

nonlinearcircuits

FOURIER build & BOM

This module is based on an article presented by E. Muller ([Jan 1983 Elektor](#) link to archive.org) in the "Ejektor" section, meaning it is an *imperfect but interesting idea* (my italics). Of course, I had to try it and to my surprise, it sounds wonderful. If you are into shifting soundscapes and drones, this is a great tool. Probably best to check out the original article for the description.

It follows the basic principles of Fourier Synthesis, with the pots (or inputs) allowing control of 7 sine and 8 cosine signals, supposedly being harmonics of the initial signals. "Supposedly" because, the waves are not pure sinewaves, rather stepped pulse waves.

This module needs to be patched into a low pass filter (ie - almost any VCF) for normal use, tho feel free not to and try something else. I didn't bother installing a VCF onto the module because pretty much everybody already has one in their case.

To use, it needs a fast clock signal from a VCO. Fast means 16x faster than what you want to hear. This clock signal is fed into a multiplexor...multiplexer...mux which scans thru the channels and feeds the signal to the output. There are two MUX, which can be operated independently otherwise channel 2 is fed a clock signal at half the rate of whatever channel 1 is getting. Channels 1 & 2 outs are available individually and mixed, with a pot to set the channel 2 level so it acts as a sub-harmonic source (or an external signal can be mixed in instead of channel 2).

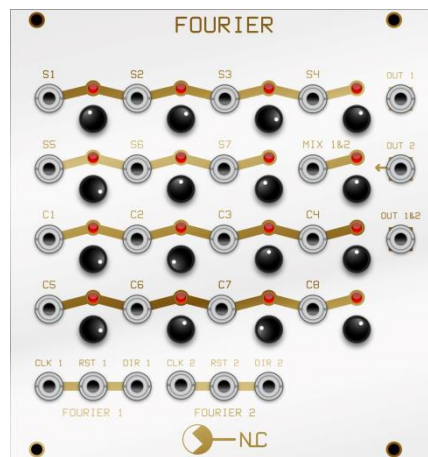
Each channel has its own reset and direction inputs to mess with proceedings as you wish.

Each pot (or input) is fed to multiple channels to create the harmonics for each stage. As the pots are wired between +/-12V, they are cut out of the circuit when an external signal is patched in, so do not work as attenuators, just as presets or nothing.

It gets very interesting to patch CVs into the harmonic inputs, especially nice slow ones from Sloths or LFOs. Audio signals are good. Using white noise is fun. Using white noise as a clock source is very interesting too.

It looks a big build, but is not too hard. The resistor matrix only uses 3 values, so it is not like you have to hunt around for many different obscure components.

Version 2 PCB has a small error, it seems it doesn't make any difference if you fix it or not, but see Pg.3 for details.



BOM — The Tayda & Mouser part numbers are given as examples

Get spares – you might drop something or my counting might be a bit off!

VALUE	QUANTITY	DETAILS
47p	2	0805
100n	8	0805
10u	4	0805 25V or higher voltage rating Mouser Part No 187-CL21A106KAYNNNG or similar
1k	20	0805
3k3	48	0805
10k	109	0805
12k ?	2	0805 see notes #5
15k	55	0805
27k	23	0805
100k	15	0805
2M2	6	0805
RL	16	0805 LED resistor, select to suit LED brightness. Not sure? Try 3k3-4k7 to start. SEE NOTES #4
LED	16	3mm see notes #4
TL072 or TL082	1	Soic Tayda: A-1139
TL074 or TL084	10	tayda A-1137 or A-1140
LL4148	6	sod-80 Tayda: A-1213
CD4029	2	Mouser Part No: 595-CD4029BM96
DG406 or DG506 (usually cheaper)	2	Mouser Part No:781-DG506BEW-T1-GE3
Eurorack 10 pin power connector	1	Tayda: A-198 cut to size
S1JL, Schottky, power rectifier	2	SMD SEE NOTES #1. dot on PCB indicates CATHODE (stripe on component).
3.5MM mono SOCKET	25	Tayda: A-2563
100k pot	16	tayda: A-5623
10 Pin 2.54mm Single Row Female Pin Header	6	Tayda A-1306
40 Pin 2.54mm Single Row Pin Header Strip	2	Tayda A-5773 cut to six 10 pin sections

Additional notes:

1., Schottky (best option) or standard power rectifier diode 50-600V Examples: BAT54GWX, PMEG2005EGWX, AEC-Q101, 20V, SOD-123, PMEG2005EH DIODE, SCHOTTKY, 0.5A, 20V, 1N400x or S1JL or similar. More examples (Mouser numbers) - 621-B1100-F, 511-STPST1H100AF, 511-STPST1H100ZF, 511-STPST1H100AFY, 771-PMEG10010ELR-QX

2. The chips, resistors, caps are cheapest from Tayda. Synthcube is also a good source of many parts. 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. I use bipolar red/blue 3mm LEDs, so 3k3 is a good value for RL (makes building a bit easier)

5. The two 12k resistors set the output gains for the 2 channels. At some settings the outputs may seem a bit quiet, tho generally you will see 10V p-p. If you want the outputs hotter, install a higher value, say 22k.

6. On version 2 top PCB, the 100k pull down resistor for the channel 2 direction input is connected to the wrong trace. It doesn't seem to make any difference to normal operations; nobody has mentioned it in the past 12 months or so that the module has been available. Anyway, version 3 PCB will be updated, if you want to fix version 2, cut the trace with the blue line through it and connect the pads with the pink line across them. Be very careful not to damage the trace running next to the 100k that goes up to pin 15, this is the clock input for channel 2.

