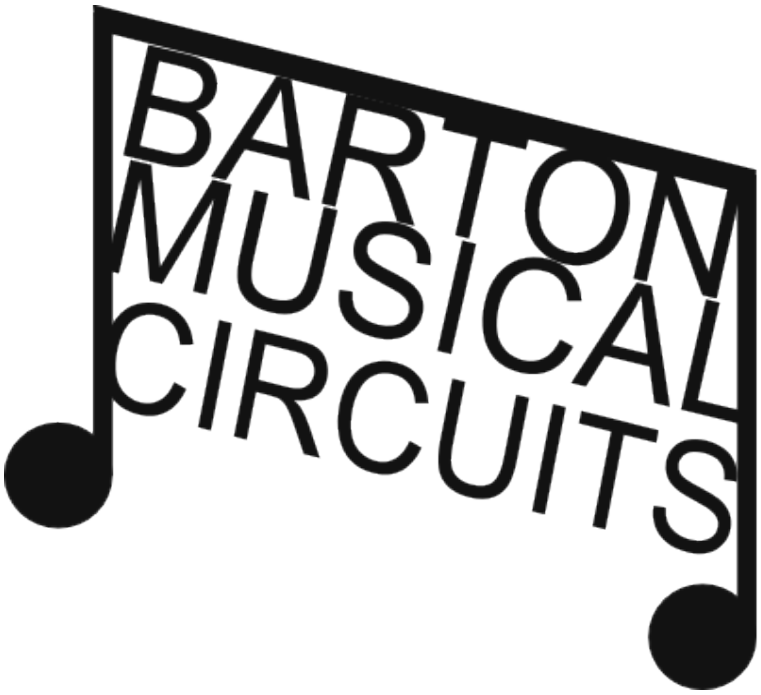


BMC089. Transposer

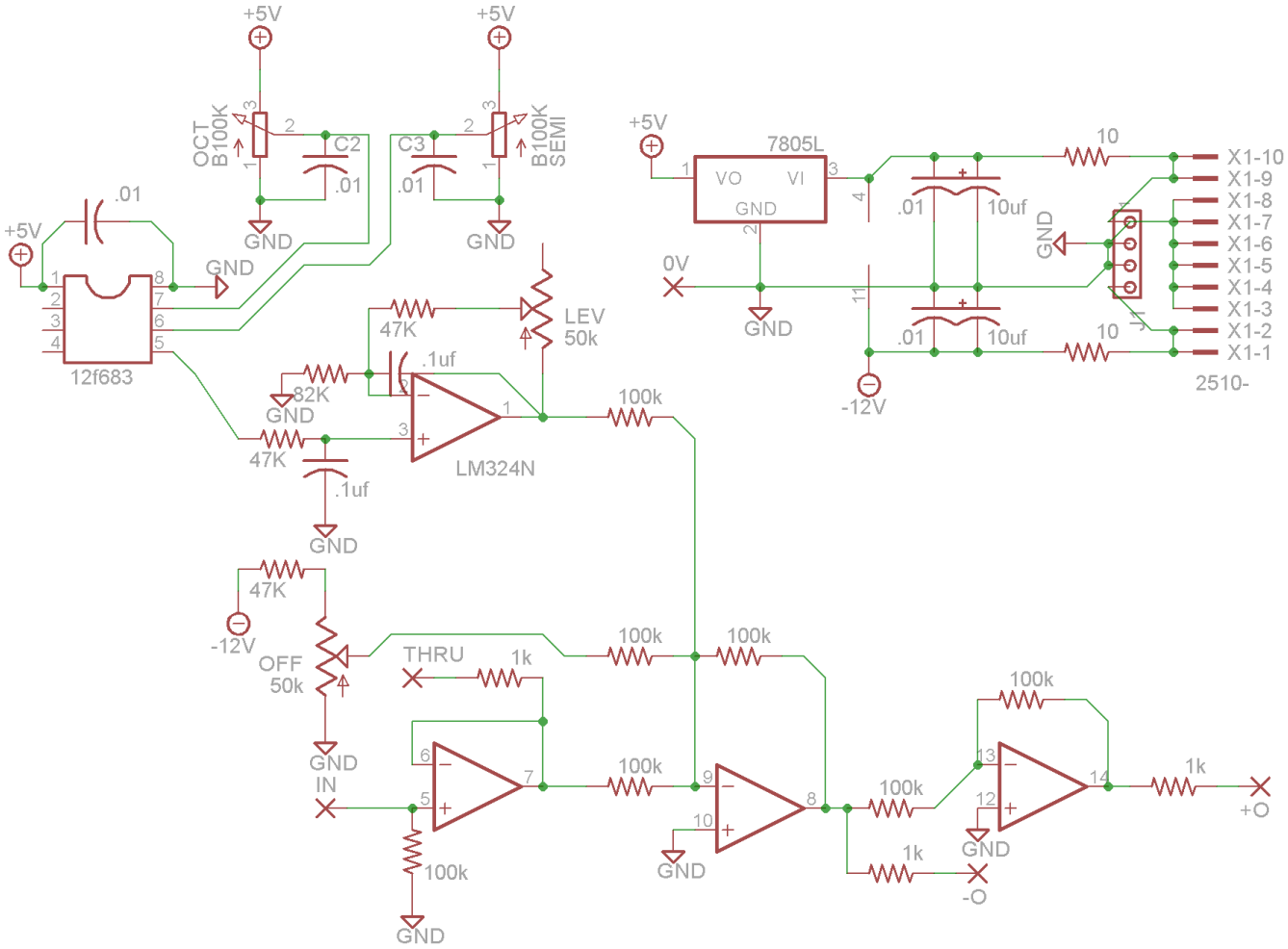
If you have any questions, or need help trouble shooting, please e-mail Michael@Bartonmusicalcircuits.com

