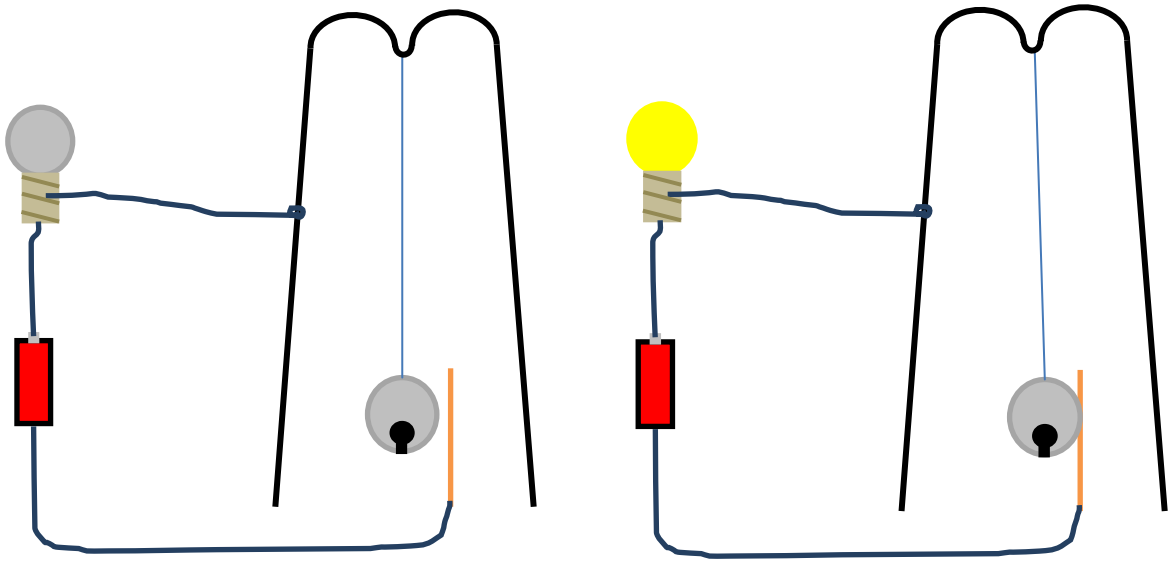
Instruction for the seismoscope kit

(ERI, University of Tokyo, 2013)

1. What is a seismoscope? How does it work?

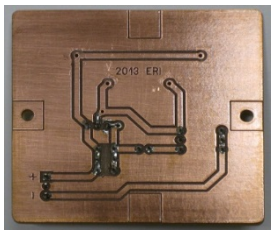
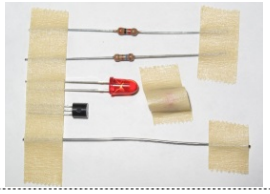
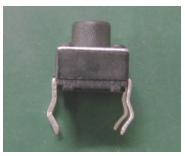
A seismoscope is a device which detects an earthquake (or vibrations in general) and indicates its occurrence.

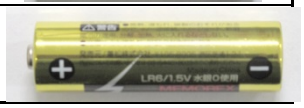
When an earthquake occurs and it is large enough to make a suspended bell touch an electrode (copper tape), the electric circuit will be closed and the LED will be lit. Once this happens, the LED remains on, even the bell is not touching the tape any more. So we can know the occurrence of the earthquake, without keeping our eyes on the device constantly.



2. Parts list

Inspect the contents of your bag to see if you have everything listed bellow.

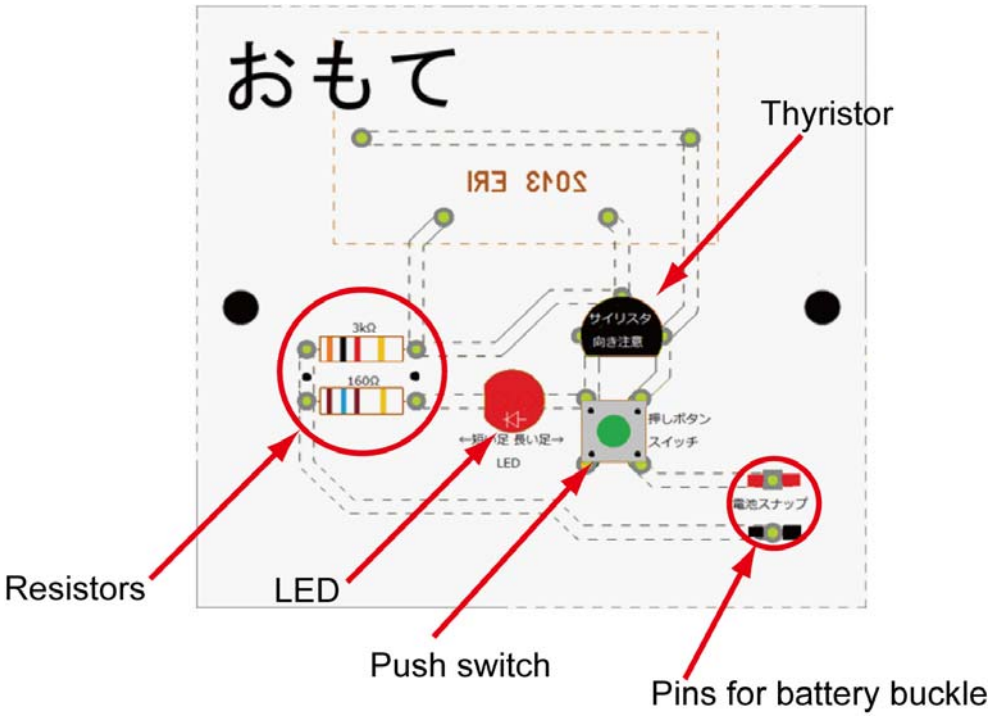
Components	
PCB　Header sockets and pins are soldered.	
Paper sheet with electric components	
Resistor 3 kΩ (orange, black, red, gold)	
Resistor 160 Ω (brown, blue, brown, gold)	
LED	
Thyristor	
Short wire (7cm)	
Push switch	
Bag with other compenents	
Conductive thread	

