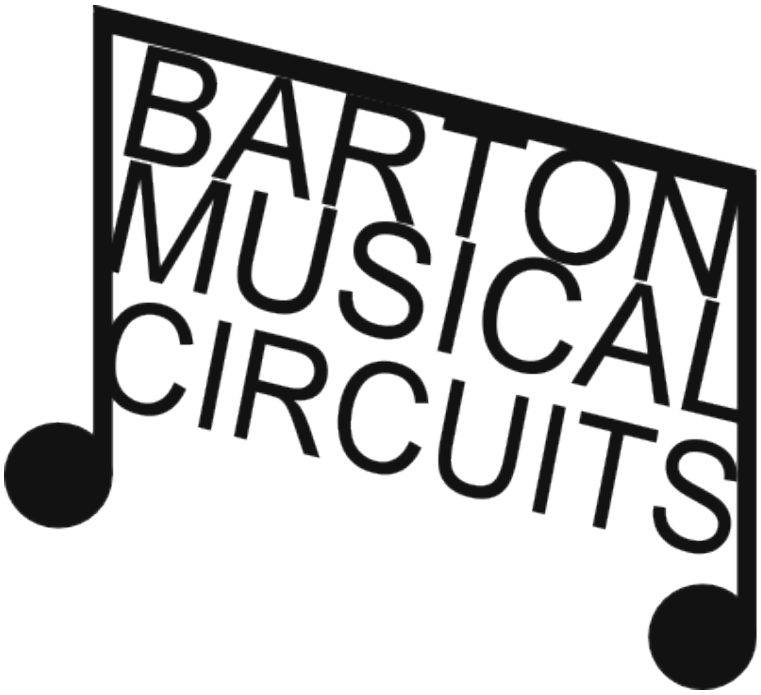

BMC113. Voltage Compute

If you have any questions, or need help trouble shooting, please e-mail
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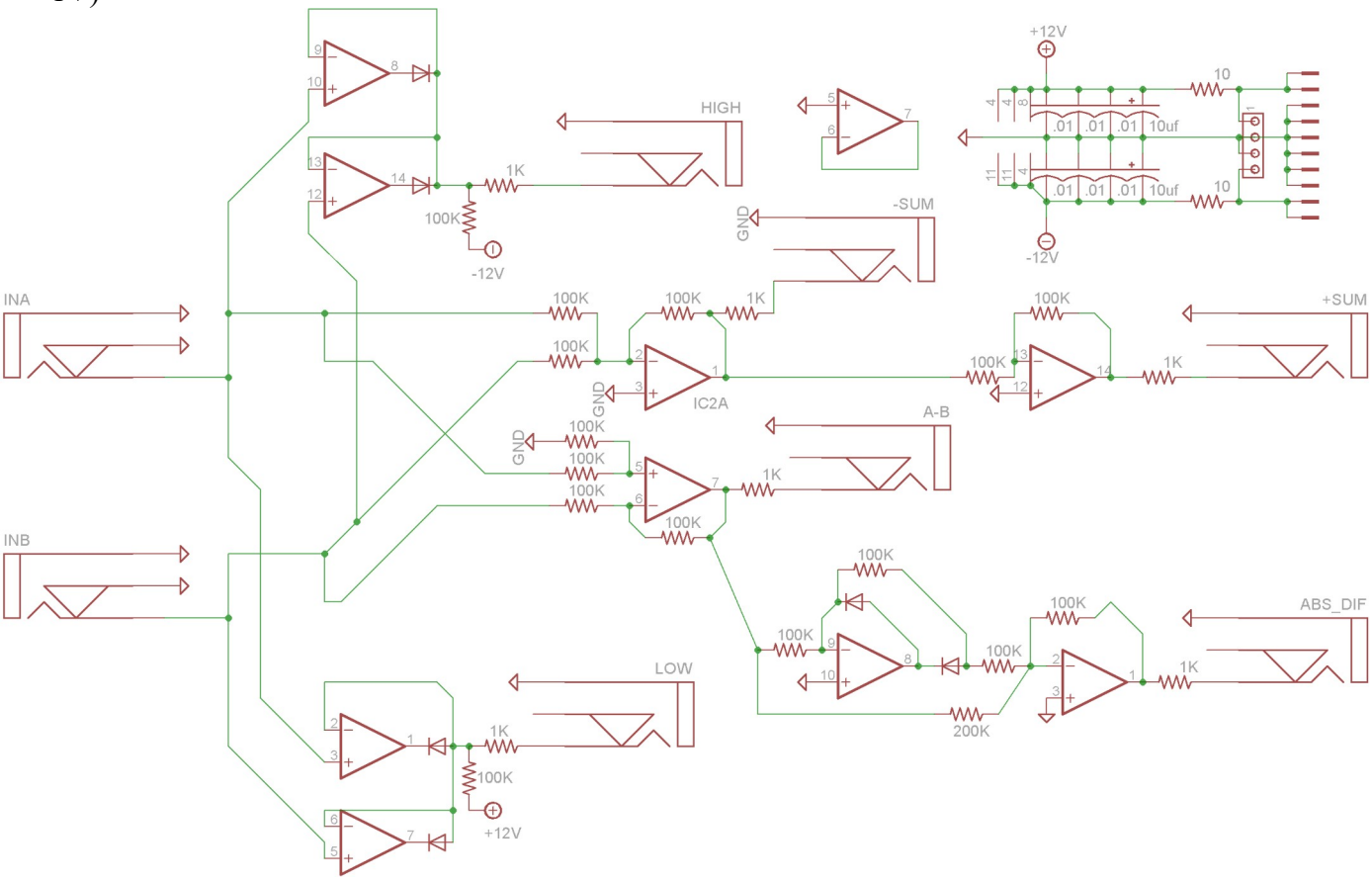
I. What it Does

