

How To: Arduino Assembly Pt. 1 -- Waveshield

McDannald Lab

Part 1: Soldering the wave shield

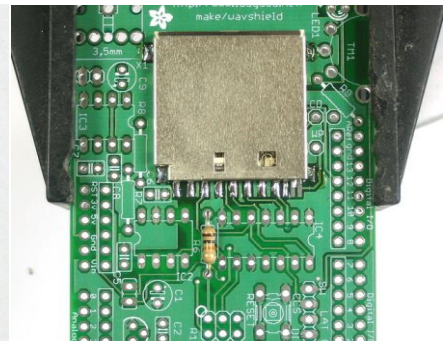
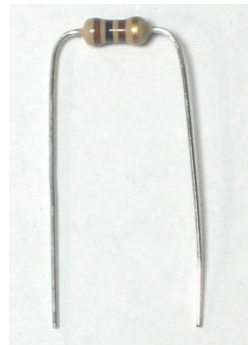
MATERIALS

- soldering iron, HAK tip cleaner
- solder wire with flux (RA 5-Core)
- wave shield kit
- safety glasses

1. Place the wave shield circuit board in the vise.
2. Put the **SD card holder** onto the large, empty square area of the board with the eight pins making connections with the eight metal squares on the board. The holder will snap into place.
3. Solder the four tabs on the side of the SD holder and the first eight leftmost pins.
 - **NOTE:** each pin should have a separate solder; the pins should not be soldered to each other or the metal body of the holder.

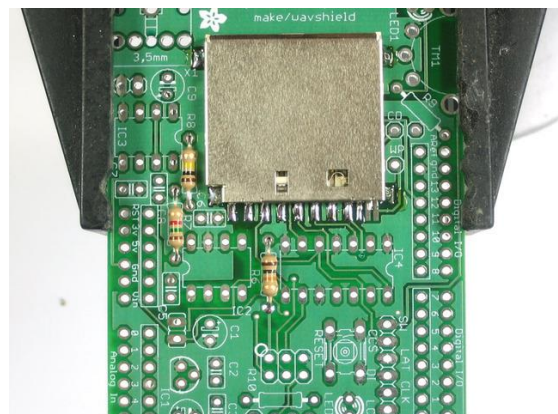


4. Next, pick out the **R6** resistor that has four stripes on it: **BROWN, BLACK, ORANGE, and GOLD**. Bend the two metal pieces down into a staple as shown to the right.
 - **NOTE:** resistors do not have polarity, so they can be placed either way into the board.
 - **NOTE:** tilt this resistor away from the 7-pin outline that is located on the right side of the resistor in the picture. You may want to insert the 7-pin isolator while you solder the R6 resistor to make sure the two components will fit side-by-side. Do not solder the isolator yet, remove it after the resistor is soldered in place.



5. The R6 resistor will be placed into the holes marked with R6 located under the SD card holder. Bend back the two metal legs so the resistor stays in place.
6. Turn the wave shield over and solder the leads to the metal pads on the circuit board. Clip the ends off using the small green clippers.
7. Repeat steps 4-6 with the R8 and R7 capacitors.

- **R8:** BROWN, BLACK, YELLOW, GOLD
- **R7:** BROWN, GREEN, RED, GOLD



8. Find the **C8** capacitor. There will be a **103** printed on the side of it. Bend one side of the metal piece so it is parallel with the other, like this:



NOTE: All other capacitors are radial, but the C8 should be axial like the picture above. If you do not see a linear capacitor like the one above, simply make sure you chose the capacitor with labeled **103**.

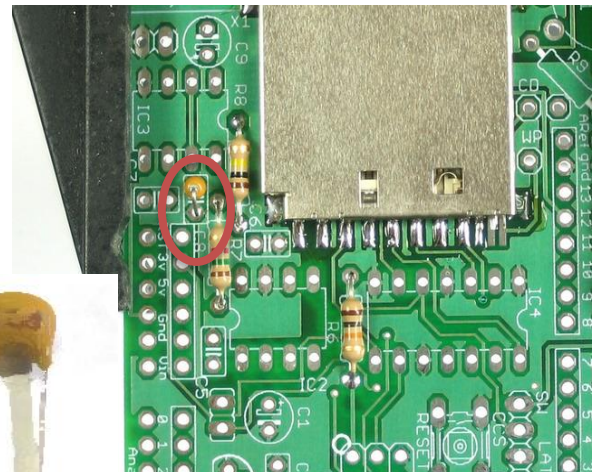
9. Put the C8 capacitor into the holes marked C8 on the circuit board.

- **NOTE:** capacitors are non-polarized and can be placed into the holes either way

10. Bend the metal leads back so the capacitor stays in place. Turn the circuit board over to solder and clip the capacitor leads.

