DIVINE CMOS

build info (updated with mod 12/5/2014 pg3)

nonlinearcircuits

This circuit takes two input signals and divides them down by /2, /4, /8 & /16. It also XORs (or ANDs or ORs or XNORs or NORs, depending upon your choice of logic chip) the two signals and all of their divisions. All of these signals can then be mixed to create the output waveform. If this is done at audio rates the output is very thick and full of shifting harmonics. If it is done at LFO rates, the output is a complex pattern that can be used as a CV source.

The idea for this circuit came from the cross product generator in Electronotes, but this version uses 4xxx series ICs rather than 7xxx and gives the choice of using different logic chips. I think the original version had AND gates.

To sum up, it is a dual sub-oscillator, harmonic divider, harmonic ring-modulator and pattern generator.

The best effect at audio rates is to get signals from 2 VCOs that are beating – running at almost the same frequency…but not quite. This gives a continuously shifting and active sound. As the input signals are divided down to /16, it is best to run the VCOs at higher frequencies than usual to be able to exploit all the available divisions.

To use as a pattern generator, connect two gate/trigger/LFO signals to the inputs (or just one – it will still work, but 2 is more interesting). Connect the output to a VCO and adjust the pots to find patterns that will be somewhat unpredictable but quite fun to use.

BOM

BC547	4	npn trannie
quad logic chip	1	4081, 4070 (best?!), 4077, 4001, etc
4520	1	
TL072	2	marked LM358 on PCB
power connector 0.156 Molex 3 pin	1	
100k pots	14	see notes
10uF electro caps	2	value not marked on PCB, 2mm spacing
decoupling caps 47nF-100nF	9	value not marked on PCB 4.5mm spacing
10R	2	
1k	11	
33k	1	
10k	7	
100k	19	
470k	2	
1N4004 diode	2	optional, for reverse voltage protection
diodes	2	any general purpose diode

notes:

pots

These are a common footprint, if you have built any of my boards before you know what to get. I use 100k pots from Song Huei - R0903N-B100k, L-25KC (the 25 is the length L).

It seems a pretty common footprint. Another pot that fits is this Alpha from Altronics - http://www.altronics.com.au/index.asp?area=item&id=R1948

You should find similar types from Mouser, Rapid, etc.

Some pots have metal tabs that may sit on top of a track, I usually bend these tabs inwards on the pots where this happens. Most of them are fine; probably no need to do this but an ounce of prevention etc.

decoupling caps

There are two 10uF and 8 spaces for decoupling caps on the PCB, these have a 4.5mm spacing, install 47nF – 100nF caps, ceramics will do.