This module takes two voltages and outputs several different voltages computed from those voltages. It's useful for combining CV sequencer outputs to create more complex sequences and may have some applications in waveshaping as well. It was designed specifically for use with BMC112 Divided Sequencer. The outputs are:
LOW – Outputs whichever input voltage is lower/more negative.
HIGH – Outputs whichever input voltage is higher/more positive.
+SUM – Outputs the two input voltages summed together (3V and 2V make 5V)
-SUM – Outputs the inverse of the two input voltages summed together.
A-B – Outputs the difference between the two input voltages (2V and 3V make 1V or -1V depending on which voltage is plugged into which jack)
ABS DIF – Outputs the absolute difference between the two input jacks (2V and 3V always makes 1V)



II. Schematic

Above is the full schematic for this module. INA and INB are the inputs for the module, each input going to four different circuits.

At the top of the schematic is the HIGH output circuit, each input goes to the non inverting input of an op-amp, with the output of the op-amp going through a 1N4148 to a summing node. The diodes make it so that the op-amp's output will only effect the output if it's higher than the voltage at the summing node. The summing node's voltage is then sent back to the negative inputs of the op-amps which gives the op-amps the feedback needed to overcome the voltage drop inherent in the diode. The node also has a 100K resistor going to -12V to provide a path for current to discharge and a 1K current limiting resistor going to the output jack.

At the bottom left of the schematic is the LOW output circuit. This works the same way as the HIGH output circuit but with the diodes reversed and the 100K resistor at the summing node going to +12V.

In the center of the schematic is the summing circuit. This is an op amp with gain stage with a gain of -1 with it's input a mix of the two input circuits, this op-amp provides the -SUM output. The output of this goes to another inverting op-amp stage to provide the +SUM output.

Below that is an op-amp wired as a differential op-amp with unity gain, which provides the A-B output. This op-amp is then sent to a full wave rectifier circuit formed by two op-amps. The first is a precision half wave rectifier with unity gain, it has a diode in it's feedback path and at its output to only output negative voltages and a 100K feedback resistor to overcome the diode voltage drop. The output of this rectifier is then sent to an inverting op-amp where its mixed with the output of the differential amplifier. The mixed output results in full wave rectification, where all negative voltages are presented as their inverse, but positive voltages are not. This gives us the ABS_DIF output.

III Construction
A.PARTS LIST

SEMICONDUCTORS

Name/Value	QTY	Notes
TL074	2	Or other quad op amp
TL072	1	Or other dual op amp
1N4148	6	

RESISTORS

Name/Value	QTY	Notes
10 ohms	2	1/4W metal film
1K	6	1/4W metal film
100K	15	1/4W metal film
200K	1	1/4W metal film

