

## **BMC050. Manual Voltage**

Last updated 6-11-17

### **I Features**

**A.What it is.**

**B.Controls/Outputs**

### **II Schematic**

**A.Master Schematic.**

### **III Construction**

**A.Parts List**

**B.The Board/Values to try modifying**

**C.Construction/Wiring Notes**

## I. Features

### A. What it is

This is a controller module, like a keyboard or a sequencer, only using a single large knob for pitch selection. It also features an internal Sample&Hold circuit for storing a voltage selected by the knob while turning the knob to the next voltage.

### B. Controls/Outputs

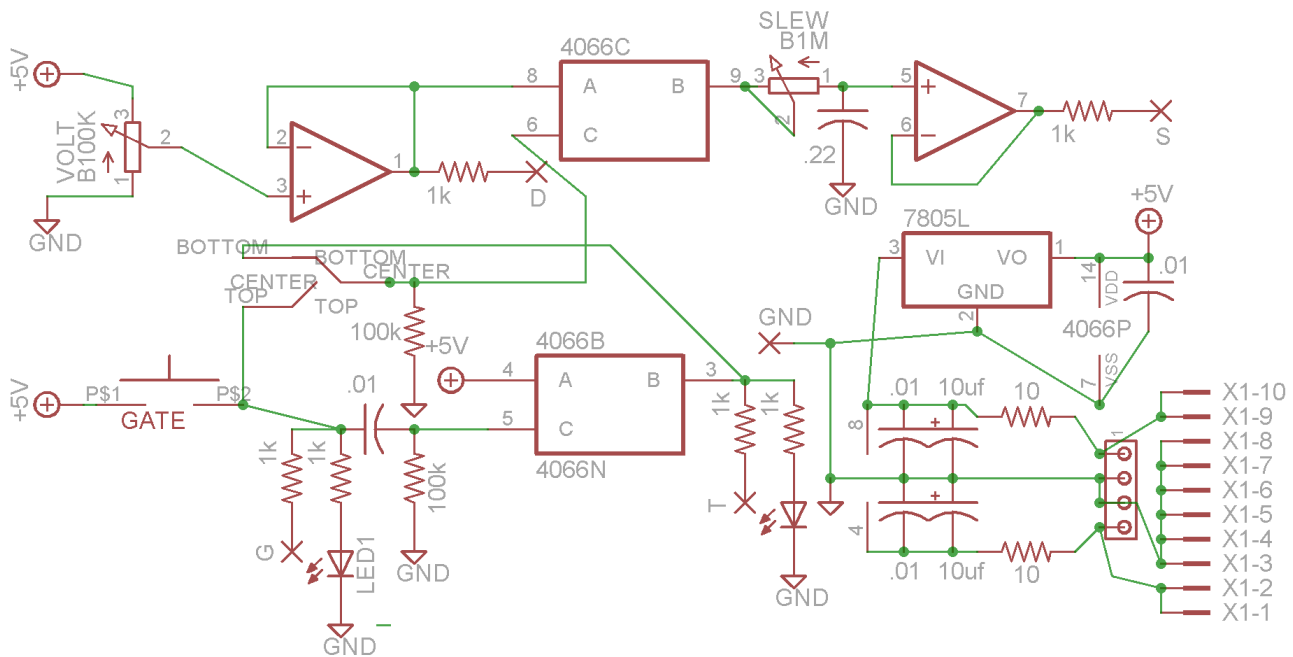
#### CONTROLS-

1. Voltage Knob – This knob sets the output voltage.
2. Slew Knob – This sets the slew/portamento rate for the Sampled/Slewed output.
3. Gate/Trig Button – Pushing this button will generate a gate and trigger output and cause the Sample&Hold circuit to sample the current voltage from the voltage knob.
4. Sample Select toggle – This toggle selects whether the Sample&Hold circuit is controlled by the gate or trigger, using the trigger will be a true Sample&Hold, while using the gate will be more of a Track&Hold. When using trigger, the slew should be set to a very fast rate.

#### OUTPUTS-

1. Direct Voltage Out – This is the direct output of the voltage knob.
2. Sampled/Slewed Output – This is the output of the sample hold/slew circuit.
3. Trigger Output – This is a very short +5V pulse that occurs when the button is pressed.
4. Gate Output – This is a +5V pulse that remains high while the button is pressed.

