

Arduino Scream Box

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FINAL VERSION

7/2/2019

Introduction

Build a \$15.00 Arduino-based "scream box" that watches for someone to walk up, and then plays a scream or growl. This is a great beginner's haunted house project! It's a motion detector-triggered MP3 player.

The motion detector we're using is a PIR (passive infra-red) sensor that responds to changes in temperature (a person, a dog, etc.) You hide the motion sensor so it's pointing where people will walk, and the Arduino monitors it. When the PIR sees a warm body, the Arduino will play the MP3.

To make this inexpensive, you can buy all the parts from eBay. Getting them from Chinese sellers will be much cheaper, but shipping can take a long time. If you need these faster, then buy from either US-based eBay sellers or Amazon (make sure the Amazon seller is also US-based!) See the section on Where to Get the Parts for buying tips.

Most of the work is assembling the parts and putting them into the box. You will also have to install the Arduino software and load the Arduino code onto the Nano board.

You only need to load the code onto the Arduino once, and then you can update the micro SD card with a new MP3 if you want to, without any code changes.

Unfortunately, there isn't a way to do this without some soldering. You will need to assemble the Arduino Nano, the terminal adapter, and make a Y cable to split the 5V power.

I also cover how to put this into a box and fasten everything down so it's reliable and wires don't come loose. The parts list includes a sheet of acrylic to mount everything on, plastic mounting spacers, which hold the electronics to the acrylic, and a project box.

Parts List

- Arduino Nano
- Nano terminal adapter - The Nano plugs into this and you connect wires to it with screw adapters.
- YX5300 UART Control Serial MP3 Player
- HC-SR501 Infrared PIR Motion Sensor Detector
- Bracket for motion sensor
- Jumper wires
- Micro SD card
- Project box
- Sheet of acrylic
- M3 Nylon Hex Spacers
- Mini solderless breadboard
- Powered speaker/boom box/etc.
- Audio cable
- USB power supply

Where to Get the Parts

These are example listings; I picked the first ones on eBay that popped up when I wrote this. They are generic parts so if these sellers are out, just get them from another seller. The same parts are on Amazon.

TIP: There are two strategies for buying on eBay:

- A. If you can find a Chinese seller who ships via SpeedPak, ePacket, or some form of air mail, the order will get here pretty fast. I have had items get here in a little over a week via SpeedPak or ePacket.
- B. If you want to make more than one screen box, look for a US seller who is selling the part in a group of 2 or 3. The price will be only a little more than Chinese sellers and you'll get it a lot faster.

Arduino Nano:

<https://www.ebay.com/itm/USB-Nano-V3-0-ATmega328P-CH340G-5V-16M-Micro-controller-board-Arduino-New-BBC/143196666478?hash=item21572fba6e:m:mjGieVpHCVrFt4dolyULeMQ>

Nano terminal adapter, this has screw connectors:

<https://www.ebay.com/itm/Nano-Terminal-Expansion-Board-Terminal-Adapter-IO-Shield-For-Arduino-NANO-Kit/132257275797?hash=item1ecb25df95:g:WJ8AAOSwa9FbFi3i>

YX5300 UART Control Serial MP3 Player:

<https://www.ebay.com/itm/YX5300-UART-Control-Serial-MP3-Music-Player-Module-for-Arduino-AVR-ARM-PIC-F8M7/113783638447?epid=24009837760&hash=item1a7e0889af:g:LKYAAOSwSXVdA~qP>

HC-SR501 Infrared PIR Motion Sensor Detector:

https://www.ebay.com/itm/New-HC-SR501-Adjust-Infrared-PIR-Motion-Sensor-Module-for-Arduino-Raspberry-pi/142644022663?epid=16008707138&hash=item21363f0d87%3Ag%3AwGYAAOSwUchaTJPX&LH_BIN=1

Bracket for motion sensor:

https://www.ebay.com/itm/HC-SR501-Acrylic-Bracket-IR-Infrared-Motion-Sensor-Detector-Module/223288277600?hash=item33fd04ba60%3Ag%3ARCKAAOSwhrpf6wH&LH_BIN=1

Jumper wires - Get male-to-female wires, such as:

https://www.ebay.com/itm/40PCS-Male-to-Female-2-54mm-1P-1P-Dupont-Jumper-Connector-Wire-Cable-10-20-30CM/264064169225?hash=item3d7b737509%3Am%3AmU8Tc8h1NCHUbO0BeHFyPOw&LH_BIN=1

They are so cheap, get at least one set of 30CM male to female, and one set of 10CM male to female. The male ends will connect to the screw terminals, the female ends will plug into the motion sensor and MP3 player. The longer 30CM wires let you extend the motion sensor easily.

Mini Solderless breadboard

https://www.ebay.com/itm/SYB-170-Mini-Breadboard-mini-Breadboard-Portable-Experimental-Platformcda-ECCA/362596084316?hash=item546c692a5c%3Am%3AmdaOeSnrL8Q8RJc0WvLiscA&LH_BIN=1

Micro SD card - Any cheap one on eBay is fine. You don't need a big one, 1 or 2 gigs is way more than enough.

Project box - A Really Useful Box from Office Depot is a good choice:

<https://www.officedepot.com/a/products/452486/Really-Useful-Box-Plastic-Storage-Box/>

I like to get a big enough box so that I can drop in the other parts, like the motion sensor and the power adaptor, so I can store all the pieces together.

Sheet of acrylic (Home Depot, Tap Plastics bargain bin)

I mount all the parts to a piece of acrylic sheet and then drop it into the box. Drill some holes in the side of the box for the power and audio cable. Mounting the electronics like this lets you take them out so you can change the micro SD card.

M2 Nylon Hex Spacers Screw Nut Stand-off Assortment – These make mounting things to the sheet of acrylic easy:

<https://www.ebay.com/itm/120PCS-M2-Nylon-Hex-Spacers-Screw-Nut-Assortment-Kit-Stand-off-Plastic-Accessory/272060054200?epid=1177650728&hash=item3f580afab8:g:DzMAAOSwp5JWWrtI>

NOTE: There are different sizes available – you want the M2 (2mm) size, not the more common M3! The holes in the little boards we're using for this need the smaller screws.

USB power supply (old cell phone chargers work fine).

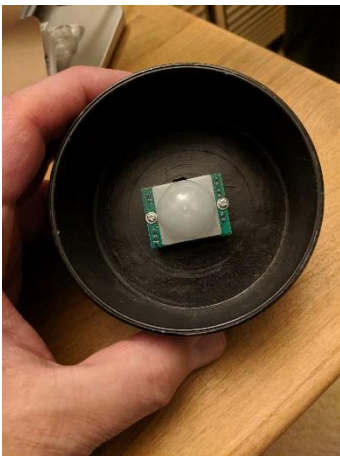
Powered speaker/boom box/etc. - Whatever you have. Find one with volume control.

Audio cable – This should have a headphone plug on one end for the MP3 player, and whatever you need to connect to your speaker on the other end.

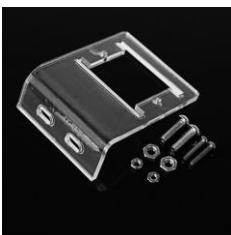
For mounting the motion sensor, there are two options:

A. I've painted one of these black and then drilled a hole in the back to connect the wires:

3 in. PVC Sewer/Drain Cap - <https://www.homedepot.com/p/NDS-3-in-PVC-Sewer-Drain-Cap-3P06/204799695>



However, with the brackets now available, you can find a plastic box with flat sides instead and use the bracket to fasten it to the side.



