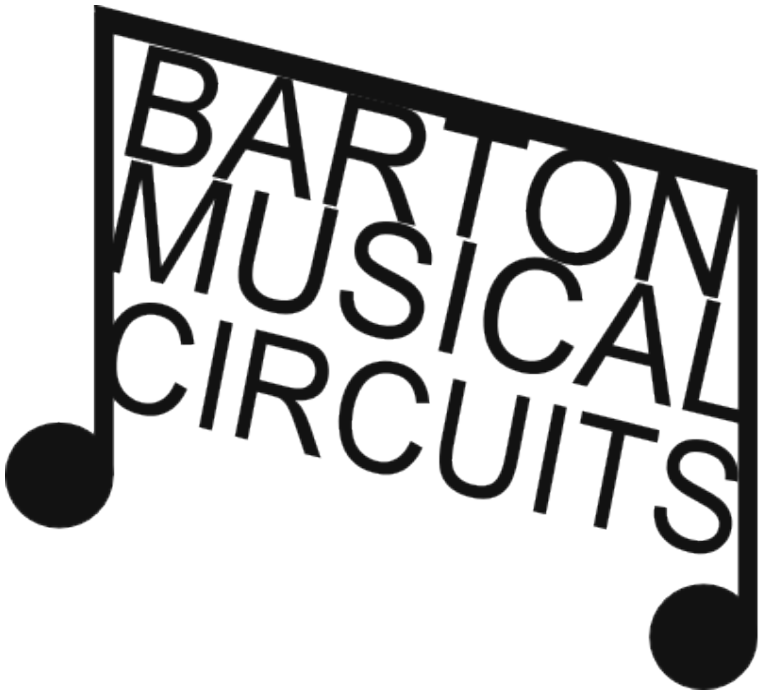


BMC059. MultiPWM

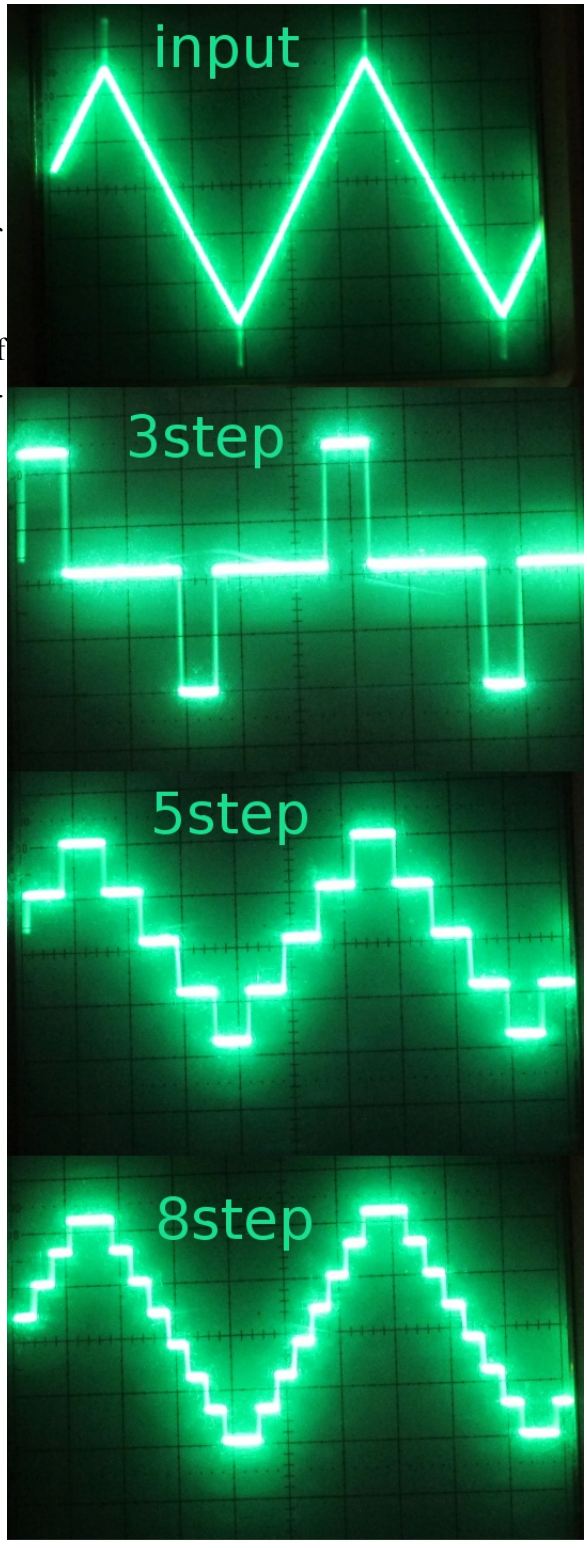
If you have any questions, or need help trouble shooting, please e-mail
Michael@Bartonmusicalcircuits.com

