

nonlinearcircuits dual VCO

The task in this workshop is to build a dual VCO. It is a triangle core design using a special type of op-amp called an operational transconductance amplifier (OTA). The VCOs range from approx. 19Hz up to 9500Hz, they are quite simple designs with reasonably low drift and can be tuned to 1V/oct (meaning for every 1V change on the CV input the frequency will change by 1 octave, useful if using a keyboard), but they are not exactly rock steady either. There is a trade-off between component quality and design complexity versus drift and accuracy.

Anyhoo, the VCOs output triangle, square and pulse waveforms. The pulse width can be set with a pot or controlled by a CV (control voltage). Both VCOs have CV inputs to control pitch, one has a soft sync input, the other has an FM input. Try injecting all kinds of CVs and audio rate signals into these to see what effects you can get.

Building: Please read and follow these instructions carefully. Tick off the boxes as you go.

- Solder on the two 14 pin IC sockets, the 16 pin socket and then the 10 pin power connector.
- Solder on all resistors, if you have some missing, ask for extras. *Note: the two 33k resistors, marked on the PCB can be replaced with 39k to increase upper frequency range to 11.5kHz*
- Solder on capacitors. For the two 10uF electros, the long leads go in the square holes. If you have different (green and grey) 2n2 (222) caps, it doesn't matter which side they go in.
- Solder on the 4 transistors, **be careful**: two of them are BC547 and two are BC557. The BC547 go in the 'n' positions and the BC557 go in the 'p' positions. Make sure the bodies of each 'n' and 'p' pair are touching each other.
- Solder on the four blue trim-pots, **be careful**: two of them are 100k (marked 104) and two of them are 20k (marked 203)
- Ask Andrew or Nathan for the 3 chips and the two 1k tempco resistors, install these. The tempco resistors go over the transistor pairs and *their bodies* must be in contact. The metal legs should not be in contact.
- Cut the lips off the two threaded panel-pots; be careful the bits of metal do not fly into your eye or somebody else's. They launch and travel far. These are the little raised edges near the nuts and washers.
- Install the two threaded panel-pots at the top of the PCB (on the back) in the 'FINE' position. Put the other four panel-pots in position too. **But do not solder the pots yet**
- Attach the 12 sockets to the panel, so their tabs will line up with the holes on the PCB. Have a look at the finished module or ask, if you are not sure.
- Attach the PCB to the panel and bolt on the two threaded pots. Make sure the PCB is sitting parallel with the panel and the shafts of the other four panel-pots are straight and not rubbing against the panel.
- If everything is straight and nicely positioned, solder on the pots and sockets. Take your time, let things cool down and check as you go that nothing has shifted (especially the 4 unthreaded panel-pots)
- Get some wire (the clippings from resistors are best) and run them thru the PCB to the ground tabs of the sockets. You can easily solder the ones on the bottom and sides without removing the PCB. The ones in the middle are harder to get at, they will be grounded via the panel so if you cannot be bothered, don't worry about them. Maybe one day you will have to get in there and solder 2 wires in, no biggie.
- Test your module, if all good, put some heat-sink paste on the transistors/tempcos and Voila!

□ 10R	2
220R	2
1k	2
1k tempco	2
3k3	4
7k5	2
10k	10
15k	2
24k	2
39k (replace 33k on PCB)	2

56k	2
91k	2
100k	20
2M2	2

10uF cap	2	
LM13700	1	
TL074	2	
100k pots	6	
20k trimpot	2	
100k trimpot	2	
2n2 cap	2	
100nF cap for decoupling	6 or so? (2.5mm spacing)	
kobiconn or similar sockets		12
bc547	2	
bc557	2	

n1c		
ota vco		
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