



EMG SpikerShield v1.2 Instructions

Prepare yourself. In 2-4 hours, you will have built your own Arduino compatible EMG SpikerBox, so you can control robots and anything you wish with your EMG muscle activity.

Materials Needed:

1. An EMG SpikerShield Bag of Parts
2. Soldering Iron
3. Solder
4. Magnifying Glass to read labels on Chips and Capacitors
6. Silly Putty to hold components in place on board while you solder on backside
8. Wire Strippers and Wire Clippers

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

EMG SpikerShield Circuit Construction (refer to photograph on page 4 while building):

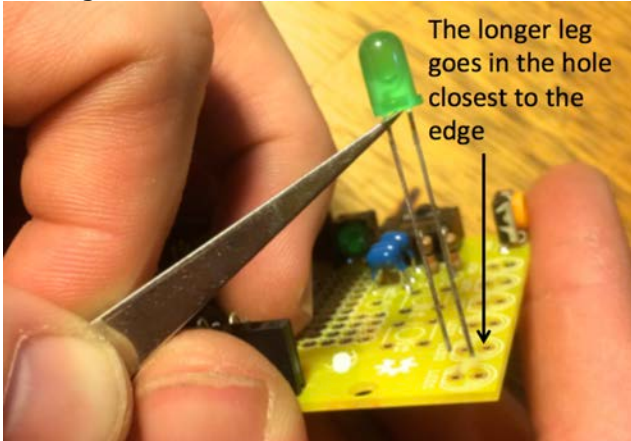
1. Install RCA inputs, and note red, black, and white labels on board that refer to red, black, and white RCA inputs (the inside of the RCA input is colored).
2. Install Audio Out Connector. You may find Silly Putty helps keep the connector in place when you solder it to the board.
3. Install LED (Light-Emitting Diode – green)
4. Install the two chip holders (align the half-circle on side of the chip holder with the half circle on the board)
5. Install potentiometer
6. Install the two 3-pin headers over AI_select and place jumper over either 1, 2, or 3 (we use 1 as default – which refers to Analog In 0 on Arduino). You can move the jumper to 1 (Arduino Analog In 1) or 2 (Arduino Analog In 2) depending on your preference and which Analog In on the Arduino you want you EMG signal to feed through.
7. Install 10 uF Capacitors at C1, C2, and C10 (blue ones – they have 106 labels on them)
8. Install 0.47 uF Capacitor at C7 (this has 474 or 4742 label on it)
9. Install 560 pF Capacitor at C8 (561 label)
10. Install 47k Ω Resistors at R15, R14, and R4 (yellow purple orange)
11. Install 10k Ω Resistors at R1 and R2 (brown black orange)
12. Install 1k Ω Resistor at R7 and R3 (brown black red)
13. Install 390 Ω Resistor at R5 (orange white brown)
14. Install 33k Ω Resistor at R6 (orange orange orange)
15. Install 220k Ω Resistor at R8 (red red yellow)



Warning: DO NOT CLIP THE HEADER PINS. THEY ARE NEEDED TO MATE WITH ARDUINO

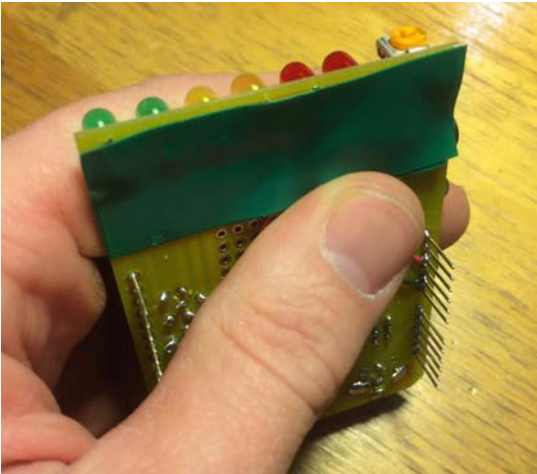
16. Install 8 pin female header in Digital I/O bank 0-7
17. Install 8 pin female header in Digital I/O bank 9 – Aref
18. Install 5 pin female header in Analog In bank 0-5
19. Install 5 pin female header in bank Vin – RST

20. Install the 6 LEDs along the edge of the board. The “longer leg” goes in the hole closest to the edge of the board.



21. Install chips in chip holders, with circle mark on chip towards the RCA input. AD623 chip goes in U1, and TLC2272 chip goes in U2

22. Add a strip of electrical tape over the LED contacts to avoid a potential shortcircuit when the with the Arduino Board



And your board is ready! It is now time to build the electrode cables.