## II. Schematic.



Above is the complete schematic for the module. In the upper left is the Volt potentiometer which is wired as a variable voltage source which is then buffered by one half of the TL072. The output of the buffer goes through a 1K resistor to the direct output wirepad, and then to the signal input of the CD4066 analog switch. This switch's control input is wired to a 100K pull down resistor and then to a toggle selecting either the trigger or gate output.

The 4066's output goes directly to the slew circuit which is composed of the Slew potentiometer wired as a variable resistor and a .22UF capacitor. These two form a low-pass filter with a cutoff determined by the potentiometer's setting. The .22uf capacitor and 4066 also form the sample&hold circuit. The other half of the TL072 buffer this circuit's output to the Sampled/Slewed output.

In the bottom left we see the Gate/Trigger pushbutton. When closed 5V flows to the Gate output wirepad through a 1K and to the gate LED through a 1K current limiting resistor. It is also connected to a high-pass filter formed by the .01uf capacitor and 100K resistor which are connected to a 4066 switch's control input. The input of this 4066 is connected to +5V and the output is

connected to the trigger output wirepad and LED through 1K resistors.

In the bottom right are the power connections. Wirepads for Eurorack and MOTM style connectors are in parallel with each other. The +V/-V rails go through low-pass filters formed by 10ohm resistors and 10 uf capacitors. The TL072 is connected to +V and -V with .01uf capacitors next to the power pins for further filtering. A 7805 voltage regulator creates a regulated +5V supply, and powers the 4066, which also has a .01uf capacitors next to it's power pin.

### III.Construction

#### A.Parts List

##### Semiconductors

Value	Qty	Notes
TL072	1	8 pin DIP packaging
CD4066	1	14 pin DIP packaging
78L05	1	TO-92 packaging
LED	2	3mm packaging

##### Resistors

Value	Qty	Notes
10 ohm	2	7.5mm lead spacing, 1/4W Metal film
1K ohm	6	" "
100K ohm	2	" "
B100K Potentiometer	1	9mm Horizontal PCB mount. <a href="#">Like this</a>
B1M potentiometer	1	9mm Horizontal PCB mount.

##### Capacitors

Value	Qty	Notes
.01uf	3	cheap ceramic 2.54mm. Value not critical
.01uf	1	Film box type
.22uf	1	Film box type
10uf	2	Electrolytic

##### Other

Value	Qty	Notes
Power Connector	1	Either Eurorack or MOTM
8pin DIP socket	1	
14pin DIP Socket	1	
Jacks	4	The jack that your synth format uses

SPDT Toggle	1	Mini Toggle <a href="#">like this</a> .
Pushbutton	1	Normally Off, Momentary On, <a href="#">like this</a>
Knobs	2	I recommend one very large knob and one small knob

### B.The Board/Values to modify

To the right are renderings of the top and bottom of the PCB. The PCB is 70mm x 38mm.

Highlighted are a few values that can be modified to change how the circuit works. In red are the resistor and capacitor that determine trigger length. To increase trigger length increase either of these values. In blue is the capacitor for the slew/sample hold circuit.

Decreasing it's value will decrease the maximum slew if you're having trouble dialing in smaller amounts of slew. The B1M pot could also be replaced with a smaller value pot or an audio taper pot to help with this.

### C.Construction/Wiring Notes

I recommend assembling the PCB in the following order:

- 1.Resistors
- 2.DIP sockets
- 3.Ceramic capacitors
- 4.Box capacitors
- 5.78L05
- 6.Power connector
- 7.Electrolytic Capacitors

For the following parts, only solder one pad for each part before securing the PCB to the panel. Then solder the rest of the connections after the PCB is secured to the panel.

- 8.LEDs. -Leave the body of the LED close to the PCB and don't clip the leads, once the PCB is attached, reheat the pad and push the LED into place and then clip leads.
- 9.Pushbutton
- 10.Potentiometers
- 11.Toggle.

Wiring is straightforward. Simple connect each wirepad to the tip connector of the appropriate jack. Then connect "GND" to a sleeve connector.

