This is a step-by-step guide to soldering your own amplifier and create your own set of speakers. You will need a soldering iron, protective eye wear and some materials to build your speakers with.

We hope you enjoy this creative task, learn some new technological skills and apply them to your life in useful ways. Enjoy!
MAKING YOUR DIY SPEAKERS

Parts:
1) Diode (black tube with grey mark on one end)
2) 2 X 22 K Ohm Resistors (Red, Red, Orange, Gold)
3) 2 X 2.2 K Ohm Resistors (Red, Red, Red Gold)
4) 2 X 10 K Ohm Resistors (Brown, Black, Orange, Gold)
5) 2 X 4.7 Ohm Resistors (Yellow, Violet, & Gold)
6) 1 X 33 Ohm Resistor (Orange, Orange, Black, Gold)
7) 1 X Red LED (Light Emitting Diode)
8) 1 X Stereo Input Jack
9) 1 X Switch
10) 1 X 8 Pin black socket
11) 2 X 220 nF (nano Farad) Capacitors
12) 2 X 330 nF Capacitors
13) 1 X 0.1 uF (micro Farad) Capacitors (round ceramic)
14) 1 X 10 uF Capacitors (cylinder)
15) 2 X 100 uF Capacitors (cylinder)
16) 2 X 470 uF Capacitors (cylinder)
17) 2 X Orange Terminal Blocks
18) 2 X 4.7 K Ohm Potentiometers (variable resistors)
19) 1 X 8 Pin Integrated Circuit (IC) TDA2822 amplifier
20) 1 X Battery Holder
21) PCB - printed circuit board with stereo jack attached
22) Blue or White Tack (not included, but helpful for soldering)
23) Stereo cable
24) Double Sided Foam Tape
25) 2 X Exciters (Speakers)
1. Diode

1.1 Bend the diode’s legs 90 degrees. Make the bend at around 3mm away from either side of the black cylinder.

1.2 Insert it into the PCB. Top tip: The diode has a direction - which means it must go into the PCB the right way! Match the grey mark on the diode with the grey mark on the PCB.
1.3 Make sure the diode’s legs are pushed all the way through the PCB.

1.4 Turn the PCB around and bend the legs of the diode at around 45 degrees to the board.
1.5 Solder the Diode to the PCB!
- Take out your soldering iron, and touch the side of the tip to the point where the leg meets the solder pad.
- Heat the point where they meet for 3-5 seconds.
- Add solder until enough melts to cover the solder pad and the base of the diode’s leg.
- Remove the solder and leave the iron for another second.
- Remove the soldering iron and you should be left with a perfectly soldered joint!

Top tip: Melted solder likes to attach itself to very hot surfaces - so you want to make sure that both the parts you’re trying to connect are given equal heat. Otherwise you’ll end up with what is called the dreaded “cold joint” - which will result in an F in your soldering exam!
1.6 After soldering both the legs, pick up the side cutters in your right hand. With your left, hold one of the legs of the diode. Clip it at its base. Repeat for the other leg.

Top tip: You’re holding the leg to prevent it from flying into your or someone else’s eyeball! Please remember that eyeballs are not easily replaceable and you should always be very careful when clipping the legs off of your components.
2. Resistors:

2.1 Take any one of your resistors and bend both the legs as close to the resistor’s body as you can. Use your finger or the table to help!

2.2 Repeat this with all the resistors.
2.3 Place the resistors in the following order from top to bottom (as in the image below):
- R5: 22 K (Red, Red, Orange, Gold)
- R7: 2.2K (Red, Red, Red, Gold)
- R2 & R1: 10 K (Brown, Black, Orange, Gold)
- R4 & R3: 4.7 Ohm (Yellow, Violet, Gold, Gold)
2.4 Bend all their legs out 45 degrees, and solder them in place. Once soldered, clip of the legs with your side cutters.

2.5 Place and solder two of the last three resistors in this order:
- R6: 22 K (Red, Red, Orange, Gold)
- R8: 2.2K (Red, Red, Red, Gold)
2.6 Place and solder the final 33 Ohm (Orange, Orange, Black, Gold) resistor into its position R9.

2.7 Once soldered in place, clip the legs. The good news: You’ve just finished the resisters!
3. LED (Light Emitting Diode)

Take the LED and look at its legs. You’ll see that one is longer than the other. This means that it has to be inserted into the PCB in the right way!

The longer leg is called the Anode - which likes to have power and the shorter one is the Cathode - which likes to have ground.
3.1 Insert the LED and solder it in place.

4. Take the green stereo jack and place it next. It will slot very comfortably in place where the PCB says “Stereo IN”. Solder it in and move onto the next component!
5 Insert the Switch into the position marked “S1” adjacent to the LED. Solder all 5 pins in place.