Build Electrode Cables

- 1- Split your three speaker wires pairs 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

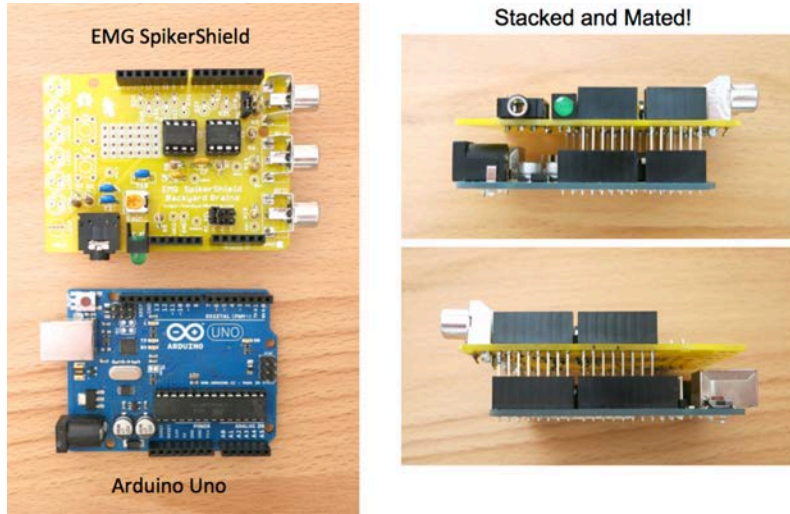


4. Solder alligator clips (red RCA to red alligator, black RCA to black alligator, white RCA to bare metal alligator) to the other ends of the wires. For the red and black alligator clips, remove one grip, slide grip over wire, solder wire to clip, and slip grip back on. For the bare metal alligator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

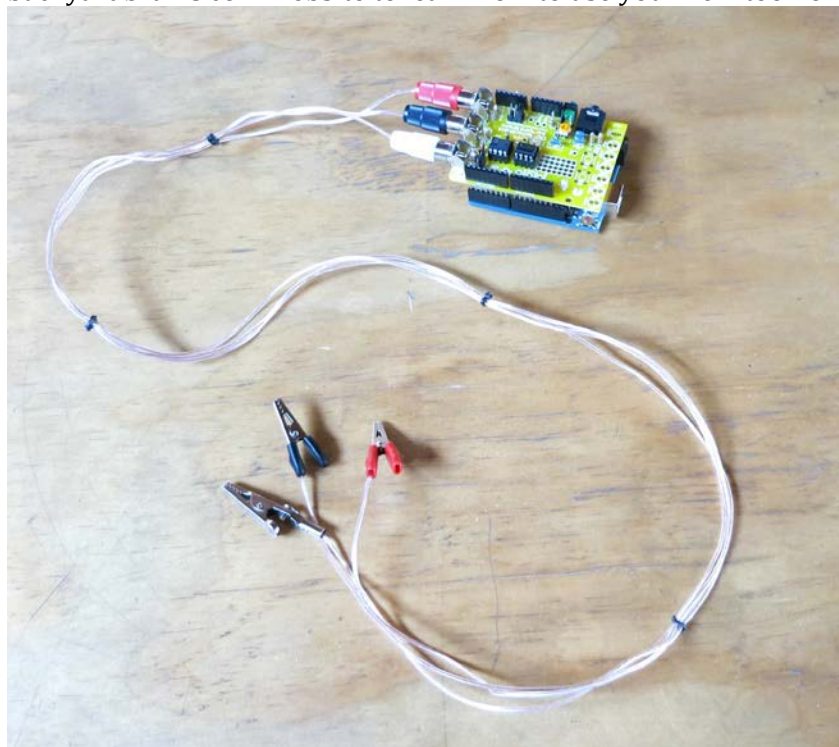


Final Assembly

1. Stack your EMG SpikerShield on top of your Arduino Uno. You can buy an Arduino Uno from RadioShack, SparkFun, Make, etc. Note that the EMG SpikerShield does not fill every single header on the Arduino.



2. Plug in your electrode cables, and you are done! To keep the electrode cables from getting tangled, you may find twistie ties around the cables placed every ~8 inches helps. Note that the Arduino needs to be plugged into a USB Power Source to Operate. Go to the experiments page on our backyardbrains.com website to learn how to use your new tool for creativity!



EMG SpikerShield Board

(your board color could be different)

Note1: Many sections have been left unpopulated for you to do your custom mods!

Note2: The position of the components could be different depending on the model of your board.

C8 = 560 uF
(label 561)

C7 = 0.47 uF
(label 474 or 4742)

R15, R14, R4
= 47 kΩ

(yellow purple orange)

R6 = 33 kΩ

(orange orange orange)

8 pin female headers

Bank of LEDs

R1, R2 = 10 kΩ
(brown black orange)

C1, C2, C10
= 10 uF
(label 106)

RCA input
(interior white)

RCA input
(interior black)

RCA input
(interior red)

potentiometer

Audio Output

LED

6 pin female headers

R5 = 390 Ω
(orange white brown)

R8 = 220 kΩ
(red red yellow)

R7, R3 = 1 kΩ
(brown black red)

Two 3 pin male headers with jumper (AI_SEL)*

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

*You can change the jumper position to 1, 2, or 3 to select Arduino Analog In 0, 1, or 2 for your EMG signal.