B. The other option is to mount the motion sensor on one end of the acrylic with the bracket and cut a hole so the motion sensor dome can stick out of the end of the box. Then paint the box black. The only wires coming out will be to the speaker and the power.

You can add a tube of cardboard to narrow the motion sensor's field of view. This lets you point it at a specific spot on a path. Here I'm using cardboard from a mailer. Paint it black and tape it in place.



Tools Needed

- Soldering Iron
- Solder
- Wire stripper/cutter
- Small drill for making holes for mounting the parts and for running wires out of the box (Dremel or similar)
- Small screwdrivers
- Glue gun - Once you have made all the connections, a bit of hot glue will keep them from moving and coming loose. (Look inside any cheap electronic holiday decoration, and hot glue will be EVERYWHERE instead of actual screws!)
- Acrylic cutting knife/box cutter/plastic sheet cutting tool
- Sharpie marker
- Masking tape or blue painter's tape

Soldering Tutorial

This will be helpful if you haven't soldered before.

<https://www.youtube.com/watch?v=Qps9woUGkvl>

Software

Arduino - <https://www.arduino.cc/>

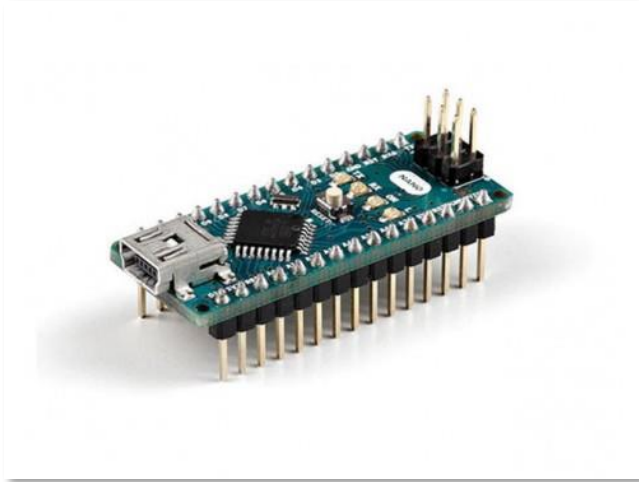
This is used for loading the software onto the Arduino.

Audacity - <https://www.audacityteam.org/>

Free open-source audio editor, you can edit the MP3 files if you want to make them longer or shorter.

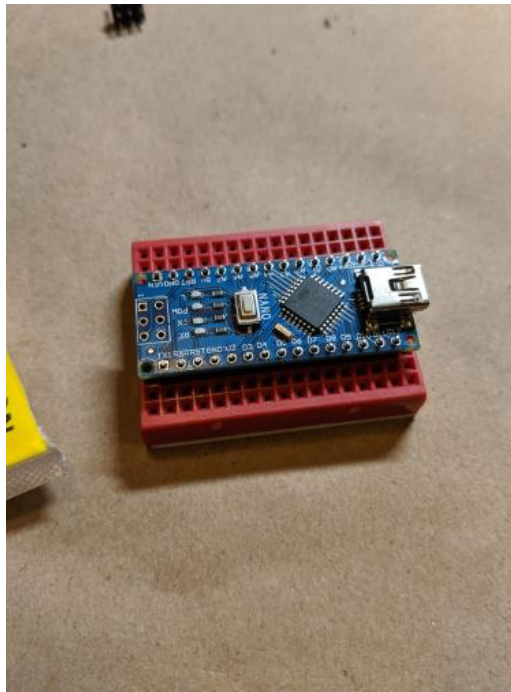
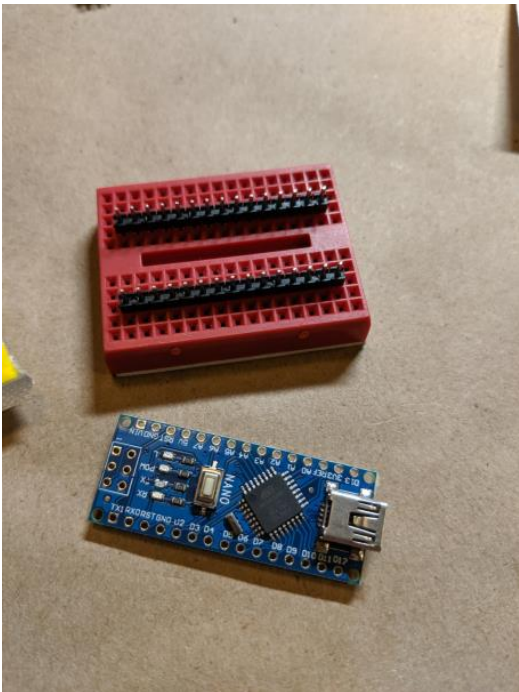
Build It

The Arduino Nano



This is what it looks like when assembled. The USB connector is on top and the long rows of pins are on the bottom. The little vertical group of pins on the right end is optional for this project, you can skip it.

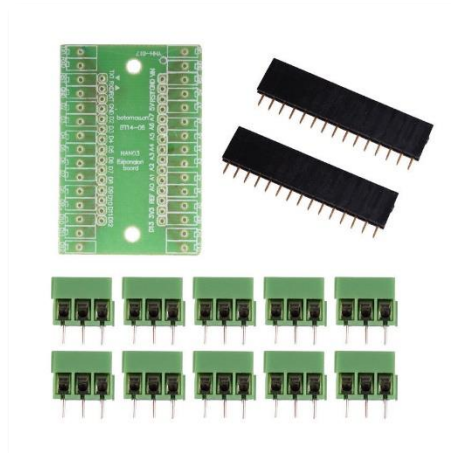
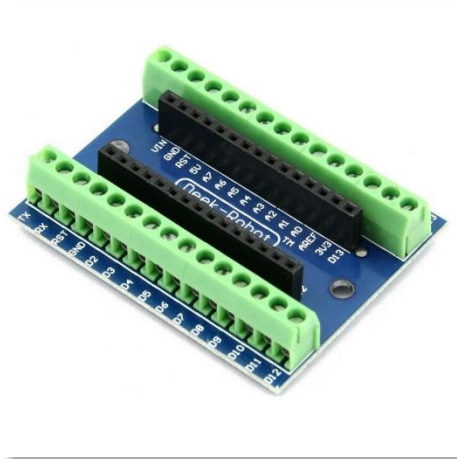
Get the mini solderless breadboard - we're going to use it to hold things in place. Plug the long rows of pins into the breadboard and set the Nano down so the short ends of the pins go through the holes. The short ends of the pins are just long enough to stick up through the holes in the Nano.



When the Nano is on the pins, press it down so all the pins are pushed into the board, and the Nano is flat. This is to make sure all the pins are not angled. Now, solder all the tops of the pins to the Nano. When you're done it will take a little bit of effort to pull it off the board, but the pins will all be straight!

