
LeafAudio
Microphonic Soundbox

Building Instructions. PCB v1.1 / Box v1.1

Thanks for building our Microphonic Soundbox DIY kit! It‘s a great instrument for creating interesting and otherworldly soundscapes.
The kit includes all parts but you will need some extra materials and tools.

DIY Level: medium but special. Some steps in the building process are not obvious, even if you are an experienced builder, please read the instructions before you start.

Even if we made the manual as good as possible, you will definitely need some DIY skills before you build this kit.
It‘s Do It Yourself - you are responsible for your creation, we cannot offer support for DIY kits. In case, you are not sure that you can do it alone, please look for someone to help you, before you start.

Needed tools: Reliability and durability of the resulting product depends on your skills and the quality of used tools.
Please visit www.exploding-shed.com/info and check our recommendations for soldering equipment and watch the soldering tutorials.
Bad equipment and skills will lead to bad results.

Good luck and enjoy!

Manu & Hagen

Part 1. Preparations

Resources

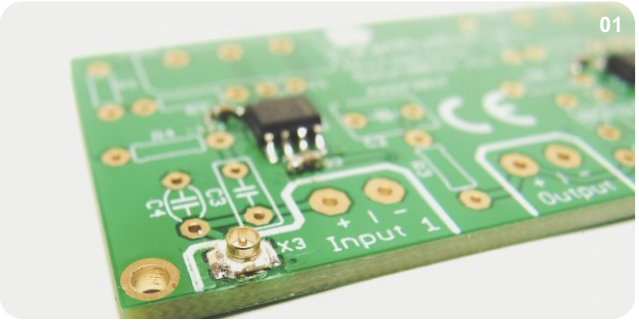
On this site you'll find all information regarding this DIY kit, including videos and help. It will be updated when new information becomes available. https://www.exploding-shed.com/microphonic-soundbox-diy-support-page

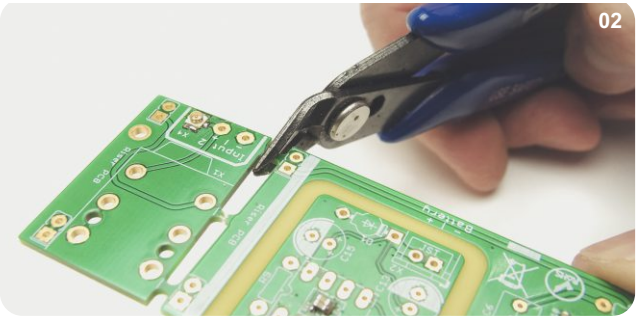
ESD Protection

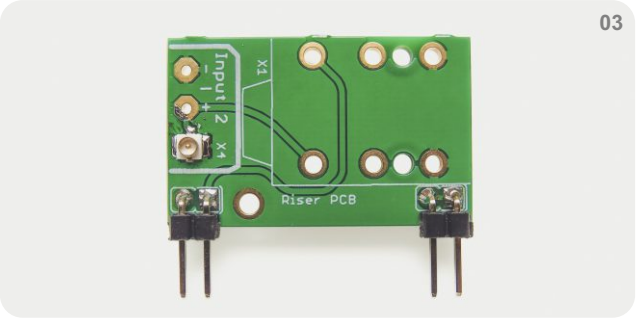
We all have experienced electrostatic charge, which dissipates when we touch something or someone. Right? This can destroy some electronic components. It is the reason why professional working places are always equipped with ESD mats. Some components are more sensitive to that, some less. In our circuit we have some Op-Amps which can easily be destroyed by that.

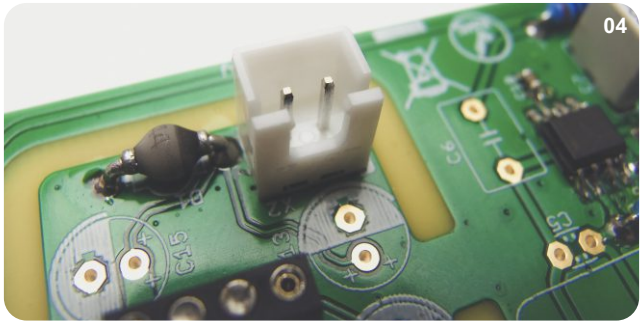
Before working on the DIY kit, please do some web-research and learn about ESD before you start!

If you don't have a professional ESD mat, go the poor man's way and use the included ESD-wristband. Take a piece of aluminum foil as a working surface and glue that side of the wristband with copper foil to the aluminum foil, connect the other side with your wrist. That's not perfect but then you and your working place are on the same electrical potential. You could hold the tip of your soldering iron onto the aluminium foil for a second from time to time, before soldering to equalize the potential between you, foil and iron. Another possibilitiy is to increase air humidity by cooking some water or drying clothes in the room. And maybe do not wear plastic or wool, better cotton. Well, it's as we said - the poor man's way. Do not power up the circuit while lying on the aluminium foil. This will create a short circuit.