4 Nuts (large)	
2 screws	
2 Nuts (small)	
Bell	
Copper tape	
Longer wire (20cm, bent)	
Battery buckle with header sockets termination	
Battery holder	
4 Batteries (AA)	

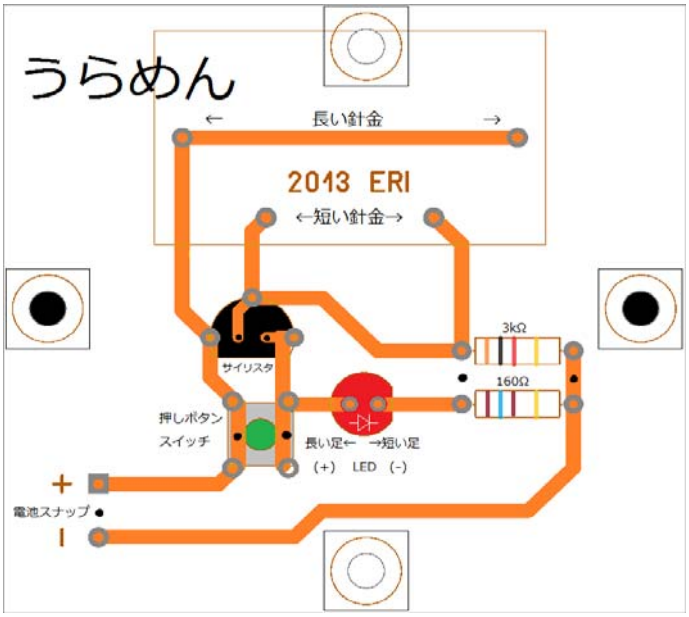
3. How to assemble your seismoscope

Step 1. Plant the components on your PCB as shown in the figures below, by inserting leads of the components into the proper header sockets.

Top Side (without copper pattern)

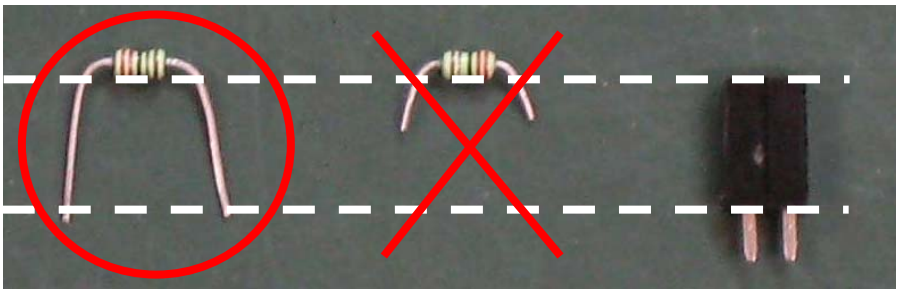


Back Side (with copper patterns)



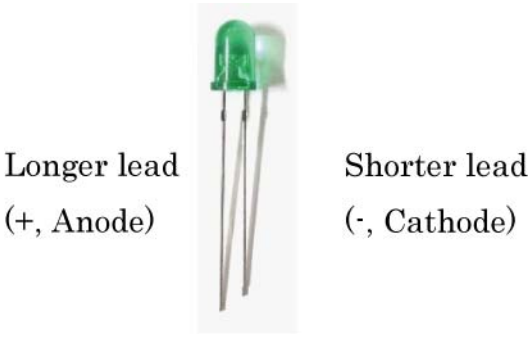
Resitors: bend the leads so that they match to the header sockets, then cut them with a cutter leaving about 1 cm. Make sure not to make them too short, otherwise they lose conductivity.



