EMG SpikerShield v1.3 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 switch
5. Install the two chip holders (align the half-circle on side of the chip holder with the half circle on the board)
6. Install potentiometer
7. Install the two 6-pin headers over AI_select and place jumper over left-most position as a default – which refers to Analog In 0 on Arduino). You can move the jumper to other pins if you want to change which Analog In (0,1,2,3,4, or 5) on the Arduino you want your EMG signal to feed through.
8. Install Relay
9. Install Relay header
10. Install programmable buttons (which color is which does not matter..you can choose!)
11. Install Diode (note the black mark needs to be on the right side)
12. Install 10 uF Capacitors at C1, C2, C10, and C100 (blue ones – they have 106 labels on them)
13. Install 0.47 uF Capacitor at C7 (this has 474 or 4742 label on it)
14. Install 560 pF Capacitor at C8 (561 label)
15. Install 1kΩ Resistor at R7 and R70 (brown black red)
16. Install 390Ω Resistor at R5 (orange white brown)
17. Install 33kΩ Resistor at R6 (orange orange orange)
18. Install 10kΩ Resistors at R1, R2, R9, and R10 (brown black orange)
19. Install 220kΩ Resistor at R8 (red red yellow)
20. Install 47kΩ Resistors at R13, R14, R15, and R16 (yellow purple orange)
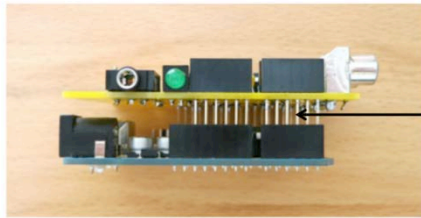
Warning: DO NOT CLIP THE HEADER PINS. THEY ARE NEEDED TO MATE WITH ARDUINO

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 6 pin female header in Analog In bank 0-5
19. Install 6 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.

The longer leg goes in the hole closest to the edge
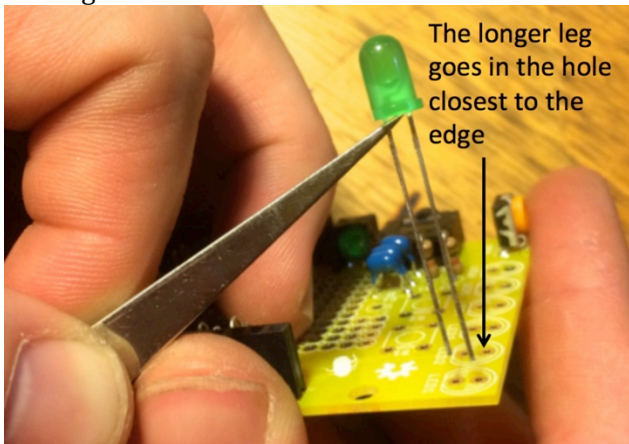
21. Install chips in chip holders, with circle mark on chip towards the RCA input. AD623 chip goes in U1, and TLC2272 chip goes in U2
22. Add a strip of electrical tape over the LED contacts to avoid a potential shortcircuit when mated with the Arduino Board
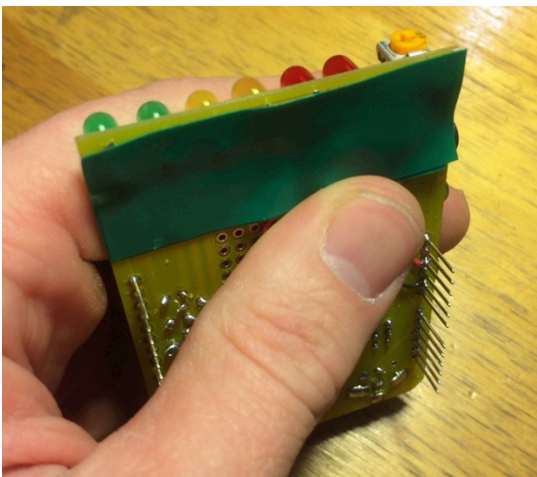
And your board is ready! It is now time to build the electrode cables.

