Bleep Labs

THINGAMAKIT

Greetings fellow maker. You are about to construct a device of huge NOISE-O-LOGICAL potential with your own two hands!

Dr. Thaddeus J. Bleep, Noiseologist

First let's look at the tools you'll need:

- Soldering iron
- Solder (the PCB and most components are RoHS, but lead-free solder is not necessary)
- Fume extractor or similar fan (necessary when working indoors)
- Small diagonal cutters (flush cutters work better but cost a bit more)
- Wire strippers
- Small pliers
- Electrical tape
- Drill and assorted bits (3/16", 5/16" and 1/2")
- Helpy hands
- Safety glasses
- Speed square or other right angle ruler (to mark holes on enclosure)
- Hobby knife
- Scissors
- Screwdrivers (regular and "jewelers" size flat head and regular phillips head)

Optional:

- Hot glue gun (very useful when working with any enclosure)
- Adjustable crescent wrench
- Multimeter (not necessary but good for diagnosing problems)

This project can be completed by those who are new to soldering, but it is very important that you know how to solder safely before you start. This includes working in a well-ventilated area and wearing safety glasses. Please refer to Bleeplabs.com for links to soldering info.

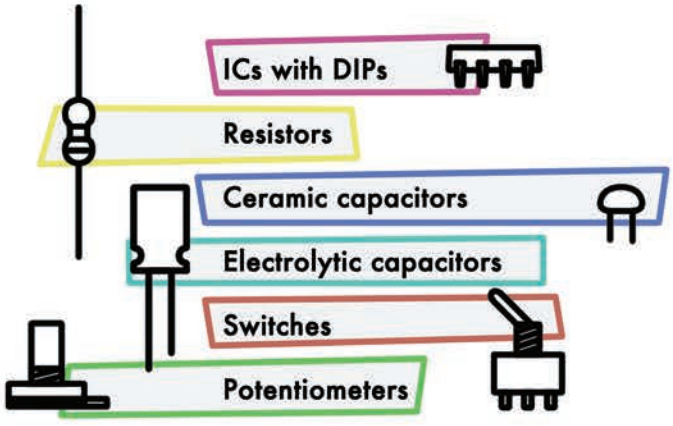
After you have gathered your tools together, take a minute to set up your workstation.
The first safety concern with soldering, lead-free or not, is breathing the fumes. The easiest place to solder is outside on a porch or in an open garage. If you must work inside, work next to a window with a fume extractor or good fan.

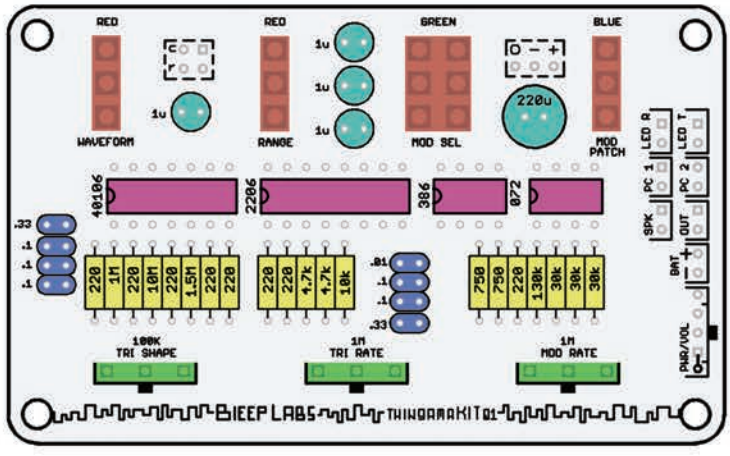
Thingamakit steps:

1. Populating the PCB
2. Wiring
3. Soldering
4. Test
5. Enclosure
6. Modification
7. NOISE!

1. Populating the PCB

The Thingamakit PCB has 6 types of components on it. You'll be installing them one by one in this order :