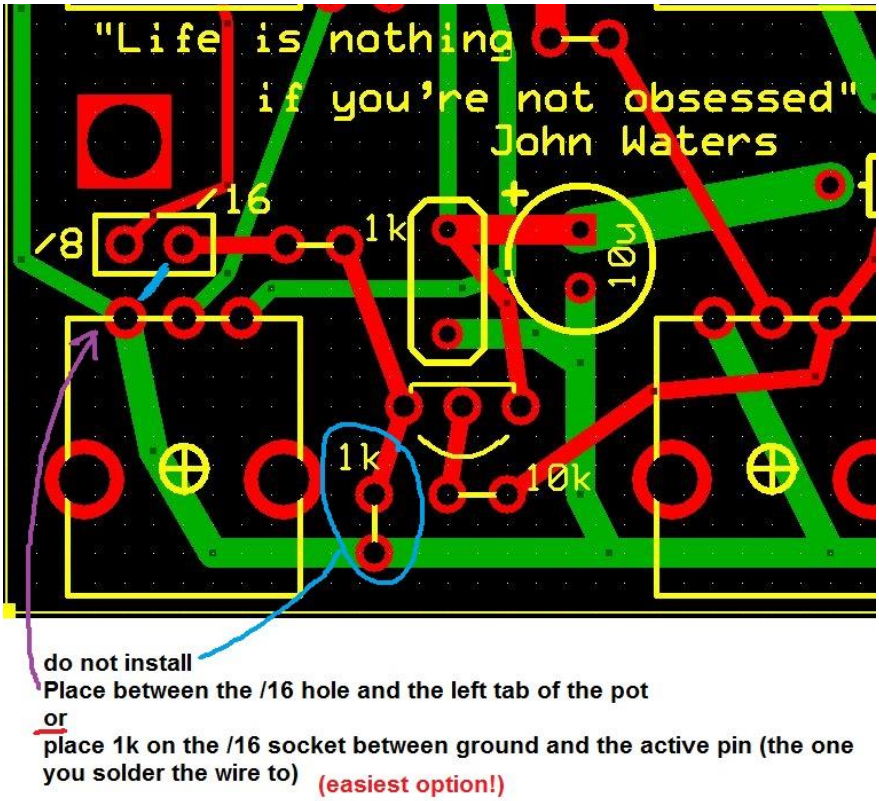
BUILDING

Should be straightforward; the two op amps marked “LM358”on the PCB would be better replaced with TL072.

Use sockets for the ICs, especially so you can swap out the logic chip to find which one you like. 4070 is a good one to try, to get a ring mod effect, 4081 is also a beaut.

ERROR on PCB

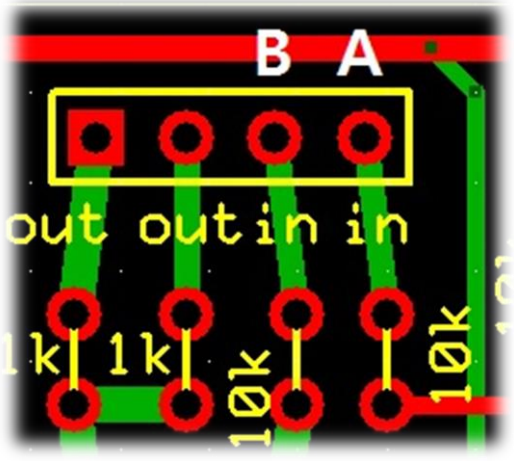
A 1k resistor setting the /16 output voltage is wrongly routed on the PCB. The easiest solution is to leave it off the PCB, see pic below and solder it onto your socket between the active pin (the one your wire is soldered to) and ground. Otherwise you could place it on the PCB between the /16 output and the left side pin of the nearest pot (ground)