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 jacks, 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
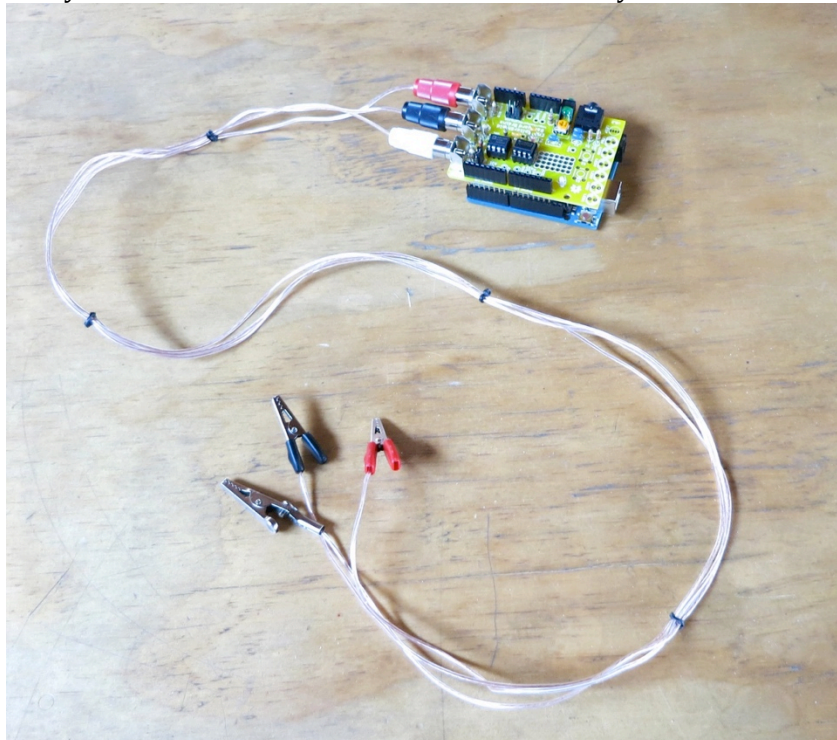screw on the bare metal alligator clip in lieu of soldering it.

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. Note SpikerShield board shown below is older model and may not be the exact one you have. The orientation is the same however.
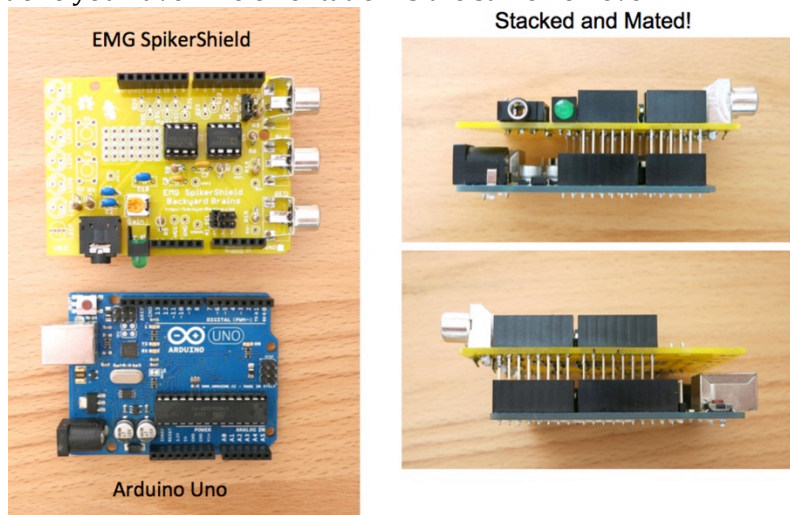
2. Plug in your electrode cables, and you are done! To keep the electrode cables from getting tangled, you may find twistie ties around the cables placed every ~8 inches helps. Note that the Arduino needs to be plugged into a USB Power Source to Operate. Go to the experiments page on our backyardbrains.com website to learn how to use your new tool for creativity!

EMG SpikerShield Board
(your board color could be different)
Note1: The position of the components could be different depending on the model of your board.

C1, C2, C10, C100 = 10 uF
(label 106)

C8= 560 uF
(label 561)

C7= 0.47 uF
(label 474 or 4742)

R7, R70 = 1 kΩ
(brown black red)

R5 = 390 Ω
(orange white brown)

R6 = 33 kΩ
(orange orange orange)

Audio Output

8 pin female headers

Relay header →

RELAY

TLC2272   AD623

RCA input
(interior white)

R1, R2, R9, R10 = 10 kΩ
(brown black orange)

RCA input
(interior black)

space for your own custom projects!

Programmable Buttons

Bank of LEDs

EMG SpikerShield v1.3

http://backyardbrains.com

Analog select

R8= 220 kΩ
(red red yellow)

Diode
(note black mark on right)

potentiometer

switch between raw/envelope mode

LED

6 pin female headers

Two 6 pin male headers with Jumper

RCA input
(interior red)

R13, R14, R15, R16
= 47 kΩ
(yellow purple orange)

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, 3, 4, 5, or 6 to select Arduino Analog In 0, 1, 2, 3, 4, or 5 for your EMG signal.