

## nonlinearcircuits

### Big Jobs build & BOM

This module is an audio rate chaotic signal generator; it contains 3 phase locked loop ICs (PLL) connected in a circle via their phase difference inputs.

It was inspired by the paper - A New Type of Intermittency from a Ring of Four Coupled Phase-Locked Loops by Hasegawa et al - although uses just 3 stages and has external control.

The circuit uses vactrols and CV inputs to control each PLL. There are 6 inputs; the upper two inputs are connected to the switching pins of the lower 4 inputs. This does not mean the 6 outputs will be the same, as each stage is phase-modulating the next it means the outputs are all different, sometimes a little and sometimes a lot.

### **BOM** - The Tayda & Mouser part numbers are given as examples

VALUE	QUANTITY	DETAILS
10nF	3	0805 Tayda: A-3507 see notes
1uF	3	0805 25V or higher voltage rating
10uF	2	0805 25V or higher voltage rating Mouser:963-TMK212BBJ106MG-T or similar
RL	3	select to suit LED in vactrols, see notes
1k	6	0805
2k2	6	0805
4k7	3	0805
100k	6	0805
TL072 or TL082	2	Soic Tayda: A-1139
4046	3	Soic HEF4046 or CD4046, see notes
vactrols	3	see notes
Eurorack 10 pin power connector	1	Tayda: A-198 cut to size
S1JL, Schottky, power rectifier or 10R	1	SMD SEE NOTES #1. dot on PCB indicates CATHODE (stripe on component).
3.5MM SOCKET Kobiconn style	12	Tayda: A-865 or Thonkiconn Jacks (PJ301M-12) from Thonk, Synthcube or Modular Addict
3 pin header	5	get a 40 pin strip and cut off 5x 3pins Tayda: A-197
3 Pin 2.54mm Single Row Female Pin Header	5	Tayda: A-1069 <b>optional</b> - you can just solder the upper PCB directly to the header pins.

### **Additional notes:**

**1.**, Schottky (best option) or standard power rectifier diode 50-600V 1A or more, or use a resettable fuse or just a 10R. Examples: BAT54GWX, PMEG2005EGWX, AEC-Q101, 20V, SOD-123, PMEG2005EH DIODE, SCHOTTKY, 0.5A, 20V, 1N400x or S1JL or similar.

**2.** The chips, resistors, caps are cheapest from Tayda. Schottky diodes, CMOS & 1uF, 10uF 25V 0805 caps from Mouser/E14/Farnell/etc.

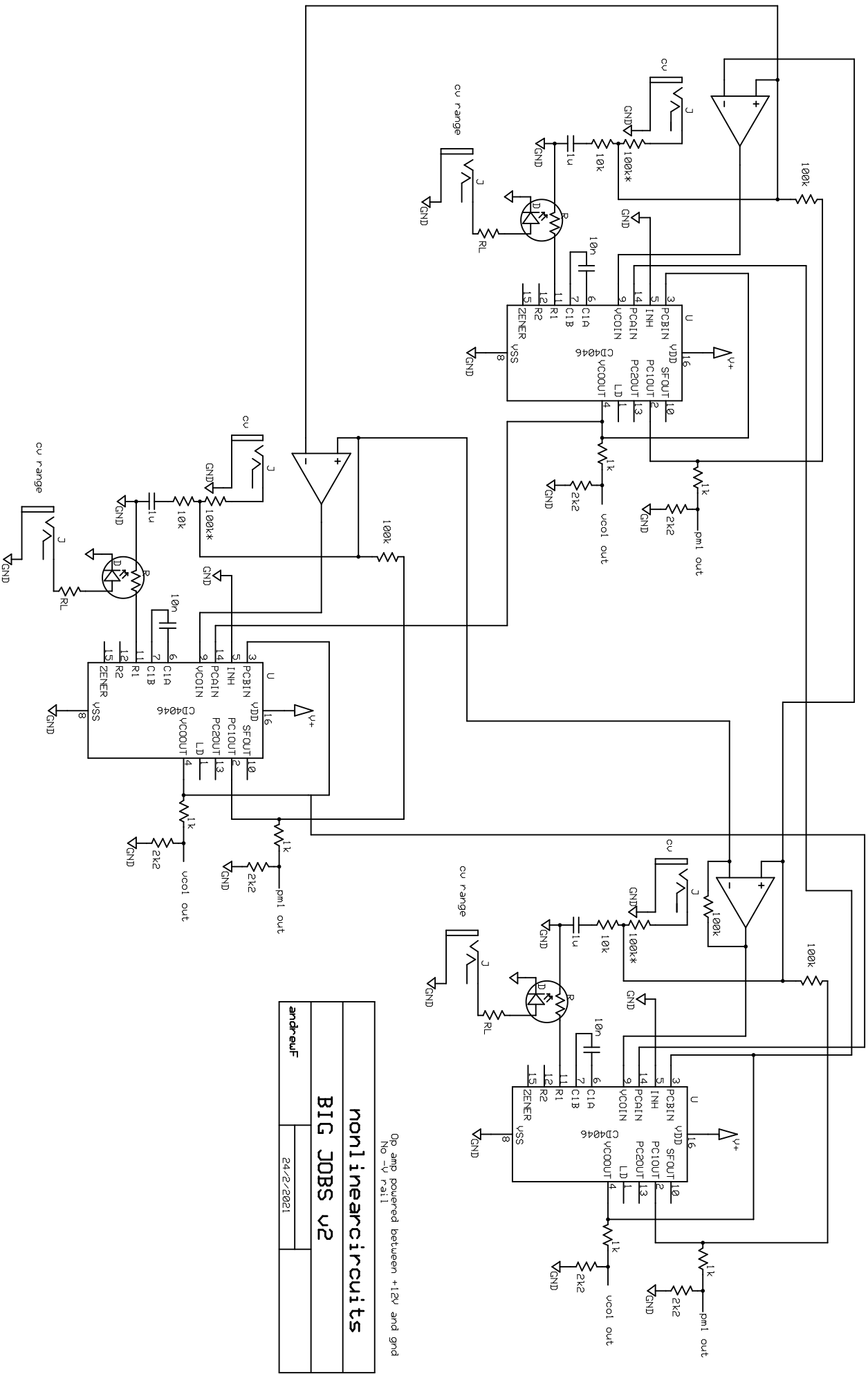
**3.** Join the Nonlinearcircuits Builders Guild on FB: <https://www.facebook.com/groups/174583056349286/> and ask questions there if you have any. If you prefer not to FB then email is fine.

**4.** The CD4046 is a wide body Soic, it can fit on the pads, but only just. Better to get regular sized HEF4046 if available.

**5.** The circuit for driving the vactrols is quite minimal: one resistor! So it is better to make your own vactrol and use the brightest LED you can find. Then select RL to be at least 4k7 which seems to be enough to protect the LED from any harm. For LDRs, you can buy them from Tayda but cheapest option is a bag of 100 GL5516 on ebay will cost \$4 or so, with postage. There are many ways to DIY vactrols have a google to check out some guides, easiest is a bit of black heatshrink.

**6.** The 10nF caps are the timing caps for the VCOs. You can try different values here. Less than 10nF will get pretty squealy, 100nF will be lower freq but often not making much sound either, 22nF or 47nF are good values to try. I could suggest all three caps should be the same but do whatever you like; it is going to be noisy & chaotic anyway.





Op amp powered between +12v and gnd  
No -V rail

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### BIG JOBS v2

andreauf

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