I. What it Does

This module processes 1V/octave CV signals by adding positive or negative voltage offset. Musically, this transpose notes, with controls for how many octaves and semitones to transpose by. When no input is present it can be used as a standalone voltage source.

It has a single CV input and three outputs; a through output that simply buffers the input, the transposed voltage output and an inversion of the transposed output (inverted in respect to 0V).

II. Schematic



Above is the schematic for this module. In the upper left is the 12F683 PIC microcontroller, powered by +5V with a .01uf capacitor filtering it's power supply pin. Pins 6 and 7 each connect to the wiper of a 100K potentiometer wired as a variable voltage source ranging from 0 to +5V, with .01uf capacitors filtering any noise from the pots.

Pin 5 of the PIC, is the PWM output. This outputs a pulse wave at a fixed frequency with the width of the pulses altered depending on the settings of the Octave and Semitone pots. These pulses are filtered by a 47K resistor and .1uf capacitor forming a passive low pass filter.

This filtered PWM signal is then amplified by a section of the LM324 op-amp. A .1uf capacitor connects the output to the negative input to filter out more high frequency signal. This cap is in parallel with a 47K resistor in series with the LEV trimpot wired as a variable resistor, this trimpot controls the total amplification of this stage.

At the bottom of schematic we see the "IN" wirepad, which connects to a 100K resistor to ground and then to an op-amp wired as a buffer that outputs to the "THRU" wirepad through a 1K resistor. The output if this buffer is mixed with the PWM's filtered and amplified output and with the offset voltage by another op-amp wired as an inverting gain stage. This op-amp outputs to the

inverting output labeled “-O” and then to another inverting gain stage which outputs to the non-inverting output labeled “+O.”

The Offset voltage is set by the OFF trimpot used as a variable voltage divider, setting an offset voltage somewhere between 0V and -6V

On the right of the schematic, are the power connections. On the right are the PCB footprints for MOTM an Eurorack style connectors in parallel. The +/- power rails are filtered by a passive lowpass filter formed by a 10ohm/10uf RC pair. Additional .01uf capacitors are placed next to the power pins of the LM324 for additional filtering of high frequencies. The +5V supply is created by a 7805L voltage regulator.

III Construction

A.PARTS LIST

SEMICONDUCTORS

Name/Value	QTY	Notes
LM324	1	14 pin DIP package.
12F683	1	Should have been provided with your PCB
7805L	1	TO-92 package

RESISTORS

Name/Value	QTY	Notes
10 ohms	2	All resistors 1/4W metal film except potentiometers
1K	3	
47K	2	
82K	1	
100K	6	
B100K PC Mounted Pot	2	16MM width, PCB mounted
50K Cermet trimpot	2	3296W Package