CAPACITORS

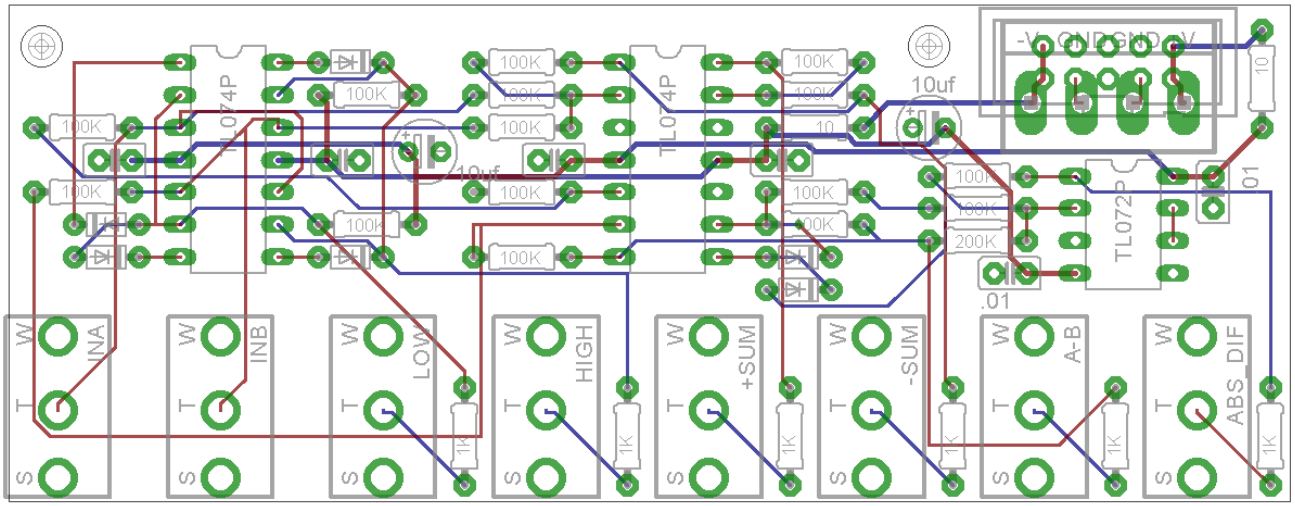
Name/Value	QTY	Notes
.01uf	6	Ceramic disc
10uf	2	Electrolytic

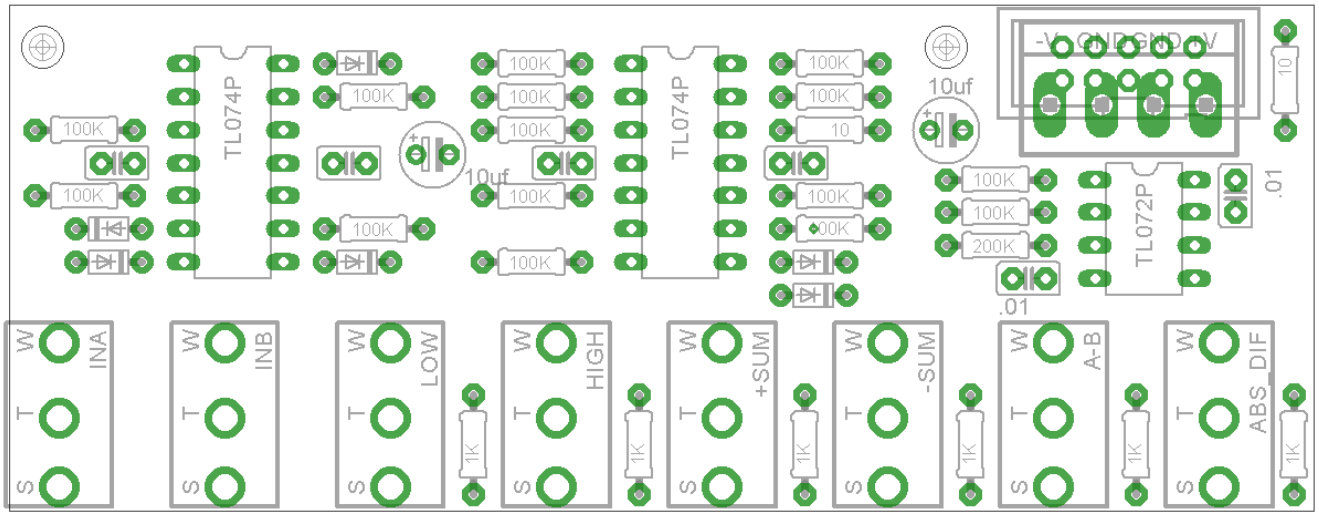
OTHER

Name/Value	QTY	Notes
3.5mm Jack	8	PC Mount like this.
Power connector	1	Right angle Eurorack 10 PIN box header
8 pin DIP socket	1	
14 pin DIP socket	2	

B. THE BOARDs

Below are renderings of the PCB, both with and without traces present.





The PCB is 100mm x 39mm, the jacks are spaced 12.71mm apart. Below is a photo of a built module to use as reference.