Wiring

There are 9 sockets to connect

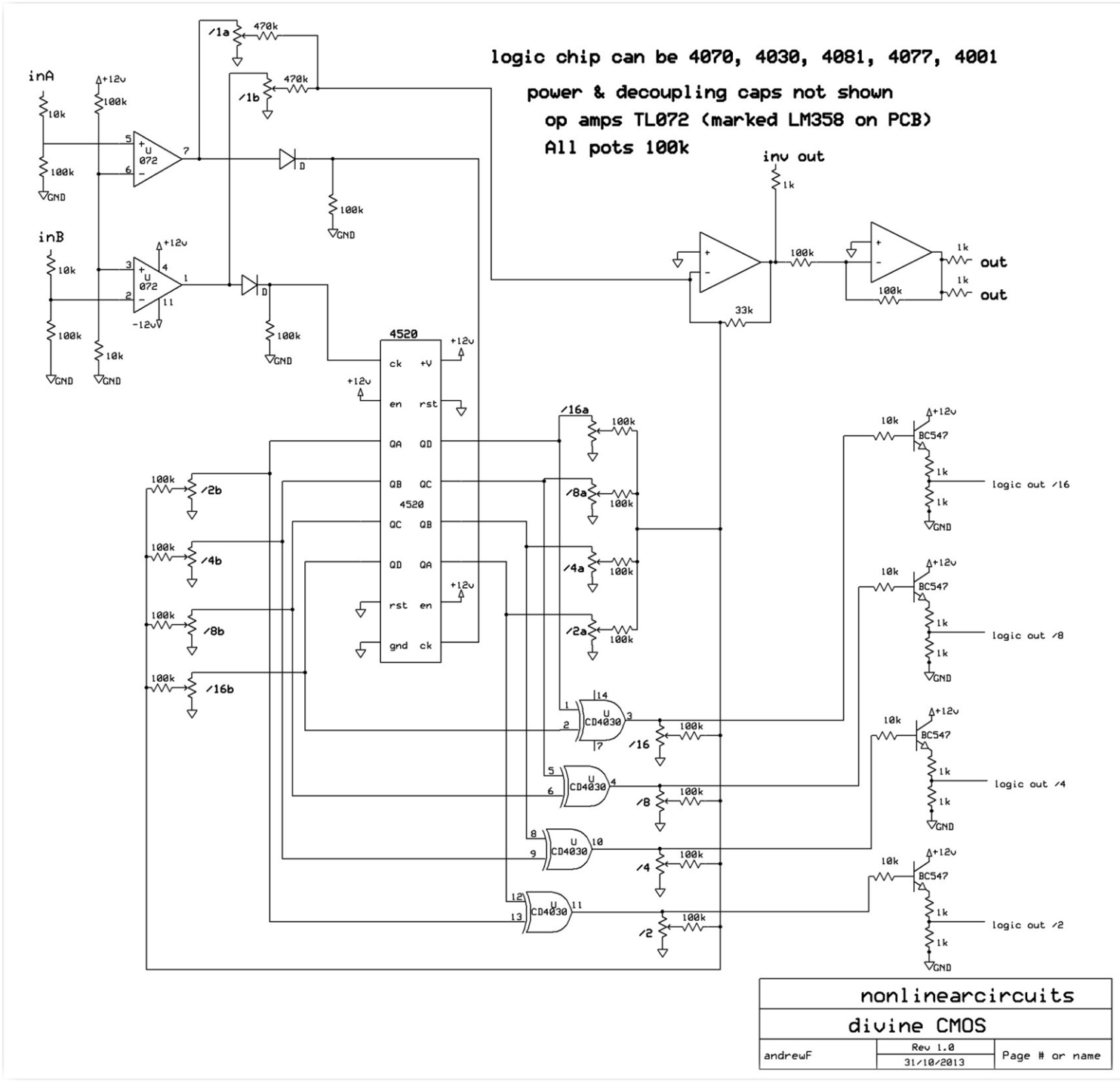
2 inputs, A and B are not marked on PCB, see pic to see which is which

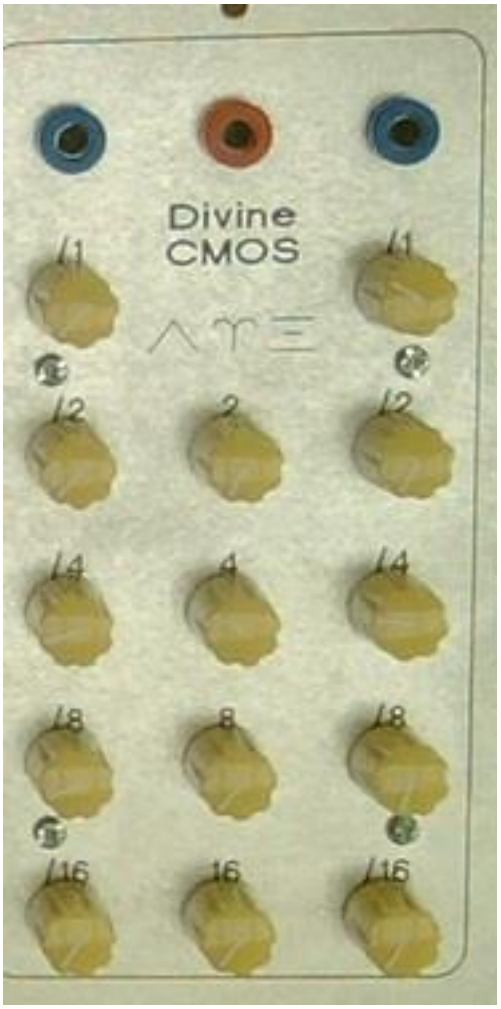


2 outputs (same)

1 inverted output

4 divided logic outputs - /2, /4, /8, /16





This panel layout only has the 2 inputs and a single output.