The Nano terminal board

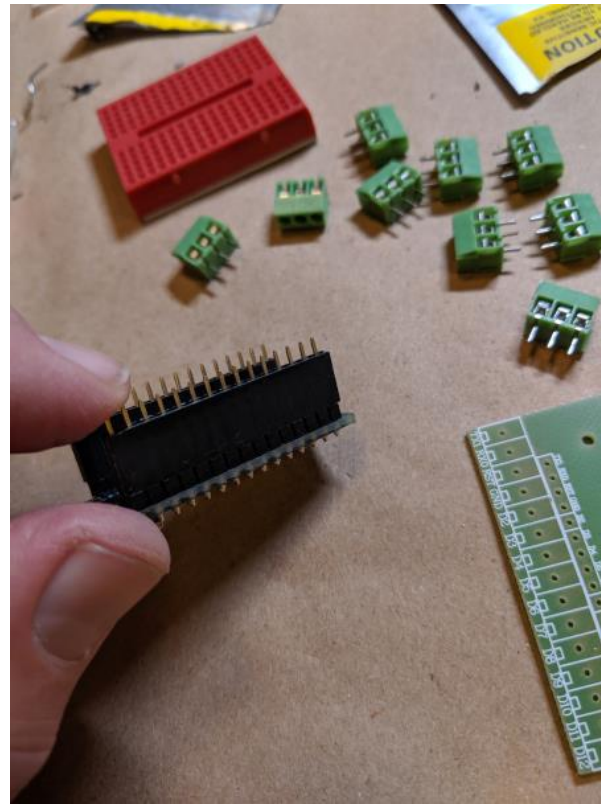
Here's what the terminal board will look like when it's assembled, and how it comes un-assembled:

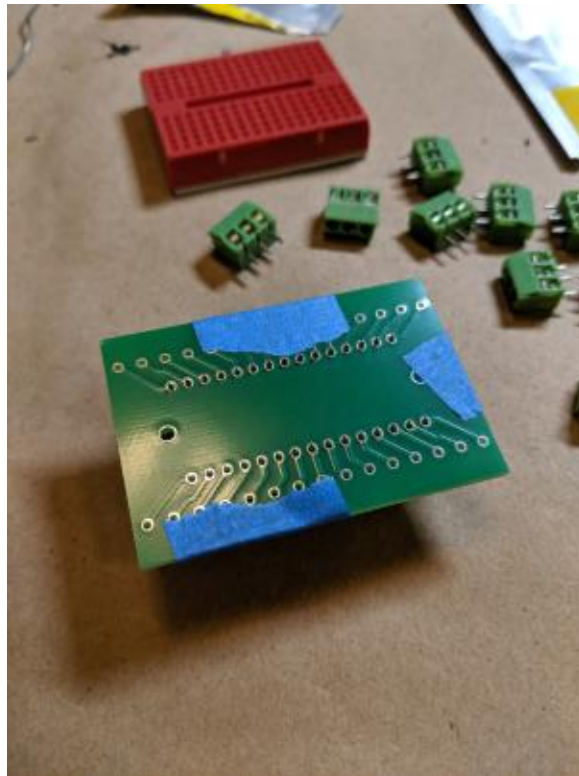


There are a few companies that make these, so yours may have some parts that are slightly different colors.

We're going to use the Nano from the last step to line up the black header pins so they're straight.

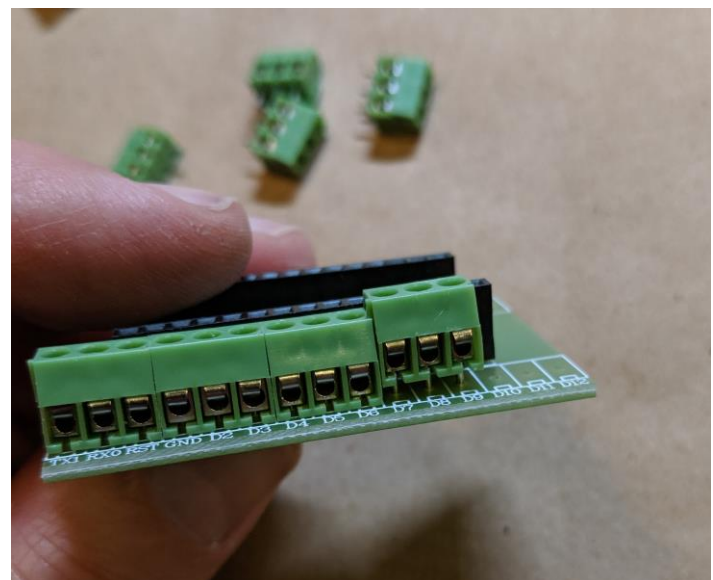
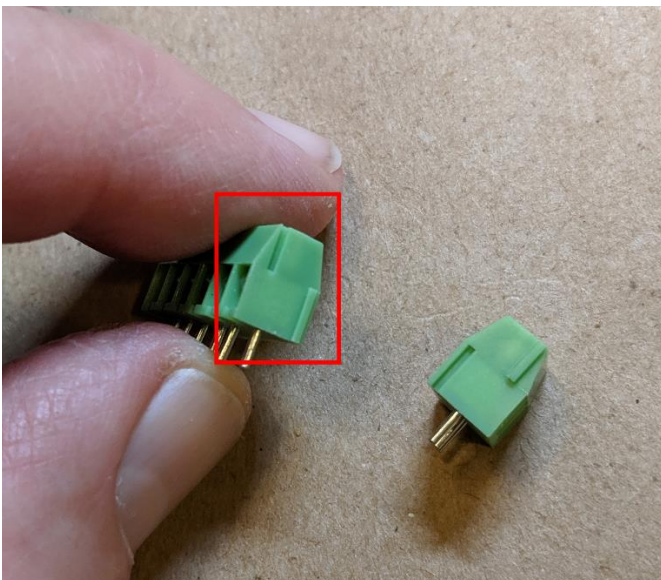
Step 1: Plug the black header pins into the bottom of the Arduino Nano.





Then push the ends of the headers into the two center rows of the terminal board and flip the whole thing over. Press down so the board is flat against the headers. You may want to use some masking tape to hold everything together, so it stays square. Then solder the ends of the header pins to the board. When you're done, take the Nano off to get it out of the way.

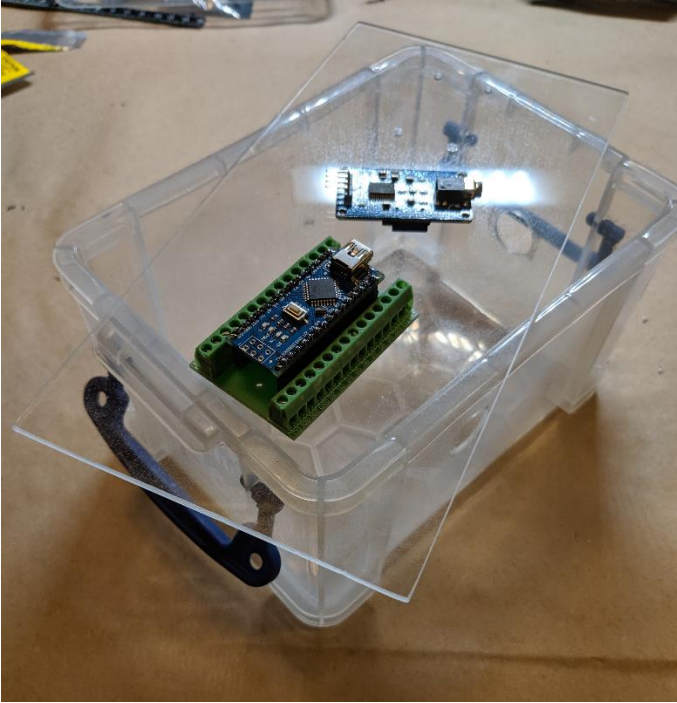
Step 2: I apologize in advance for this next step, this was the hardest thing I had to do in this entire build! The green terminals have little notches on their sides that slide together, so you can make a long group.



