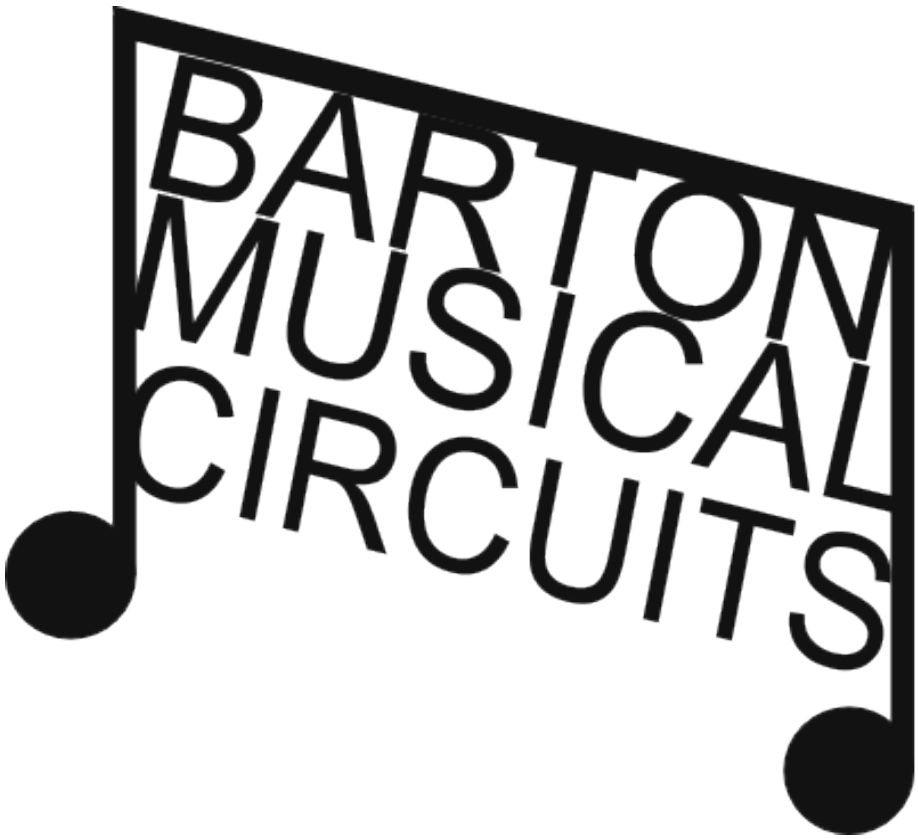


BMC 078. Infrared Input Build Documentation.

I. Using The Module.

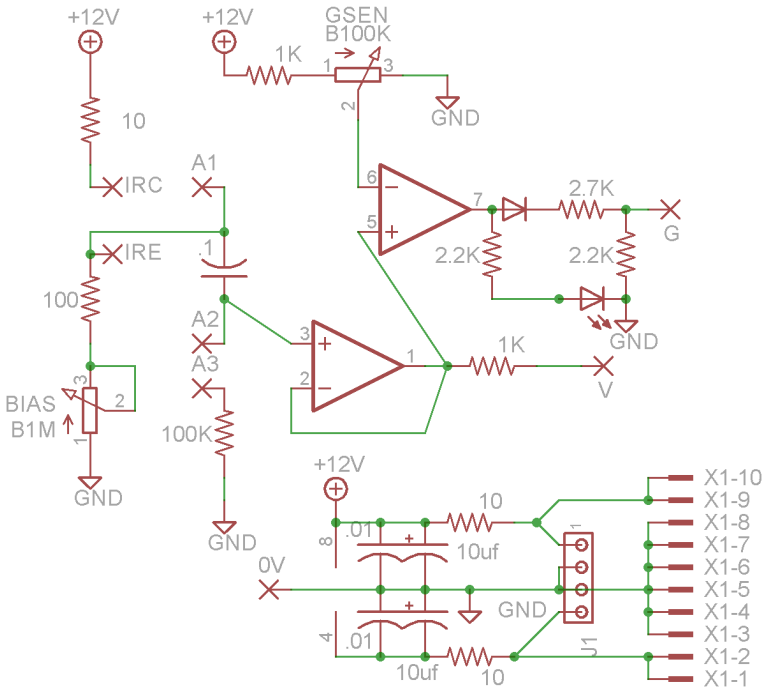
This module is designed to allow infrared light sources to interact with your synthesizer. The most common household sources of infrared light are fire and remote controls. Infrared LEDs are also readily available to DIYers who wanted to experiment with creating new devices for controlling synthesizers through this module.

The module provides a voltage output that can be either AC or DC coupled and a gate output. It is compatible with +/-12V or +/-15V systems.

In my testing with the module, I've set up a candle next to the sensor to create a slow random voltage source, controlled pitch by moving a lighter back forth, and modulated VCOs with remote controls.

Controls:
1.Bias Knob – This controls the sensitivity of the infrared sensor, the more clockwise the more sensitive it becomes. The further your light source is from the module, the more you'd need to turn it up.
2.Gate Knob – This sets what voltage needs to be present on the voltage output to turn the gate output on.
3.AC/DC toggle – This sets whether the voltage output is AC or DC coupled.

