



EMG SpikerBox Instructions

Prepare yourself. In 2-6 hours, you will have built your own SpikerBox to begin doing neuroscience and whatever your creative mind can conjure.

Materials Needed:

1. A Backyard Brains EMG SpikerBox Bag of Parts
2. Soldering Iron
3. Solder
4. Magnifying Glass to read labels on Chips and Capacitors
5. 9V battery to power your SpikerBox.
6. Silly Putty to hold components in place on board while you solder on backside
7. Pair of scissors
8. Wire Strippers and Wire Clippers
9. Superglue (gel is best) to glue speaker into the acrylic enclosure.
10. Small piece of sandpaper

A Soldering Iron can be purchased at RadioShack or any local hardware store. The Magnifying Glass and Silly Putty are available at drug stores.

Circuit Construction (your board color may vary)

1. Solder the 3 RCA plugs. Red on extreme end, black in middle, and white on other side. It takes elbow grease to shove in
2. Install LED light
3. Solder the 2 audio out headphone jacks
4. Install Speaker Connector near audio out headphone jacks
5. Solder volume knob potentiometer, then use screw driver to install wide circle thumb knob
6. Solder Battery Connectors - Fat in the middle, skinny on the outside...using a battery makes it easier to install in place
7. Install three chip holders. Have half-circle side point towards RCA connectors
8. Install 220 uF capacitor at C3, vertical stripe towards volume knob
9. Install C1, C2, and C10 = 10 uF, [blue ones – have 106 labels on them]
10. Install R1 and R2 = 10k Ohm [brown black orange]
11. Install 47k Resistor at R15, R14, and R9 [yellow purple orange]. If you have an older board that has R10, install 47k there as well
12. Install 33k Resistor at R6 [orange orange orange]
13. Install 1k Resistor at R7 [brown black red]
14. Install 0.47 uF Capacitor at C7 (this has 474 or 4742 label on it)
15. Install 220k Resistor at R8 (red red yellow)
16. Install 560 pF Capacitor at C8 (561 label)
17. Install 390 Ohm Resistor at R5 (orange white brown)
18. Install 10 Ohm Resistor at R3 (brown black black)
19. Install 0.047 uF Capacitor at C4 (473 lable)

20. Install 0.1 uF Capacitor at C5 (104 label)

21. Install chips, moon towards connectors. LM386 near volume knob, then TLC2272, then AD623

Build Enclosure

1. Remove paper backing from Acrylic (backing may already be removed in your kit)

2. Cut speaker wire to ~3 inches, and strip ¼ inch off end of black and red wires. Solder each wire to one side to female header (speaker connector)

3. Lightly sand hole in acrylic and insert speaker inside. It should fit with a friction fit. If not, use a slight dab of glue – be careful as superglue can easily smear on the acrylic

4. Cut Tubing into four ¼ inch and four ¾ inch segments

5. Insert screws into bottom acrylic piece (acrylic without large hole)

6. Put ¼ inch tubing on top of screws

7. Put circuit board on top of screws

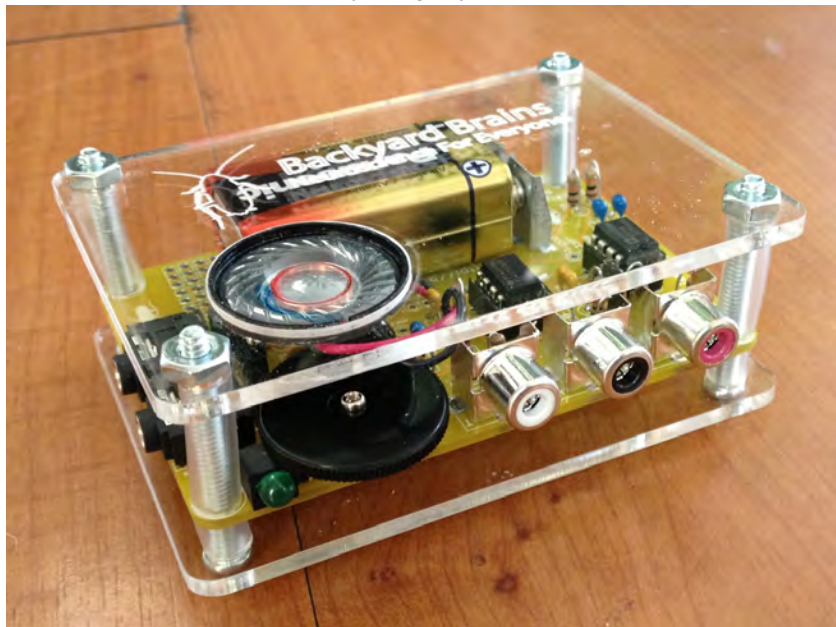
8. Put ¾ inch tubing on top of screws, over circuit board

9. Plug speaker connection into board, and slide top acrylic over screws

10. Install nuts on screws

11. Install 9V Battery (not included)

12. Turn your SpikerBox on by turning volume/switch thumbwheel. It should make a loud squeal (this is normal, as it is not connected to anything—your muscles!)