The best way to put these into the board is to put one in on the left and straighten out the pins so it goes into the board. Then take it out and connect the next to it – the one on the right is pushed down from the top. Straighten out the pins again and put them both into the board. Do this for the entire row. Then you can solder them. Again, use some

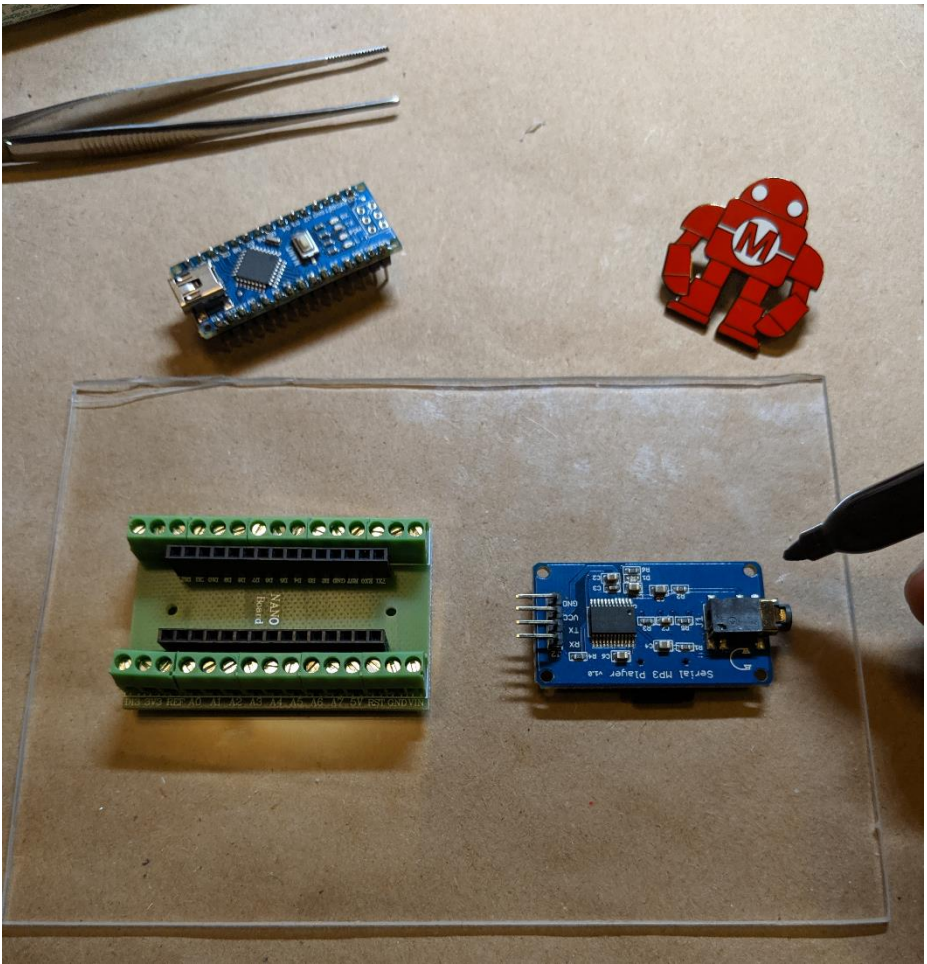
masking tape to hold them in place so they're square. Don't forget to make sure the openings for the wires face out!
Look closely at the picture.

Set Up the Box



Measure the interior of the box and cut a piece of acrylic to fit inside. This doesn't have to be a tight fit; it just needs to drop into the bottom and come near the edges. You want to be able to fasten everything to it and then drop it in.

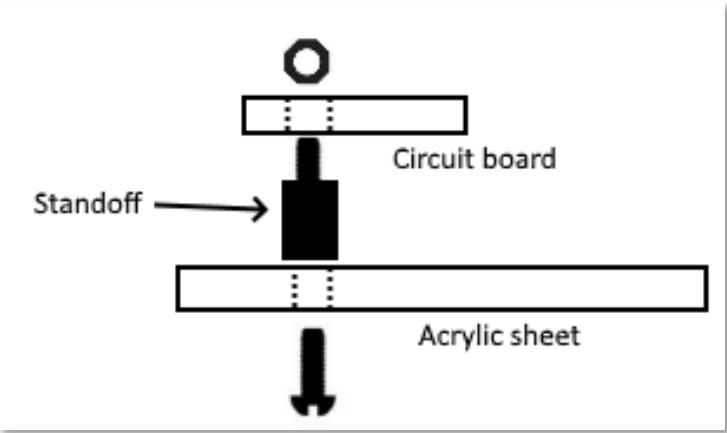
Place the Nano board (without the Nano - the Nano will block the holes in the adaptor board!) and the MP3 player on the board and use the Sharpie marker to put dots in the holes on the boards, for the plastic standoffs.



Then drill the holes for the standoffs.

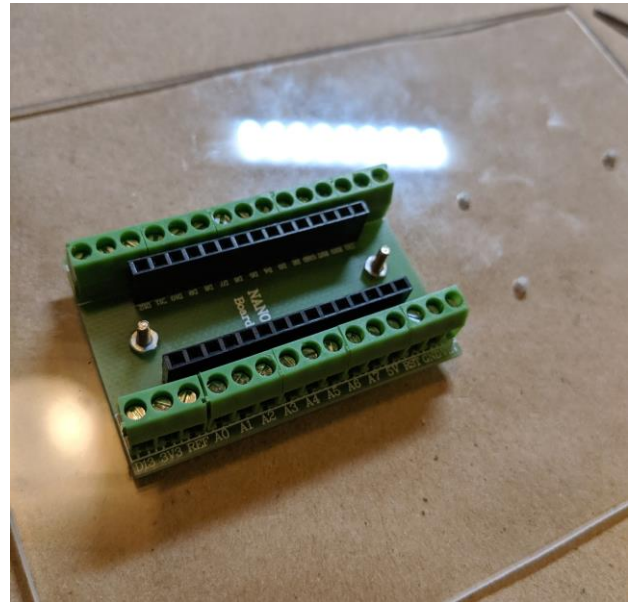
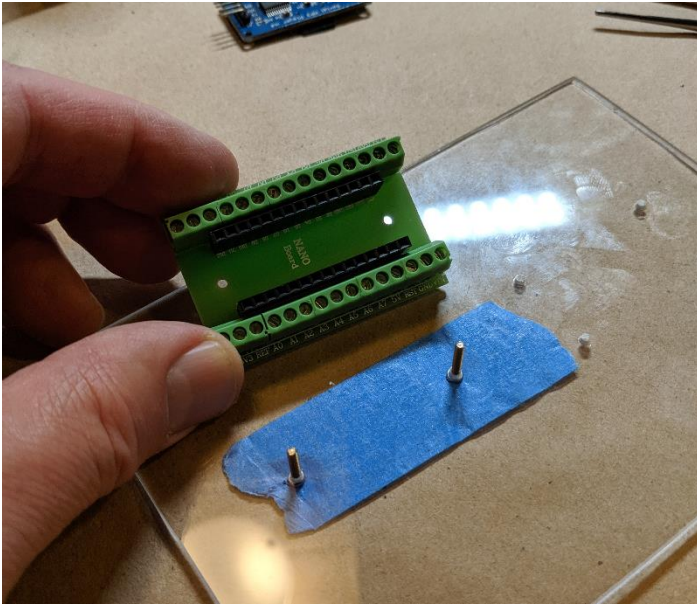
Makey the Bot approves!

