Welcome to BLEEPHAUS: ASSEMBLE!

This is an experiment and a discussion to see if people would be interested in a regular hacking / building / circuitbending night, and any feedback is gratefully received. Please let us know what you would like to see and how we can improve the evening. Also, this evening is run by rank amateurs and we won't be able to answer all your questions, but we've got quite good at knowing what you should Google to get the info you need.

If you are taking part in the workshops, please sign the disclaimer below.

Name: _____

Email: _____

Emergency contact details: _____

I, the undersigned, understand that building circuits has a level of danger, but I also understand that life without danger is worthless, that ultimately we are all mortals who are going to die, and that this is what gives life its fundamental meaning.

Having said that, I understand that it would be really inconvenient if I died at BLEEPHAUS: ASSEMBLE! and as such I will endeavour to work with the organisers to keep myself and others safe. Y'know, just the basics, like keeping drinks away from the electrics, remembering which end of the soldering iron is which, going outside for a breath of fresh air after soldering, and not plugging anything into the mains that I've built myself.

If I do end up burning or electrocuting myself, it's my own damn fault, and neither the 2 Pigs or the organisers of BLEEPHAUS: ASSEMBLE! are responsible. I'm an adult, and I would like to be treated as one. In fact, I resent reading this far, knowing that the whole statement could have been summed up with that last sentence. Show me the gadgets already.

Signed: _____

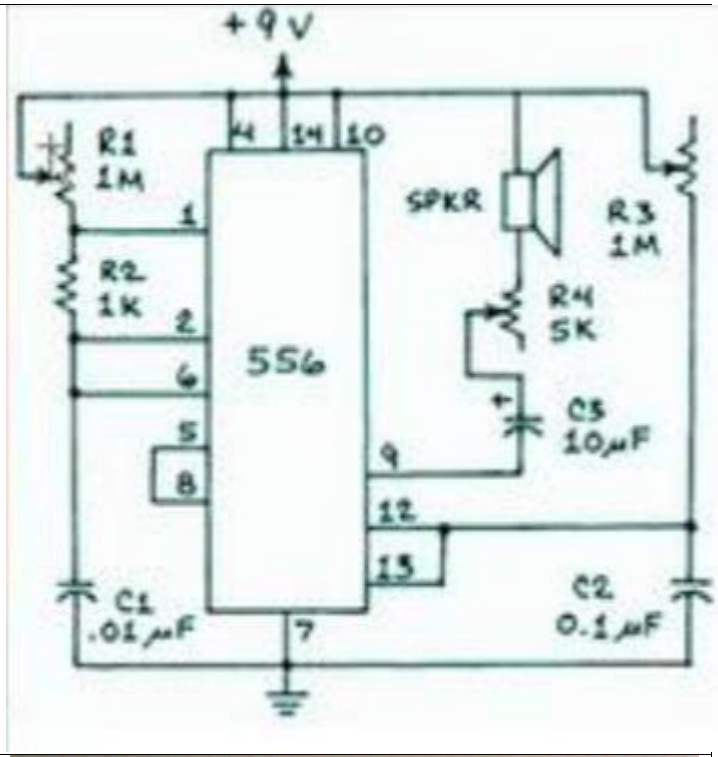
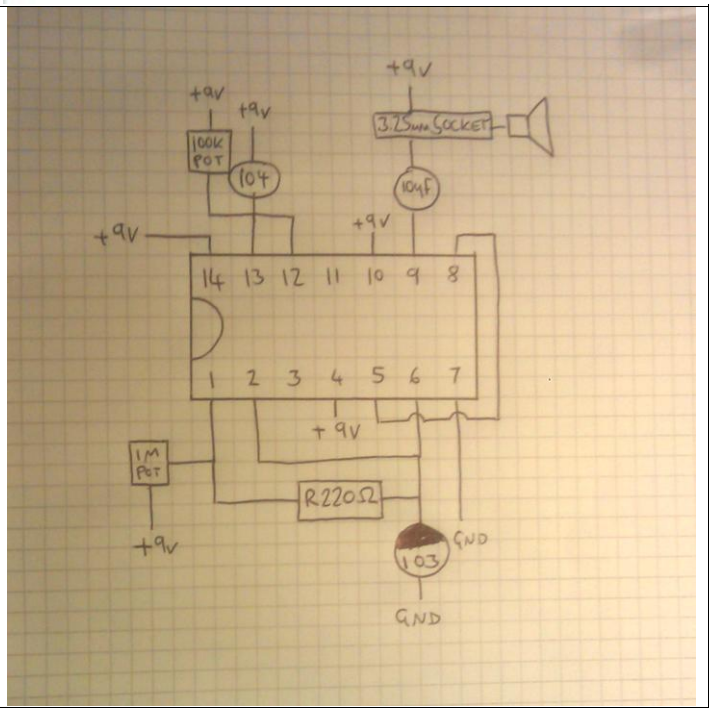
Date: _____

