

## **BMC96. 4LFO**

Last updated 10-8-2023

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## I. Features

This module has four low frequency oscillators. Each oscillator has a frequency range of approximately 0.04hz to 55hz and both square and triangle waveform outputs.

## II Schematic

To the right is the schematic for this module. Each LFO section is identical, composed of an integrator and a schmitt trigger.

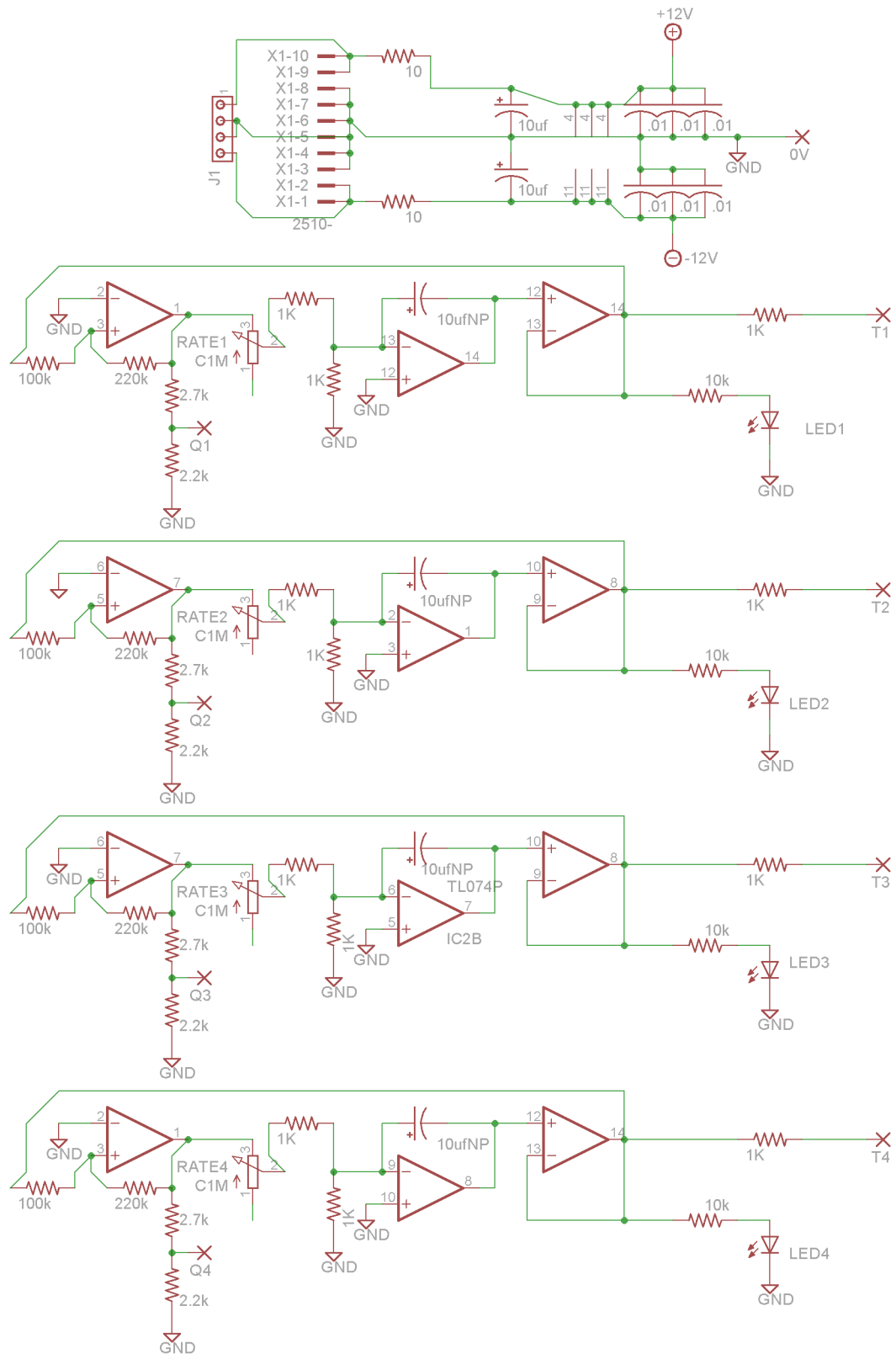
The schmitt trigger takes it's input from the triangle buffer's output. The 100K/220K resistor combination sets the threshold. When the input voltage rises above +5V, the output of the trigger goes negative, and when the input goes to -5V the output turns positive.