Bolt Everything Down



There are three main parts to the standoff kit: small screws, the standoffs of various heights, and small nuts. The standoff in the pictures is a male/female version, but you may also get some that are female on both ends.

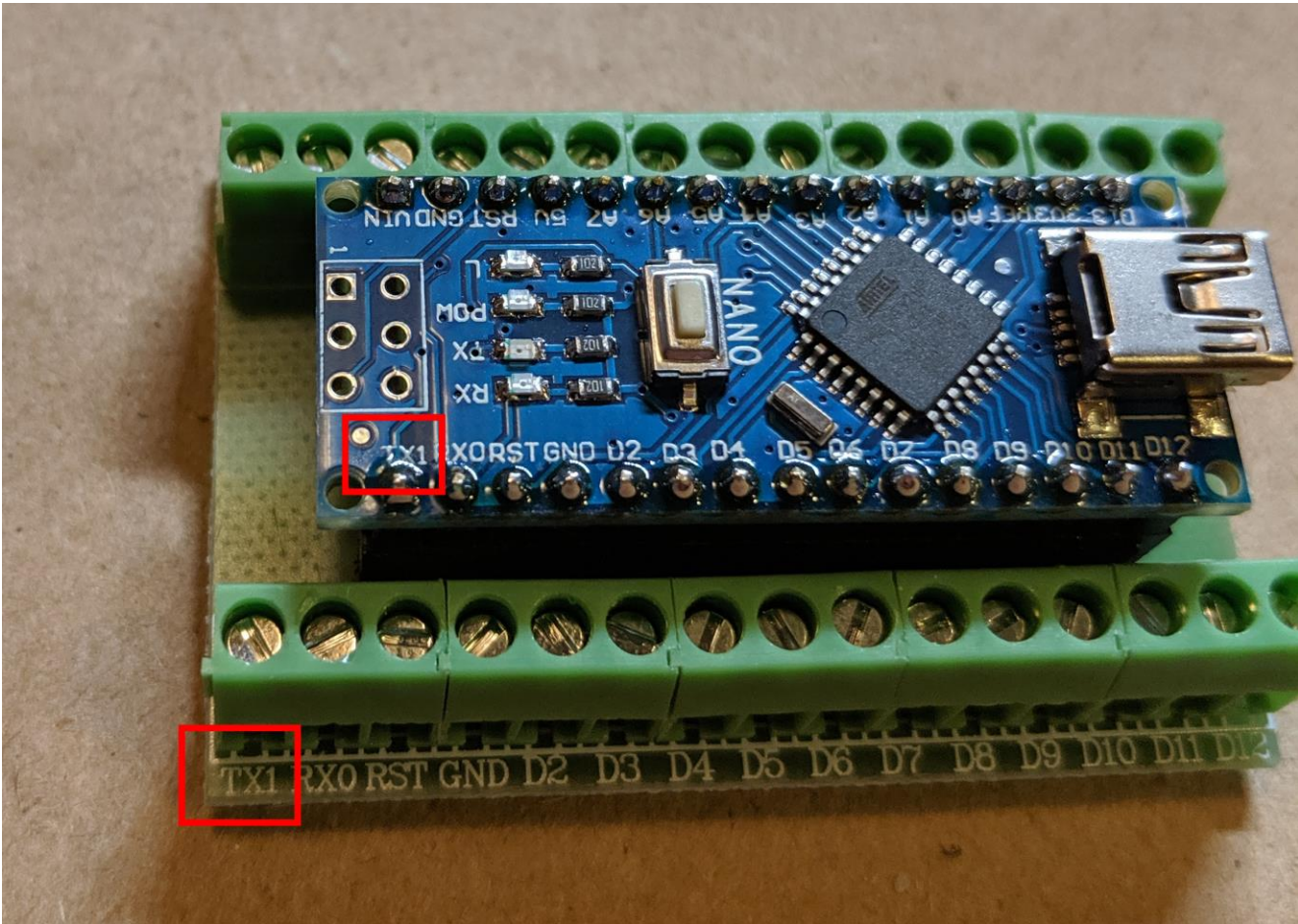
I find the easiest way to do this is to put the plastic screw in from the bottom of the board and screw the standoff down. Then put the circuit board onto the standoff's screw end and finally use a plastic nut to hold the circuit board down.



I found that since the Nano expansion board only has two mounting holes in it, running down the center, you do NOT want to use the standoffs...it will be unstable. Instead, just push screws in from the bottom of the board, hold them in place with tape, and then fasten down with nuts.

The MP3 player has four mounting holes, one in each corner. Use some of the taller standoffs. The micro SD card slot is small and on the underside of the board, so using taller standoffs makes it easier to put the SD card in.

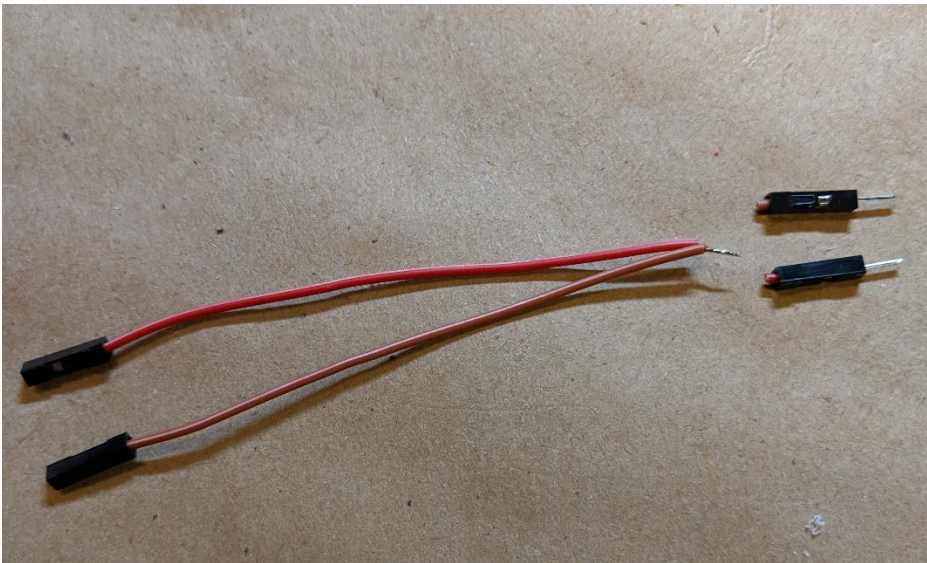
When this is done, you can plug in the Nano to the board. Make sure the numbers next to the Nano pins match the numbers on the board. Look at the red squares in the picture. This way you can look at the bigger numbers on the board and you'll make the right connections.