Welcome to **BLEEPHAUS: ASSEMBLE!** Today we are going to be building an ATARI PUNK CONSOLE (APC) on a breadboard. This is a simple noise box which we'll add a few controls to. We are using this video as a basis, with a few tweaks:

http://www.synthtopia.com/content/2010/11/21/how-to-build-an-atari-punk-console/

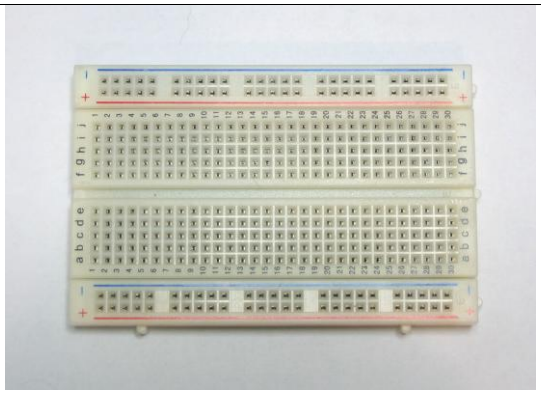
You can read about how Atari Punk Consoles work here, explained better than I could ever hope to:

http://www.notesandvolts.com/2011/12/atari-punk-console-how-it-works.html

This is the circuit diagram for the APC from the original Forrest Mimms design:	
Personally, I find that really confusing, so I've decoded it a bit and also changed some of the components to the ones we'll be using today.	

We're going to build our APC on a mini-breadboard. These are used for prototyping circuits, and are awesome as you can just push the components in without having to solder anything. This means if you make a mistake – and you almost certainly will – it's easy to fix. It's like the difference between making a Lego kit and an Airfix kit.

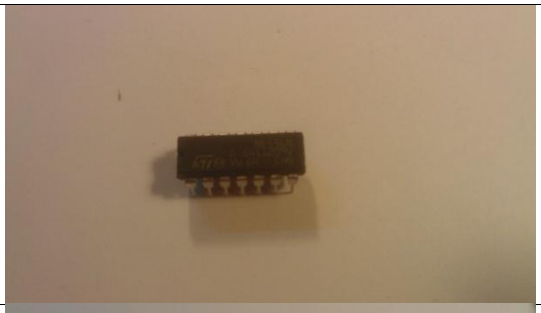
Most regular sized breadboards look like the one on the right. The top 2 and bottom 2 horizontal rows of holes are all connected underneath the breadboard, and each of the 5 vertical columns of holes are connected. So, thinking of things a bit like a game of Battleships, if you plug one component into 'A1' and one into 'E1' then they will be connected as if they were soldered together.



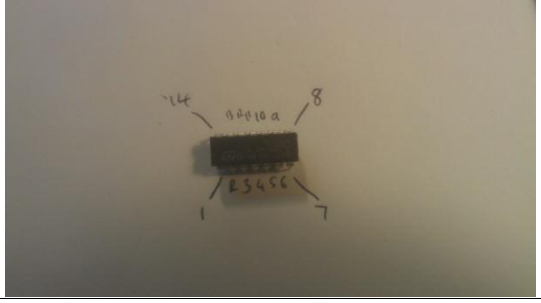
However, we're going to cram everything on to a slightly smaller breadboard, which only has the vertical columns connected, like this one.

