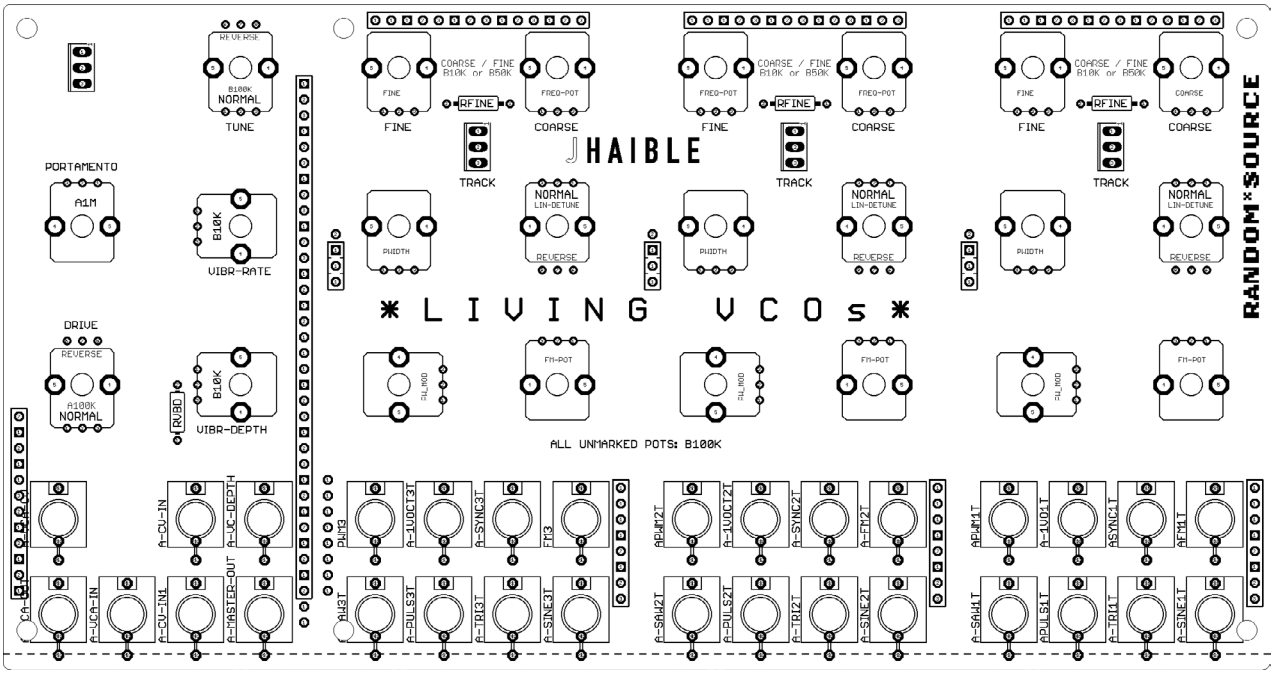
Jürgen Haible
Living VCOs for Eurorack

Jürgen Haible designed his triple VCO set known as the “Living VCOs” with the goal to combine the untamed bass range power of early EMS and Moog VCOs with modern features and decent tracking. He found that “untamed” Beating in the bass range and controlled beating in higher octaves is not possible with standard exponential 1V/Oct oscillators. A good part of that special sound of early Moog and EMS oscillators is not because of any “randomness”, “unstability”, “instability” or “noisyness”, as so often is said. A good deal of their behavior is because of that, but it is not the whole story. There are also some very deterministic factors in these old circuits which have been implemented in form of three “linear detune” potentiometers on the Living VCOs.

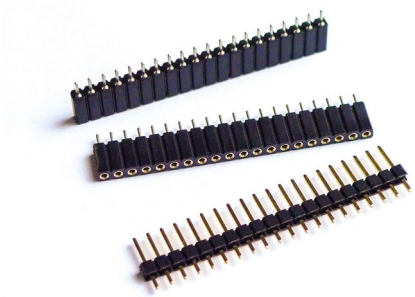
The Living VCOs have been re-issued by Random*Source as an extended (“Deluxe”) version in form of a single pcb (8” x 4.1” - the **main pcb**) including waveshapers for TRI and SINE - thanks to Ray Wilson and Thomas Henry - as well as the original Haible VCA/Inverter/Overdrive) and more. Random*Source has acquired the electronic heritage of Jürgen Haible and is the only authorized source for Haible modules and products.

To adopt the Living VCOs for Eurorack, Random*Source offers a **front panel in Eurorack format** (42hp wide) as well as a **matching front panel pcb** to mount potentiometers, switches etc. and take care of all wiring - **as an addition to the Living VCOs main pcb**. In other words: **to build the Eurorack module, you need both the Eurorack front panel bundle and the (generic) main pcb**.