The output is attenuated by the 2.7K/2.2K to provide the square output. The output also connects to the input of the integrator through a 1M rate pot in series with a 1K resistor.

As resistance increases on this pot, less current will reach the integrator and the oscillator will slow down. A 1K resistor to ground attenuates the current input even more.

The integrator has a non-polarized 10uf capacitor in it's feedback path, taking a long time to charge.

The output of the integrator is buffered by another op-amp. The buffer connects to the triangle output through a 1K resistor and the LED through a 10K current limiting resistor.



### III. Construction

#### Parts List

##### Semiconductors

Value	Qty	Notes
TL074	3	Or any quad package op-amp with the same pinout.
3mm LED	4	

##### Resistors

Value	Qty	Notes
10 ohm	2	1/4W Metal Film
1K	12	1/4W Metal Film
2.2K	4	1/4W Metal Film
2.7K	4	1/4W Metal Film
10K	4	1/4W Metal Film
100K	4	1/4W Metal Film
220K	4	1/4W Metal Film
C1M Pot	4	16mm PCB mounted

##### Capacitors

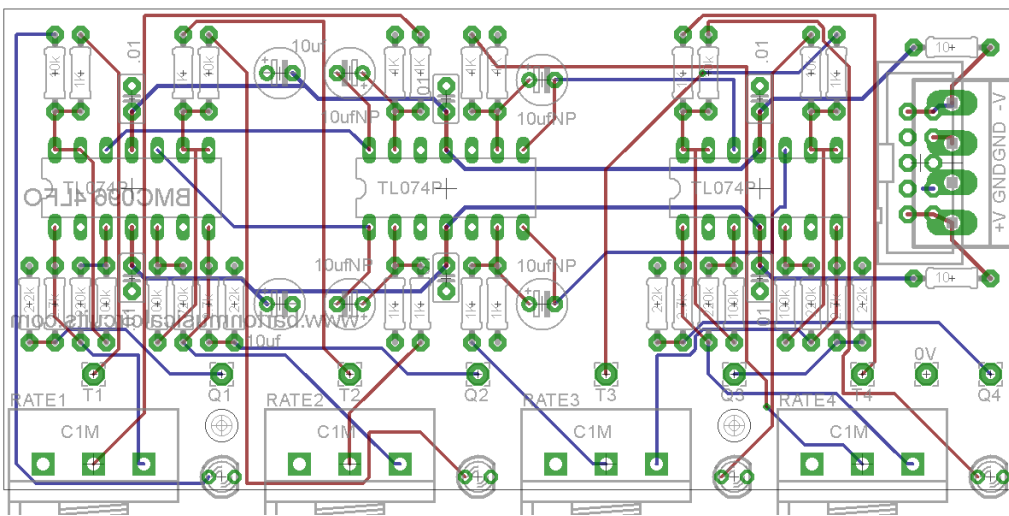
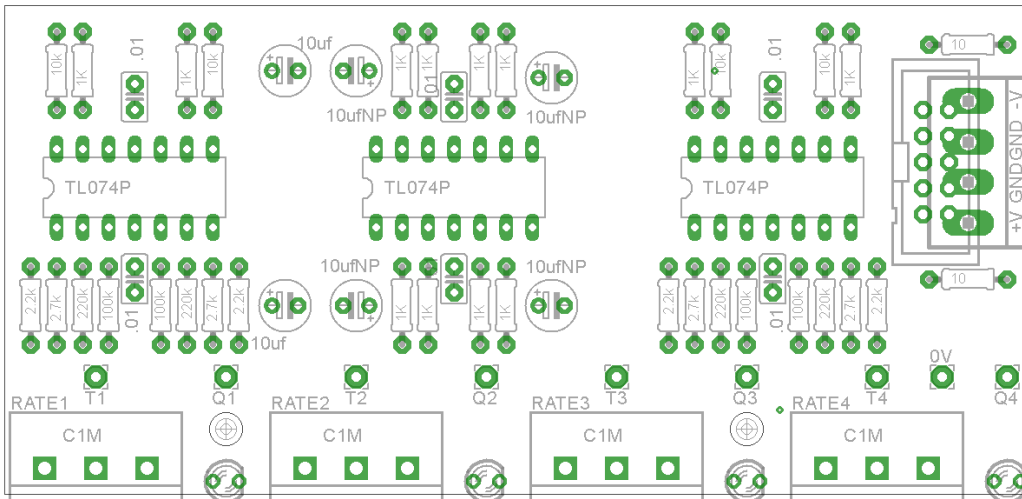
Value	Qty	Notes
.01uf	6	Ceramic disc. 2.5mm lead spacing
10uf non-polarized electrolytic	4	At least 10V voltage rating
10uf electrolytic	2	Non-polarized can be used if at least 15V voltage rating.