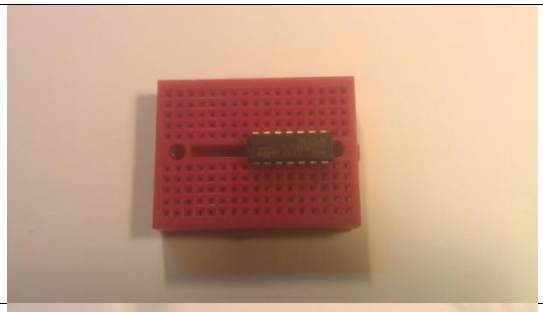
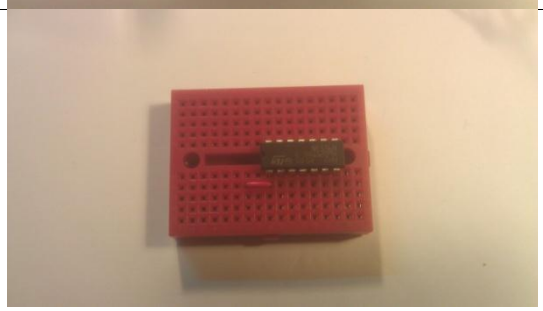
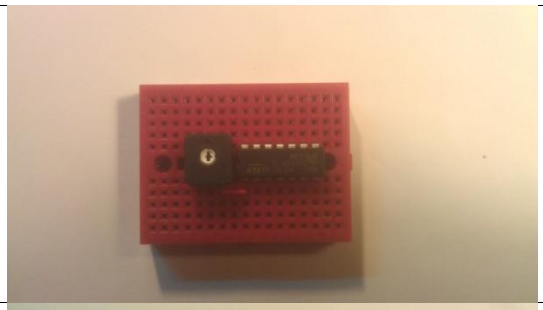
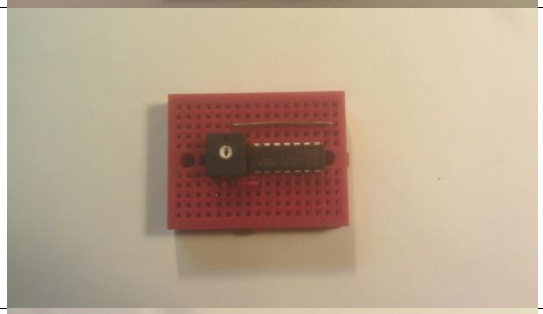
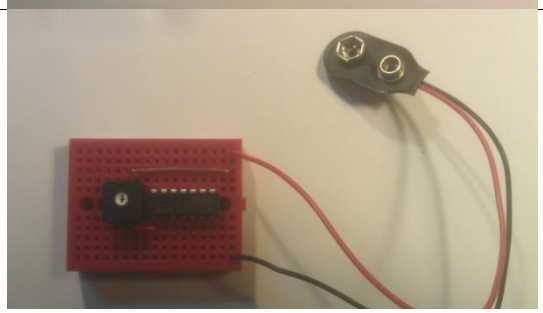
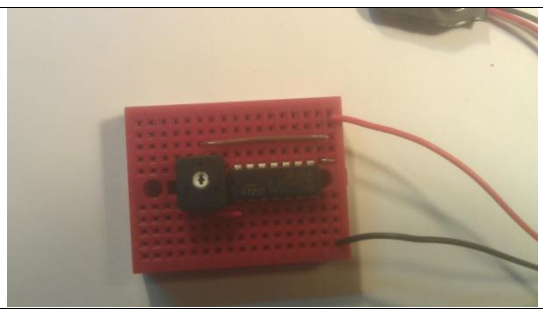
If you look really closely you'll see that the board is marked A-J along the short edge and 1-17 along the top long edge. Start off with 1A in the bottom corner. If you can play Battleships, this will come in handy for finding the location of the holes on the breadboard.