The Y Cable

Make a Y cable to split power to both the MP3 player and the motion sensor. It will end up like this:

- One male end
- Two female ends

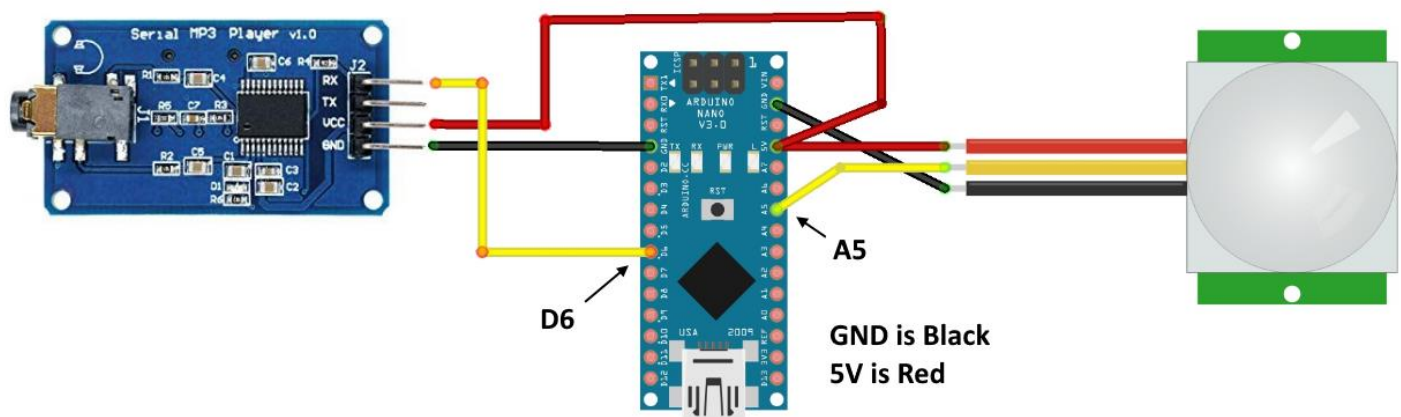


Strip off a set of two of the jumper wires from the group. Cut the male end off two of the jumper wires. At the ends you just cut off, strip enough of the plastic to expose about 1/2" of wire. Solder them together, to make one bigger end you can plug into the terminal on the Arduino. The other ends will provide 5 volts to the MP3 player and the motion sensor.

Connect the Motion Sensor and MP3 Player to the Nano

Use the Y cable you just made to connect to the 5V pins on the MP3 player and the motion sensor. These are the red lines in the diagram.

The female ends connect to the motion sensor and the MP3 board. The male ends plug into the terminal blocks for each pin. Use a small screwdriver to tighten the terminal block down so the end of the pin is held in place.



The diagram is a bit small, so here are the pins you need to connect:

Arduino – Motion Sensor

5V – 5V (this is one end of the Y cable)

GND – GND

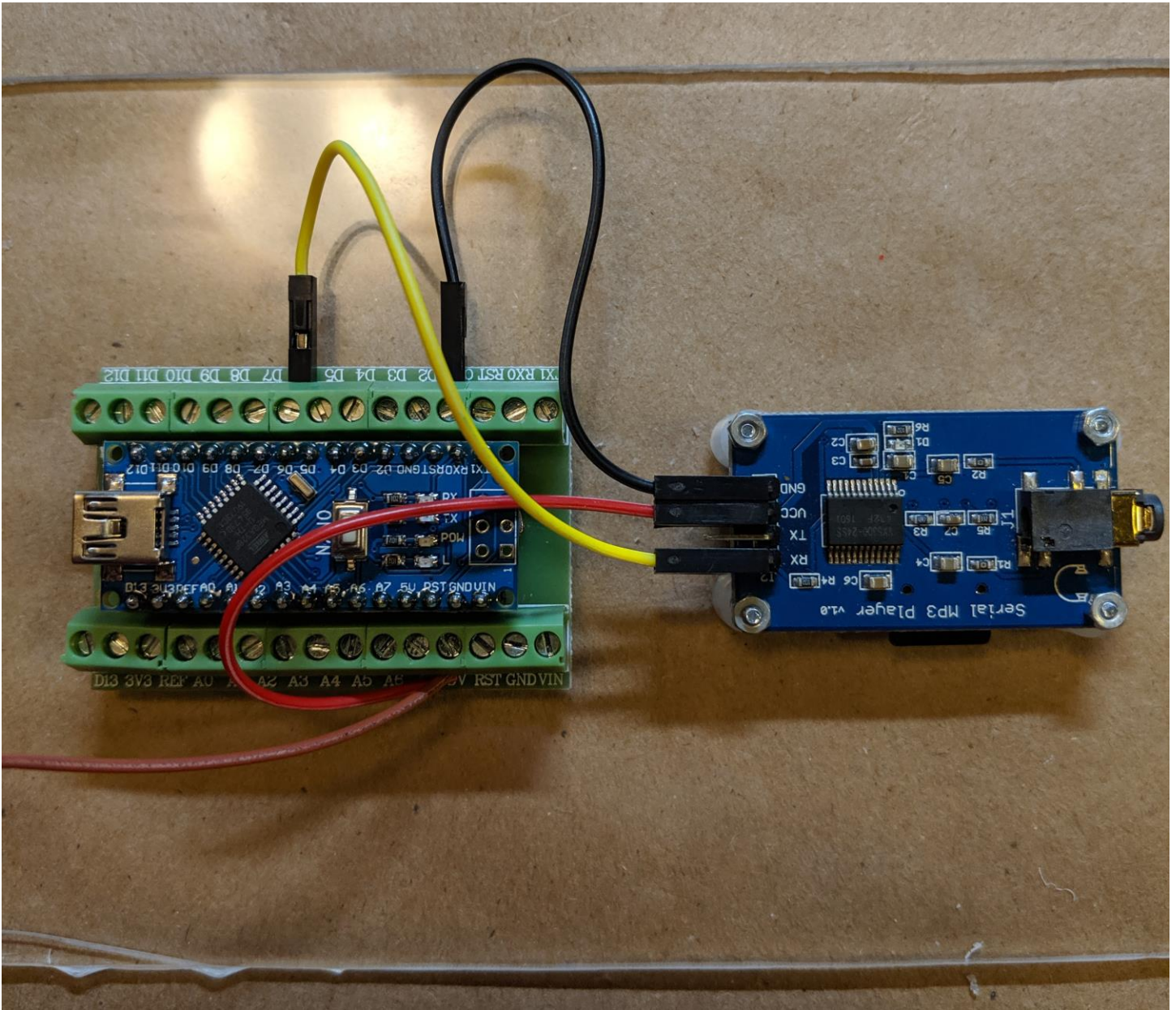
A5 - OUT

Arduino – MP3 player

5V – VCC (this is one end of the Y cable)

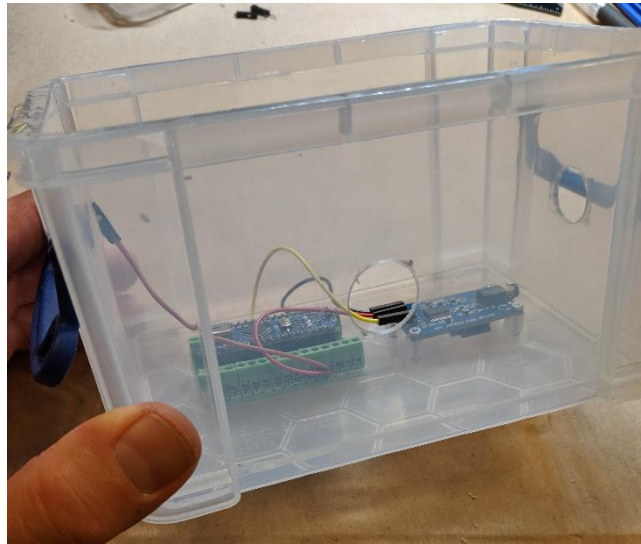
GND – GND

D6 – RX



Here's what the connections to the MP3 board look like. The brown wire going out of the left of the picture is power for the PIR motion sensor.