Please note:

- The front panel is screen printed. **Do not use strong cleaning liquids, solvents, acid, ethanol, detergents etc. to clean the front panel** as that could solve/harm the paint. A damp cloth should be sufficient if you need to clean it.
- The main pcb connects to the component pcb through single row pin strips and connectors. Especially if you use precision connectors (available from Reichelt) like these



it will be difficult (but possible) to remove the main pcb again due to the size of the boards and the large number of connectors. Ideally, you will not have to remove the main pcb again, but if you ever decide to do so, use maximum care and go very slowly, moving the pcbs away from each other with gently force, millimeter by millimeter in order not to break anything.

- **FINE-RANGE**: the range of the FINE knob is set by a resistor. The value of 1.5M printed on the pcb translates to a very narrow range of a few cents only. You might want to lower this to increase the range, e.g. to 820k.
- **VIBR-DEPTH**: Here's a mod suggested by some builders: the behavior ("taper") of the pot can be changed by inserting a resistor (marked "**RVBD**" on version 1.01 of the pcb) between wiper and GND (= pad closest to the Thonkicon jacks). A value of 1k (for a B10K pot!) should give a nice "log" response, don't go much lower to avoid causing a short (in particular if you try this with a trimpot!). Higher values will make the curve closer to linear. Adjust the value if you use a different pot - e.g. 10k for a B100K.
- **LINEAR DETUNE**: As of version 1.01, the panel pcb allows to set the direction of the pot by using "NORMAL" or "REVERSE". Please note that NORMAL means turning the knob clockwise means that DETUNE is increased (and pitch is lowered), so it is recommended to try this (without soldering by simply inserting the pot) first.
- This document describes the Eurorack addon bundle only - not the Living VCOs main pcb. A picture of the **main pcb with a suggested value set for 12V is shown at the end of this document**. Please refer to the info on the website for further information on building the main pcb.

Bill of Materials

Resistors

3	620k to 1M5	marked “1M5” or “RFINE”	Resistor 0207, 1% - Sets the range of the FINE frequency pot. 1.5M means very fine! (about 2 cents), lower values provide a wider range. Pick according to taste!

Potentiometer

8	Potentionmeter 10k linear (B10K)	Driver: VIBR RATE, VIBR DEPTH, 3x COARSE, 3x FINE	Alpha 9mm vertical pcb mount available from Thonk, Tayda VIBR-DEBTH: Check out the mod described above.
13	Potentionmeter 100k linear (B100K)	Driver: TUNE, 3x Osc: FM_POT, PWIDTH, PW_MOD, LIN-DETUNE	Alpha 9mm vertical pcb mount
1	Potentionmeter 100k LOG (A100K)	Driver: DRIVE	Alpha 9mm vertical pcb mount
1	Potentionmeter 1M LOG (A1M)	Driver: PORTAMENTO	Alpha 9mm vertical pcb mount

Misc

1	Switch SPDT ON - OFF - ON	Driver: OCT UP / DOWN	Sub-Miniature Switch, (3 Positions) e.g. Mountain Switch (Mouser: 108-0044-EVX)
3	Switches SPDT ON - NONE - ON	TRACK 1-3	Sub-Miniature Switch (2 Positions), e.g. Mountain Switch (Mouser: 108-0042-EVX)
31	Thonkiconn Jacks		3.5mm Jack Sockets (PJ301M-12) from Thonk
	Various SIL connectors		pin connectors/headers, linking main pcb to component pcb - using precision strips allows to break off pieces as needed

Some building tips:

1. Main pcb and component pcb are to be connected through precision DIP socket and pins. It is recommended to use the pins on the main pcb (facing down, soldered from above) and the pin sockets on the component pcb (standing up, soldered from the front panel side). Break or cut off the pieces you need and stick them together so that main pcb and component pcb form a nice sandwich (don‘t solder yet). Check that you didn‘t leave out any pins / holes and that the sockets are all on the same side (component pcb). **Make sure you do not mix up sides of the component pcb(!)** - Double check before you solder anything.

2. Solder all the pins on the component pcb (only) while keeping the sandwich together - this avoids any misalignments and allows you to easily remove the main pcb again.

3. Mount the Thonkiconn jacks, the pots and the switches onto the component pcb. Pots should sit on the side facing the front panel (as marked on the board). Don‘t solder them in yet.

4. Attach any screws / spacers if desired to the component pcb (this gets more difficult once the component pcb is connected to the front panel). Spacers are not really needed as the connectors will hold the pcbs very tight together anyway.

5. Carefully mount the component pcb (with the pots etc. inserted) onto the front panel. You may then have to wiggle each pot a bit to get the pots through. Make sure the threads of the pots go through completely and the pots sit right at the front panel. Screw the jacks, pots and switches to the the front panel to make sure of that.

6. Once everything is nicely in place, solder the pots, jacks und switch onto the component pcb (while the front panel is attached).

7. Build the main pcb. You may want to do some basic tests without the component pcb - this saves you from having to remove the main pcb if there is any error.

8. Attach the main pcb onto the component pcb and solder the pins onto the main pcb.

9. Connect a power cord supplying +12V, GND, GND, -12V to the power-headers on the main board and double check the direction of the power header before you turn power on. You should be ready to go now :-)

(Version 5 July 2016)

Appendix: Living VCOs main pcb - suggested Values for +/-12V operation