Engr 101  
Electrical Engineering  
Notes on assembling the speaker

**Amplifier**
The speaker amplifier comes in a plastic bag with the following parts:
1. Printed Circuit Board (pcb) that is 1-1/4 x 1 inch. It is labeled *Audio Amp*.
2. 220 μf polarized capacitor.
3. 0.047 μf ceramic capacitor.
4. 0.01 μf ceramic capacitor.
5. 20Ω resistor.
6. 8-pin Dual Inline package (DIP) socket.
7. LM 386 Audio Amplifier integrated circuit (IC).
8. 10K potentiometer.
9. Audio jack.
10. 9 volt battery connector.

See Figure 1 and verify that you have all of the parts.

![Image of the amplifier printed circuit board with parts soldered in.](image-url)

**Figure 1**  
The audio amplifier printed circuit board with parts soldered in.
Figure 2
Circuit diagram for the amplifier.

Place the parts on the side of the board that has the printing on it and solder it on the other side. Begin with the shortest parts (DIP socket) and proceed to the tallest parts (220μf capacitor). Place each part on the board, turn it over, and solder it on the back.

**The 220μf capacitor is polarized. Be sure to get the positive side of the capacitor in the hole labeled with a +. All of the other parts are non-polarized and it doesn't matter which way they go in.**

**Do not solder the LM386 chip. Solder the socket to the pcb and snap the LM386 chip into the socket.**

*Speaker*
The directions for putting together the Styrofoam portions of the speaker along with the speaker coil assembly are given in a video on the web site at [http://csserver.evansville.edu/~blandfor/EN101/StyrofoamSpeaker.mp4](http://csserver.evansville.edu/~blandfor/EN101/StyrofoamSpeaker.mp4)

The following shows how to connect the amplifier to the speaker and make it functional.

You will need the following connector wires. Wire colors used here are for instructional purposes – you may use whatever color wire is available.
1. Three wires about 7 inches in length to connect the potentiometer to the amplifier. I used red, white, and black.
2. Two wires about 6 inches in length to connect the phono-jack to the amplifier. I used black and white.
3. A single wire about 2 inches in length to go from the switch to the amplifier. I used red.
4. A 9-volt battery connector. This connector will have a red and a black wire attached to it. Each is about 4 inches in length.

You will also need a hot glue gun and a sharp standard pencil to make holes in the Styrofoam.
Use a wire stripper to strip the insulation off the ends of all of the wires. Leave 1/8" to 1/4" of bare wire on each end. Solder each wire to the parts (potentiometer, switch, and phono-jack) and solder the other ends to the amplifier board. Figure 3 shows all of the wired soldered in place.

Figure 3
The amplifier with the potentiometer, switch, 9-volt connector, and phono-jack soldered in place.

Use the pencil to poke two holes in the front face of the Styrofoam speaker. One of these is for the potentiometer and the other is for the switch. This works best if you push the pencil through from one side so that it barely penetrates the other side leaving a mark. Use the pencil to complete the hole by pushing it through the other side at the mark. If you push the pencil through from one side only, the paper tends to flare out leaving rough uneven edge. Make the hole just big enough so that the switch or the potentiometer fits in tightly.

Place the potentiometer, switch, and amplifier on the speaker. You can use hot glue to tack the wires in place. You should also use hot glue to glue the phono-jack and battery holder in place.

You will need to use a small piece of sandpaper to rub the varnish insulation from the two loose speaker wires. Do this carefully and solder the two speaker wires to the two holes labeled Out on the amplifier board. These are not polarized and either wire can fit into either hole.

Figure 4 shows several views of the fully assembled speaker.
After you have your speaker assembled connect a wire between the phono-jack and your cell phone. Set your phone to play sound, adjust the volume, and verify that your speaker works. If all is working, you can hot glue the amplifier board to the speaker bottom as shown in Figure 4. If your speaker is not working see your instructor.