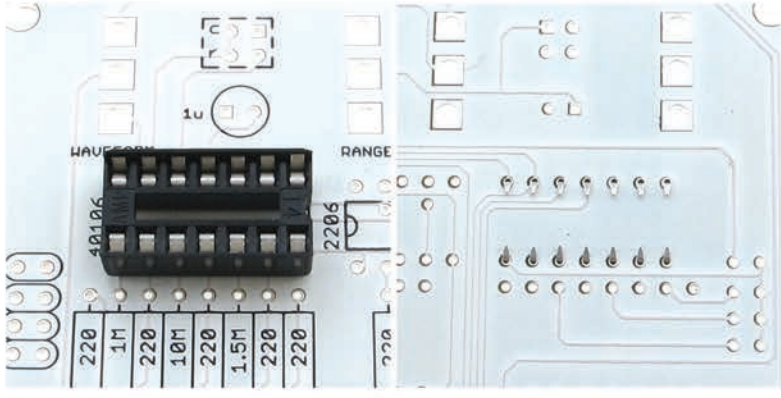


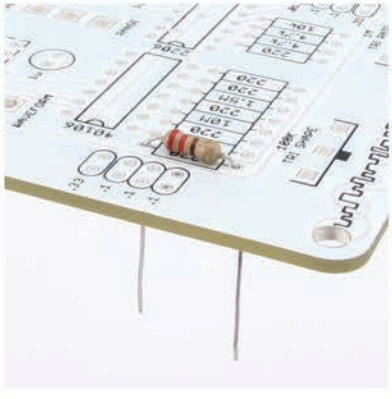
The DIPs.

DIPs are sockets that protect the ICs from direct soldering. The ICs will be installed after all the soldering is done.

Insert the DIPs into the middle row (direction doesn't matter). One 14-pin DIP in the 40106 space, one 16-pin in the 2206 space, and two 8-pins in the 386 and 072 spaces.

Then, bend the pins toward each other using your large flat-tipped screwdriver.





The resistors.

Starting with the first value on the left (220), install all of the resistors for that value and move on to the next value until all 20 resistors are installed.

Bend the leads of the resistor down, insert the leads into the PCB, and then flatten the leads away from the resistor.

Clipping the resistors.

Once all the resistors are in the right place, take out your cutters, put on your safety glasses, and clip off the leads. Leads can shoot off with some force, so cut away from you. Be sure to save a few for later.

The best place to cut is *just* on the outside of the pad, leaving enough lead for the resistor to hang on but not too much so that it could touch another pad.

The large capacitors.

The electrolytic capacitors are polar, meaning that they **must** be oriented in a specific way on the PCB.

Insert the side with the black stripe and the shorter lead into the square pad. When you are finished, all 5 large capacitors will have their black stripes on the left.

After they are all inserted, fold and cut the leads just as before.

The small capacitors.

The ceramic caps are not polar, but you have to take care to put the right value in the right place. On one of the capacitor's sides there will be a number showing the value:

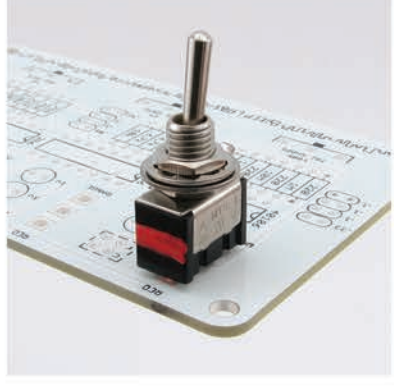
104 = .1
103 = .01
334 = .33

You can insert, fold, and clip the small capacitors just like the other components.

Switches and Pots.

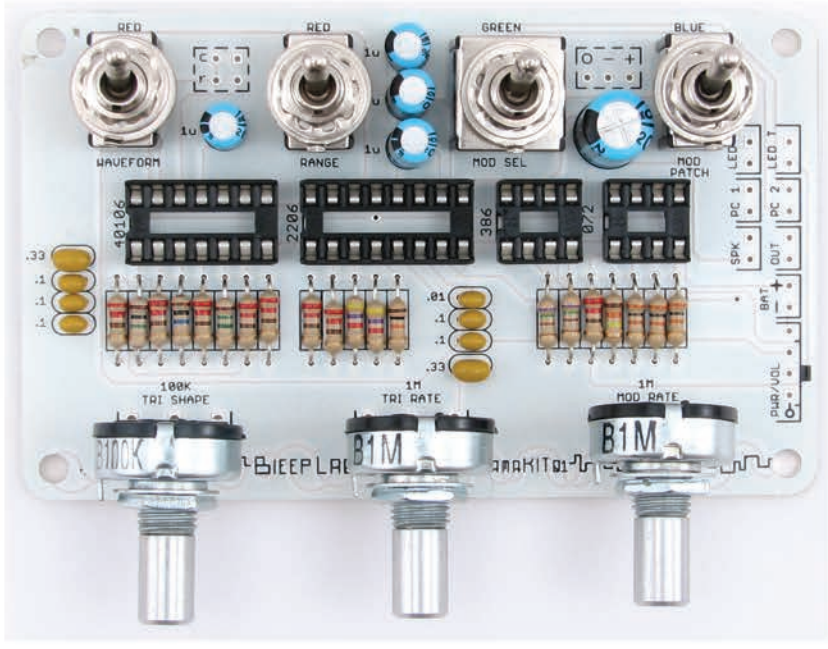
With the colored mark facing up, insert the switches into their corresponding slots. It will take a good amount of force, but don't worry, you won't break anything.

