

BMC114. Diode Break Wave Shaper

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

I What it does

II Schematics

III Construction

A. Parts List

B. The Board

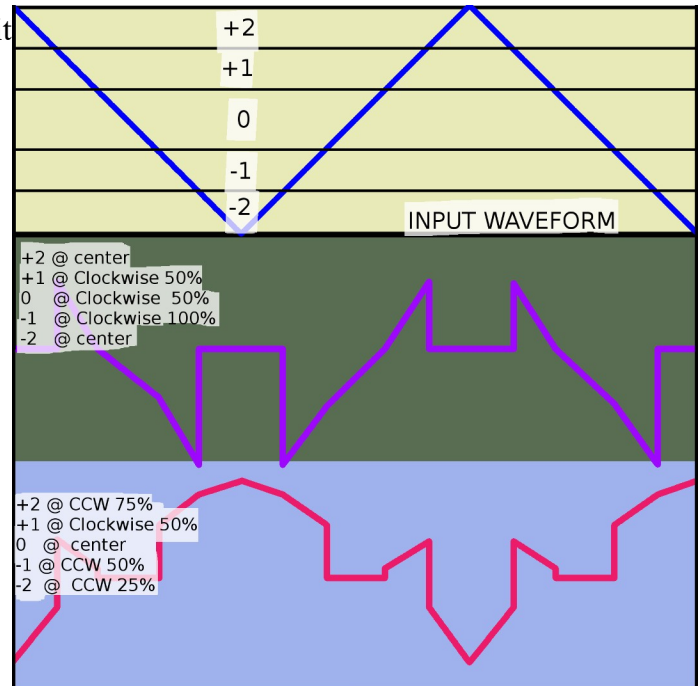
C. Calibration.

I. What it Does

This module takes an input waveform and breaks it down into five voltage range bands (-2, -1, 0, +1, +2) based on the break voltage controlled by a knob and CV input. The voltage range bands are then mixed together with attenuverting pots to create strange new waveform outputs.

The design is inspired by the diode function generator circuit [here](#). I had trouble getting that circuit to work, so I changed from using diode breakdown voltages to create voltage range bands to using schottky diodes clipping to voltages derived from a single source.

On the right is a diagram illustrating waveform changes possible.