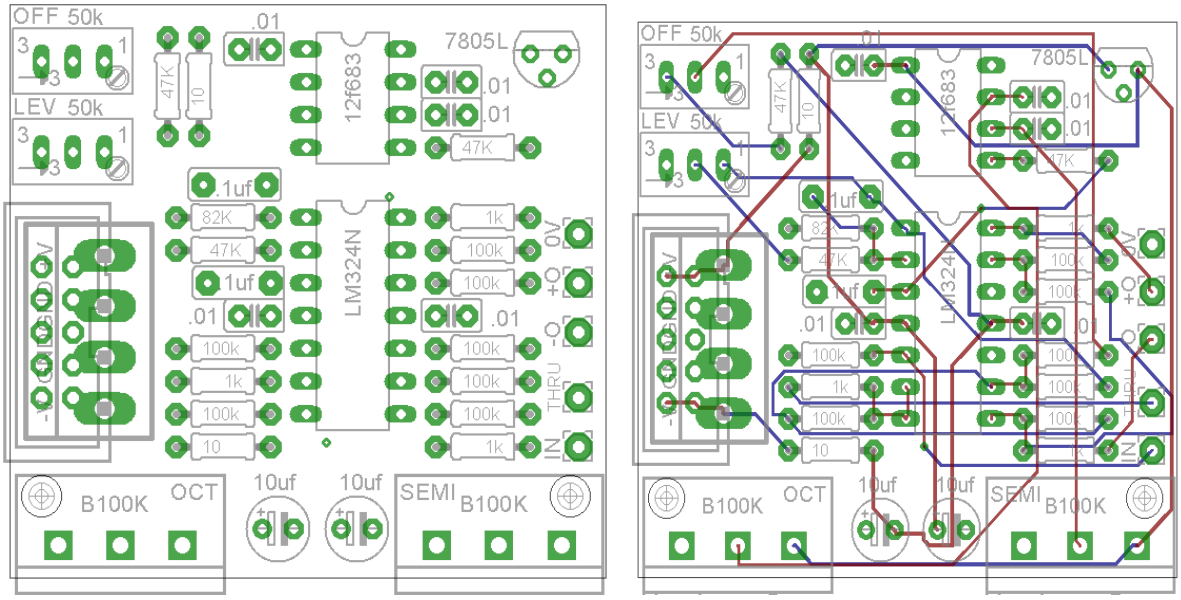
CAPACITORS

Name/Value	QTY	Notes
.01uf	5	cheap ceramic disc. Value not critical.
.1uf	2	Metal film or mylar.
10uf	2	Electrolytic, 16V or higher rating.

OTHER

Name/Value	QTY	Notes
8 pin DIP socket	1	
14 pin DIP socket	1	
Power connecter	1	MOTM or Eurorack style
Jacks	4	