The values of the potentiometers are printed on their sides. Insert them with their shafts facing down and just a small bump of their leads sticking out the opposite side of the PCB.



2. Soldering

First make sure everything is installed correctly. It is very difficult to replace a component once it's soldered in.

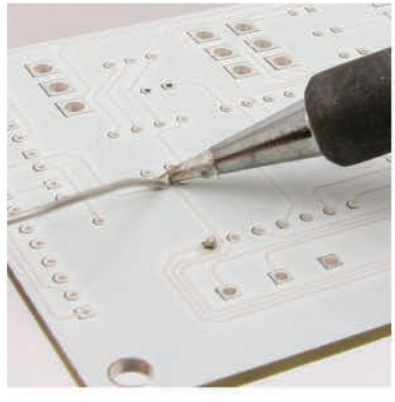


Begin by soldering in the pots and switches.

Heat the component's lead, then slowly push the solder into the hole. Avoid using too much solder since it can glob up on the opposite side.

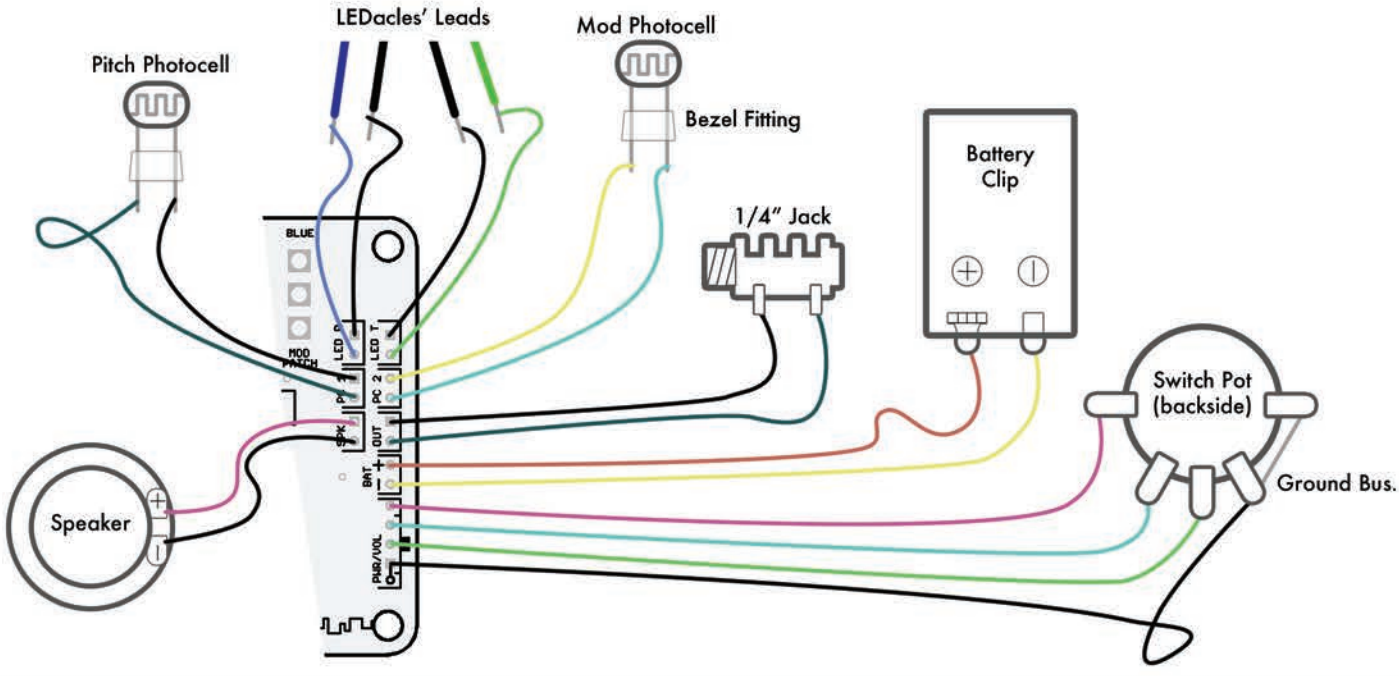
The rest of the soldering on the PCB is simple. Just work in lines from top to bottom so you don't miss any pads or connect any leads together.

Next you'll wire and solder up the rest of the components.