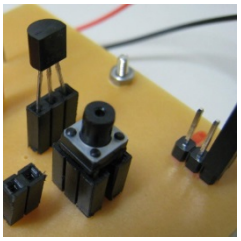


Push switch: Insert the leads to the header sockets. Be careful about its orientation. You may need to straighten the leads to match them to the sockets.

LED: LEDs have a polarity. When connected in wrong polarity, they won't light even the current applied .Longer lead indicates + (anode) and shorter – (cathode). The longer leads should be inserted to the socket closer to the switch.



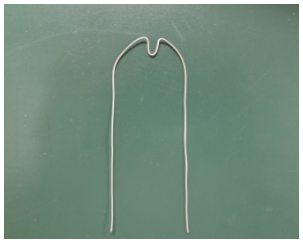
Thyristor: Thyristors work properly only when their leads are inserted in right sockets as well. Make sure the flat side of the thyristor faces to the switch (see the picture below).



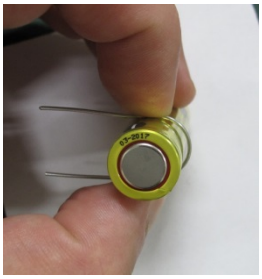
Battery buckle: Connect them to the pins on the PCB, following the color indicated on it, red (+) and black (-).

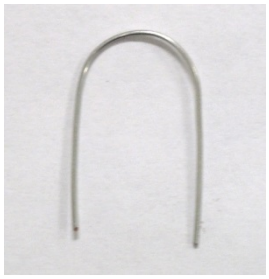
Step 2. Sensing part

Pendulum support: Bend the longer with your hand wire as shown in the picture below.

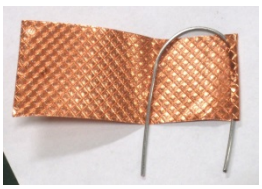
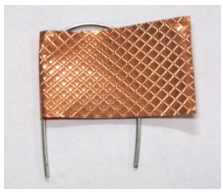
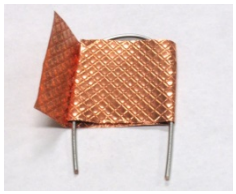


Electrode: Bend the shorter wire in the U shape by using the battery, as shown in the pictures below.





Wrap the bent wire with a copper tape (remove a release liner)


Solder the pendulum support and the electrode onto the PCB.

Pendulum: Tie the bell with the conductive thread and hook it on the pendulum support to suspend it at the same height to the copper tape, not

touching the PCB, so that the bell moves freely. Fix the other tip of the thread to the PCB with scotch tape.

Step 3. Testing the circuit

Note: Take out the battery immediately if you smell something or the circuit heats up while testing.

a) Unhook the pendulum from the support and connect the battery buckle to the battery holder (remove a plastic film inserted between the battery and the holder). The LED should stay off.

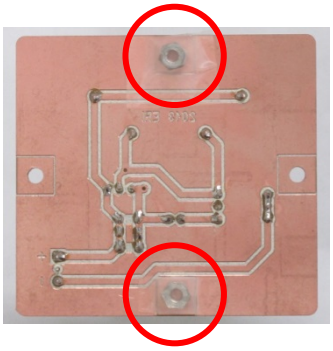
b) Hook the pendulum and push the bell to make it touching against the electrode (copper tape). The LED should light.

c) Remove the bell off the electrode. The LED should remain bright.

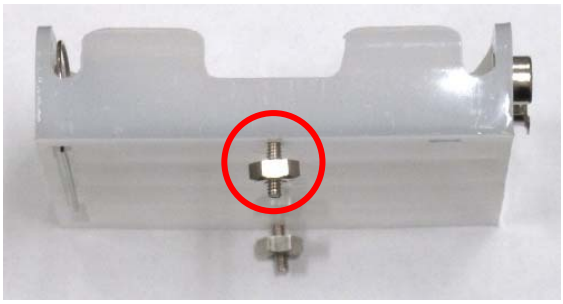
d) Push the switch. If the circuit is working correctly, the LED should be turned off.

Step 4. Mounting the PCB to the battery box

a) Attach two large nuts on the backside of the PCB, inside a square lands at the middle of the sides without holes for screws (see the picture below), using scotch tape.



b) Put two screws through the holes of the battery holder, from inside (battery side) and put the larger nuts. They stay loose as the thread does not match. work as spacers to make an appropriate gap between the PCB and the battery holder. To do this, you need to remove batteries from the holder.



c) Put the PCB on the battery holder to make the screws stick out the side holes of the PCB, then tighten the screws with the small nuts.

d) Insert the batteries to the holder again.

Now your seismoscope is completed.

4. Tuning

Bend the pendulum support to position the suspended bell with a tiny gap to the electrode.

The seismoscope becomes more sensitive to little vibrations as you make the gap smaller.

5. Enjoy!

Put your seismoscope where you want, and wait until the bell stays still and not touching the electrode. Push the switch carefully, if the LED is lit. It should be turned off.

Leave the seismoscope. If it detects an earthquake (or vibrations), the LED will be light and keep turned on.