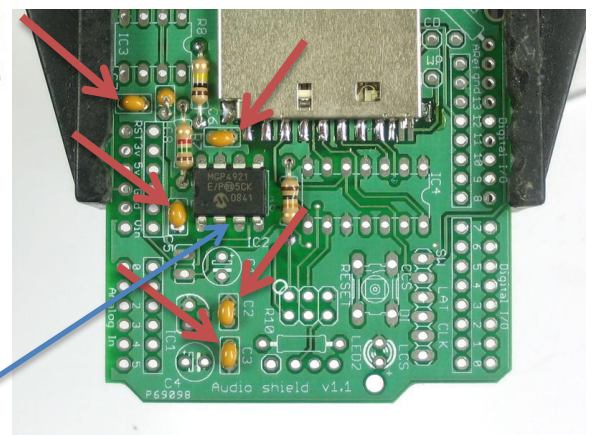
11. Repeat steps 9-10 with capacitors C2, C3, C5, C6, and C7.

- **NOTE:** these capacitors look different than the C8; they are radial and have metal leads sticking out and down like this →
- **NOTE:** These capacitors are non- polarized and can also be placed into the holes either way.



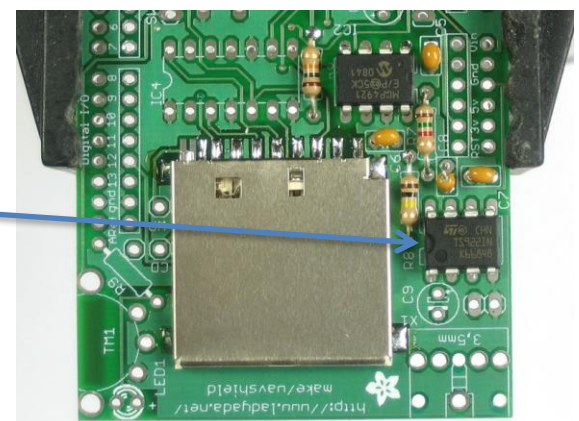
11. Next, find the digital analog converter (DAC) **IC2**. This turns data from the SD card into music. There are a few pieces in the kit that look similar. The DAC has MCP4921 printed on it with a stylized M.

- **NOTE:** the chip has a notch on one end, which will match up with the outline on the circuit board, **proper orientation** of this part is crucial for function of the board.



12. This piece has no long leads to bend. Simply turn over the circuit board and solder the pins in place. Always double check the position of the DAC before soldering!

13. Next, find the operational amplifier (op-amp) IC3. This is used to buffer and amplify the output for use with our small speakers in the behavior boxes. This chip will be labeled TS922 with a stylized S7.



- **NOTE:** the chip has a notch on one end, which will match up with the outline on the circuit board

14. Like the DAC, this piece does not have long leads to clip, simply solder the pins and move to the next piece. Again, double check the position, **proper orientation** of this piece is required for function.

15. The last of these pieces is the IC4, which talks to the SD card. This is the longest piece out of the three.

- **NOTE:** the chip has a notch on one end, which will match up with the outline on the circuit board, **proper orientation** of this part is crucial for function of the board.

16. Turn over the circuit board and solder the pins in place. Once again, you do not need to clip any of the pins.

17. The next piece is the IC1 regulator that provides power to the SD card. The IC1 is a semi-circular piece. You will have to bend the middle lead in order to fit the piece into its triangular, three-hole place on the board.

