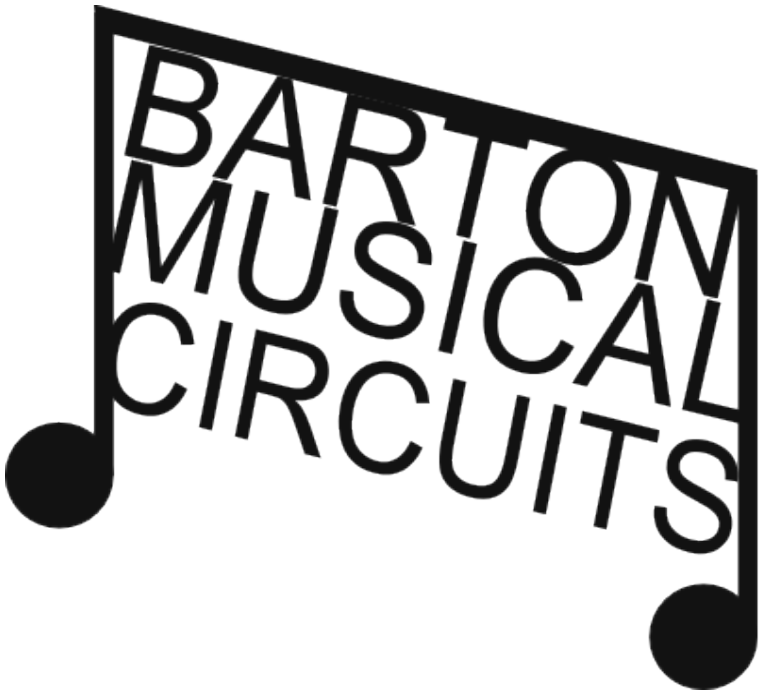


BMC030. Guitar Input

Last updated 2-23-2015

I Features
- **-What it does/Controls**
- **-Demos**

II Schematics
- **-Preamp**
- **-Envelope/Gate**
- **-Square Out**
- **-Return**
- **-Power**

III Construction
- **-Parts List**
- **-PCB information**
- **-How to Install an LED**

I. Features

This module is designed to provide an input/output point for guitar and other unbalanced external signals into a modular synthesizer patch. It has the following controls/inputs/outputs

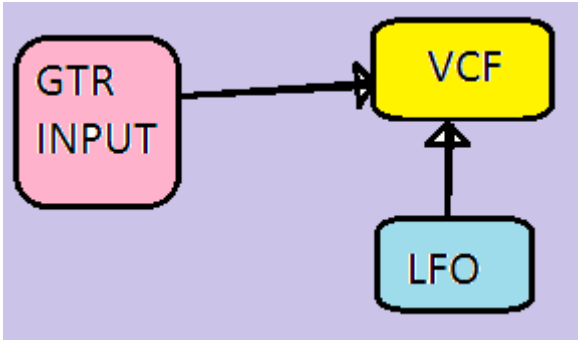
CONTROLS
1.Gain Knob – This knob controls the gain of the initial pre-amp.
2.Gain Switch – This attenuates the signal before the initial pre-amp. When active, the gain range is 1-1000, when deactivated, the gain is .2 – 200.
3.Envelope Sensitivity Knob – This knob controls the "release" of the envelope output.
4.Gate Sensitivity Knob – This knob sets the threshold for the gate output.
5.Return Volume Knob – This knob attenuates the signal going to the return jack.

INPUTS
1.External Input – This input is where you plug in your guitar or other external signal. This is an unbalanced 1/4" input.
2.Return Input – This input is for whatever you'd like to send out of the "Return Output."

OUTPUTS
1.Audio Output – This is the amplified audio sent into the external input.
2.Envelope Output – This is a rectified and filtered version of the audio, useful as control voltage.
3.Gate Output – This is a +5V/0V pulse, useful for triggering things like A/R generators
4.Return Output – This is an unbalanced output.
5.Square Output – This is a +/-5V audio pulse output.