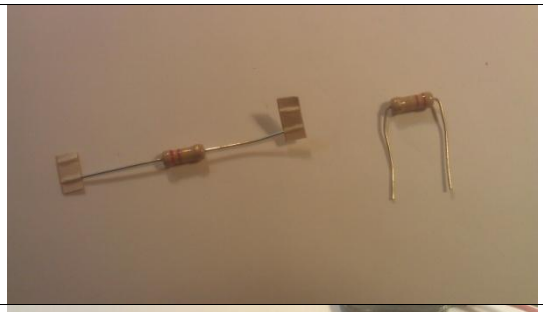
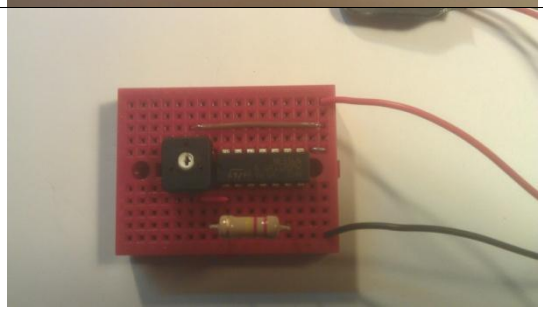
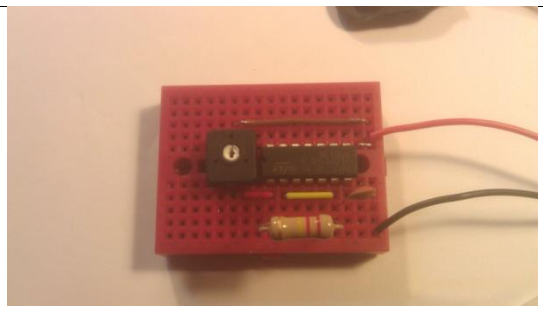
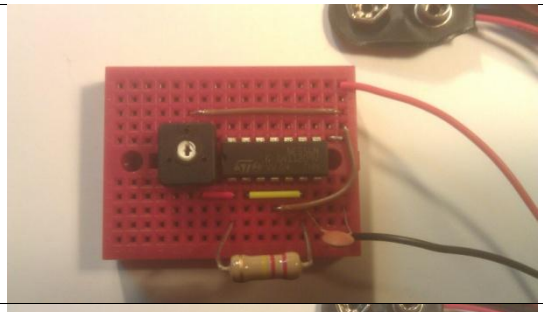
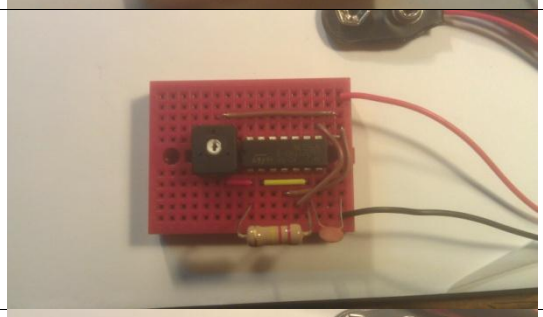
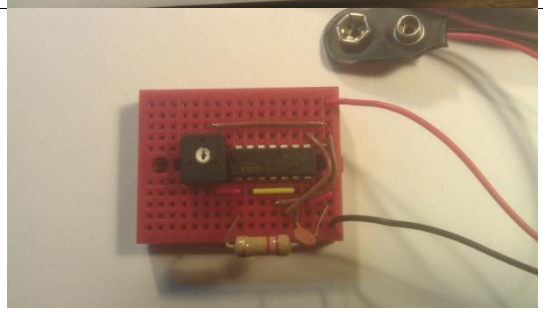
Grab an NE556 chip. Make sure the semi-circle is on the left hand side.