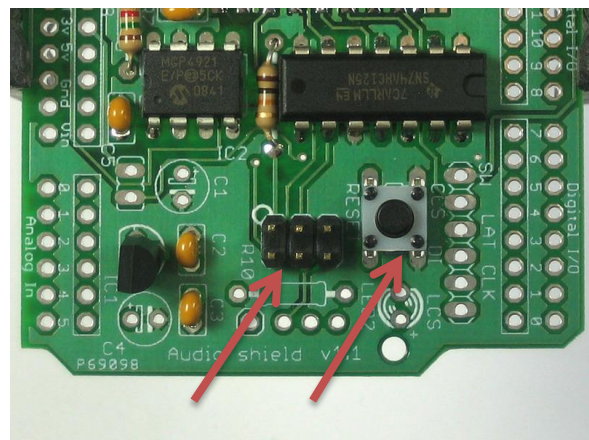
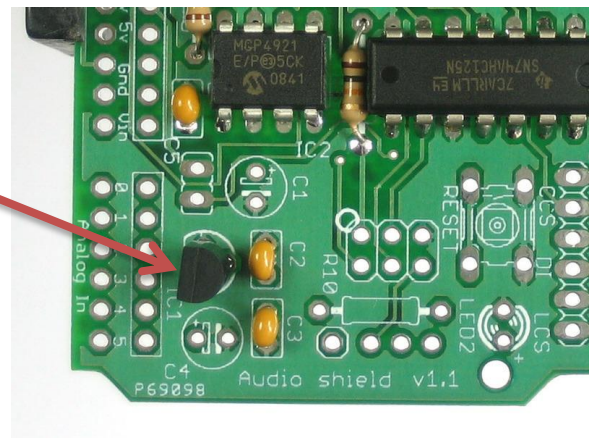
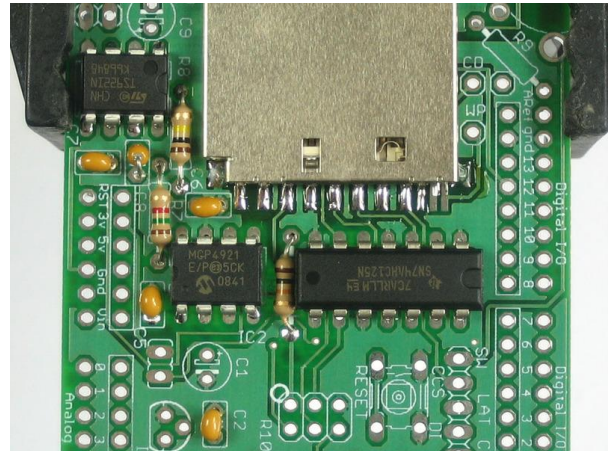
- **NOTE:** the IC1 shape will match an outline on the circuit board, **proper orientation** of this part is crucial for function of the board.
- **NOTE:** This piece will not sit flat on the board because of its pins. Push it in as far as you can, but be aware that too much pressure may damage the pins.

18. Always double check the position before soldering. Turn the circuit board over, solder in place and clip the leads.

19. Next, find the reset button and the ICSP header. The ICSP header is a square unit with 6 pins arranged in a 2x3 fashion.

- **NOTE:** Both can be placed either way, BUT the ICSP header MUST be placed with the long ends sticking up.

20. Turn over the circuit board and solder the two in place. Remember, you should be soldering **SHORT** ends of the ICSP. You will not need to clip the pins on these pieces.



21. Next, find the three electrolytic capacitors for spaces C1, C4, and C9.

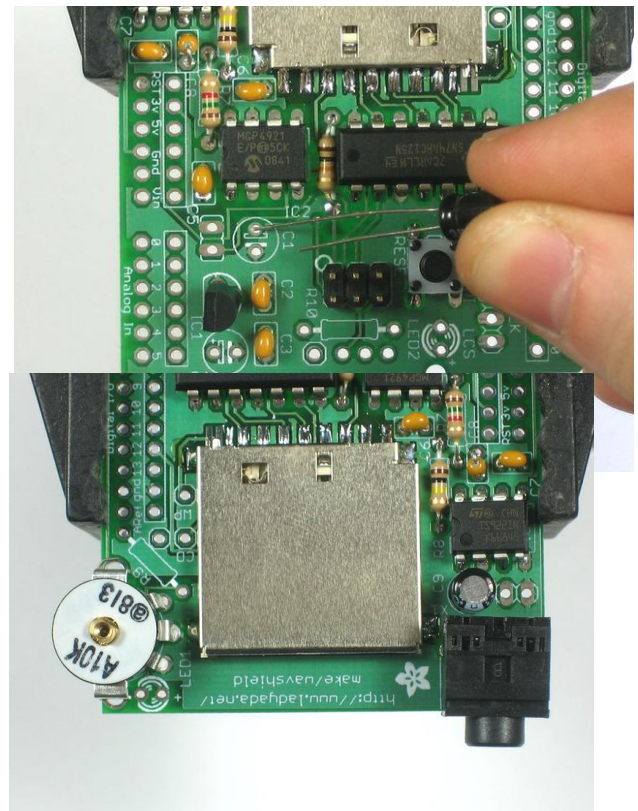
- **NOTE:** these capacitors ARE POLARIZED and must be put in the right way
- LONG lead = positive (+) = goes into hole marked with + and unfilled rectangle

22. Make sure they are in correctly, with the longer lead as the positive one. Solder them in place and clip their leads.



Snap the headphone jack into the edge of the circuit board and solder it in place.

- **NOTE:** Try not to let the solder “clump” up around these pins. The single pin towards the edge of the board needs to be as flat as possible for the next part of ARDBARK assembly. Clip the ends after soldering the headphone jack, making them as flat as possible.