Part 2. Electronics

If you have good soldering skills, we recommend to use more environmentally friendly lead-free solder. If you are less skilled, we recommend using leaded solder as it is easier to use.

You start with the PCB, already containing the pre-populated and tested SMD parts.

All parts are populated from the top side of the PCB, as shown by the silkscreen. **picture #01**.

Only take out the parts from the bags, which are used in the current step and leave the rest inside.

01. Separate the two parts of the PCB, using a sharp wire cutter. **picture #02**.

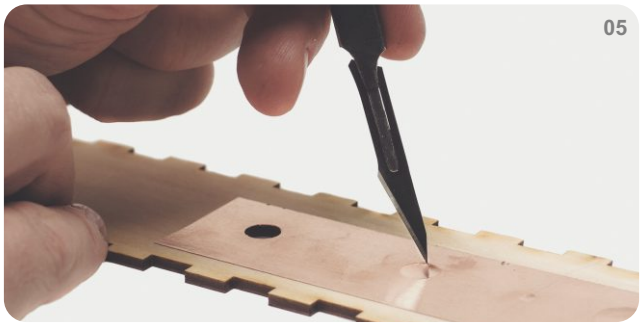
02. Solder the two angled headers onto the small PCB (Riser PCB). **picture #03**. To make sure, the PCB lies flat when you solder them from the bottom side, you can use one or both of the 220nF capacitors to lay them flat under the board, as they have the same height as the angled headers.

03. Solder the 6,3mm connector to the small PCB (Riser PCB). The silk screen print tells you the side of the PCB you want to use. Take off the nut, so the connector lies even on the surface and make sure the PCB lies absolutely flat on the connector before soldering.

04. Put all resistors (R1-R9) in place and solder them.

05. Put the diode (D1) in place and solder it.

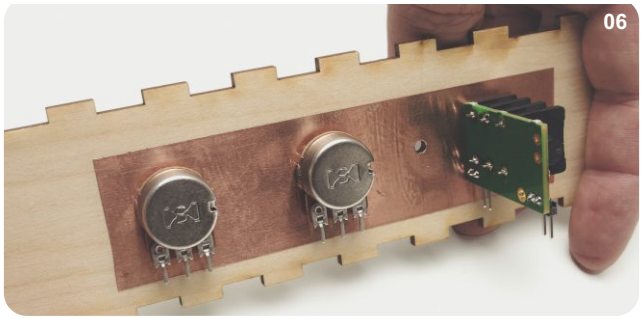
06. Next comes the socket for IC3 (the IC itself will follow later). The socket and also the IC has an indication for its direction, also shown on the silkscreen (notch).



07. Next are all brown ceramic capacitors (C1 and C5, C4 and C8), they also have no polarity.

08. Put the 2-pin battery connector in place and solder it. It has a notch on one side, which faces towards the IC socket. **picture #04**.

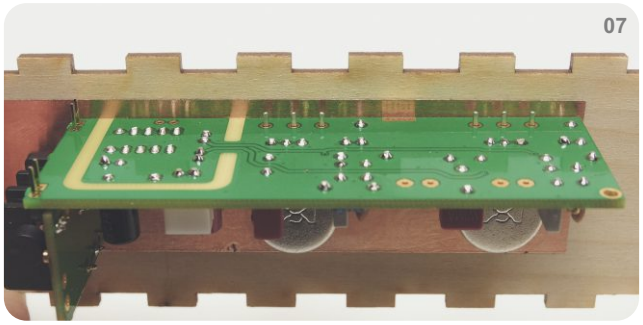
09. Put the 220nF capacitors in place, they have no polarity.