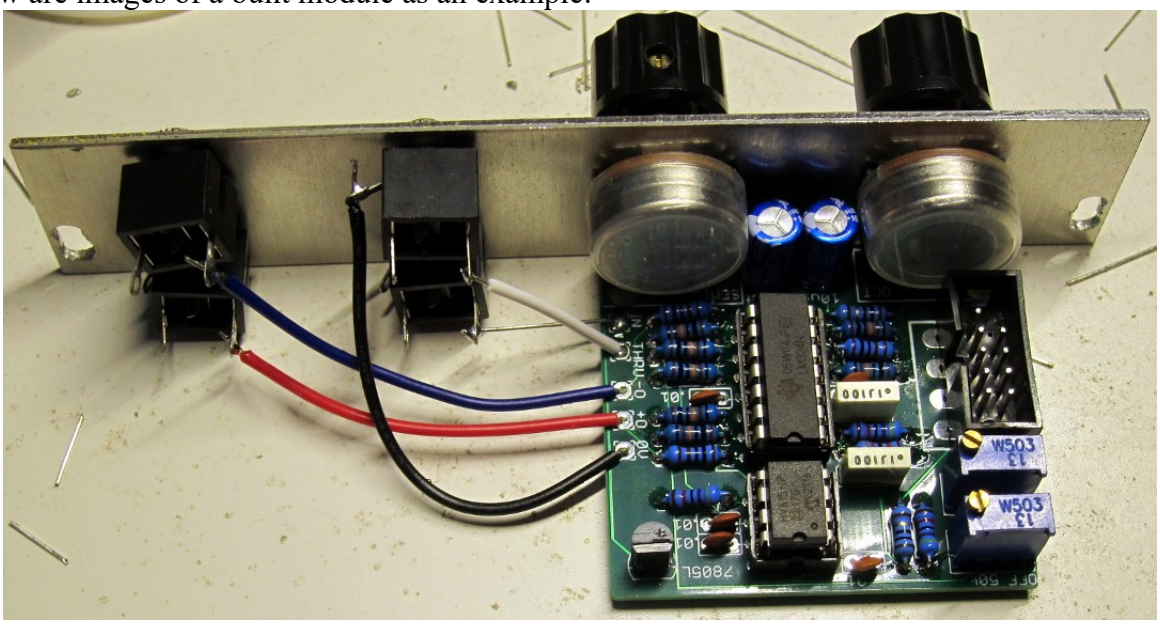
B. THE BOARD

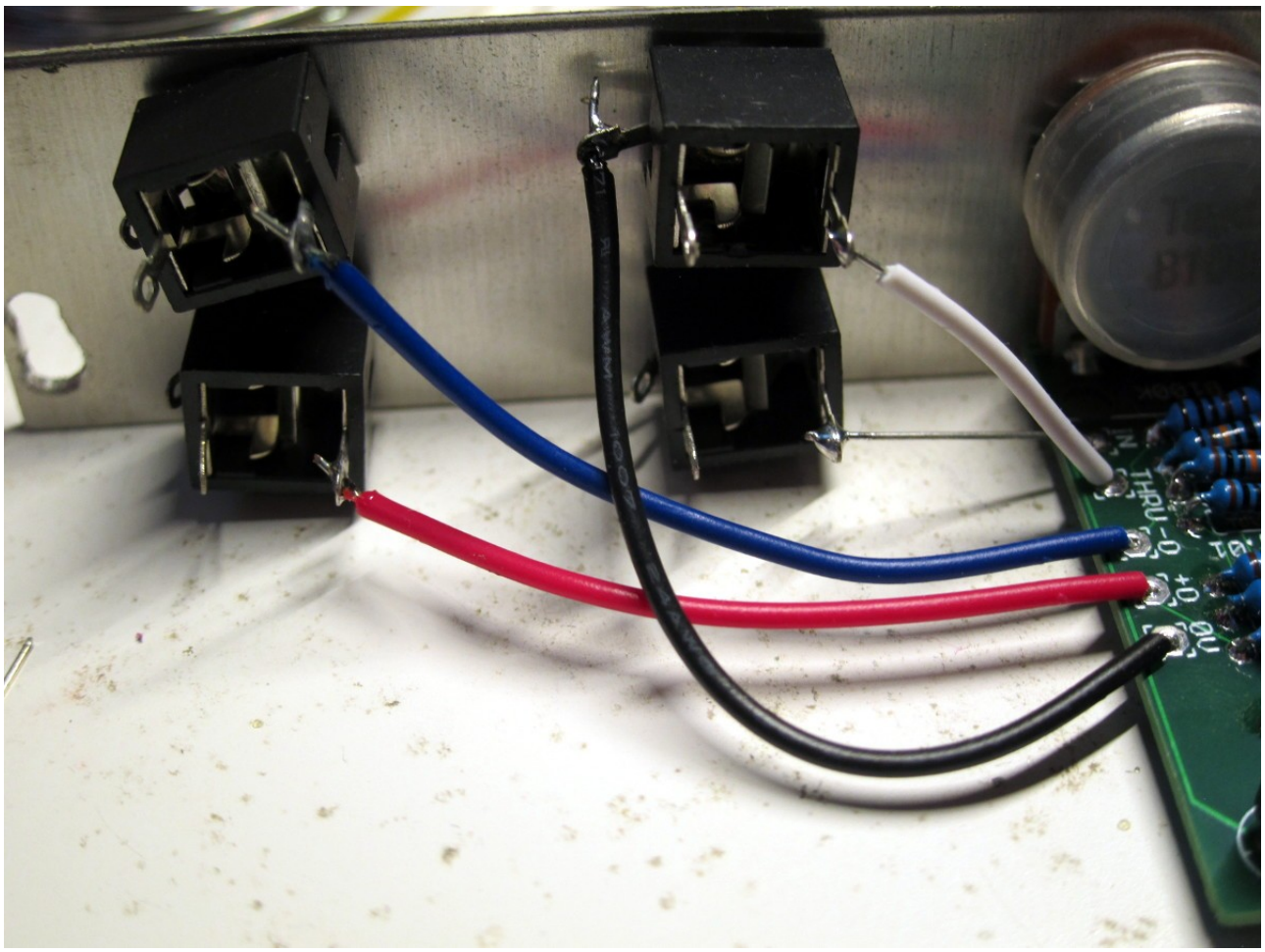


Above are images of the circuit board, with and withotu traces shown. The ground fill plane is not shown on the image with traces. The PCB measures 48mm x 45mm with the pots spaced 30.48mm apart.