I. What it Does

A. What it does to the Signal

The MultiPWM module is a wave shaping module that creates "stair-stepped" waveforms out of sine, triangle or ramp/saw waves. It does this by sending the input signal through a bank of parallel comparators (commonly found in the PWM section of oscillators). The outputs of these comparators are mixed together to create a waveform.

On the right you can see oscilloscope photos of the three outputs and the base input of a triangle wave.



The threshold voltages for the top and bottom comparators (labeled "Hi" and "Lo" on the PCB) in the bank can be controlled via external control voltages, and the thresholds of the other comparators in the bank are derived from these two voltages.

B.Controls/Inputs/Outputs

CONTROLS

1-2. Hi and Lo knobs – These set the threshold voltage of the most positive (Hi) and most negative (Lo) comparators. Labeled "PWMHI" and "PWMLO" on the PCB

3-4. Hi and Lo CV knobs – These attenuate the input voltage from the Hi CV and Lo CV input jacks. The attenuated voltages are mixed with the voltages set by the Hi and Lo knobs to set the thresholds of the top and bottom comparators. Labeled "HI" and "LO" on the PCB

INPUTS

1. Signal In – The waveform input jack. Labeled "IN1" on the PCB

2-3. Hi CV and Lo CV – Input for control voltages to modulate the Hi and Lo thresholds. Labeled "Hi" and "Lo" on the PCB.

OUTPUTS

1. 3 Step output – This outputs a waveform derived from only the Hi and Lo comparators mixed together, labeled "3MX" on the PCB.

2. 5 Step output – This outputs a waveform derived from the Hi, Lo and 2 center comparators mixed together. Labeled "5MX" on the PCB.

3. 8 Step output – This outputs a wavefrom derived from all seven comparators. Labeled "8MX" on the PCB.

