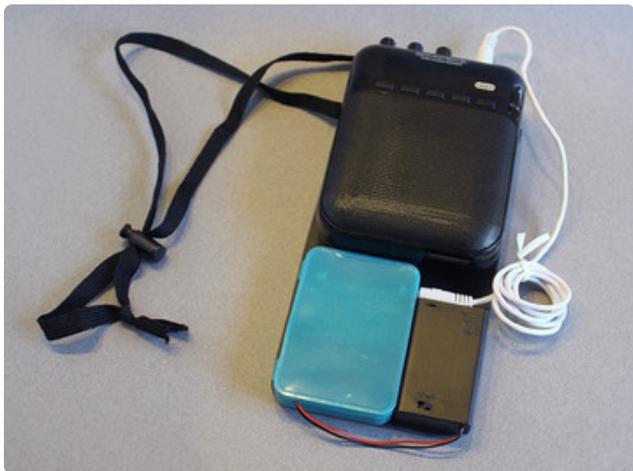
…this then clipped to the speaker amp (plus some tape for good measure).

The whole package can then hang from one's neck and is just slim enough to be concealed under the chest of a monster suit.

It's much easier for characters that wear armor or a big medallion…if the electronics are outside the body of the costume, they need less protection from heat and perspiration!

Triggering Sounds

For the remote control, you have a few options…

Easiest is just to "palm" it...carry it in your hand and try to be discreet. Visibly operating a gadget throws off the effect.

If you're out with a "spotter," they might be able to trigger the sounds for you. Getting the cues right requires coordination and practice.

If your character carries a prop like a staff or axe, the remote can be fastened to it with hot glue or cable ties. Conspicuous in broad daylight, but in the dark nobody will notice (put some tape over the LED).

Those tiny buttons can be difficult if you're wearing gloves. The 2-button and single-button versions of the remote may be easier to work with. You can load up the Audio FX board with a list of sounds on rotation so it's not repetitive and annoying.

Or if you're really good with electronics, you can go all Ben Heck and dismantle the remote, running wires to your own customized trigger buttons that are better concealed.

Completing the Effect

Surprisingly, the most time-consuming part is curating the audio tracks — finding or creating just the right set of sounds that work best with the costume. Seems simple, but isn't.

If you're skilled at sound effects and audio mixing, then you're all set. The rest of us will have to scrouge on sites like Freesound (https://adafru.it/e2z) or Wavlist.com (https://adafru.it/e2A).

After downloading anything and everything that shows potential, you can then sort through the list to pick the very best ones and convert everything to WAV or OGG format. Then assign filenames so they're played in succession or randomly in groups for each of the buttons.

The final piece is a little bit of acting. You'll find that some sounds are cool on their own but just don't work well for performing...cull your list a bit further. Then practice discreetly triggering sounds, because fumbling around with buttons totally spoils the illusion. Also, the remote adds a slight delay. With a little misdirection and body language, nobody will see the remote in use.