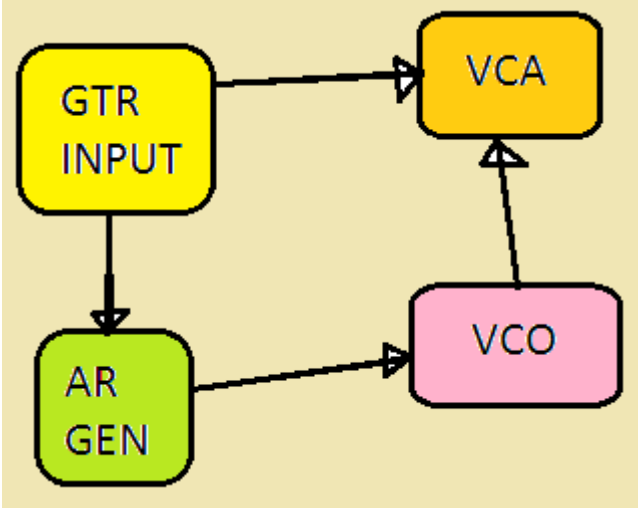
EXAMPLE PATCHES

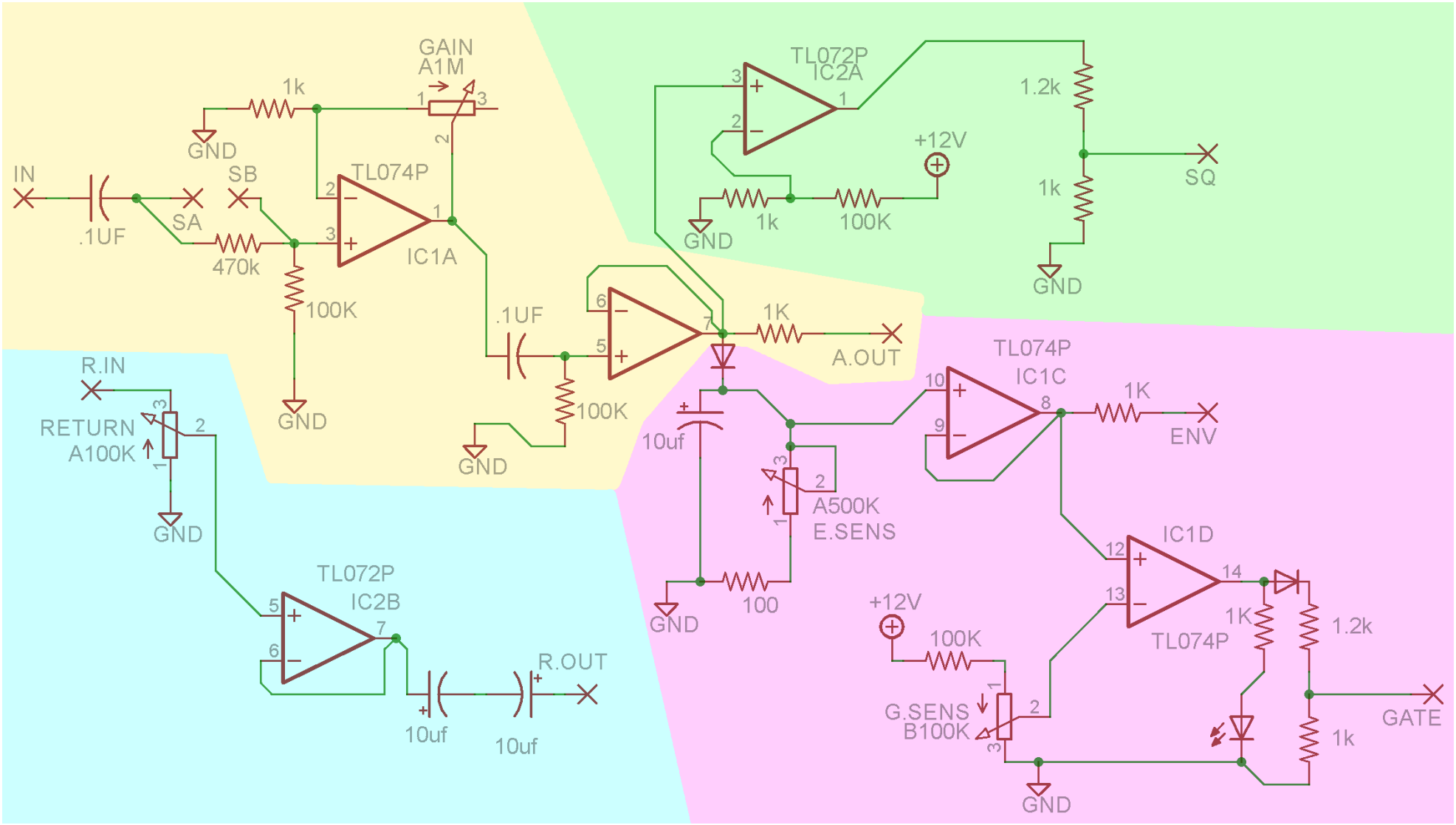
Patch #1
This is a very simple patch demonstrating the module with a non-guitar input. A drum machine is being filtered by a VCF, the cutoff of the VCF is being modulated by an LFO.