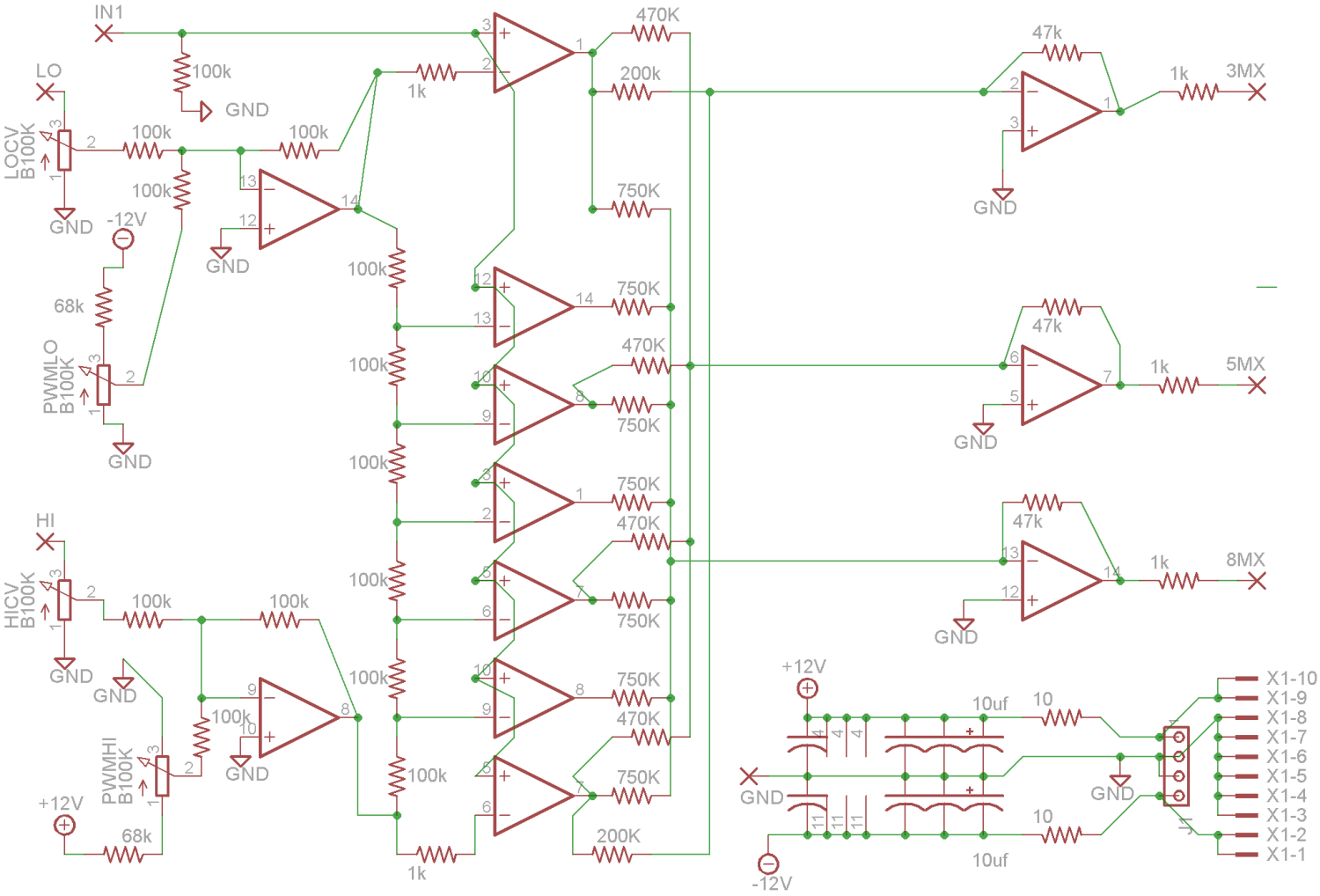
C. Demos

DEMO 1 – No modulation, Triangle input, 8 Step Output, 5 Step Output, 3 Step Output

DEMO 2 – input run through VCA before MultiPWM. Triangle, 8 Step, 5 Step, 3 Step

DEMO 3 – 8 step output of triangle wave, Hi and Lo are modulated by seperate LFOs

II. Schematics



Above is the complete schematic for this module. Starting at the top left, we see the waveform input "IN1". It connects directly to a bank of seven op-amps wired as comparators and a 100K pull-down resistor.

Below the IN1 wirepad we see the Hi and Lo threshold voltage summing circuits. Each is composed of a pair of B100K potentiometers, one for the manual voltage and for attenuating the input CV. The way the manual voltage pots are wired is the only difference between the Hi and Lo circuits, with one connecting to +12V through it's 68K resistor and the other connecting to -12V. The wipers of the two pots are summed together by an op-amp wired as an inverting amplifier with 100K mixing resistors and a 100K gain control resistor.

The outputs of the summing amplifiers are sent to the comparators at the top and bottom of the stack through 1K resistors and then to a series of six 100K resistors in series. At the junctions between the resistors we derive the threshold voltages for the middle comparators.

The outputs of the comparators are then sent to summing amplifiers using 47K gain resistors and 1K resistors in series with the output wirepads. All seven are sent to the 8MX output using 750K mixing resistors. The top, bottom, 3rd from top and 3rd from bottom comparators are sent to the 5MX output using 470K mixing resistors. The top and bottom are sent to the 3MX output using the 200K mixing resistors.

In the bottom right we see the power connections. Unmarked capacitors are .01uf. The main filtering is provided by a 10 ohm/ 10 uf low pass filter.

III Construction
A.PARTS LIST

SEMICONDUCTORS

Name/Value	QTY	Notes
TL074	3	14 pin DIP package. Other quad op-amps should work, but untested

RESISTORS

Name/Value	QTY	Notes
10 ohms	2	All resistors 1/4W metal film except potentiometers
1K	5	
47K	3	Replace with 62Kohm if using a +/-15V system
68K	2	Lower the value of these to increase range of HI/LO knobs
100K	13	
200K	2	
470K	4	
750K	7	
B100K PC Mounted Pot	4	Alpha 16mm.