3. wiring

It's easiest to first cut and strip all of the wire needed, then solder the wires to the componets. For the stompbox enclosure, that means twelve 4" wires and six 8" wires. If you have your own enclosure, make sure to cut the wires long enough.



Start with the switch pot. This is where the helpy hands tool becomes necessary.

Use one of the clipped leads you saved earlier to connect the two right-most pins, creating a ground bus. This allows you to connect one of the black wires shown above (such as the inside pin of the 1/4" jack) to the ground bus instead of its PCB pad. If you are using the stompbox enclosure, I recommend connecting the 2 LEDacle grounds to the 1/4" jack ground.

Use black wire where indicated in the diagram. This makes it easier to tell what pins are grounded. The rest of the wires can be whatever color you choose.

If you're going with the stompbox enclosure, make sure to use the longer wires on the switch pot and speaker.

Soldering as you go, hook up the rest of the componenents in this way, but wait to solder the LEDacles and speaker. You'll solder them later when everything is in the enclosure.

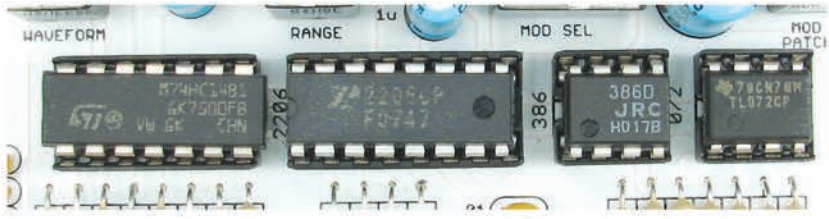
Slide the bezel fittings over the photocell's leads. The fitting's open end should be by the photocell. Clip the leads to about 3/4"and solder the wires to the ends of the leads.

Lastly, solder the wires to the PCB. This includes the wires for the LEDacles and the speaker, but wait on soldering the other ends of these wires to their components.

4. Testing

Now it's time to test!

Insert the chips into their corresponding DIPs with their text right-side up.



Twist the LEDacles' wires to their matching PCB wires and insert a fresh 9 volt battery. Flick all the switches down, turn the pots to the center, and turn the switch pot up. You should be instantly delighted by **bleepish noise!**

If not then check:

- Wiring: Go through the diagram again, especially the battery and switch pot connections. Separate any leads that shouldn't be touching.
- Solder side: Make sure that all of the points are soldered. Also separate any solder points that are touching.
- Chips: Are they in the right way? If they feel warm, immediately take the battery out. This means that they are in upside-down or that there is a short somewhere.
- Capacitors: Are they all in, with their black marks on the left side?
- Photocells: Make sure that the leads are not touching each other.

If this does not solve your problem, then the best advice is to come back to it later. Seriously. I cannot count the number of times I have spent hours infuriated by a project only to look at it the next day and find the problem immediately.

If you still cannot find the problem, we are glad to help. Just email us at drbleep@bleeplabs.com

5. Enclosure

Next, you'll need to find an adequate enclosure. You can purchase our "stompbox" enclosure but the world is full of great junk begging to be turned into a noise friend! Just keep in mind that it will have to accommodate:

- The PCB and its controls
- The volume pot and output jack
- Two LEDacles and their mounting hardware
- A speaker
- The 9V holder
- The photocells

The PCB is designed to have as little wiring as possible, with most of the controls being soldered directly to it, but you can wire all of the controls by hand.

This guide is for our stompbox enclosure but the same steps can be applied to any enclosure. Check out the kit section at Bleeplabs.com for enclosure ideas from Dr. Bleep and other noise enthusiasts.

Please submit pictures of your finished box to the Thingamakit Flickr group!

Dr. Bleep's first kit prototype, built into an old desk intercom.

Marking the box.

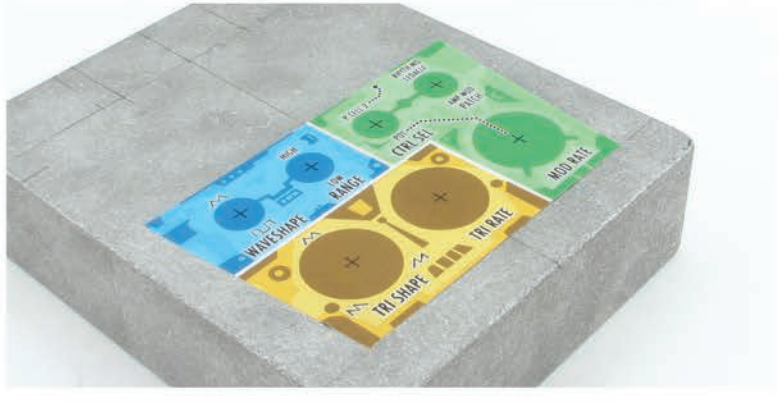
First you will have to mark where to drill and place the control panel sticker. With your right-angle ruler and a pencil, draw the red and blue lines indicated on the jig sheet onto the enclosure.