Patch #2
This patch consists of a guitar being input to the module. The audio out of the guitar is going to the control input of a VCA. The gate output is going to an AR Generator, which is modulating the frequency of a VCO, the output of the VCO is going to the input of the VCA.

When picking hard, the gate output is made active and the VCO's frequency increases.




GAIN
A1M
1k
GND
IN
SB
TL074P
.1UF
SA
470k
IC1A
100K
GND
.1UF
100K
GND
TL072P
IC2A
1.2k
+12V
SQ
1k
100K
GND
1k
GND
1K
A.OUT
R.IN
RETURN
A100K
GND
TL074P
IC1C
1K
ENV
10uf
A500K
E.SENS
100
GND
IC1D
TL072P
IC2B
+12V
100K
1K
1.2k
R.OUT
G.SENS
B100K
TL074P
GATE
10uf
10uf
1k
GND

II Schematics

In the previous page is the schematic for the circuit (minus the power connectors), each part of the circuit will be briefly examined. The different sections of the circuit have been color coded:

PEACH = Pre-amplifier
GREEN = Square Wave output
PURPLE = Envelope and Gate Out
BLUE = Return

Pre-amplifier

The "IN" wirepad is conencted to the tip of the input jack. It's connected to a .1uf capacitor to remove DC offset from the input. The other side of the capacitor is connected to a 470K capacitor with the gain switch wired in parallel, so that when the switch is activated the resistor is bypassed and the gain is increased. The switch and resistor are then connected to a non-inverting amplifier stage, the 100K resistor both biases the input to 0V and acts as part of a voltage divider with the 470K resistor.

In the feedback path of the op-amp is a logarithmic tapered 1 Meg pot which adjusts the gain and a 1K resistor to ground is connected to the negative input. The output of this op-amp goes through another .1uf capacitor to remove any incidental offset and then goes to a buffer stage with a 100K resistor providing bias. The output of this buffer goes through a 1K resistor to the "A. Out" wirepad which is connected to the audio-out jack. The output is also connected to the square wave output and envelope output sections.

Square Wave Output

The output of the pre-amplifier is connected to an op-amp wired as a non-inverting comparator. The threshold is set at 1/100 of the positive power rail (0.12v in a +/-12V system and 0.15V in a +/-15V system) by a 1K and 100K resistor forming a voltage divider between ground and the positive power rail. The output then goes through a voltage divider to reduce the op-amps output to +/-5V.