6. Take the 8 pin black socket and insert it where the PCB is marked “TDA2822”. You’ll notice there is a notch in the illustration on the PCB and a notch in the 8 pin socket. Keep these aligned when inserting, and solder it in!
7. Capacitors:

7.1 We’ll begin by soldering the non-polarized capacitors. IE: the ones which can go into their places any way around!
Find the 220nF, 330nF and 0.1uF capacitors.

7.2 Insert the capacitors in the following positions:
- 220nF capacitors into C8 & C9
- 330nF capacitors into C10 & C11
- 0.1uF capacitors into C6 & C7
7.3 Onto the Electrolytic Capacitors.
WARNING! These ones are polarized - which means they can only go into the PCB in a particular way.
Find the 10uF, 100uF and 470uF electrolytic capacitors.

7.4 Take the smallest one - the 10uF capacitor and look at its legs. You’ll see that one is longer than the other.

Top tip: If you ever find an electronic component with different length legs, you know immediately that it can’t be installed any which way. So pay attention to its orientation!
7.5. If you look at the PCB, you’ll see a “+” next to one of the plated holes. The long leg is “plus sized,” so it should be inserted next to the “+.”

7.6. With this in mind, insert the electrolytic capacitors into the following positions:
- 10uF capacitors into C3 (thinnest cylinder)
- 100uF capacitors into C1 & C2
- 470uF capacitors into C3 & C4 (widest cylinders)
7.7. Turn over the PCB and bend the legs of all the electrolytic capacitors out at 45 degrees. Solder them all in, and clip the legs.

Top tip: These “polarized” capacitors must be connected the right way around. The long leg is inserted on the “+” side because that is where the voltage is going into it. The other side will have to be lower than that voltage and in the world of electronics we refer to the other side or the “-” side as ground.
8. Solder in the 2 Orange Terminal Block connectors. Connect them with the white levers on side of the 0.1 uF capacitors - like the picture below.

![Image of circuit board showing soldered components]

11. Solder the two potentiometers in place.

![Image of circuit board with potentiometers highlighted]
12. Integrated Circuit (IC):

12.1 The IC is an amplifier chip. It must be placed inside the 8 pin socket you soldered previously. If you look carefully at the chip, you’ll see a notch in the center of the one end.

12.2 Carefully insert the IC into its socket so that the notch is directed towards the LED.

Top Tip: The reason for using a socket is to make sure that we don’t over-heat the IC by soldering it directly.
13. The battery holder:

13.1 Before we solder the battery holder in place, it’s a good idea to test test test! So insert 2x AA batteries (not included) into the battery holder.

13.2 Insert the battery holder into the PCB from behind. It goes in on the edge of the board closest to the IC.
13.3. Bend its legs out at 45 degrees to keep it in place. It will also ensure that they make contact with the conductive pads which we will solder them to later. Turn the switch on...

Does the LED go on???

If so, congratulations!
If not, try the following:
- press down on the bent legs of the battery to ensure contact.
- Try the switch again in both directions while pressing the battery legs.
- Are you sure you put batteries in?
- Go back through the manual and make sure you put everything in the right way around.
- Check the forum at twsu.co/forum for support
13.4 Remove the battery holder and find the double sided foam tape. Attach the foam tape to the back of the battery holder on the other end to the legs. Then reveal the other sticky side of the tape before inserting the legs back into the PCB.

13.5 Solder the legs in place and trim them.
13.6 Turn the switch on again to make sure the LED turns on and everything is in good shape.
14. Attach your Exciters

14.1 Each exciter (speaker) has two cables. Your amplifier has two orange terminal block connectors. All you need to do is match one terminal block with one exciter - and away you go!
14.2 Depress one of the white levers of the terminal blocks and then insert one of the wires from the exciter into the slot.

Top Tip: Whichever one of the exciter cables you plug into the first slot of your terminal block, make sure the other exciter wire goes into the same terminal block!
CONGRATULATIONS!

You have now completed your Uber Amp 9000, and attached it to your exciters! All that is left is to attach the exciters to various materials, and begin experimenting with sound waves and surfaces. Enjoy exploring different material’s responses to the vibrations emitted by your exciters. Then decide on a material you want to become your speakers!
THANK YOU

Technology Will Save Us exists to educate and inspire people to make, tinker and experiment creatively with technology as a way of unleashing new possibilities. Devices, gadgets, computers are all a part of our everyday life and yet most people know so little about what these things are made of, let alone how to fix them or create new uses for them. We believe that the opportunity for technology to play a richer, more creative role in our lives has yet to be explored.

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This is a step-by-step guide to soldering your own amplifier and create your own set of speakers. You will need a soldering iron, protective eye wear and some materials to build your speakers with.

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