10. Then follows the red, squared 2,2µF capacitors (C2, C6), also no polarity here.

11. Next is C15 with value of 220µF, please check polarity. White stripe / white area on silkscreen indicates minus.

12. Then follow C13 and C16 with value of 180uF. Polarity indication as before.

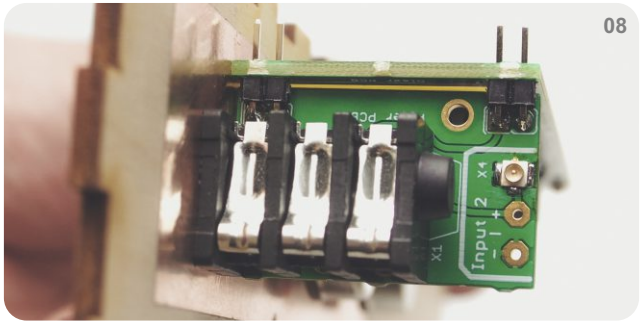


13. Put IC 3 into its holder, considering the direction, as mentioned before.

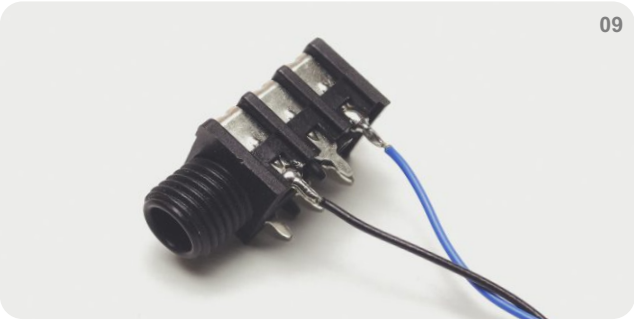
Note: we have cut off legs 6 and 7, which is intended like this. If the IC doesn‘t fit into the socket, bend the legs gently by pushing them onto a flat surface or utilize a flat nosed pliers.

14. Take the wood front panel and use a sharp slim knife, cutter, scalpel etc. to carefully cut out the copper foil from the holes. If you don‘t have a knife, use a needle to punch out lots of holes at the edges, this also does the job.

Note: The copper shielding foil has to have contact to the the body of the potentiometers in the end, so don‘t take away too much foil around the hole! **picture #05**.

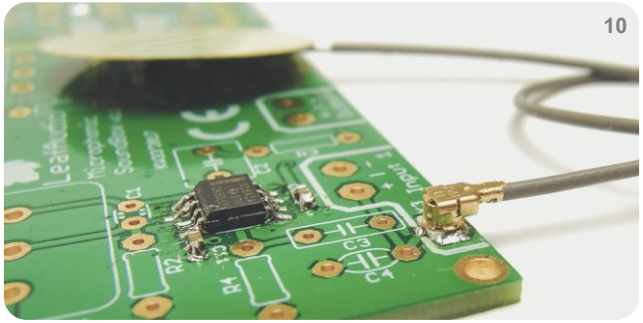


15. When this is done, take the wood front panel and mount the potentiometers and the Riser PCB into the panel, but keep it a bit loose first. **picture #06**. Then, attach the PCB to it and make sure everything fits well together. Tighten the nuts. Solder the potentiometers and pin headers, coming from the Riser PCB. **picture #07** & **picture #08**.


09

16. Take off the front panel again, now it‘s time for the LED. Please check the silkscreen for polarity. The plus sign corresponds to the long leg of the LED, hold it that way. Use a flat nosed pliers to bend the head of the LED carefully by 90° into the direction of the front panel, so later it will point through the hole in the panel.

17. Stick the LED in place and mount the PCB behind the panel again. Adjust the height of the LED and solder it. If done, take the panel off again.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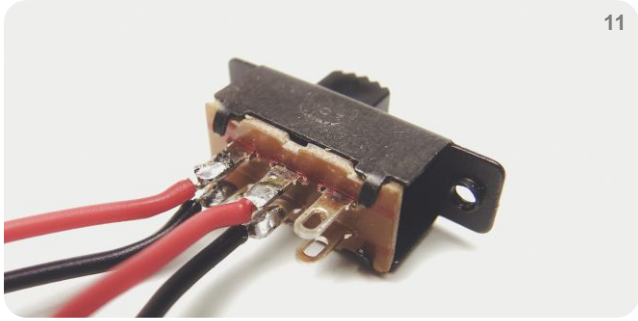
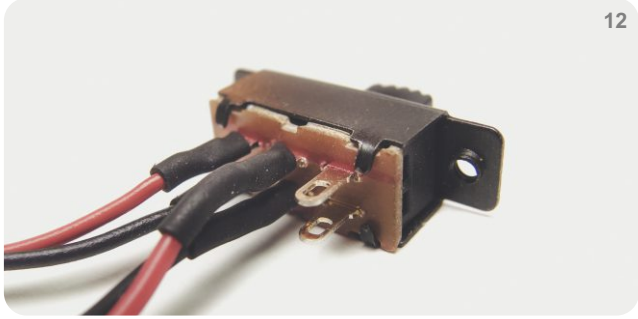
18. Now it‘s time to connect the output TRS socket. Take the black and colored wire, strip the endings on one side, then tin-coat them. Solder them to the TRS socket like you see in the **picture #09**. Cut the other ending to an equal length, strip them, tin-coat them and solder them to the PCB. If you like, twist the wires to avoid a mess.
Note: Black is shield or minus, color is signal or plus.


11

19. Take the contact microphones with pre-soldered coax-cable and attach the their plugs to the corresponding sockets, but read and think first! Please see video #01 and the **picture #10**. Also note that one contact mic has a long cable and the other one has a short one. In the “box assemby” section you’ll find more info about their position inside the box, read this first and then come back here before connecting them. Later, when the circuit is definitely working and you want to make sure the connectors stay forever, use a little drop of hotglue from the side to fix it.
Note: These connectors are made to attach them only a few times and leave them. Multiple cycles might wear them out!


