



Sands of Time Filtered Noise Source - Assembly Instructions for Eurorack
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Hello and thank you for building the Sands of Time DIY kit. We hope you will find its sound and vibe useful and fun!

Bill of Materials:

1x Panel + 2x SMT populated PCB
1x Through Hole LED
1x 10-Pin 2.54mm Power Header (or 2x 5-pin Single Row headers)
2x 5-Pin Header Connector (single row)
2x 5-Pin Socket Connector (single row)
2x M3 6mm Screws
1x 11mm M3 spacer
1x SPDT On-Off-On Switch
1x C100k Dual-Gang Potentiometer
1x 6.35mm knob
1x 1uF Film Capacitor
2x 470nF Film Capacitor
1x 100k trimpot (Single- or Multiturn)
1x 2N3904 transistor (2 transistors included with kit, see below)
3x Thonkiconn Jacks + Knurled Nuts
1x 10 to 16 Pin Power Ribbon Cable

Technical Specifications:

Width: 10 hp (Intellijel 1U format)

Depth: 35 mm

Peak Current Draw: 25 mA @ +12V, 20mA @ -12V

Assembly Instructions:

1. Solder the 2x5-pin power connector onto the back of the main PCB (the one without holes for panel hardware). We recommend using the provided power ribbon cable to hold the header in place while you first solder one pin, double check to confirm the header is completely perpendicular to the PCB (as close to perfectly vertical as possible).

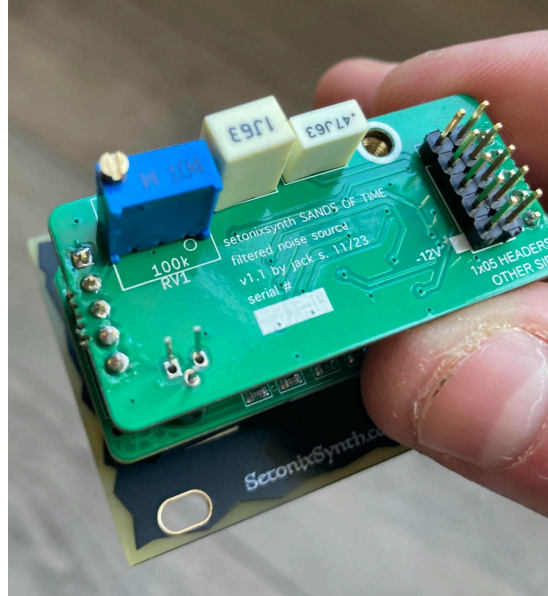
Once the header is straight, solder the rest of the header pins, making sure that each pad is making contact with the header but not with adjacent pins.

2. Solder the rest of the through hole non-hardware parts **except for the 2N3904 transistor**: 3x film capacitors and one trimpot. The larger 1uF capacitor should go in the footprint labeled C2, while the two smaller 470nF capacitors correspond to footprints C9 and C14 (C14 is on the Panel PCB and should be mounted on the same side as the surface mount components).
3. Insert an M3 screw into the Panel PCB so that the threading is on the same side as the surface mount components and the silkscreen circle. Screw the 11mm spacer on finger tight.



Rear of Panel PCB. Note the position of the 470nF cap and 11mm spacer.

4. Prep your pin headers: insert two 1x5 pin headers into two 1x5 pin sockets and press them together.
5. Place the two pin header assemblies from step 4 into the footprints on each side of the Panel PCB. Make sure they match, i.e. both socket sides are placed into the panel PCB and both header sides are facing upwards.
6. Place the Main PCB on top of the pin headers. Make sure each side neatly slots into the corresponding footprints, and that the mounting hole at the top of the PCB aligns with the 11mm spacer. Once everything is in place, place an M3 screw through the hole matching the spacer and tighten it with a screwdriver so the two PCB's form a sandwich with the pin headers and sockets held in place.
7. Solder the headers and sockets. We recommend soldering one pin on each side before double checking that everything is straight and sitting in place, then soldering the rest of the pins.