IF USING A +/-15v POWER SUPPLY REPLACE 1.2K RESISTOR WITH 1.5K

Envelope and Gate Output

The output of the pre-amplifier is connected to the anode of a 1n4148 diode, the cathode of this diode is connected to a 10uf capacitor connected to ground. Positive output from the pre-amplifier will charge this capacitor. In parallel with the capacitor is a 500K pot wired as a variable resistor, with a 100 ohm resistor in series with it. This is the "Envelope Sensitivity" pot. This pot allows the capacitor to discharge itself, and by adjusting the resistance the rate of discharge changes. A buffer is used to output the voltage on the capacitor. The output of the buffer goes through a 1K resistor to the "ENV" wirepad which is connected to the envelope out jack.

The output of the buffer is also connected to the input of an op-amp wired as a non-inverting comparator. The threshold of the comparator is set by the "G. Sens" pot. This pot is wired in series with a 100K resistor to the positive voltage rail, setting the range of threshold to be between 0V and ½ of the positive rail voltage (6V on a +/-12V system and 7.5V on a +/-15V system). The output of the comparator is wired to an LED through a 1K current limiting resistor, and then through a diode to a voltage divider network to the "GATE" wirepad which is connected to the gate output jack.

IF USING A +/-15v POWER SUPPLY REPLACE 1.2K RESISTOR WITH 1.5K

RETURN

The "R. In" wirepad is conencted to the tip of the Return Input jack, and the signal is then attenuated by the "RETURN" potentiometer. The attenuated signal is then buffered and the output of the buffer goes through a pair of capacitors in series to remove any DC offset before going to the "R. OUT" wirepad which is connected to the "Return" jack.

III. Construction

Parts List

Semiconductors

Value	Qty	Notes
TL074	1	14 pin DIP package
TL072	1	8 pin DIP package
1N4148	2	Or other small signal switching diode
LED	1	3mm

Resistors for +/-12v

Value	Qty	Notes
10 ohm	2	1/4W Metal Film
100 ohm	1	1/4W Metal Film
1K	7	1/4W Metal Film
1.2K or 1.5K	2	Value depends on power supply
100K	4	1/4W Metal Film
470K	1	1/4W Metal Film
B100K Pot	1	16mm PCB mounted
A1M Pot	1	" "
A500K Pot	1	" "
A100K Pot	1	" "