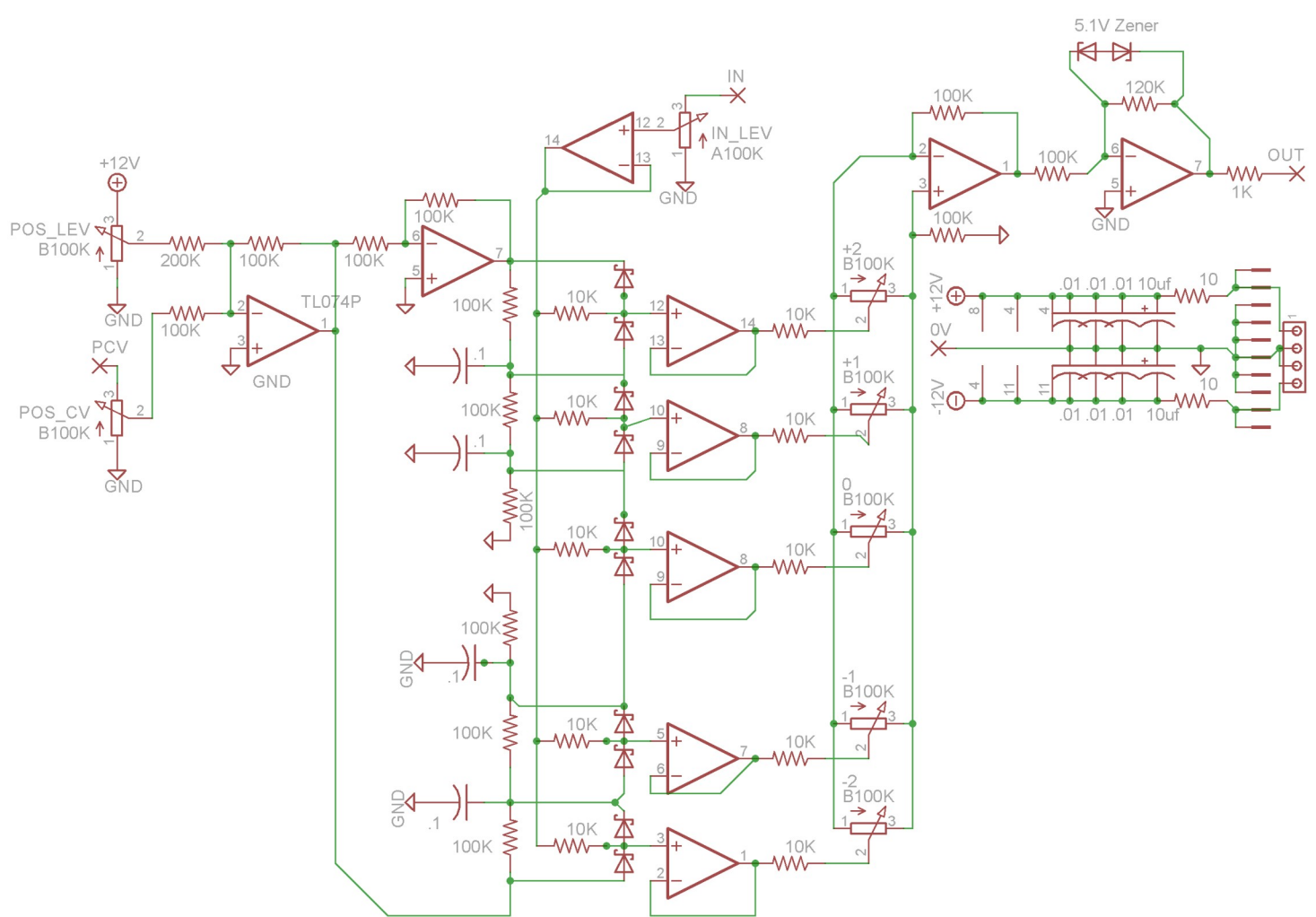
CONTROLS/INPUTS/OUTPUTS

1. Level mixing knobs. Labeled -2 through +2, these control the phase and intensity of how a voltage band is mixed into the final output. When the knob is centered, no signal should pass onto the output, when turned to the right, inverted signal is passed and when turned to the left non-inverted signal is passed.
2. Input attenuator – This knob attenuates the input signal. Making the input smaller or larger will change the relative range of the voltage bands and control how clipped or distorted the output might sound.
3. Break Knob/CV knob – The break knob controls the voltages where the bands break off from each other. As you turn the knob clockwise, the break points will go up and the signal range of the 0 band will increase and the range of the +2/-2 decrease. The CV knob attenuates an external voltage which modifies the break voltages.
4. Input, CV, and output jacks – These jacks input and output signal to the module.

SOUND SAMPLES

[No external CV](#) – This is just a sine wave input with some knob twiddling.

[Envelope CV](#) – An envelope generator is used to modulate the break voltage.



II. Schematic

Above is the schematic for this module. Starting at the top left, we have the potentiometers labeled POS-LEV and POS_CV. These are the knobs for break voltage and break cv (initially the module had negative and positive break voltage controls, the part name didn't change when going down to a single control). The voltages from these pots are mixed together by an inverting op-amp gain stage. The POS_LEV pot has a 200K resistor from it's wiper to attenuate it's output further since it connects directly to the +12V supply.

The output of this gainstage is sent to another inverter and to three 100K resistors in series leading to ground. The forming a voltage attenuator that makes three distinct voltages which act as thresholds for the voltage bands. Schottky diodes connect to these voltages and clip any input signal that goes above their higher voltage or below their lower voltage. .1uF capacitors to ground are there to keep the voltages steady as the clipping occurs. An identical arrangement can be found after the 2nd inverter of the control voltage signal.

The IN wirepad can be found at the top of the schematic, it's attenuated by the IN_LEV pot and then buffered by an op-amp. The buffered signal is then sent to the five schottky pairs through 10K resistors. These 10K resistors are there to isolate the voltage bands from each other so clipping in one band doesn't affect another. The schottky clipped signal is then buffered and sent to the wiper of a pot through a 10K resistor.

The five level pots are wired in parallel with each other, with all of the clockwise lugged wired together, and all of the counterclockwise lugs wired together. These two lugs are then sent to the two inputs of a differential amplifier, making it so then when the knobs are turned clockwise, the positive input gets more signal and when turned counterclockwise the negative input gets more signal. When the knobs are centered, equal signal is sent to both inputs and they cancel each other out.

The differential amplifier is then sent to a final amplifier with 5.1V Zener diodes in it's feedback path. These are used to limit the output of the circuit to +/-5.1V.

The PCB has footprints for eurorack and MOTM style power connectors. Positive and negative voltage rails are filtered by 10 ohm/ 10 uf low pass filters and .01 uf capacitors are placed near the power pins of ICs for further filtering.

III Construction

A.PARTS LIST

SEMICONDUCTORS

Name/Value	QTY	Notes
TL074	2	Or any quad op-amp
TL072	1	Or any dual op-amp
1N60P	10	Or any other small schottky diode
1N4733	2	Or other 5.1V zener diode

RESISTORS

Name/Value	QTY	Notes
10	2	1/4W metal film
1K	1	1/4W metal film
10K	10	1/4W metal film
100K	13	1/4W metal film
120K	1	1/4W metal film
200K	1	For 15V system builds, replace with 270K
A100K	1	9mm Pc mount like these.
B100K	7	9mm PC mount like these.