Properly aligned PCB sandwich. Note the spacer and screw hole line up and the transistor is not yet soldered!

8. Unscrew the M3 screw on the main PCB and pull the sandwich apart. The headers should all be soldered and straight, ready to be re-attached later.
9. Remove any nuts that come pre-attached to the hardware, then insert all the front panel components into the Panel PCB: Dual Gang potentiometer, Thonkiconn jacks, SPDT On-Off-On switch, and Red LED. **Make sure the short leg (cathode) of the LED corresponds to the Square pad of its footprint.**
10. Taking care that nothing slips out of place, fit the module's front panel over the hardware. With a little wiggling it should fit on pretty easily. While holding the PCB against the panel, thread the appropriate nuts over the switch, all three Thonkiconns, and Potentiometer. This helps a lot with keeping the hardware straight.
11. Flip over the PCB/panel sandwich and move the LED around so that it slots into its panel hole. Once it is in place, solder both legs of the LED and clip them.
12. Inspect the PCB/Panel sandwich. The PCB will naturally sit a little closer to the panel on the side with the Thonkiconns and Switch. To counteract this, do your best to gently move the PCB so that it is as close to parallel with the Panel as possible. When the PCB's are parallel, the Thonkiconn jacks should sit slightly off the PCB.
13. Hold the PCB in place and solder one pin of a Thonkiconn jack. Re-inspect the sandwich from all angles, making sure it is as straight as possible behind the panel. (There is some margin of error, but do your best!)
14. Once you are satisfied, solder the rest of the front panel hardware. Be careful not to miss any pads or short together any legs of the dual gang potentiometer.

15. Inspect your work: double check that all through hole pads are properly soldered and not shorted on both the Panel and Main PCB's.
16. Insert a 2N3904 transistor into the footprint labeled "Q1" on the Main PCB. Pay attention to the transistor's orientation – it should match the silkscreen outline. Press the transistor into place so that it makes contact with the pads, but still **do not solder it**.
17. With the transistor still sitting in its footprint, fit the Main PCB's headers into the sockets on the Panel PCB and re-insert an M3 screw into the hole in the Main PCB which matches the 11mm spacer. At this point the module should be fully assembled except for the transistor and final touches such as knobs, so now is a good time to take a break before testing and calibration.
18. Test the module: connect the power ribbon cable with the -12V side facing down to your system and power it on.
 - 18a. Use headphones or a speaker to monitor the Logic output first: it should sound like a noisy drone and requires no calibration.
 - 18b. Once you have confirmed the Logic noise source is working, listen to the Analog noise output. This output will take a few seconds to activate after start-up, but if you tested the Logic output first it should be producing a sound resembling pure white noise. If you hear nothing or faint Logic noise, use some tweezers to press your transistor into place until it starts up, as it has likely slipped out of place.
 - 18c. Once the Analog output is producing sound, it should be calibrated. You can do this by ear or with an oscilloscope.
 - Oscilloscope method: set your scope to the 5V range with a 5ms time base. Adjust the rear trimmer until the noise output level is approximately 10V peak to peak.
 - By ear method: monitor the "Filtered" output and set the switch to the middle ("Both") position. Sweep the Filter Freq. knob and adjust the rear trimmer so that the Logic and Analog noise sources are equally audible.
19. Turn off your system and disconnect your module. If the module is producing healthy full-spectrum white noise from the Analog output, go ahead and solder the transistor in place, then use edgecutters to remove excess legs. If it struggles to match the level of the Logic noise output and/or lacks bass frequency content, try a different transistor and re-test the module. You should not have to try more than two different 2N3904 transistors to find a suitable one.
20. Once you have tested, calibrated, and fully soldered your Sands of Time module, it's time for final assembly. Tighten all the front panel nuts as much as you can and put the knob on the Filter Freq. potentiometer. Now you can rack and enjoy your module!

Thanks for building the Sands of Time!