Build Electrodes

1- Split your three speaker wires lengths so you end up with six ~3 foot lengths of wire. You will only use three of these lengths – that's OK

2. Unscrew RCA input jackets, strip about ¼ inch of a length of your speaker wire, and solder to the center section of the RCA connector. Do this for all three RCA input connectors.

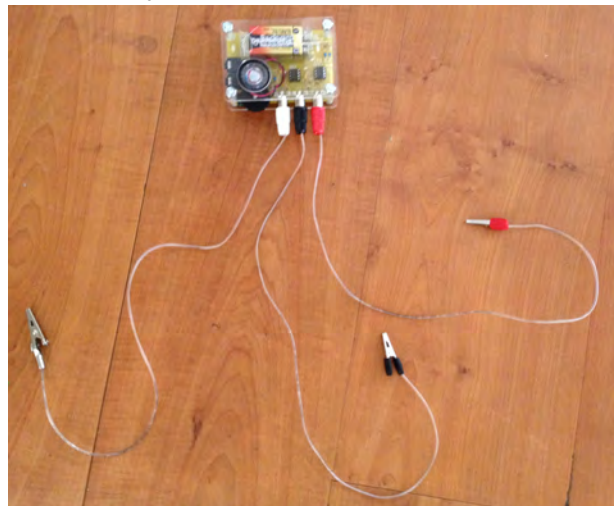
3. Crimp tap, and screw RCA jackets back on



4. Solder alligator clips (red RCA to red alligator, black RCA to black alligator, white RCA to bare metal alligator) to the other ends of the wires. For the red and black alligator clips, remove one grip, slide grip over wire, solder wire to clip, and slip grip back on. For bare metal alligator clip, you can often get away with simply fastening wire underneath the screw on the bare metal alligator clip in lieu of soldering it.



And you are done! Go to the experiments page on our backyardbrains.com website to learn how to use your new tool for discovery!



EMG SpikerBox Board

(your board color may be different)

C4 = 0.047 μ F
(473 label)

R3 = 10 Ω
(brown black black)

C5 = 0.1 μ F
(104 label)

C3 = 220 μ F
Grey Stripe
Points Down

Dual
Audio
Outs

Speaker
Connector
LED

Power & Volume Wheel

C8 = 560 μ F
(561 label)

R8 = 220 k Ω
(red red yellow)

- connector (skinny)

+ connector (fat)

R1, R2 = 10 k Ω
(brown black orange)

C1, C2, C10
= 10 μ F
(106 label)

R7 = 1 k Ω
(brown black red)

C7 = 0.47 μ F
(474 label)

R15, R14, R9
= 47 k Ω
(yellow purple orange)

R6 = 33 k Ω
(orange orange orange)

R5 = 390 Ω
(orange white brown)

RCA input
(white inside)

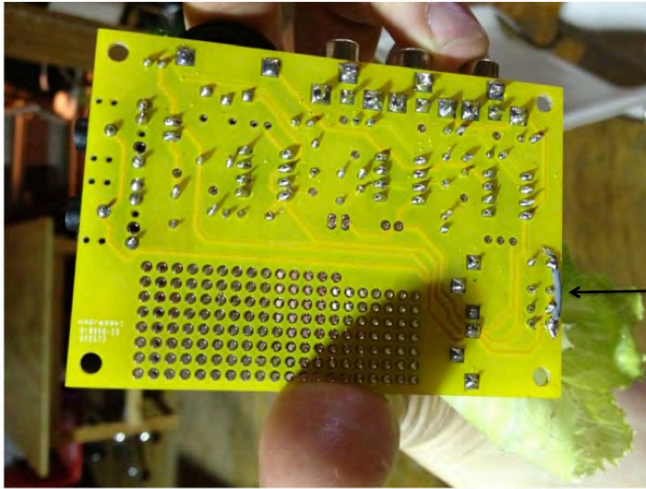
RCA input
(black inside)

RCA input
(red inside)

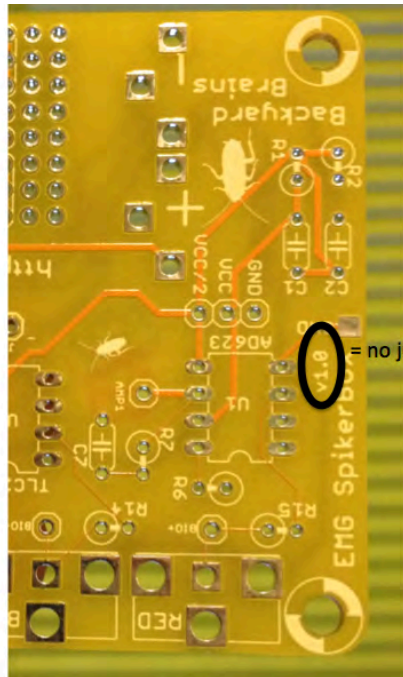
Make sure all chips face towards the connectors (notice circle or half-circle mark in corner of chip)

Final Note:

If you bought a DIY EMG SpikerBox kit prior to July 2013, you need to solder a Jumper wire on the backside of the circuit board as below. If your board number is v1.0 or above, you do not need to do this (see photo on how to identify your board number).



Solder Wire here



= no jumper needed