

## BMC047. Balanced Outs.

Last updated 8/31/19

### I Features

- A. How it works
- B. Controls/Inputs/Outputs

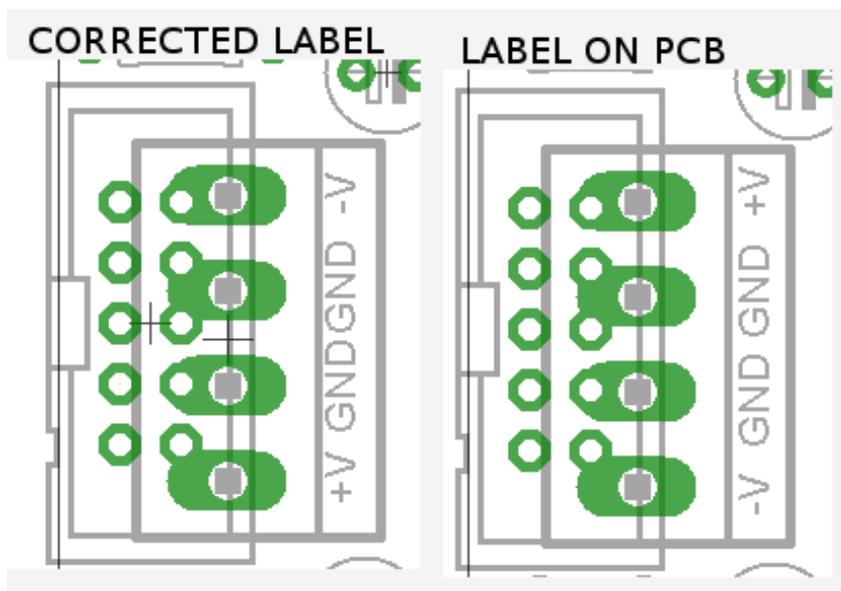
### II Schematic

- A. Master Schematic.

### III Construction

- A. Parts List
- B. The Board
- C. Wiring Notes

**PCB ERROR:** The MOTM connectors screenprint displays the V+ and V- labels backwards on the PCB. The position of the tab on the Eurorack connector is correct. Sorry for the confusion.



## I. Features

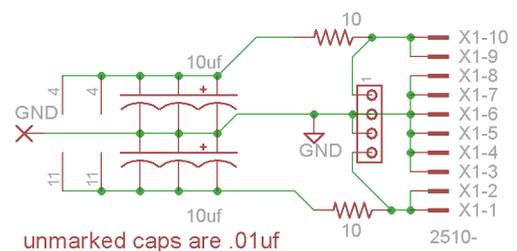
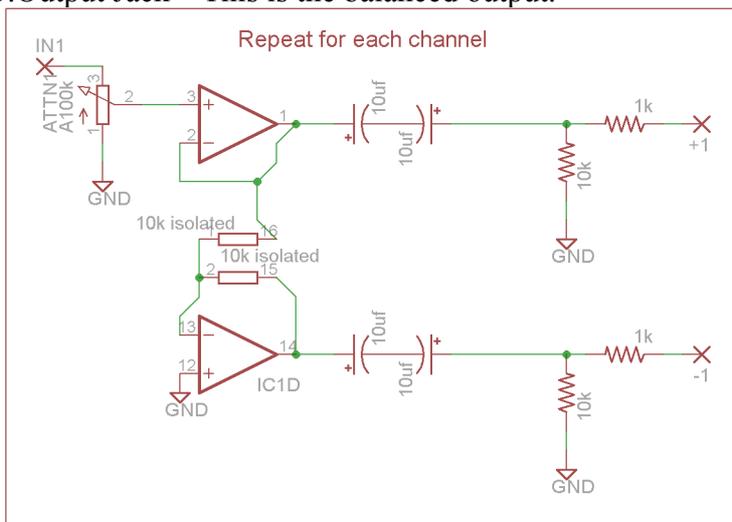
### A. How it works

This module provides four balanced outputs for a modular synthesizer system. I designed it to use with a recording interface that had mostly XLR inputs, but it can also be useful for live sound applications. It is capacitor coupled, and the PCB is designed to be compatible with most popular modular synth formats and to work with both XLR and 1/4" balanced connections.

### B. Controls/Inputs/Outputs

Each of these is repeated four times.

1. Input Jack – The signal to be sent through the balanced connection is input here.
2. Attenuation Knob – This controls the signal level going to the balanced connections. Synthesizer signals are much larger than microphone signals, so when driving equipment expecting to see a microphone, you will not need very much signal.
3. Output Jack – This is the balanced output.