CAPACITORS

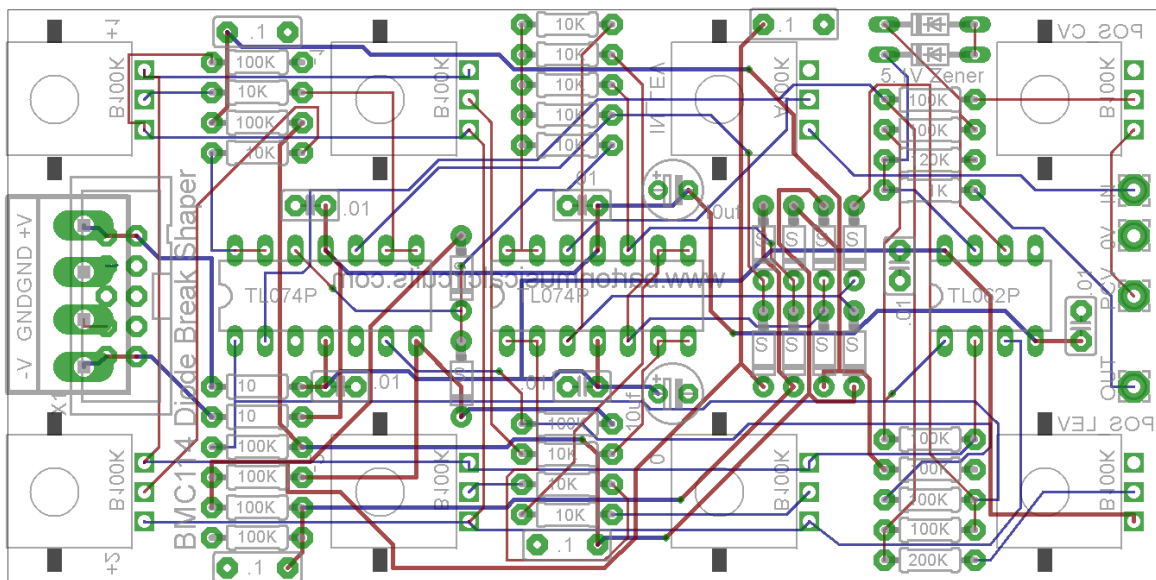
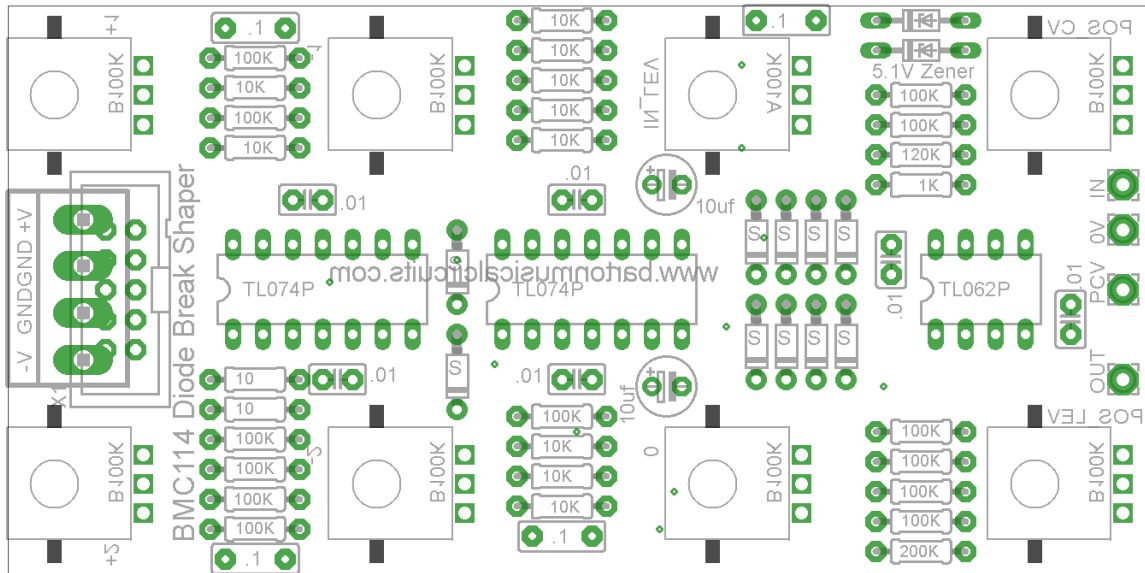
Name/Value	QTY	Notes
.01uf	6	Ceramic disc
.1uf	4	Box film type
10uf	2	Electrolytic

OTHER

Name/Value	QTY	Notes
3.5mm Jack	3	
Power connector	1	
8pin DIP socket	1	
14 pin DIP socket	2	

B. THE BOARD

Below are renderings of the PCB, both with and without traces present. The PCB is 97mm x 48mm, with the pots spaced 27.5mm x 33mm



C. Wiring.

Wirepads should be connected as follows:

IN – tip of input jack

0V – Ground, sleeve of any jack

PCV – tip of Break CV Jack

OUT – tip of output jack