Next, continue the blue lines down the sides of the enclosure and make a perpendicular mark 5/8" from the top of the enclosure.

Applying the control panel sticker.

Before applying the sticker, check that your lines are straight.

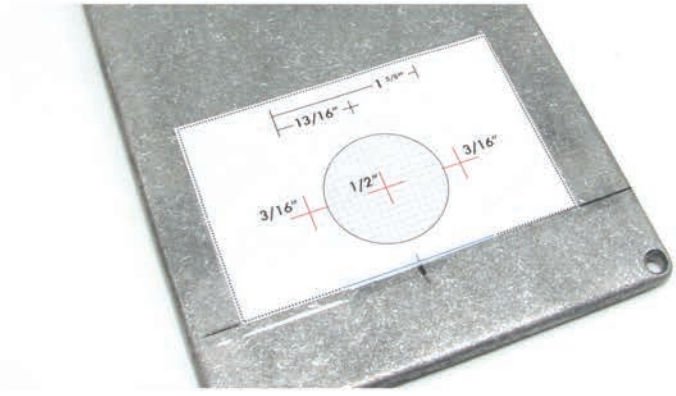
Peel the bottom off and carefully position the sticker as shown on the jig sheet. Don't be afraid of taking the sticker off and trying again if it is not lined up correctly.

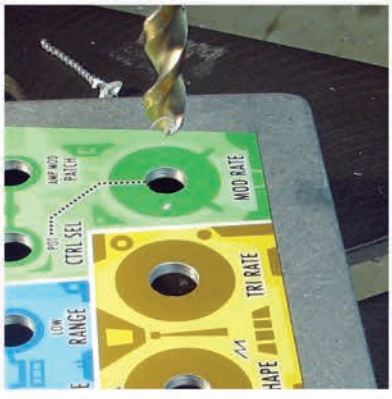


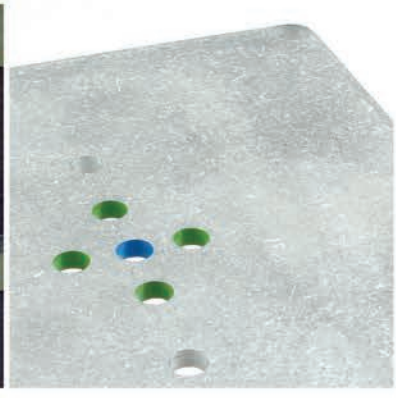
Next, you need to mark the holes for the speaker.

On the back plate, make a line 1" from the bottom with a perpendicular line 2 3/8 " from the side to mark the center.

Cut the speaker section off of the jig sheet along the dotted line. Match the blue line up with the mark you just made and tape it down with clear packing tape. The tape will allow you to drill through the paper without ripping it.







When drilling the enclosure, be sure to go slowly, starting with a small bit and working up to the size needed. This will make your holes more accurate and reduce the possibility of binding the bit up and dangerously spinning the enclosure around.

For the speaker grill, you can either make the holes as indicated, or you can use the grid to make whatever design you like. Just stay inside the speaker outline.

Once all of the holes are drilled, you can erase your pencil marks. I like to color the insides of the holes using paint pens.

Now, you can install the electronics starting with the LEDacles.

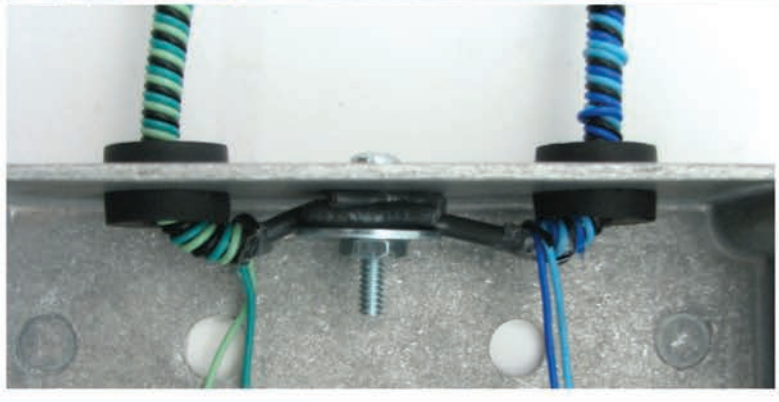
Insert the rubber grommets into the large holes and push the LEDacles through them.