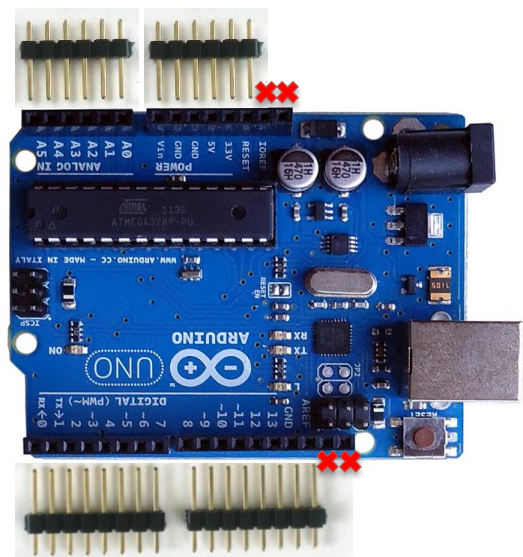
24. Take the volume potentiometer TM1 and place it opposite of the headphone jack. This piece will need plenty of solder for a strong electrical connection.

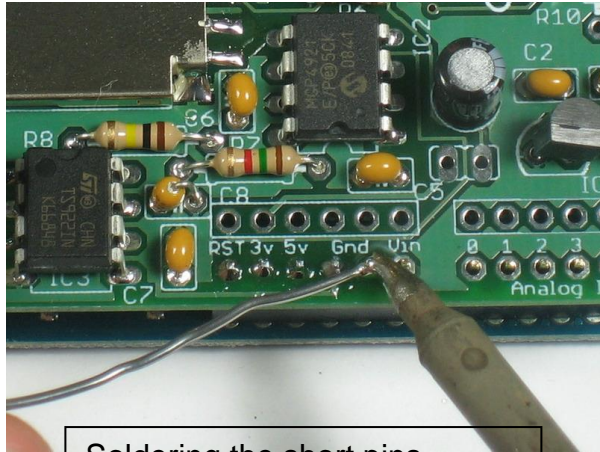
25. Next, clip the 36-pin header strip into two 6-pin and two 8-pin pieces. Save the extra pins. (Place them in the “Extra wave-shield parts drawer”)

26. Take an Aduino from the Arduino drawer and stabilize the **LONG** 6 and 8 pin headers by placing them into the female sockets on the Arduino. Next, place the circuit board on top of the Arduino so all the holes match up with the headers.

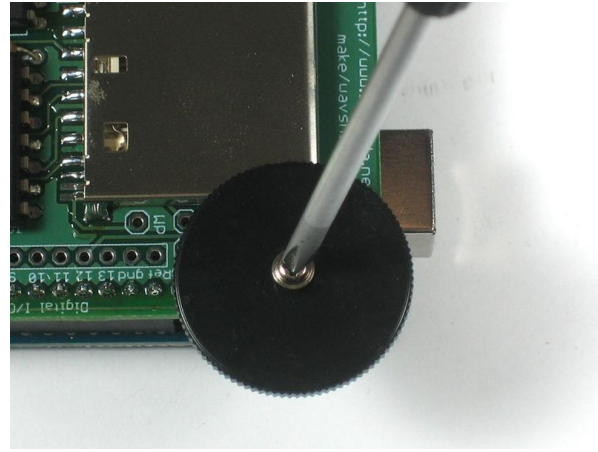
NOTE: The 6 and 8-pin slots closest to the short edge of the Arduino will be filled, but there will be 2 empty holes (see red **X**'s in the photo) in the other two 6 and 8-pin holders on the Arduino.

27. Solder the short ends of the pins onto the wave shield you have just assembled.



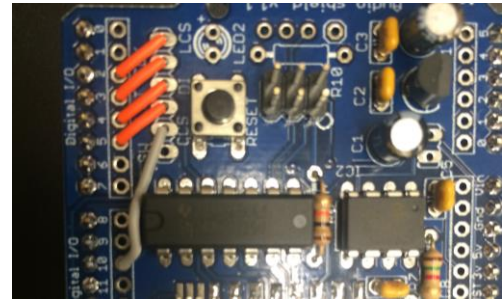


Soldering the short pins.



29. Using a small phillips head screw driver, screw on the volume dial from the waveshield packet.

30. Almost done! This is a slight modification to allow communication between the pins and the SD cards. Take four small orange jumper wires and one grey jumper wire from the box. Place one side into the holes to the right of the reset button. Then the other side will go into the holes next to it starting at the **3rd hole (number 2)**.



31. The grey jumper wire starts from the hole immediately following the last orange wire and goes to **hole 10** next to the IC1 regulator.

Source: <https://learn.adafruit.com/adafruit-wave-shield-audio-shield-for-arduino/solder>