C. WIRING

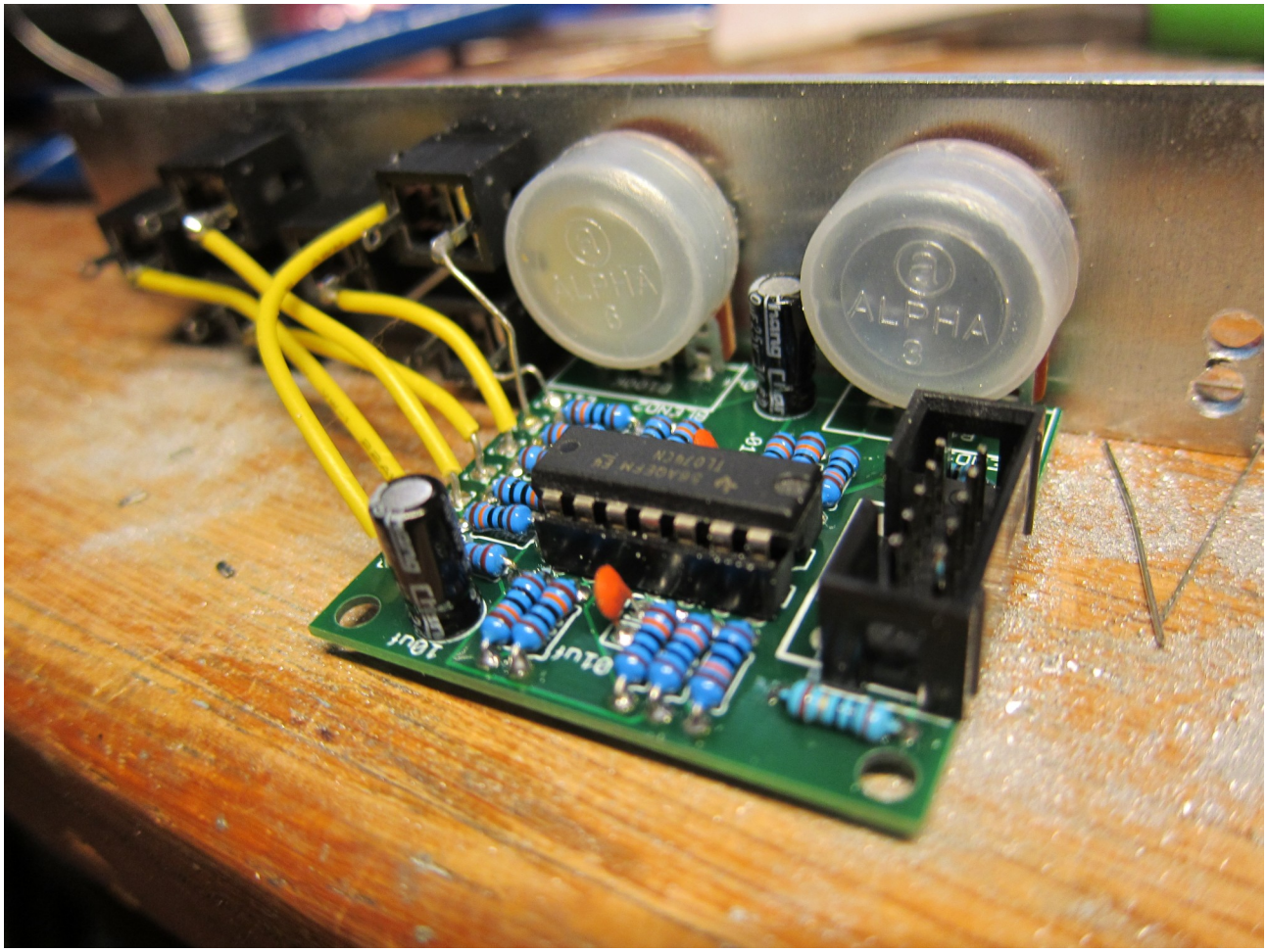
The wirepad marked “0V” is a ground connection, it should be wired to the sleeve of a jack.
The remaining wirepads should each be wired to the tip connector of the jack corresponding to their function.
Below are images of a built module as an example:

