

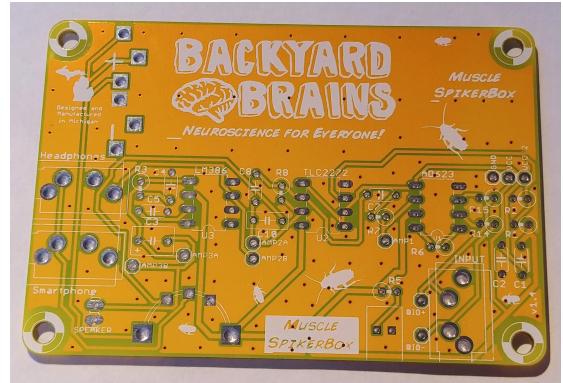


MUSCLE SPIKERBOX v1.4 INSTRUCTIONS

Prepare yourself. In 2-4 hours, you will have built your own Muscle SpikerBox which you can use to control electronics, robots, and programs with your Muscle activity.

Materials Needed:

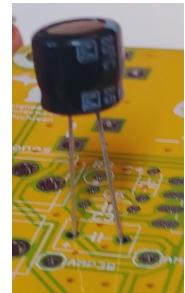
- DIY Muscle SpikerBox Bag of Parts
- Soldering Iron
- Solder
- Magnifying Glass to read labels on Chips and Capacitors
- Silly Putty to hold components in place on board while you solder on the back of the board
- Wire Strippers and Wire Clippers to trim leads



Muscle SpikerBox Circuit Construction (refer to photograph on last page while building):

Capacitors

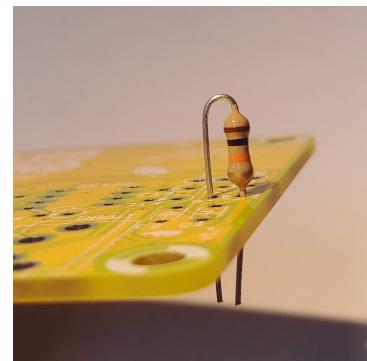
1. Install three blue 10uF Capacitors at C1, C2, and C10 (blue ones – "106" label)
2. Install one black 220uF Capacitor at C3. Make sure to match the - marking to the hole on 3. the board (the shorter stem).
4. Install one yellow 0.047uF Capacitor at C4 ("473" label)
5. Install one yellow 0.1uF Capacitor at C5 ("104" label)
6. Install one yellow 0.47uF Capacitor at C7 ("4742" label)
7. Install one yellow 560pF Capacitor at C8 ("561" label)



For resistors, bending the leads so that they make a U with the thick part on one side. This leg of the U is inserted in the hole that has the circle around it on the board. The stripes of color indicate the resistor and are noted in the steps.

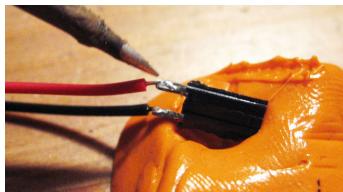
Resistors

1. Install two 10kΩ Resistors at R1 and R2 (brown-black-orange)
2. Install one 10Ω Resistor at R3 (black-black-brown)
3. Install one 390Ω Resistor at R5 (orange-white-brown)
4. Install one 33kΩ Resistor at R6 (orange-orange-orange)
5. Install one 1kΩ Resistor at R7 (brown-black-red)
6. Install one 270kΩ Resistor at R8 (red-purple-yellow)
7. Install two 47kΩ Resistors at R14 and R15 (yellow-purple-orange)



Larger Components

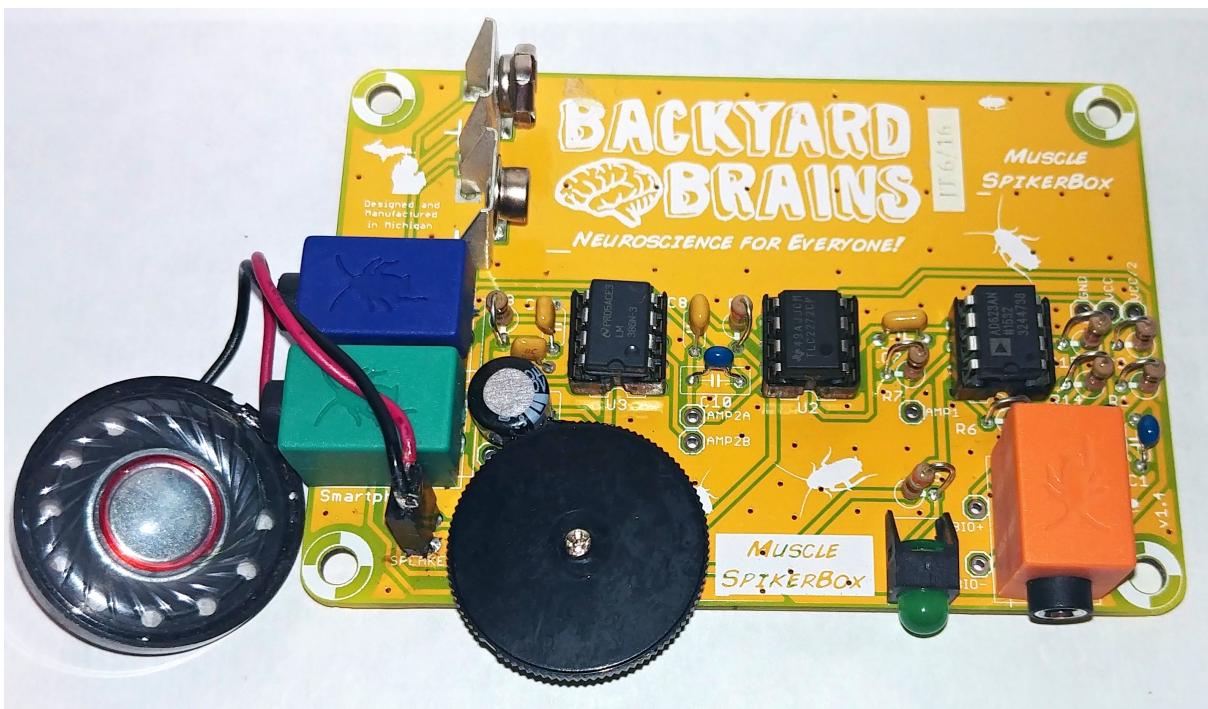
1. Install the 9V +/- battery connectors at the top of the board.
2. Install 3.5mm blue connector at the top left position marked HEADPHONES
3. Install 3.5mm green connector dire right position marked SMARTPHONE
4. Install 3.5mm orange connector in the bottom right position marked INPUT
5. Install LED (Light Emitting Diode, green) in the two pins to the left of the INPUT position (below R5)
6. Put together black volume knob potentiometer: place the black circle on the clawed potentiometer base, then screw together. Install the black knob at the half circle of holes to the left of the Muscle SpikerBox label at the bottom of the board.
7. Install the three chip holders under the BYB logo, in the center of the board. Align the half circle on the side of the chip holder with the half circle on the board.
8. Install chips in the chip holders. Align the circle/half-circle mark on the chip toward the half-circle on the end of the chip holder. AD623 chip goes into the far right chip holder (below the mark AD623), TLC2272 chip goes in the middle chip holder (below the mark TLC2272), and LM386 goes in the far left chip holder (below the mark LM386).