Make a 90° bend 2" from the end. Then make a 180° bend 1/2" from the end, creating a hook.

Put a toothed washer on the longer screw (3/4"), and put the screw through the small hole on the top of the enclosure. Then loop the LEDacle's hook around the screw.

Repeat these steps for the second LEDacle.

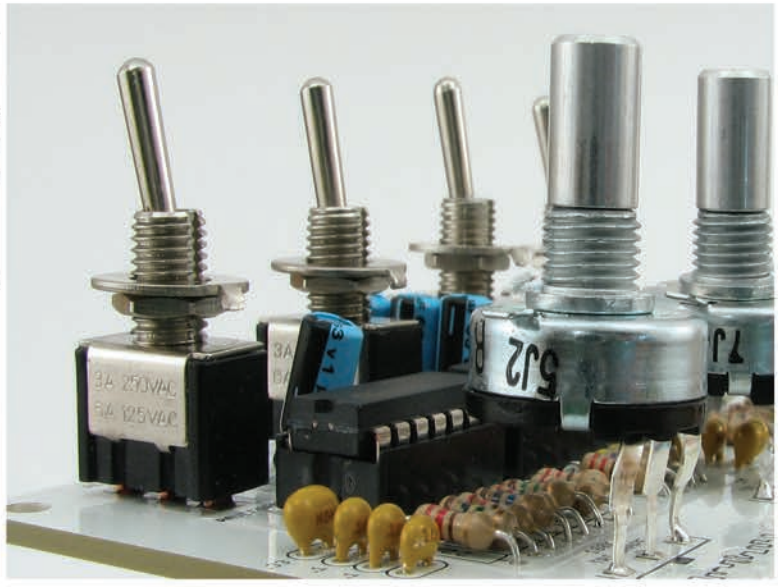
Once both of the LEDacles are hooked on, put the large washer and nut on the end of the screw and tighten the nut as far as you can.



Next up is installing the PCB. Start by removing all the screws and washers from the components.

For the switches, put on a nut and flat washer as shown. The washer will be about 2mm from the bottom. Make sure that the small tab on the washer is facing down.

Bend the pots where the leads meet the base. Then, fold down the small flange next to the shaft.



Now insert the PCB up through the enclosure.

Once it is through, place the toothed washers on the switches and the flat washers on the pots. Then loosely screw on the nuts. Move the PCB around until the controls are straight and then tighten the nuts. A crescent wrench would be best but pliers will work fine. Make sure not to overtighten any of the nuts.

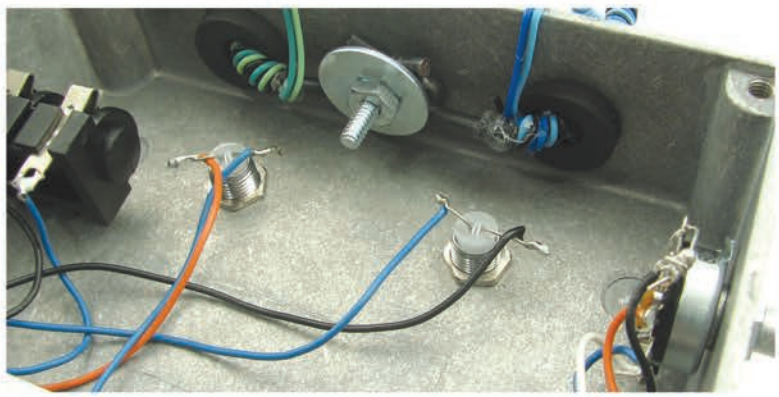
Install the switch pot and output jack on the sides of the enclosure. Make sure that none of their leads are touching the enclosure.

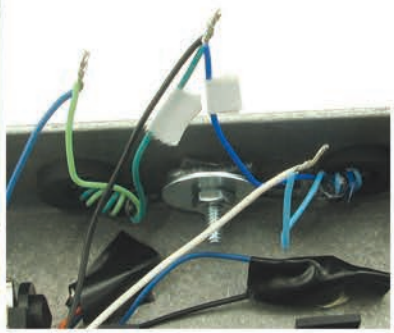
The output jack will have a black plastic washer on the inside and a black nut on the outside.

Insert the photocells into the bezels, pushing the clear fitting down into the holes. Then push the leads of the photocells through the fitting.

Make sure that the photocell's leads are not touching, using your small screwdriver to separate the leads if necessary.

