

nonlinearcircuits

VCO

build notes version 1

25 Oct 2014

BOM - let me know if I missed something!

Please note, the PCB is designed for mostly thru-hole resistors standing upright, but it is very easy to solder on 0805 SMD resistors instead, if you prefer. 1206 are possible too, but a bit of a squeeze.

If you think you will need to experiment with some resistor values, it is much easier to use 0805 resistors. These can be removed and replaced very easily with no need of solder suckers or solder wick, just heat them up and flick them off.

component	quantity	
100k pot	10	<i>see notes</i>
10k pot	1	
100k multi-turn trimpot	1	
10k multi-turn trimpot	1	
20k multi-turn trimpot	1	
spdt toggle switch	1	on-on
TL072	2	DIP
CA3140	1	DIP
TL074	2	DIP
LM394	1	DIP, or self-matched NPN transistors
LM311	1	DIP
BC547	2	any general NPN okay, pinout suits BC547
BC557	2	PNP
J108	1	or J112 or similar
CAPS		
4.7uF electro	1	2.5mm pin spacing
100nF caps	16	2.5mm pin spacing, for decoupling, marked on PCB with 'c'
10uF (35v or higher rating)	2	2.5mm pin spacing, for decoupling
10uF BP electro	1	2.5mm pin spacing, bipolar/non-polarized
1nF	1	Lead spacing 0.25 inch
2.2nF	2	Lead spacing 0.25 inch
33nF	1	Lead spacing 0.25 inch
47nF	1	Lead spacing 0.25 inch
150nF	1	4.5mm pin spacing
10pF	1	2.5mm pin spacing
18pF	1	2.5mm pin spacing
20pF	1	2.5mm pin spacing
100pF	2	2.5mm pin spacing
sockets	15	
upright 20pin IDC	1	<i>see notes</i>
right angle 20pin IDC	1	<i>see notes</i>
20 pin connectors	2	<i>see notes</i>
20 strand ribbon cable	1	~10-15cm

10 pin power connector	1	or 3 pin Molex
1N4148	5	any regular signal diodes ok
1N4004	2	or similar
thru-hole resistors		
10R	2	
390R	1	
470R	2	
680R	1	
1k	5	
1k2	1	
1k5	2	
3k	2	
3k3	1	
4k7	1	
5k1	1	
5k6	1	
10k	5	
15k	5	
18k	4	
20k	1	
22k	4	
39k	3	
47k	6	
56k	1	
68k	1	
91k	1	
100k	21	
150k	3	
220k	2	
470k	1	
910k	1	
1M	2	
3M	1	
10M	4	or two 22M if you can find them
1k tempco	1	goes over the top of the LM394

NOTES

Building

pots

These ones from Tayda will do, though be careful none of the metal flaps/tabs are sitting on PCB traces, trim them back if so. You can find many brands of this type of pot, Alpha make nice ones too.

<http://www.taydaelectronics.com/potentiometer-variable-resistors/rotary-potentiometer/linear/100k-ohm-linear-taper-potentiometer-round-shaft-pcb-9mm.html>



Breakout board connections

1	CV in	2	CV in
3	FM dc in	4	FM ac in
5	mod in	6	sync in
7	pwm in	8	soft sync in
9	pan pwm in	10	pan pulse out
11	saw pro in	12	pro saw out
13	no connection	14	pulse out
15	tri out	16	saw out
17	gnd	18	gnd
19	gnd	20	gnd

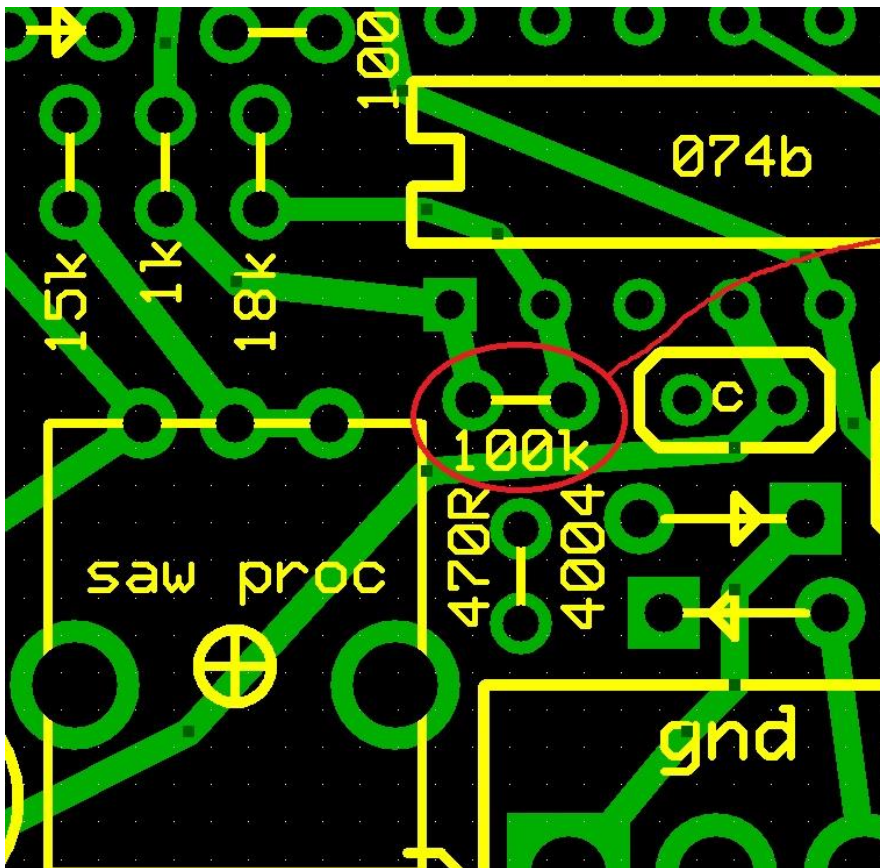
20 pin connectors

These unshrouded ones are fine, Futurlec have them.