12

20. Take the battery holder and measure 75mm (~3") of the wire, beginning from the battery holder. Cut it there. You will now mount the on/off switch in between. Remove approx. 5mm (~0.2") of insulation from the ends of the wires and tin-coat them. Take the shrink tube and cut it into 4 parts of ~8mm (~1/8") each. Put one over each wire, as far as possible from the stripped endings to avoid accidentally shrinking. Solder the wires to the switch as seen on the **picture #11**. One side goes to the battery holder (side), the other side (mid) to the battery connector (each side has 1 black and 1 red), the right side of the switch stays unused. If you are sure that all connections are good, pull the shrink tube over and shrink it down with heat. **picture #12**.

21. You are now ready to test the unit! Output socket and contact microphones should now be connected and you are nearly ready to test the circuit.

22. In the final assembly, don’t forget to solder the PCB and copper foil together.

Additional notes:

Before you stick a 9V battery into the battery holder, please look over the entire circuit and all wires again, if it looks correct and there are no short circuits or mistakes. Check parts and wires for correct polarity.

If you are absolutely sure that all is correct, power it up! Does the LED light up? If not, switch off and feel, if the battery gets hot, you might have a short circuit somewhere or the LED is reversed. When the LED lights up: Check the channels 1 and 2 if they are working as intended. If not - take power off and do trouble shooting. If yes: congratulations. video #02. If you had to do troubleshooting and solved it, feel free to report to support@exploding-shed.com. We will collect all issues and solutions.

If you have access to a laboratory power supply and you can monitor the current draw of the circuit, it should not draw much more than 11mA. If it does, there‘s definitely a mistake somewhere.

Part 3. Box Assembly

This is what you need now:

- A screwdriver of size PH1 and a small flat screwdriver
- Wrenches of sizes 10 and 14
- A flat nose pliers or better small combination pliers
- All wood parts of the box except the bottom part
- Syringe with wood glue and cannula
- Painter‘s masking tape (german: Maler-Krepp). We recommend the more expensive Tesa „Malerband Classic“, as it leaves no adhesive residues on the wood. Prepare 4 strips of ~10cm (4") length and 8 strips of ~8mm (~1/8") length.
- 1-2 rubberbands
- An absolutely even surface to work on. A kitchen counter for example
- A kitchen sponge, which should be slightly damp but not dripping wet
- Sand paper with grain of about 150/180

Now the wood box has to be glued together, except the bottom. You should glue the bottom in a few weeks, when you are absolutely sure, that the machine works perfectly, as it will be difficult to open it again.

We could waste many words now, but we think videos can transport the needed information much better. Please take the time to watch the videos first. All videos can be found here https://goo.gl/DSdfXW. Please plan every step carefully before you execute it.

General order:

1. Glue the box and let it dry. video #03
2. Prepare the carbon strips. video #04
3. Prepare the box and attach the Kalimba body to the box. video #05
4. Attach the wood block on the top. video #06
5. Attach the screws to the metal springs and then the springs on the wooden block. video #07
6. Build in the electronics and attach the contact mics. video #08
7. Build in the battery holder, attach the bottom part to the box and finalize it. video #09

Some hints for a better assembly:

- In case, the box doesn‘t lie absolutely even on the surface after glueing it, you could carefully put some weight on it. For example a cooking pot standing on an absolute even cutting board. Then let it dry over night or at least eight hours.
- If the box has dried, remove all the masking tape from it. It might be, you have to sand it carefully now to remove tape residues or to make the top absolutely even where the wood block is attached. We recommend sand paper with grain 150/180 for that.
- You can generally use a battery-powered screwdriver like in the video, but please always tighten the screws manually towards the end to avoid destroying the wood or the Kalimba body, it‘s fragile materials.
- When you attach the screws to the metal springs, be aware that the nuts are used backwards in this case!
- Do not use the same sand paper for the carbon strips and wood box. The carbon dust will definitely ruin your wood look!
- Before using the carbon strips, their corners and edges must be ground and deburred. Carbon dust is unhealthy, be responsible and careful, clean up the dust with a damp cloth and throw it into the dustbin. Wash your hands afterwards or use thin, disposable gloves.
- Feel free to find your own favourite spots for placing the contact mics. You can use painter‘s tape or Gaffa first to attach them and when you found the ultimate positions, which sounds best to your ears, use the double sided tape to make it final.
- When placing the contact mics, be aware that the one which is connected to the Riser PCB is switched off when inserting external signals. You maybe want to use your favourite signal on Input 1 (see PCB silkscreen).
- During the final assembly, remember to lay the cables in such a way that they do not make any rattling noises on the wood when playing the instrument.

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