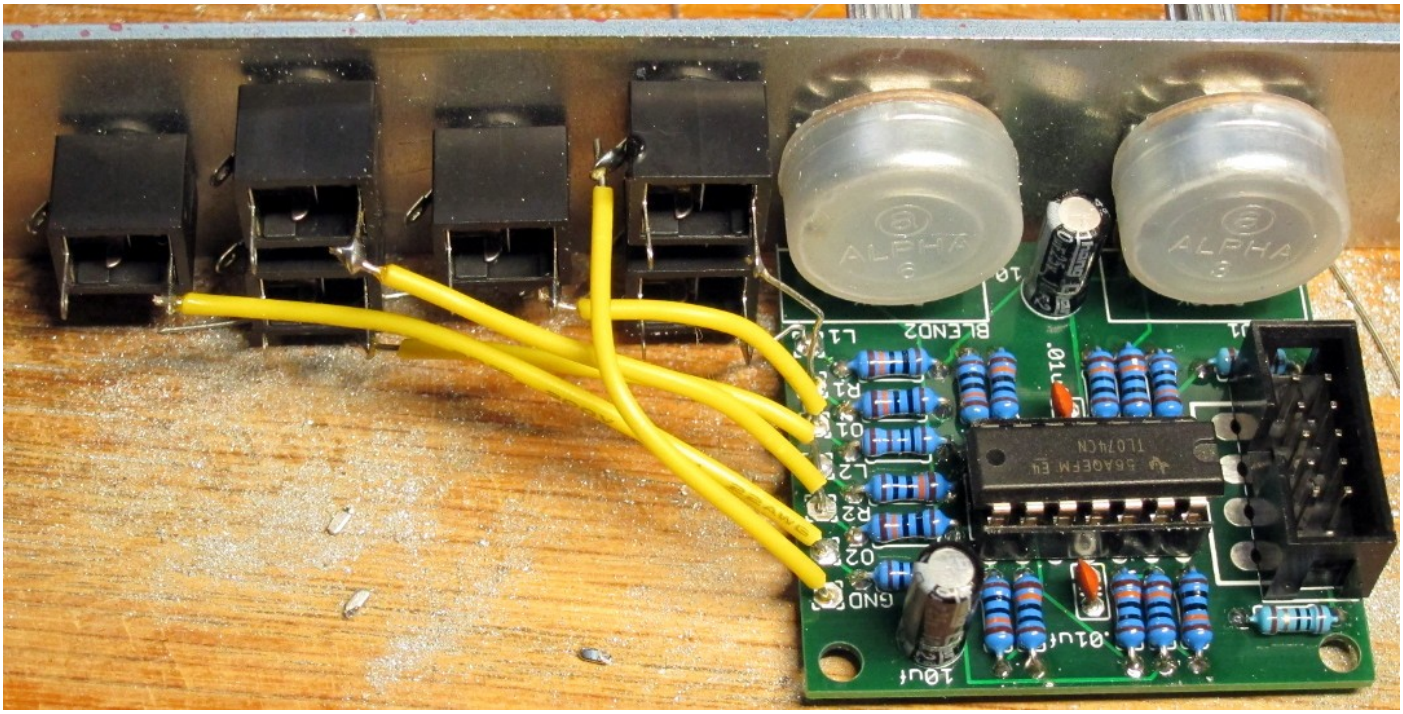




D. CALIBRATION

STEP 1. Attach the red lead of your multimeter to the tip of the "+Output" jack, and the black lead to ground. Set the meter to measure voltage.
STEP 2. Turn both knobs on the module completely counterclockwise.
STEP 3. Adjust the "OFF" trimpot until the output voltage is -4V.
STEP 4. Slowly turn the "OCTAVE" knob clockwise until you get a change in voltage.
STEP 5. Adjust the "LEV" trimpot until the output voltage is -3V.
STEP 6. Turn the OCTAVE knob a little more until you get another change in voltage.
STEP 7. Adjust the "LEV" trimpot until the output voltage is as close to 1V higher than the last step as you can make it.
Repeat steps 6 and 7 as you go through the range of the module.


ALPHA
ALPHA


ALPHA
ALPHA
BLEND2
GND