

# Open.Theremin V3 Kit

Congratulations, this is your Open.Theremin V3, the newest version of a DIY Theremin used by more than 1000 people around the world today. Happy to have you in the community of people exploring the amazing instrument initially conceived by Leon Theremin. This is a digital theremin shield for the Arduino UNO based on the original principle of heterodyne oscillators.

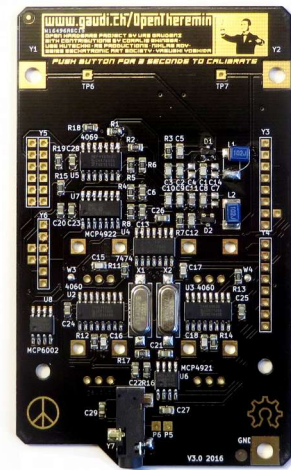
Some instruction on how to set it up and get the best out of the circuit:

This is the content of your Kit:

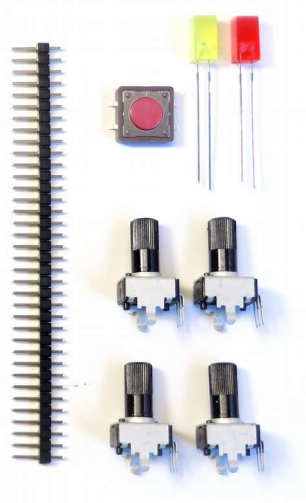
*Mechanical Parts*



*Theremin Circuit Board*

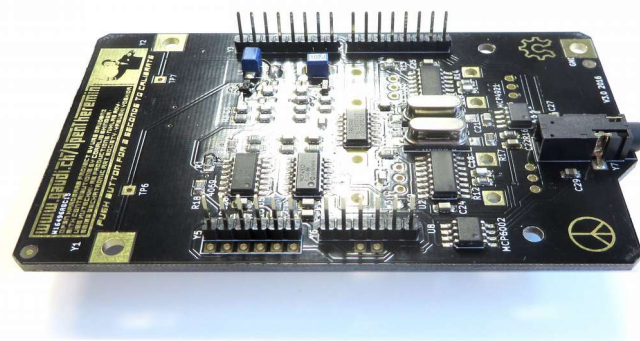


*Electronic Components*

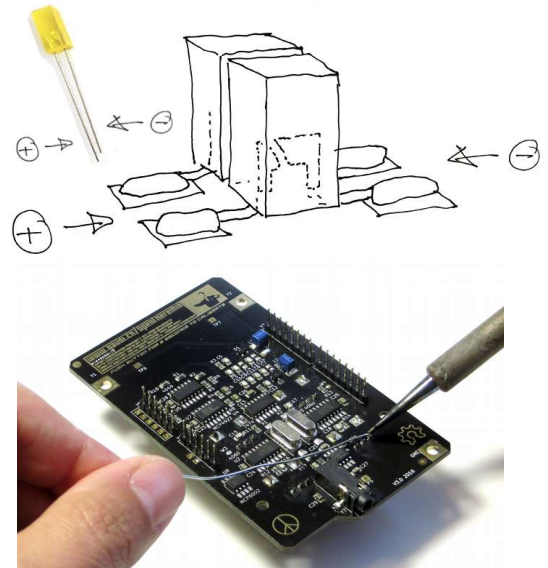
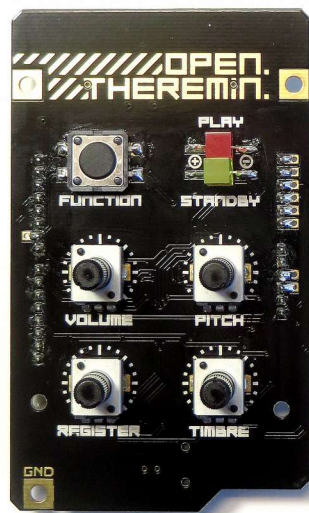


## 1. Complete the shield

First solder in the pins that connect the shield to the Arduino as shown in the picture below.



Next solder the push button and the two LEDs to the front. A good soldering technique for these surface mounting parts is to first put a bit of solder on one pad, then heat the solder and slide the component in place. Then solder the rest of the pads. The LED-lights have a plus and minus leg. The leg that goes to the plus side is longer. Bend the two legs of the LED to the outside and cut them to the right length. See the drawing.



Finally add the four potentiometers and solder them carefully on the backside. Be sure to only put solder on the pads for the potentiometers.

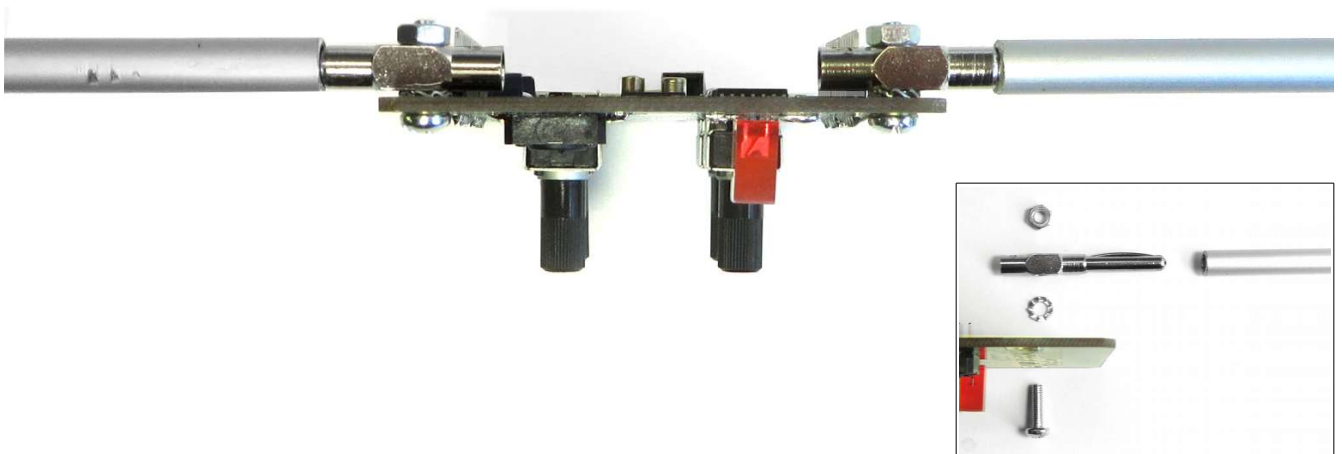
Now you are ready to connect the shield on top of an Arduino UNO. Arduino UNO is a very popular open source electronic development platform that you can get from many sources on the Internet. See here for Resellers: [www.arduino.cc/en/Main/Buy](http://www.arduino.cc/en/Main/Buy)