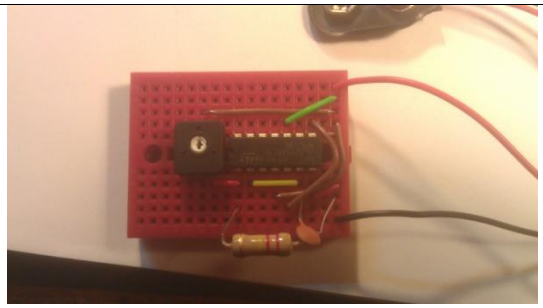
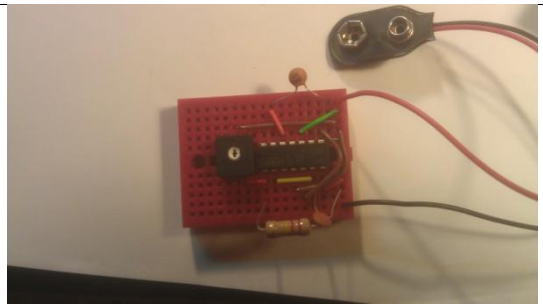
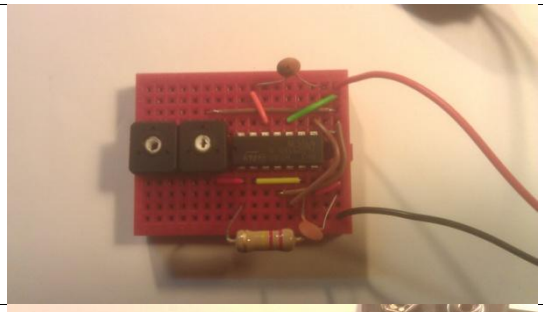
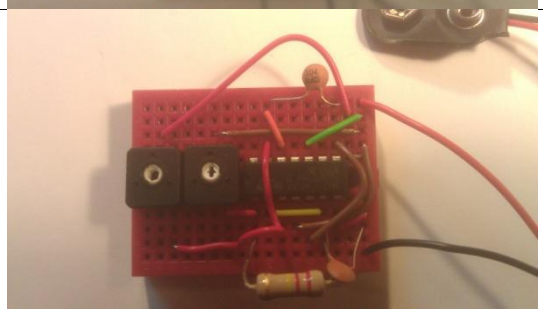
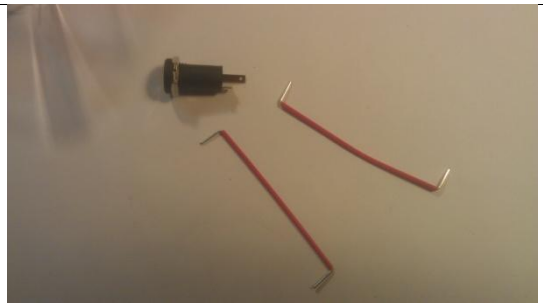
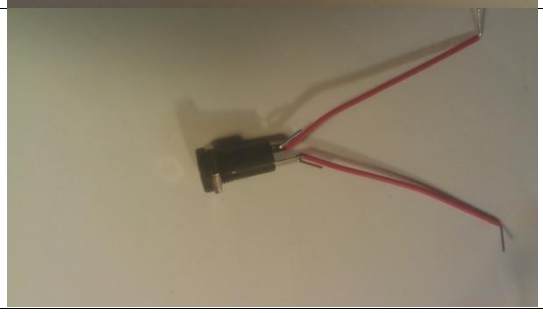