Cover the exposed leads with electrical tape.





Remove the backing from the white foam tape squares and apply them to the bottom of the battery holder. Install the battery holder as shown, pushing it down hard for 10 seconds.

Next, wire up the LEDacles. The ground wires for the LEDacles are usually black but might be denoted with a white flag as seen here.
Solder their leads to the PCB wires and cover the bare connections with electrical tape. Here, I have connected both of the LEDacles' grounds together and then connected them to the PCB.

Next is the speaker. On the internal side of the back plate, center the screen on the middle hole and place the speaker on top so that the screen pokes out slightly on both sides as show..

Hold the speaker in place and screw the short, pointed screws into the plastic holes. Be sure not to overtighten them as you might strip the plastic.

Flip the back plate over and apply the rubber feet and logo sticker.

Tuck all of the loose wires under the PCB or tape them down. Insert a battery and close it up.

Next the knobs go on. Loosen the small set screws on the knobs and turn all of the pots to the left. Push the knobs on so that the white pointers are as shown. Once you are happy with their orientation, tighten the set screws.

The last step is to put on the face. It is up to you how you would like your noise friend to look. Here I have cut the orange squares into eyebrows. You could also unscrew the bezels and put something around the eyes.

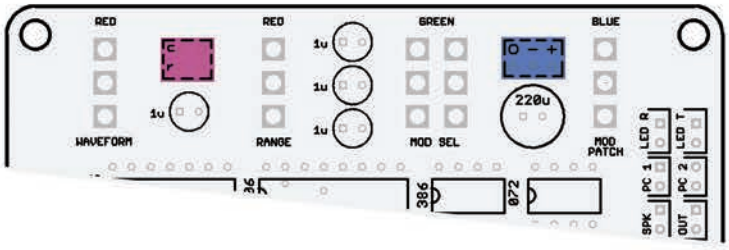
Or you could use the colored vinyl stickers included in the kit to make your own designs from scratch!

Success!

Your new noise friend is complete!

6. Modifications

The Thingamakit was designed with modification and bending in mind. Just start poking around and you will find all kinds of bending points. Just remember not to connect anything directly to the positive battery terminal.



If you want to do something more advanced you can use the schmitt trigger and op-amp that are left open on the board.

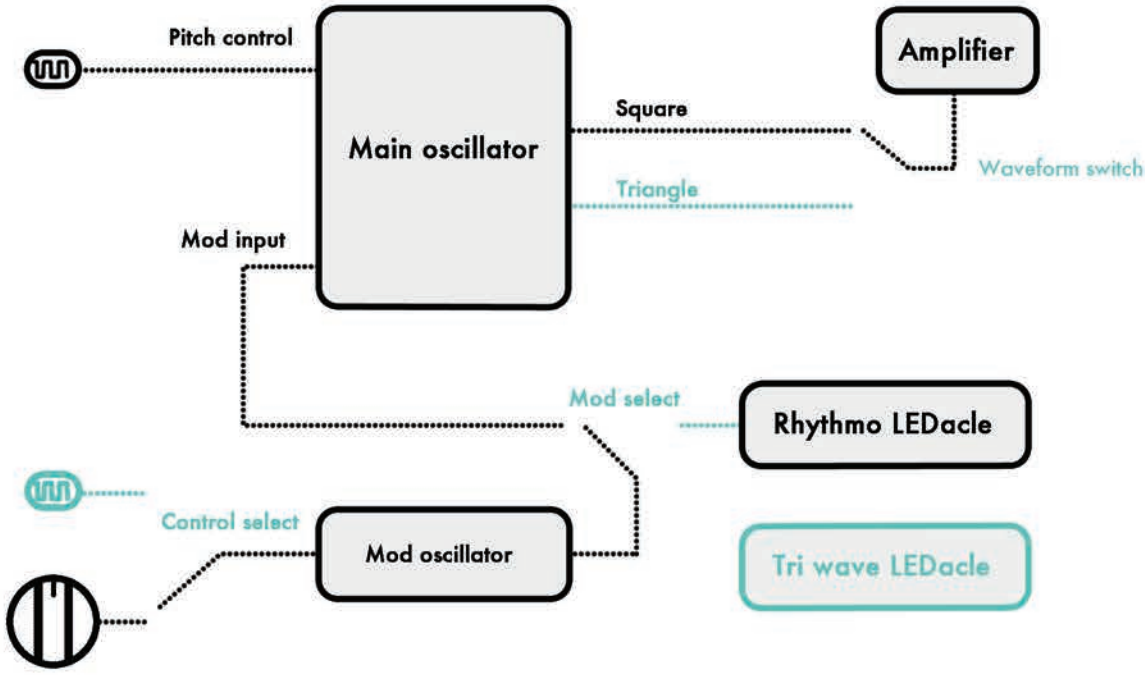
For example, you could make another square wave oscillator with the schmitt or you could add the op-amp and make another triangular wave oscillator. Schematics are available at bleeplabs.com/kit.