CAPACITORS

Name/Value	QTY	Notes
.1uf	6	cheap ceramic disc. Value not critical.
10uf	2	Electrolytic, 16V or higher rating.

OTHER

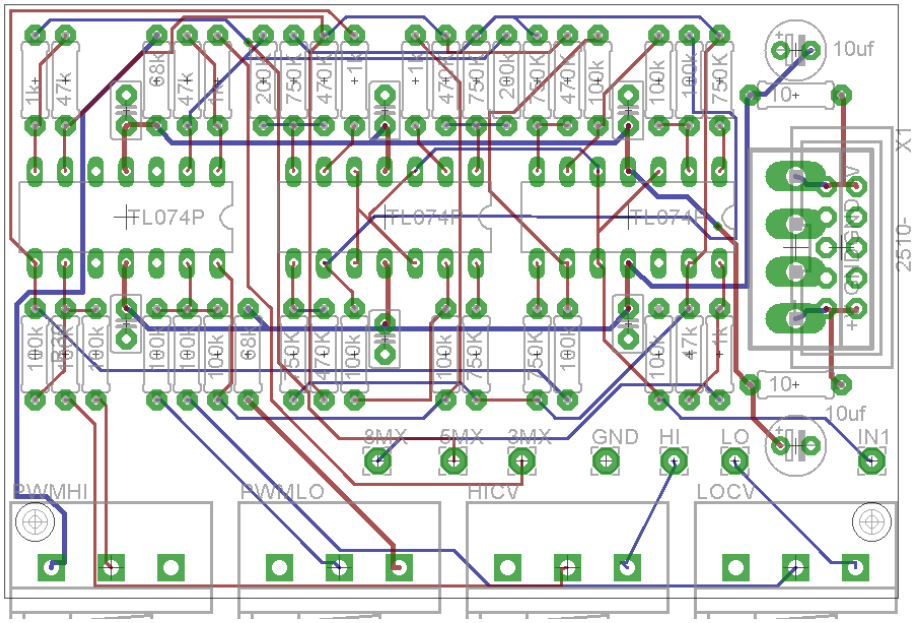
Name/Value	QTY	Notes
14 pin DIP socket	3	
Power connecter	1	MOTM or Eurorack style
Jacks	6	