I/O:
1.IR Sensor – An infrared transistor attached to the front panel of the module.
2.Voltage output – either AC or DC coupled.
3.Gate output – A gate output with it's threshold set by the gate knob. The gate alternates between 0 and +5V



II. Schematic.

Above is the schematic for this module. Wirepads “IRC” and “IRE” connect to the collector and emitter of the infrared phototransistor which is mounted off board. The collector connects to +12V supply through a 10 ohm resistor. This resistor shields the +12V supply from directly shorting to ground in case of a mishap while wiring the phototransistor. The emitter connects to ground through a 100 ohm resistor in series with the bias pot.

The AC/DC switch's terminals are connected to the wirepads marked. “A1” “A2” and “A3”. When A2 is connected to A1, the output will be DC coupled, the .1uf capacitor is bypassed and the DC voltage from the emitter goes directly to the output buffer. When A2 connects to A3, the output is AC coupled, the emitter is separated from the output by the .1uf coupling capacitor and the 100K resistor to ground is introduced to the circuit to provide a ground reference.

The output buffer goes to the voltage output wirepad, V through a 1K resistor, and then to a comparator. The comparator's threshold is set by the Gate knob. The output of this comparator goes to an indicator LED through a current limiting resistor and then to the gate output through a diode and a 2.7K/2.2K voltage divider pair.

At the bottom right of the schematic the power connections are shown. Footprints for MOTM and Eurorack style power connecters are available in parallel. The positive and negative power rails are filtered by a 10 ohm/ 10 uf low pass filter, additional filtering is done at the pins of the TL072 with . 01uf capacitors.

III. Construction

A. Parts List

Semiconductors

Value	Quantity	Notes
TL072	1	8 pin DIP
IR Phototransistor	1	I've used this model in my testing
1N4148	1	Or other small switching diode
LED	1	3mm through hole

Resistors

Value	Quantity	Notes
10 ohm	3	5mm lead spacing. Use 3.5mm body length or stand up
100 ohm	1	
1Kohm	2	" "
2.2K ohm	2	" "
2.7K ohm	1	Replace with 3.3K if building for +15V system
100 Kohm	1	" "
B100k Pot	1	16mm PCB Mount
B1M Pot	1	16mm PCB Mount

Capacitors

Value	Quantity	Notes
.01uf	2	Small ceramic disc. Value not critical
.1uf	1	Polyester/Polypropelene/Metal film etc
10uf	2	Electrolytic

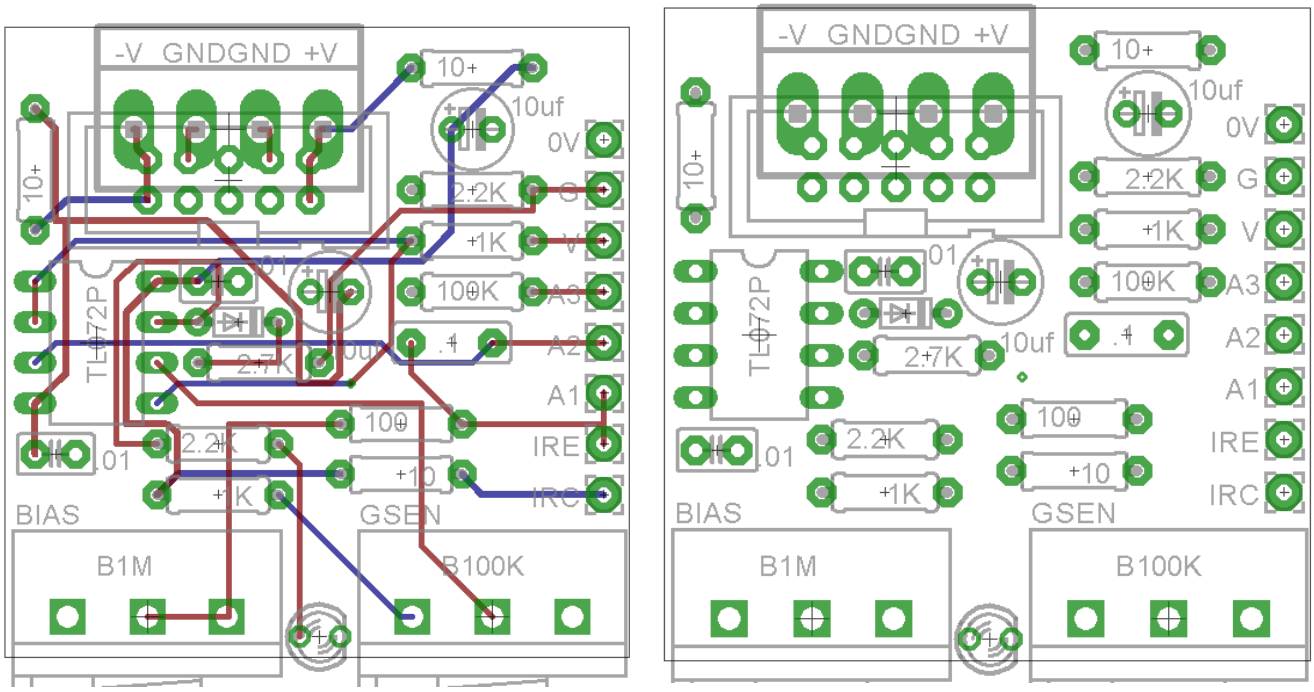
Other/Off Panel

Value	Quantity	Notes
Power connector	1	
SPDT Toggle	1	
Knobs	2	
Jacks	2	
8 pin DIP Socket	1	
LED Bezel	1	For IR transistor, optional

B. PCB Layout

Below are renderings of the PCB. The rendering showing the traces does not show the ground fill plane, so assume any missing connection is a ground fill.