Capacitors

Value	Qty	Notes
10uf	5	Electorlytic 5mm
.1uf	6	Metal film box type

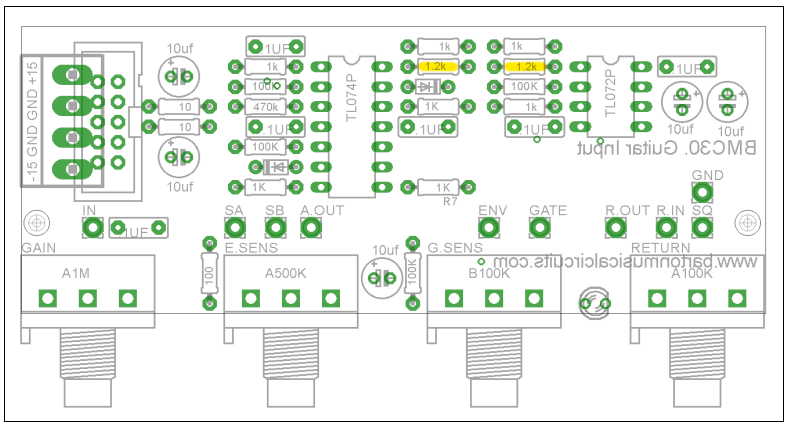
Other

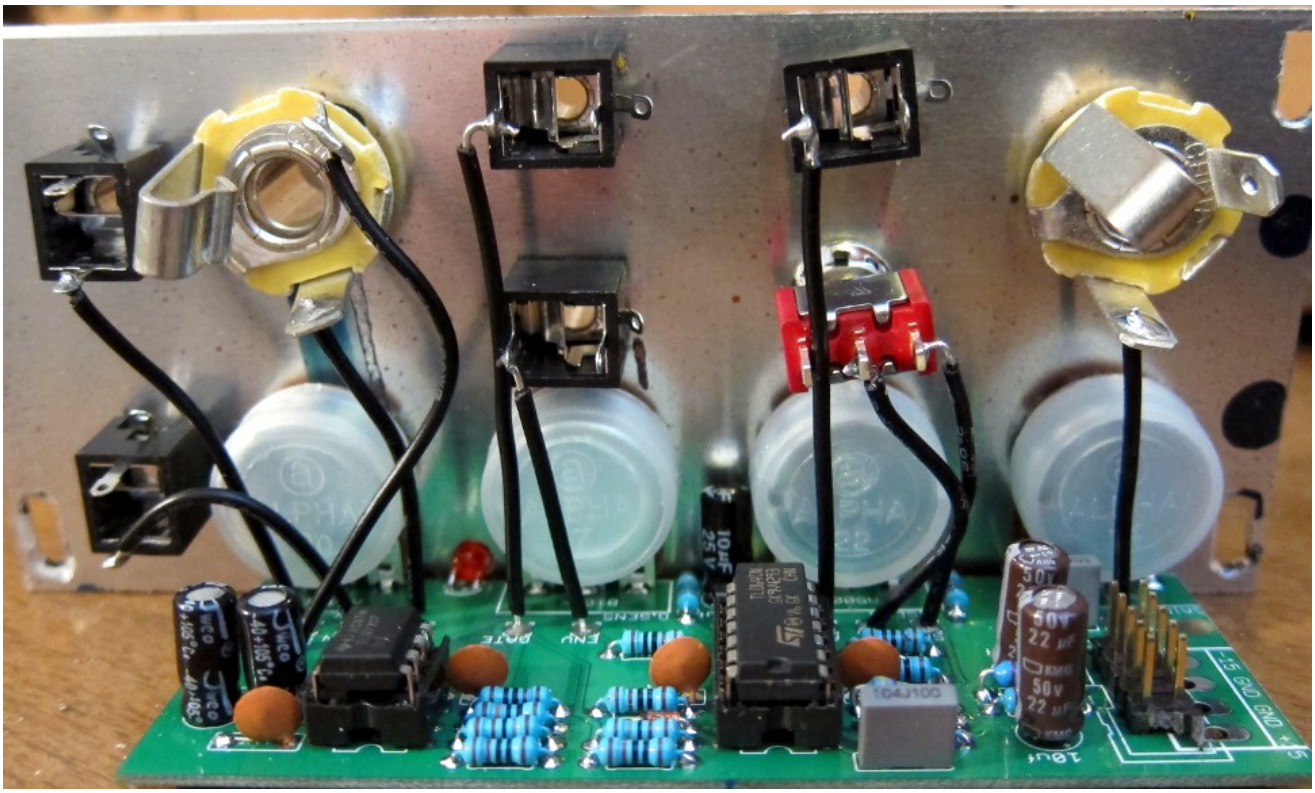
Value	Qty	Notes
Power Connecter	1	Eurorack or MOTM style
14 Pin DIP Socket	1	
8 PIN DIP Socket	1	
Knob	4	
Jack	5	
1/4" Jack	2	
Toggle Switch	1	

***To learn how to make an array, visit this poorly drawn page.**

The Board

To the right is the PCB. In yellow are the resistors which should be replaced if using a +/-15V power supply. The board's dimensions are 93mm x 36mm. The mounting holes are 89mm apart. The pots are spaced 1" apart.





Installing LED Sideways

The PCB indicates that the LED should be mounted parallel to the board, do not do this. Leds should be pointing in the same direction as the pots. The leads of the LED should be bent at a 90 degree angle, the easiest way to install them is in four steps:

1. Place the LED on the edge of the board facing out with it's leads going over it's pads on the PCB. Make sure the bottom lip of the LED is flush with the board.
2. Clip the leads 2 or 3 mm past the pads on the PCB.
3. Bend the LED leads 90 degrees 2 or 3mm from the edge.
4. The LED should pop into place easily.