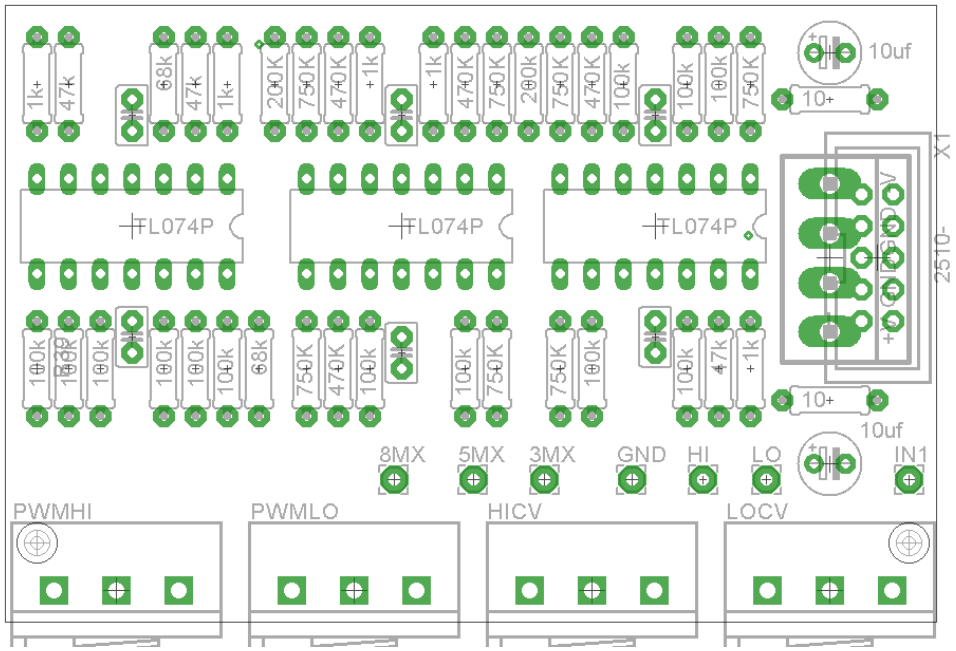
B. THE BOARD

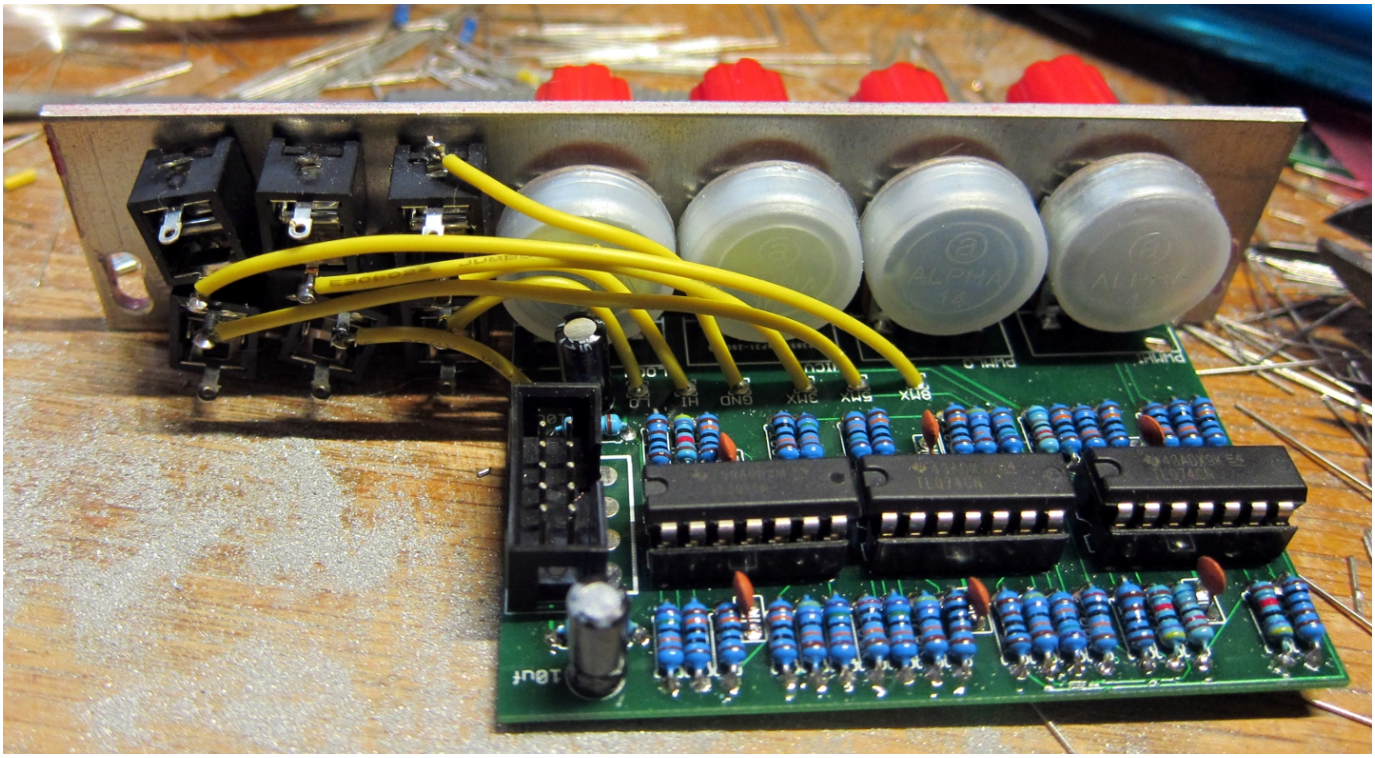
The PCB is 75mm x 50mm. The pots are spaced 19.05mm (¾ inch) apart, and the mounting holes are spaced 70mm apart.

Wiring for this project is simple enough that no diagram should be necessary. Connect the wirepad for each jack to the tip connector for that jack, then connect the "GND" wirepad to the sleeve of a jack.

IN1 = Signal input jack
LO = Lo CV input jack
HI = Hi CV input jack
GND = Ground connection
3MX = 3 step mixed output.
5MX = 5 step mixed output.
8MX = 8 step mixed output.
Below are images of the PCB with and without traces rendered and a photo of completed module.






ALPHA
TL074CN