## II. Schematic.

Above is the schematic for this project. The four channels are identical, so only one is shown in the schematic to save space. The signal goes through the attenuating knob into an op-amp buffer. The output of the buffer is sent to two places. First, it goes through a pair of electrolytic capacitors which decouple the DC offset from the signal, these are followed by a 10K resistor to ground providing a ground voltage reference and a 1K output impedance resistor to the non-inverting output of the channel. The buffer's output is also sent to an inverting amplifier with a gain of 1. The amplifier's output goes through the same network of capacitors and resistors to the inverting output of the channel.

The PCB is set up to use an isolated 10K resistor array for the resistors used in the inverting amplifier amplifier, as the resistors in an array are generally better matched to each other than two random resistors of the same value. It is not necessary to use an isolated array or even to use matching resistors, but it will increase the balance of the balanced output which should reduce harmonic distortion.

To the right of the channel schematic is a schematic of the power connections. There are two PCB footprints for power connectors which are parallel to each other. The positive and negative voltage rails are filtered by a 10ohm/10uF low-pass filter, and there are additional .01uF capacitors at the power connections for the ICs.

### III.Construction

#### A.Parts List

#### Semiconductors

Value	Qty	Notes
TL074	2	14 pin DIP packaging

#### Resistors

Value	Qty	Notes
10 ohm	2	7.5mm lead spacing, 1/4W Metal film
1K ohm	8	" "
10K ohm	8	
10Kohm isolated array	1	8 resistor array, or replace with 8 10K resistors
A100K Potentiometer	4	16mm pot, PCB mounted, Log/Audio taper.

#### Capacitors

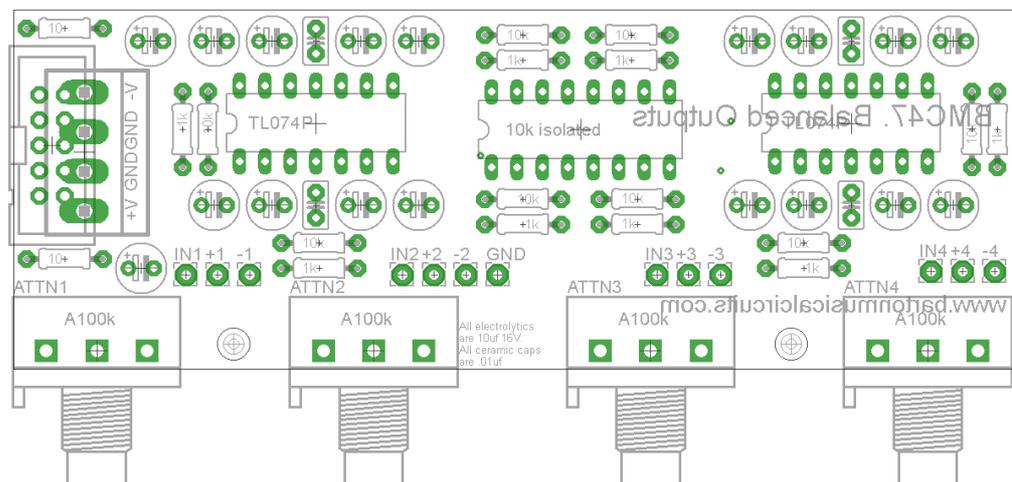
Value	Qty	Notes
.01uf	4	cheap ceramic 2.54mm
10uf	18	Electrolytic

#### Other

Value	Qty	Notes
Power Connector	1	Either Eurorack or MOTM
14pin DIP Socket	2	
Input Jacks	4	The jack that your synth format uses
Output Jack	4	Either a TRS 1/4" jack or a Male XLR connector. If using the XLR panel from Barton Musical Circuits, it's designed to use Neutrik NC3MPP part.
Knobs	4	

#### B.The Board

To the right is a picture of the PCB. The PCB's dimensions are 100mmx33mm. The pots are spaced 27.6mm apart. The mounting holes are



spaced 55.5mm apart.