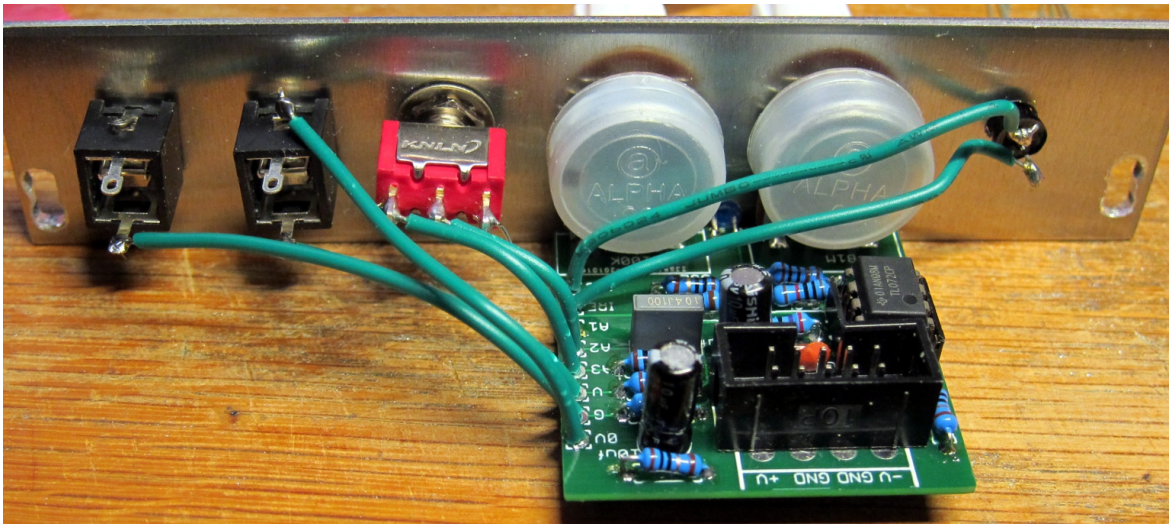
The PCB measures 39mm x 39mm. The pots are spaced 21.6mm apart.



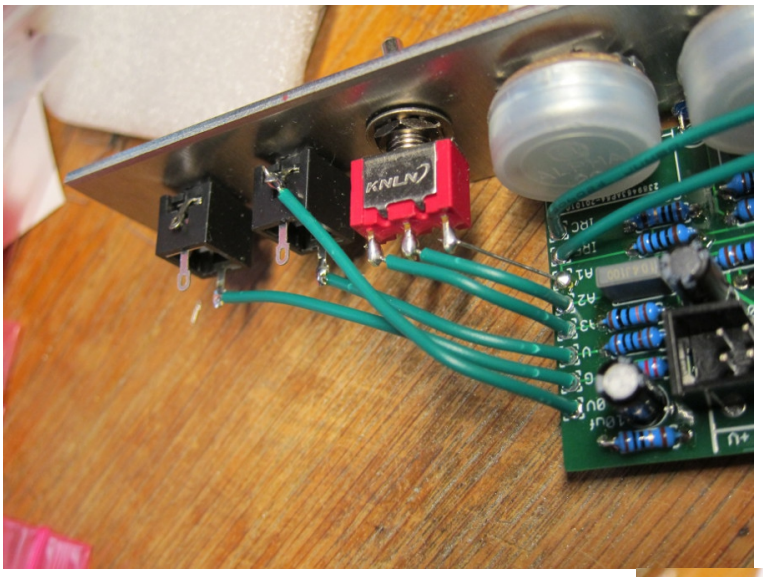
C. Wiring

The PCB's wirepads should be connected as follows:

IRC → The collector of the infrared transistor, this is the longer lead on an LED shaped transistor.
IRE → The emitter of the infrared transistor, the shorter lead.
A1 → The top terminal of the SPDT
A2 → the middle terminal of the SPDT
A3 → The bottom terminal of the SPDT
V → The tip of the voltage output jack
G → The tip of the gate output jack
0V → The sleeve of any single jack. If using a metal panel the panel is connecting all of the jacks, if using a non-conductive panel, connect the sleeves of the two jacks.



Above is a photo of a completed module.



Above is a close up of the switch/jack wiring.

To the right is a close up of the wiring of the IR transistor. For use in my studio, just using solid hook up wire provided enough stability for the transistor to remain in place.

If you wanted to increase the stability, you could glue the transistor into place or use an LED bezel or LED holder.