Mods

1. To increase the amplitude of the sawtooth change 3k to 5k1 (marked '3k-5k1' on PCB)...or take the middle path and just install 4k7, it all gets you around a 5V signal.
2. The pan-pulse signal can get very hot, see image below to adjust



pan-pulse can get pretty hot, up to +/-10V. Change this resistor to 47k or 51k to keep pan-pulse at +/-5V

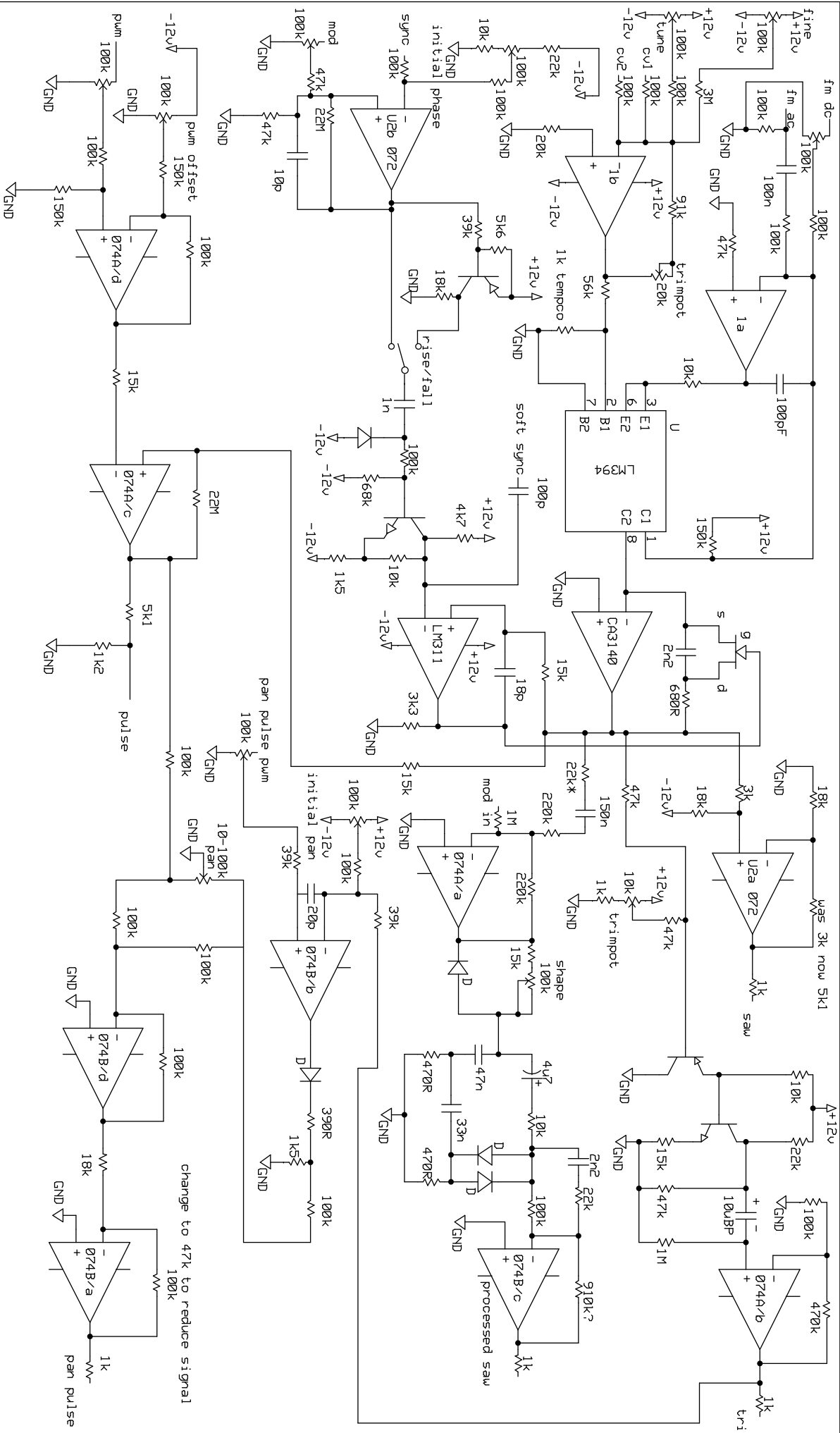
Setup

1. Adjust to 10k 'Saw' trimpot to get a clean Triangle wave.....yes it should be marked 'TRI', I keep forgetting to change it.

Best done with a scope, otherwise just listen to the Tri signal and adjust it until the buzzy content is gone.

2. Adjust the 100k 'iniFreq' trimpot so you can get a full range from the Coarse panel pot with no dead zones at the extremes. The VCO should get up to approx. 90kHz.

3. Adjust the 20k V/O trimpot to get 1V/octave tuning. Set the VCO to oscillate at some frequency, say, 220Hz. Put 1V into the CV input, adjust the trimpot so the frequency is now 440Hz. Put in a 2V CV, adjust so you see 880Hz. It can take a bit of doing to get right. Make sure you have some heatsink on the tempco resistor and LM394 (or matched transistors)



Core based on EN76 design, as seen in ASM, Modulus, CGS and many other VCOs
 Phase mod Sync and pan-pulse based on Airies-338
 Saw processor based on 1983 design by Dave Rogers

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VCO vers.1.3

andrewwf

Rev 1.2
 10/9/2014

Page # or name

change to 47k to reduce signal