Speaker

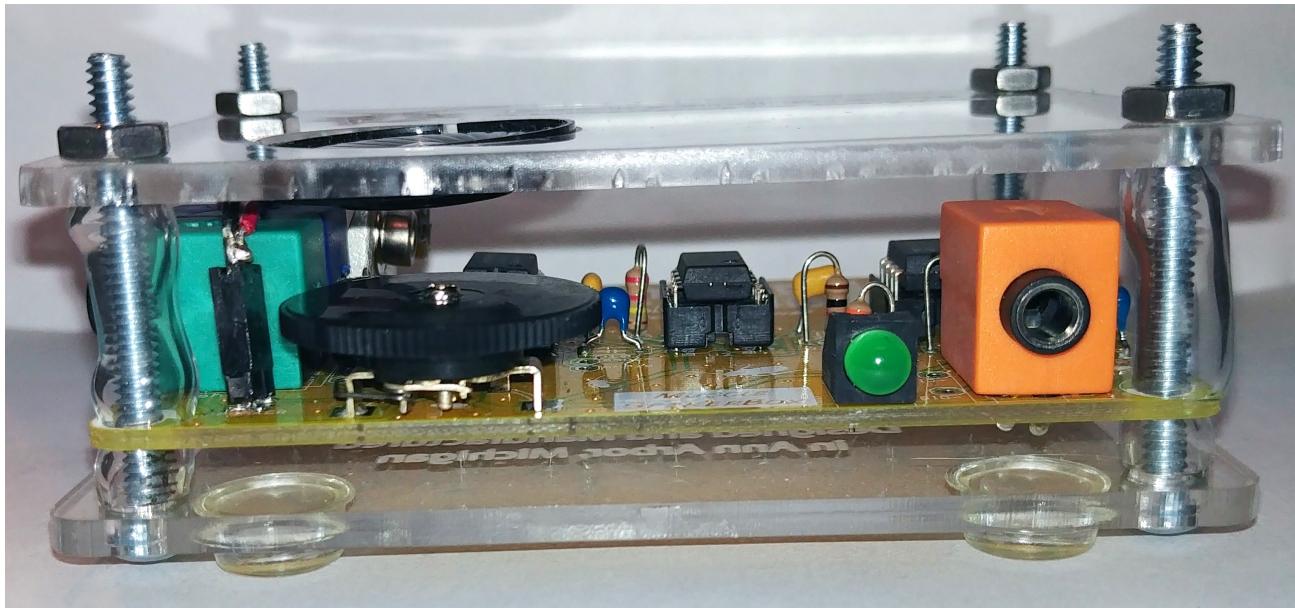
1. Cut about half of the speaker wire off the end of your speaker. Strip the ends of the wire, and solder them to the legs of the black female connector. Separate and wrap solder joints away from each other using electrical tape. Take care that the two solder joints do not touch.
2. Install the two-prong male header in the position marked SPEAKER, below the SMARTPHONE position. Solder the male header to the board. This is where your speaker will plug in.

This is generally how your board should look after you finish it!



FINAL ASSEMBLY

1. Place four screws through the bottom acrylic (the one that says "Designed and Manufactured in Ann Arbor, MI")
2. Cut your plastic tubing into 4 pieces of $\frac{1}{4}$ inch and 4 pieces of $\frac{3}{4}$ inch. Put the four smaller pieces onto screws.
3. Place your finished board onto the four screws, with the components facing up.
4. Place the longer pieces of plastic tubing onto the screws.
5. Fit the speaker into the hole in the top enclosure. It should be pretty snug, but you can secure it with a few dots of glue if necessary. Place the enclosure on the screws, then add the nuts on top and tighten them down.



Plug in your electrode cables, and you are done! To power the Muscle SpikerBox, it needs to have a 9V battery plugged in and the knob must be switched on. Visit the Experiments page on our website, www.backyardbrains.com, to learn how to use your new tool for creativity!