For the rest of the connections, strip off a set of two of the jumper wires from the group, and plug them in.



Here's how it will eventually drop into the Really Useful Box. This is from a previous project, where I've drilled holes in the sides for wires to go through.

Setting Up the Arduino Software

Install the CH340 driver:

The Chinese clones have a driver that needs to be installed on your computer before you can connect to the Arduino. This guy talks more than he needs to, but he is clear on how to do things. He also has links for both PC and Mac versions of the driver. And his basement is a MESS.

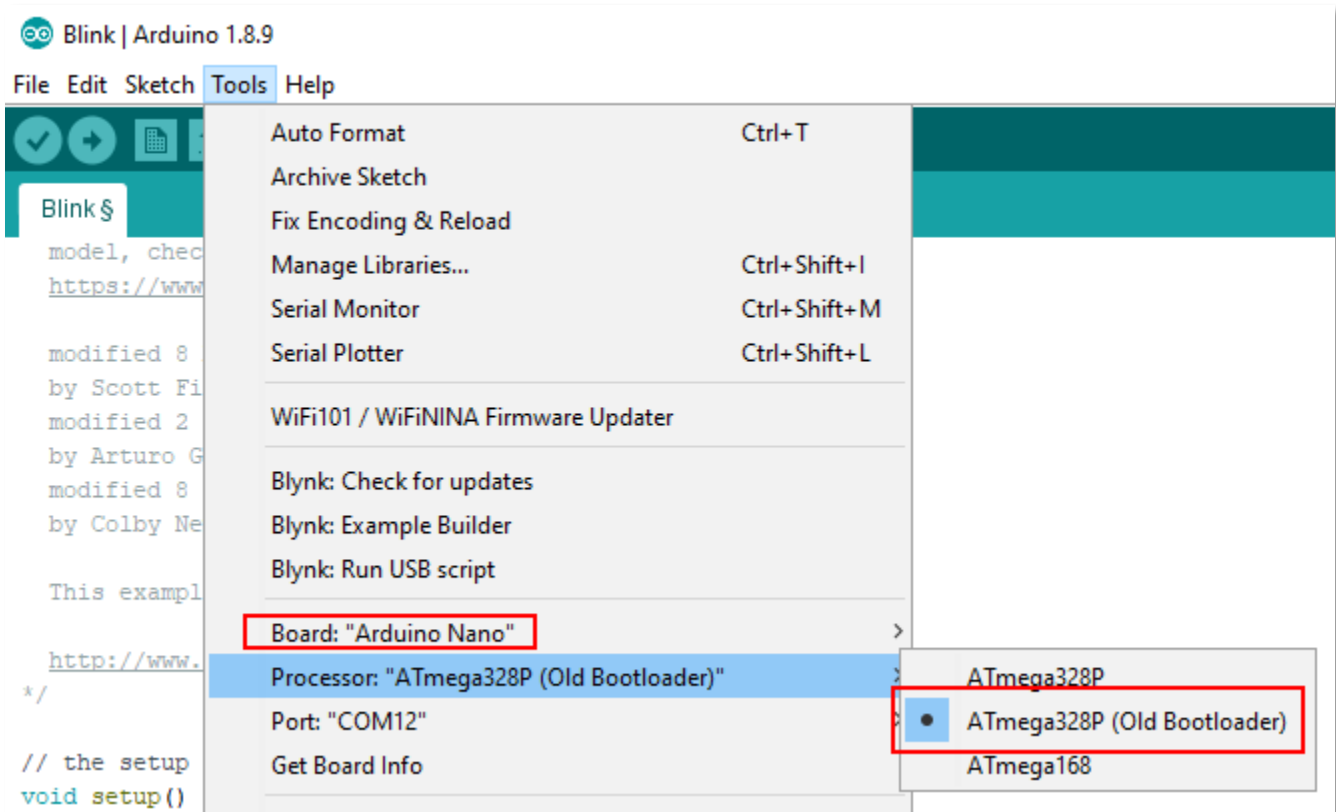
<https://www.youtube.com/watch?v=U-Q8EX-5Mpw>

Arduino tutorial by Adafruit:

This tutorial will show you how to set up the Arduino software and load software onto the Nano that will make an LED blink.

<https://learn.adafruit.com/ladyadas-learn-arduino-lesson-number-1>

Note that they use an Arduino Uno for this. Since we're using cheap Nano clones, select these options at the Select Board Type step:



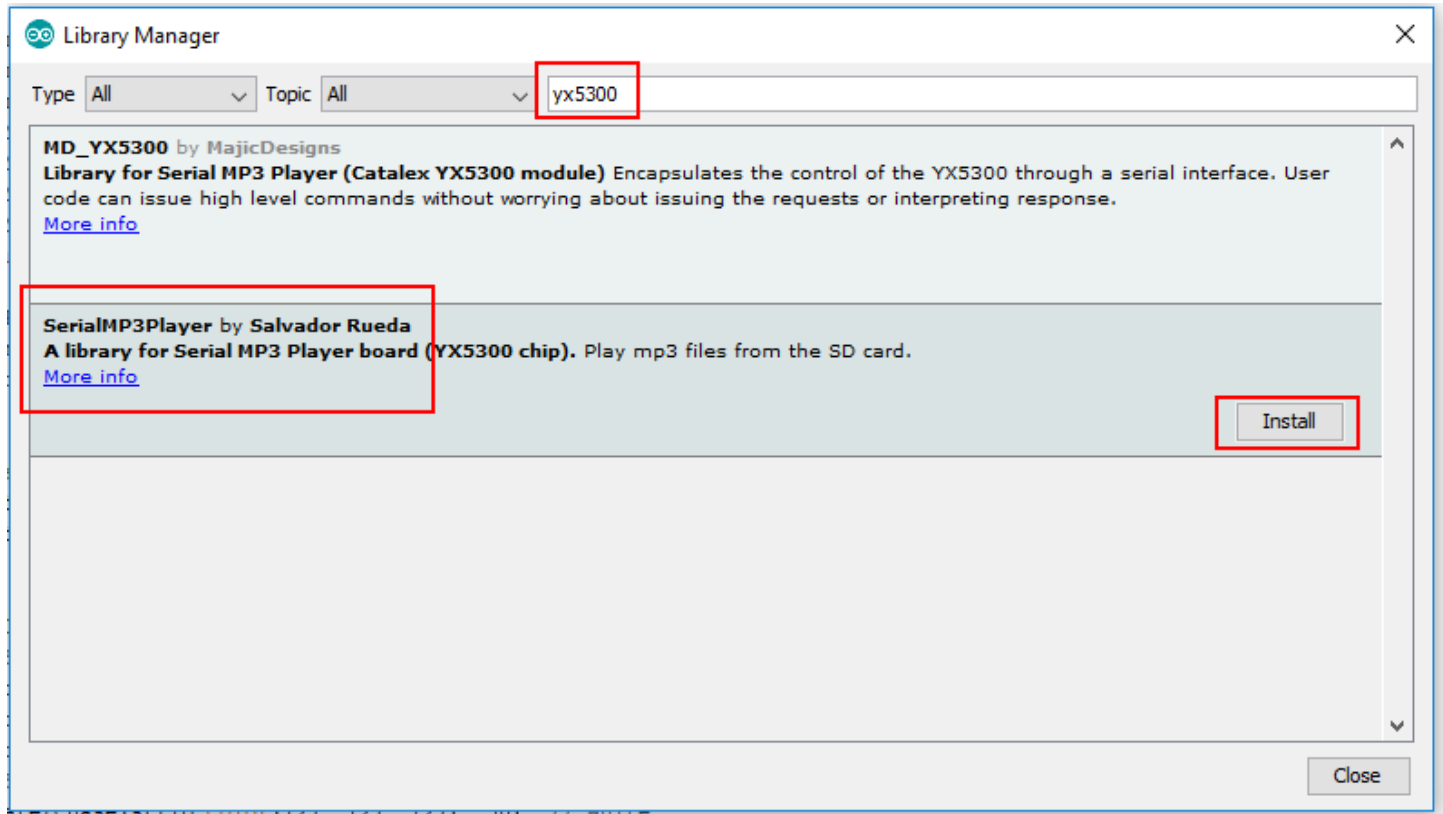
Once you can load a sketch onto the Nano, you need to do one more step so it can play MP3s.