##### Other

Value	Qty	Notes
Power Connector	1	Eurorack or MOTM style
Jack	8	3.5mm depending on build
Knob	4	
14 Pin DIP socket	3	

## The Board

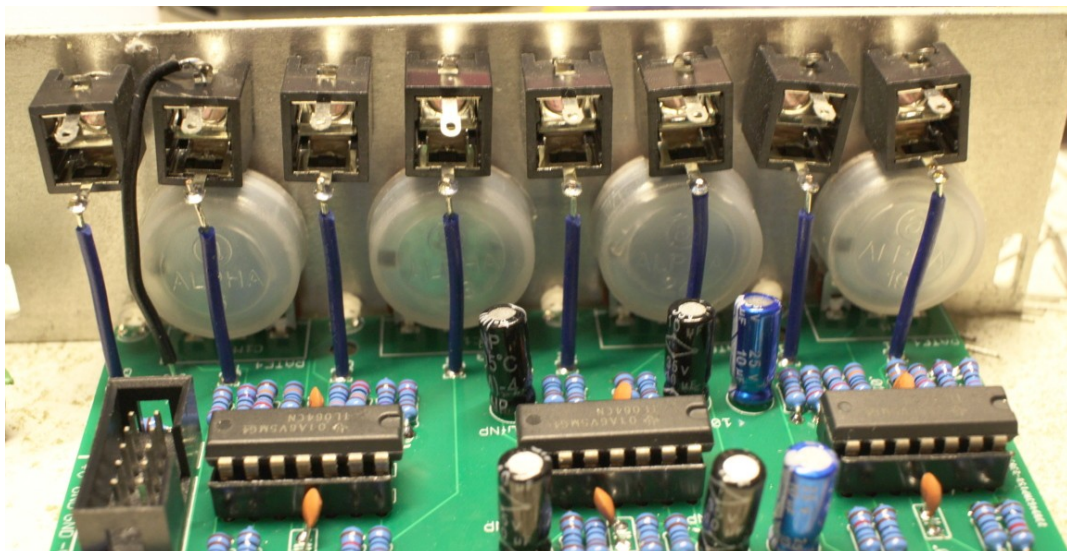
Below are renderings of the PCB both with and without traces shown. The PCB's dimensions are 100mm x 47mm, the pots are spaced 25.4mm and the mounting holes are spaced 50.8mm apart.



### WIRING.

Wirepads marked “T1” through “T4” are the triangle outputs, they should be wired to the tips of the triangle output jacks.

“Q1” through “Q4” are the square outputs and should be wired to the tips of the square output jacks. The “0V” wirepad should be connected to the sleeve of a jack.



## 15V Builds

For 15V builders. Two resistor values per LFO need to be changed to get  $\sim\pm 5V$  outputs from a 15V system. The 220K resistors in the feedback path of the schmitt triggers need to be increased to 330K, and the 2.7K resistors attenuating the schmitt trigger's output should be increased to 3.3K.