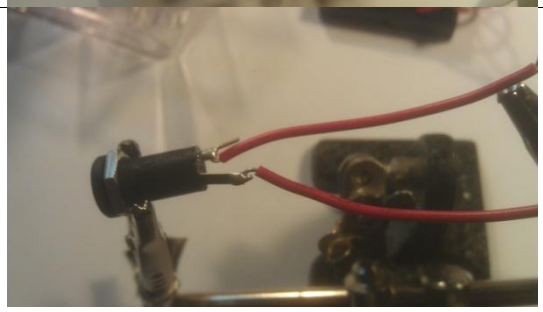
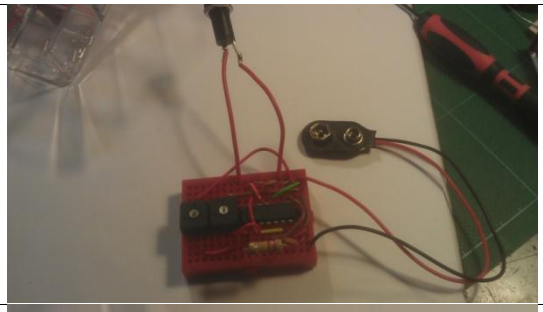
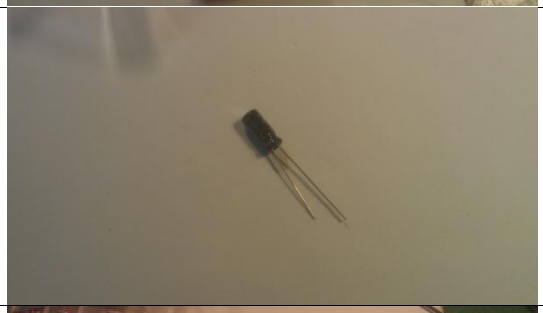
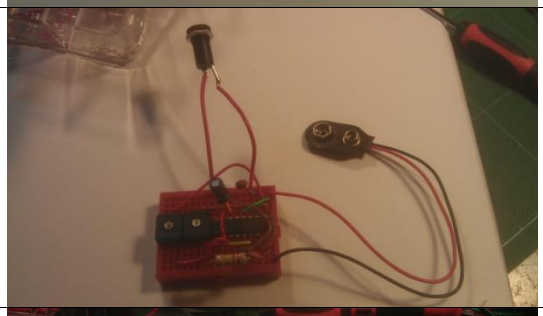
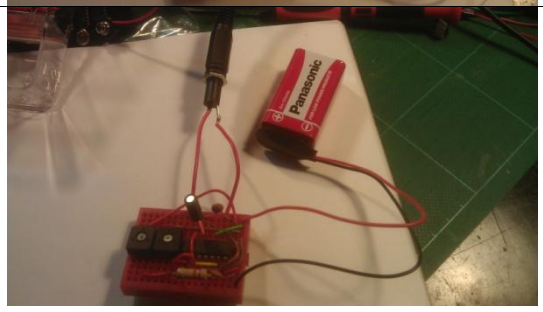
This means pin 1 is in the bottom left corner, and then counting anti-clockwise, pin 7 is bottom right, pin 8 is top right and pin 14 is top left.



Put it in the breadboard so it straddles the central groove. Push it in so that pin 1 is in location E9 and pin 8 is in F15.	
From the circuit diagram, we can see that pin 1 goes to a pot (short for potentiometer) and is also connected to pin 6 of the chip. The little bits of colour coded wires are called jumper wires. Get one of the little red ones and join D9 to D7.	
Now take the little black pot marked with '1M' on the front and connect it so the bottom pins are in E5 & E7 and the top pin into G6 - this will connect pin 1 of the chip to the first pin of the pot.	
Now we need to connect the other terminal of the pot to the positive terminal (which we'll set up in a bit). Grab a jumper and connect H6 to H17.	
Now we are going to turn the top columns (F-J) 16 & 17 into the 'positive rail' and the bottom column 17 (A-E) into the 'ground rail'. Take the 9-volt battery connector and push the red (positive) cable into the top right hole (J 17) and the black (negative) cable into the bottom right hole (A 17).	
Because we need more than 4 holes for positive connections, we're going to 'bridge' two columns with a small jumper. Push the tiniest jumper wire in to connect F16 and F17.	

Next to connect pins 1 and 6 with a resistor – it's the beige thing with paper on the end. Remove the paper and fold the wires at 90 degrees.	
Push it into B9 and B14. It doesn't matter which way round it goes. It's worth having a look back at the original diagram to see how what's starting to take shape on the breadboard relates to the original circuit diagram.	
Now we need to connect pins 2 and 6. Do this with a yellow jumper wire from D11 to D14. Then we need to join pin 6 to ground through a capacitor - this is the little biscuit-coloured disc. There are 2 in the kit, and you need the one marked '103'. It doesn't matter which way round it goes.	
Pin 3 isn't connected to anything, so we can forget that. Pin 4 needs to be connected to the positive rail, so grab a brown jumper wire and connect C12 to G17.	
Pin 5 needs to be connected to Pin 8, so plug a jumper wire into B13 and join it to G15.	
Now it starts to get fiddly...Pin 7 needs to go direct to the ground rail. Plug a jumper wire from C15 - D17... or anywhere in the lower half that connects 15 to 17. In fact by now you might have worked out that it doesn't need to be that *exact* hole, just somewhere in that column of 5 holes.	