Add the SerialMP3Player library to the Arduino IDE:

In the Arduino software, go to:

Tools > Manage Libraries

In the search box, type YX5300:



Click the "Install" button on the section named **SerialMP3Player** by **Salvador Rueda**.

The Arduino Software

Download and unzip Scream_Box.zip, this is the file that has the software for the Scream Box.

Then open the Scream Box file in the Arduino IDE:

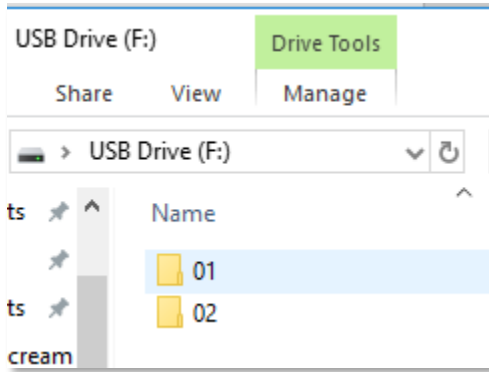
File > Open > (browse to where you saved the file and select) Scream_Box.ino

Connect the Nano to your computer and upload the Scream_Box sketch. This is the same as the way you uploaded the Blink sketch.

Unplug the Nano from your computer.

Put MP3 on the Micro SD card

Get the sound you want into MP3 format.



Make a folder on the micro SD card. Name the folder “01”.

The software can play many MP3s in multiple folders, but for this project we’re only using the one MP3.

Name the MP3 like this:

001 Scream.mp3

The important part is the “001” at the start of the name.

Copy the MP3 to the folder on the micro SD card. Plug the micro SD card into the slot on the MP3 board. (This is why I had you use taller standoffs; the card is tiny and so is the slot you plug it into.)

Connect the speaker to the MP3 card

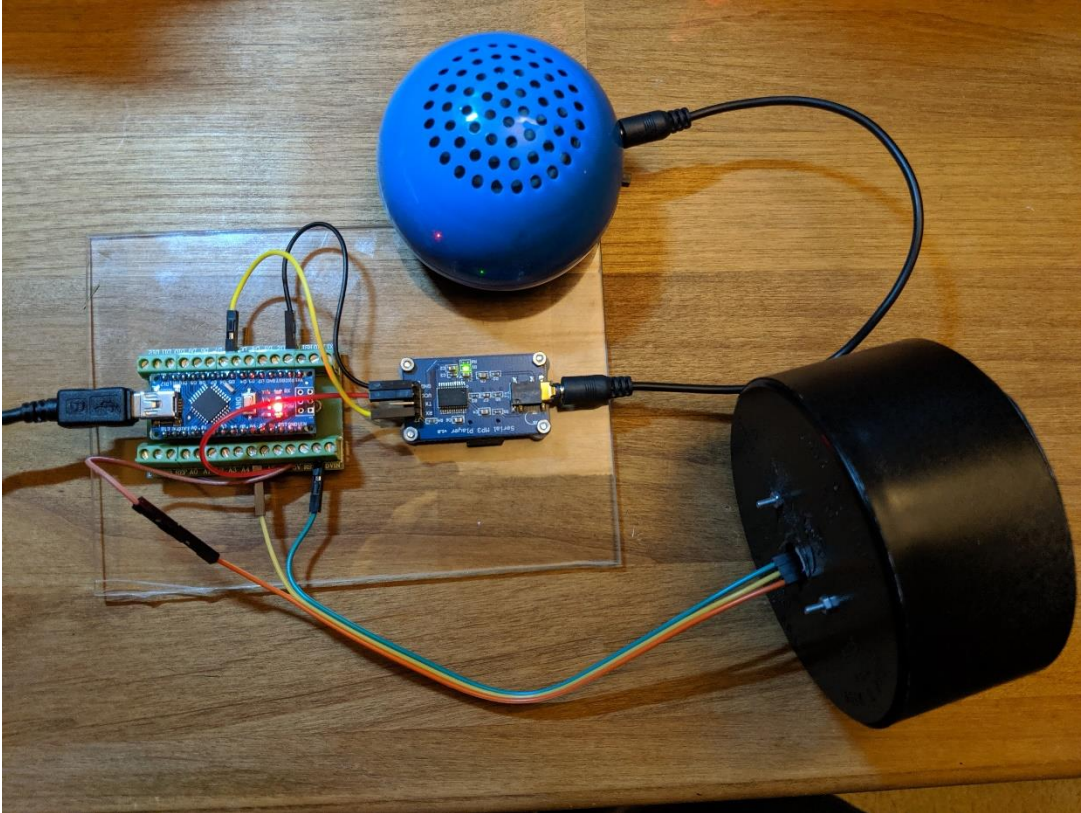
Use the audio cable to connect your speaker to the MP3 card’s headphone jack. Turn the speaker on.

Power on and test

Plug the USB power supply into the Nano.

The motion sensor needs time to warm up and get used to the area it's pointed at. There is an LED on the Nano that I set up to indicate that this warmup is taking place. It blinks while it's warming up and stops when it's ready. This takes about 30 seconds.

Once the LED stops blinking, wave your hand in front of the motion sensor. You should hear the MP3 play from the speaker!



This is the setup with a small dollar store speaker I use for testing.

Note you can use the jumper wires to extend the PIR motion sensor farther away, just daisy-chain the longer ones and then tape the connections together.

You can also use the bracket to mount the PIR on the acrylic sheet and have it look out a hole in the box.

Disguise It

Paint the box black, hide it behind or inside something, or cover it with camo cloth as part of the ground cover. Set it up so the PIR motion sensor looks where people will walk.

Changing How Long It Waits

The Arduino software is currently set up to wait 30 seconds after it's triggered before it can go again. If you want to change this, look for this line in the code, in the Prop Timing variables section near the top:

```
int ResetTime = 30;           // Time until next trigger.  Time in seconds.
```

This includes the length of the MP3 and how long you want to wait until it can be triggered again.

For example, if you have a 3 second scream, and you want it to trigger again soon, you could set it to 15 seconds total. The MP3 will play for 3 seconds, then it can be triggered again in 12 seconds.