You could also:

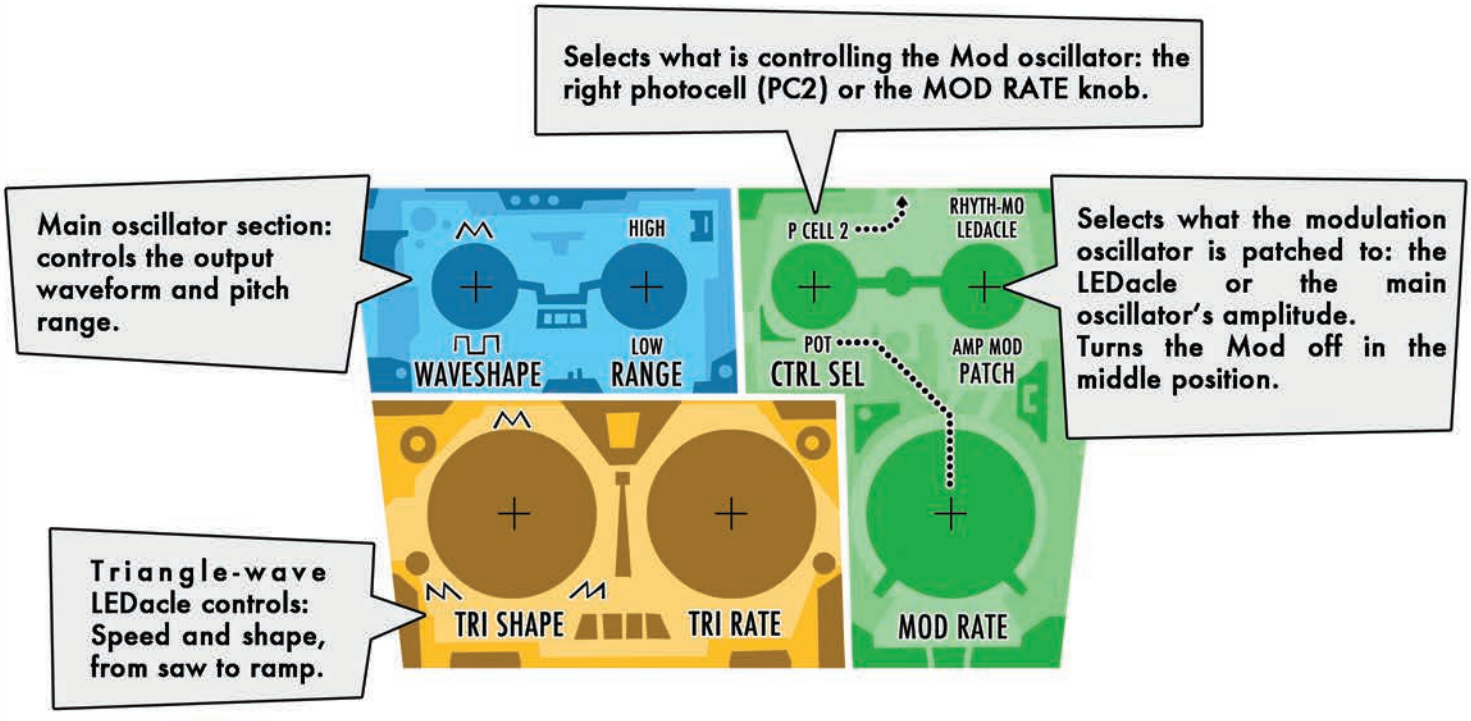
- Replace the photocell with resistors and buttons, making a simple keyboard.
- Substitute the waveform switch for a 100k pot, creating a waveshape knob.
- Make a bending patchbay from screws and alligator clips.
- Replace the 1M, 1.5M, and 10M resistors with 10M pots giving you complete control of the Rhyth-mo-LEDacle. Or you could replace the three .1uF caps on the far left with 1uF caps and use 1M pots instead.
- Use the extra LEDs included with the kit to increase blinkatude. Connect them through the extra 220 ohm resistors to avoid damaging them.

Be sure to submit your creations to the Thingamakit Flickr group or to drbleep@bleeplabs.com

Circuit diagram:



7. NOISE!



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