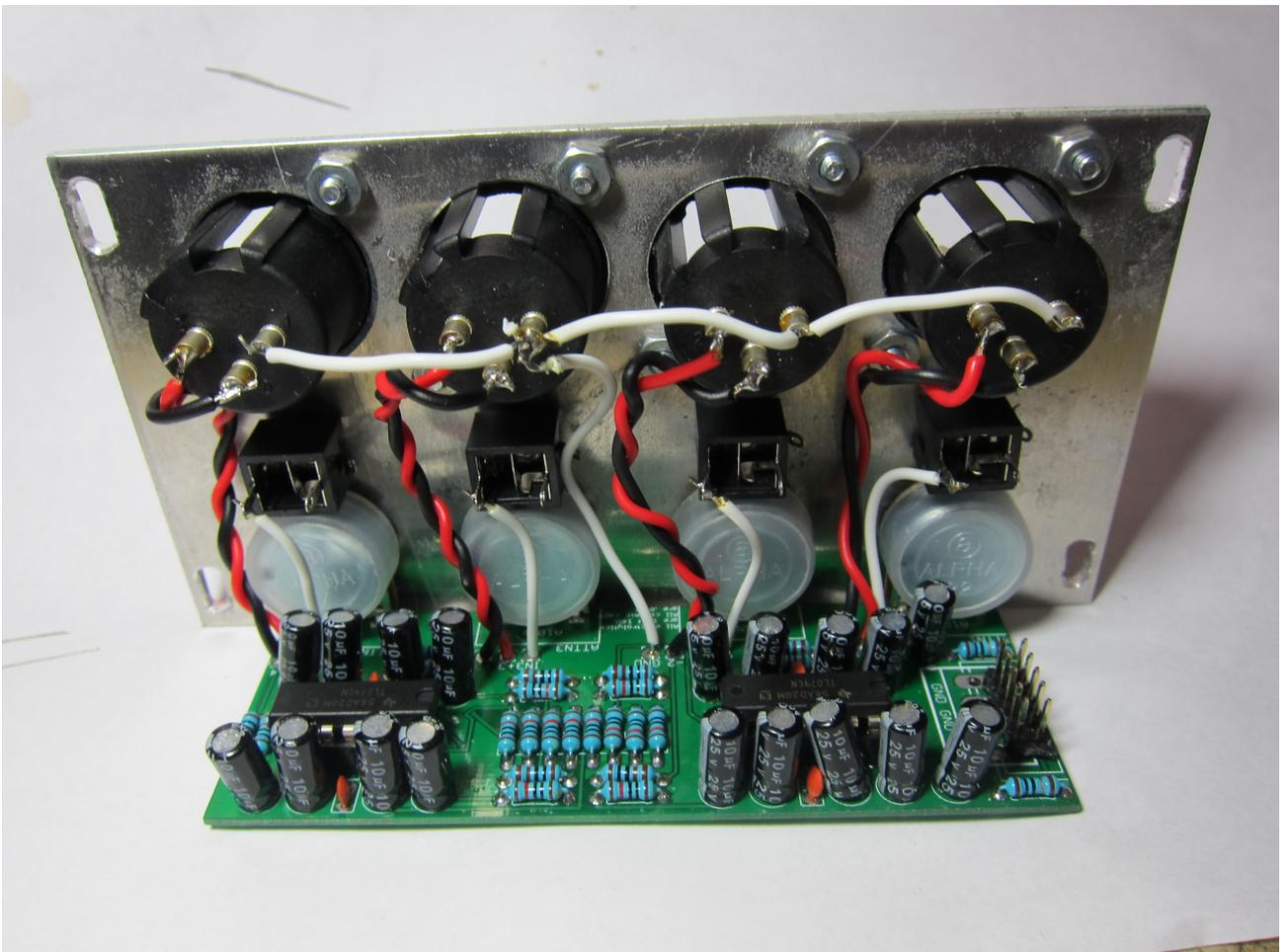
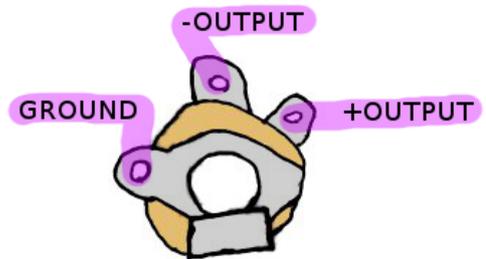
## C. Wiring Notes

The input jack for each channel is marked “INx” with the “x” replaced by the channel number. These should be wired to the tip connection of the input jack. Each channel has two outputs, one inverting “-x” and one non-inverting “+x.” How these are wired depends on what type of output jack you're using.

If wiring for a 1/4” jack, follow the diagram on the right. “-x” should be wired to the ring connector, and “+x” should be wired to the tip connector. Ground should be wired to the sleeve

If wiring for XLR, follow the photo below. “-x” should be wired to connector 3, “+x” to connector 2 and ground to connector 1.

### WIRING FOR TRS 1/4" JACK



Above is a photo of a wired module. Note that individually packaged resistors are used in place of the array. This is the correct orientation when not using an array. Twisting the wires towards the output jacks will help keep the signal balanced.