We'll come back to pin 9 in a moment as that one needs a bit of soldering... Pin 10 needs to go directly to the positive rail - G13 to I17 should do the trick. Pin 11 stays unconnected.	
Pin 12 and 13 need to be linked together- G11 to I10 or similar will do. Pin 13 also needs to be connected to the positive rail via another capacitor - this time the one marked '104' - again, it doesn't matter which way round it goes. Bend the legs out a bit and connect J10 to J16.	
Now we need to push in another pot. This time take the one marked '100k' on the front, and push it in so the bottom 2 pins are in E1 & E3 and the top pin is in G2.	
Now to connect the pot to pin 13 which we do by joining B3 to G10, and then connecting it to the positive rail - H2 to I16. No matter how neat you tried to keep it, your breadboard is probably starting to look a bit tangled & congested now – apologies to anyone with OCD, should've warned you that might happen.	
Now we need to do a tiny bit of soldering to make the audio socket. Get 2 long pieces of jumper wire and the 3.5mm mini-jack socket.	
Push one end of each through the hole and bend them over.	

Now use the ‘helping hand’ (the device with the weight and crocodile clips) to hold everything in place.	
Then you need to solder the wires onto the socket. Heat the **wire** and then push the solder against the heated wire until it melts. Then remove the solder but leave the soldering iron on for a couple of seconds, then remove the soldering iron. If this is your first go at soldering, don't be afraid to ask for help. There is some extra info on soldering at the end of this guide.	
Now we can connect the socket. Push one end of the cable into J8 (which is a column that’s not doing much at the moment) and the other into J14 to connect it with pin 9.	
Then we need to connect the socket to the positive rail via a capacitor. This time we’re using the black barrel-shaped one, and it *does* metter which way round it goes.	
Connect the long leg - the positive one - to the positive rail at G16. Then connect the short leg to the mini-jack socket by plugging it into I8.	
Congratulations! You have now finished your first noise box! Now, the moment of truth... does it work? Attach the audio cable which is connected to the test speaker to the output jack, then connect the 9 volt battery, and....	

If it doesn't make a noise, don't worry, just check your connections. It's fine to swear, rip the whole thing apart and start again, or take a more methodical approach, whichever feels good to you.

If it does make a noise, well done! Attach the control knob to the left hand pot. The right hand pot can be adjusted with a screwdriver for a more industrial look when performing (which is code for: I was expecting these components to turn up with little knobs, but they didn't, so we'll have to improvise...)

The knobs change the sound - as I recall, the one with the knob on the left alters the width of the square wave, and the one on the right alters the pitch.

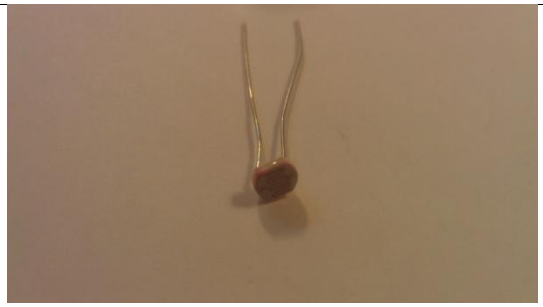
At this point, you might be thinking, 'where's the off button?' - well, there isn't one, just disconnect the battery or one of the leads from the battery to the breadboard.

At this point you might be thinking 'is that it?' which would be a shame. But, to answer your question - NO! Now, because we've built it on a breadboard, we can start to circuit-bend and hack it!

Firstly, try touching the resistor - this should cause a tremolo effect or cause the pitch to rise. Now try touching each side of the '103' capacitor with a diferent finger - this should cause the pitch to drop.

Well done - you've just accidentally done some circuit bending. The results are unpredictable but fun - and are safe **as long as you <u>NEVER</u> plug it into the mains** - *even* through an adapter and **<u>ONLY EVER run it off batteries</u>**. Don't make me use my teacher voice again.

Also - with absolutely no knowledge of electronics - you can try plugging in some other components completely at random! In your kit is a light dependent resistor (LDR) and as the name suggests, the mount of resistance it provides varies depending on how much light it receives. The more light, the less resistance.



Try plugging it in between the power rail and one of the pots, then you can control the pitch or pulse width by waving a light at it or covering up the LDR. Congratulations - you've started hacking!