## 2. Connect Antennas to the Open.Theremin

You can basically use any electrically conductive material as antennas. The picture shows how to connect two aluminum rods (can be found in most hardware stores) with an inner diameter of 4 mm using the supplied spring plugs (banana plugs). The total length per antenna should be around 40 to 50 cm. You can easily bend antennas from aluminum tubes of 6 mm diameter by hand to the desired shape. To build the theremin into a case you can also use stiff wire to connect the antennas.

*Volume Antenna*

*Pitch Antenna*



## 3. Connect the Audio Out

Use the mini jack connector on the bottom of the open.theremin shield to connect an amplifier or an active speaker.



#### 4. Set up and Grounding

The theremin measures smallest variations of capacities (less than 1 pico Farad). The capacity between the antenna and your hand is measured and translated into the pitch (or the volume) of the sound. The electric loop with the instrument is closed from your hand through your body, through your shoes through the floor into the ground and from ground back into the instrument. This is why proper grounding of the instrument is important.

Use any of the following methods to ground your theremin.

- a. Use a grounded audio cable. If you connect your theremin to a mixer or amplifier that is grounded, the theremin is grounded through the audio cable.
- b. Use a grounded power supply. You can power your theremin through the USB plug (by a device like a computer or a power adapter with USB connector) or by a separate power adapter. If the power supply is grounded the theremin is grounded as well. Notice that many USB power adapter and power supplies are not grounded.
- c. Use a separate grounding wire. There is a ground pad (GND) on the open.theremin board where you can connect an extra grounding wire. Attach this wire to a grounded metallic object in your room (like a lamp or a water tube).

And not only your body is interfering with instrument, also a table or an object close to the theremin will add to the capacity sensed by the instrument. So best is to put up the theremin on a stand in the open space. The little acrylic adapter piece with a threaded hole (supplied in the kit) fits to commercial camera stands (1/4" UNC) and can be stuck to the back of the arduino or your own housing.



## 5. Programing the arduino

Connect the Arduino UNO to the computer using a standard USB cable. Note that the LED-light will only light up when the Arduino is programmed. For this download the latest Arduino IDE Software and the Open.Theremin V3 code form the links below and upload it to the board. When the upload is successful you should see the red LED-light turn on.

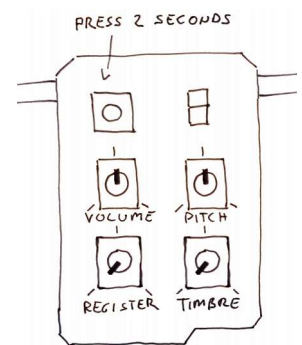
Instruction on how to install the Arduino programming tool and how to use it can be found here: <http://arduino.cc/en/Guide/HomePage>

Get the Open Theremin Code from the Git-Hub Repository by clicking the "Download ZIP" Button on this site: [https://github.com/GaudiLabs/OpenTheremin\\_V3](https://github.com/GaudiLabs/OpenTheremin_V3)

## 6. Auto-calibration of the theremin

Theremins are very sensitive devices. This is why they need calibration before playing. The new open.theremin V3 has an electronic auto calibration built in, it makes calibration very easy. To do so follow these steps:

- Power the theremin and let it warm up for about 10 minutes.
- Now turn the two knobs VOLUME and PITCH to the middle position and the knobs REGISTER and TIMBRE all to the left.
- Press the FUNCTION button on the theremin shield for about 2 second until you hear a short melody. The yellow LED-light will now start blinking and the theremin does the automatic calibration of the antennas. To not disturb the calibration step away form the theremin and wait until the red LED-light goes back on.



**Now you theremin is ready to play.**

The calibration values are stored in the Arduino. So you only have to do this procedure once. If however you move your theremin or feel that it is not playing well, you can always repeat the procedure to re-calibrate.

### Functionality of the knobs:

The PITCH knob allows you to fine adjust the playing range of the pitch antenna (zero beat). The VOLUME changes the sensitivity of the volume antenna. For a good introduction on how to tune the theremin see this excellent introduction by Carolina Eyck: <https://youtu.be/A48fm1ZEgZU>

With the REGISTER knob you can vary the sensitivity of the theremin. Turn it to the right to increase sensitivity. Note that higher sensitivity may come with more noise picked up by the antenna.

The TIMBRE knob allows you to choose from one out of 8 different sound settings.

You can mute your theremin by pressing the FUNCTION button.

For more information, documentation and source code of the open design go to: [www.gaudi.ch/OpenTheremin](http://www.gaudi.ch/OpenTheremin)

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