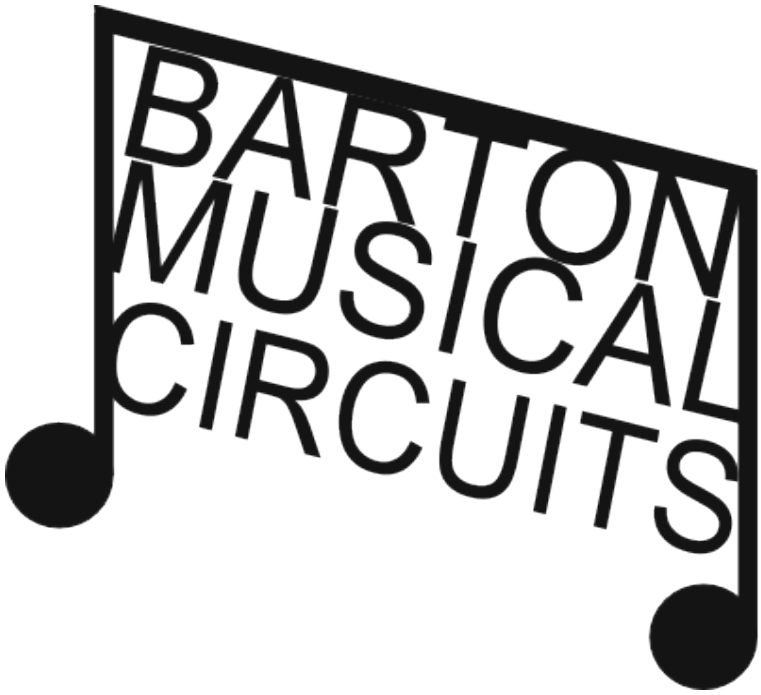


BMC14. Gate Delay/Looper Build Documentation.

Last updated 8-21-2013

I. Using The Delay/Looper

A.Features

The Gate Delay/Looper is a module which either delays gate signals or creates loops from them. It is low parts count, the only chips are a quad op-amp and an 8 bit PIC microcontroller. It has two ranges of delay times, allowing for better fine tuning of short delays. In loop mode it can also do "Gated Looping." In gated looping mode, it doesn't begin to play the loop until a pulse is given to the "reset" input, and will continue to play that loop while this pulse is high.

Maximum Delay time (short range): 220ms
Maximum Delay time (long range): 3.25 Seconds
Maximum Loop Length: 3.18 Seconds
Sampling rate: 1.1khz

B.Inputs/Outputs/Controls

Inputs:
1.Gate Input: This is where you plug in the source for the gate or trigger signal that you wish to delay or loop. There is an onboard LED that turns on when this is high.
2.Reset Input: In delay mode, a pulse here will kill all upcoming delays, it clears the buffer. In regular looping mode, this starts the loop over at zero, and in gated looping this tells the chip when to start playing the loop and for how long.
3.CV Input: This is an input for external control voltage used to modulate the delay time/loop length.

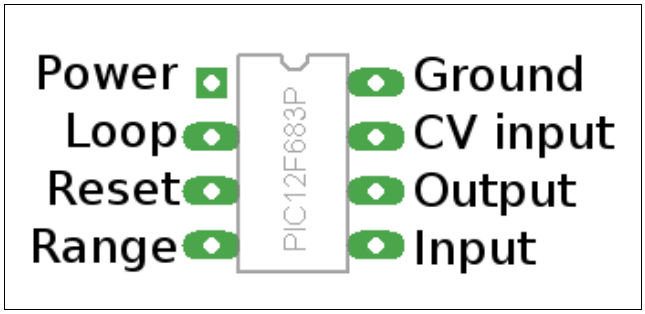
Outputs:
1.OUT: Just one output, this is the delayed or looped output. There is an onboard LED that turns on when this is high.

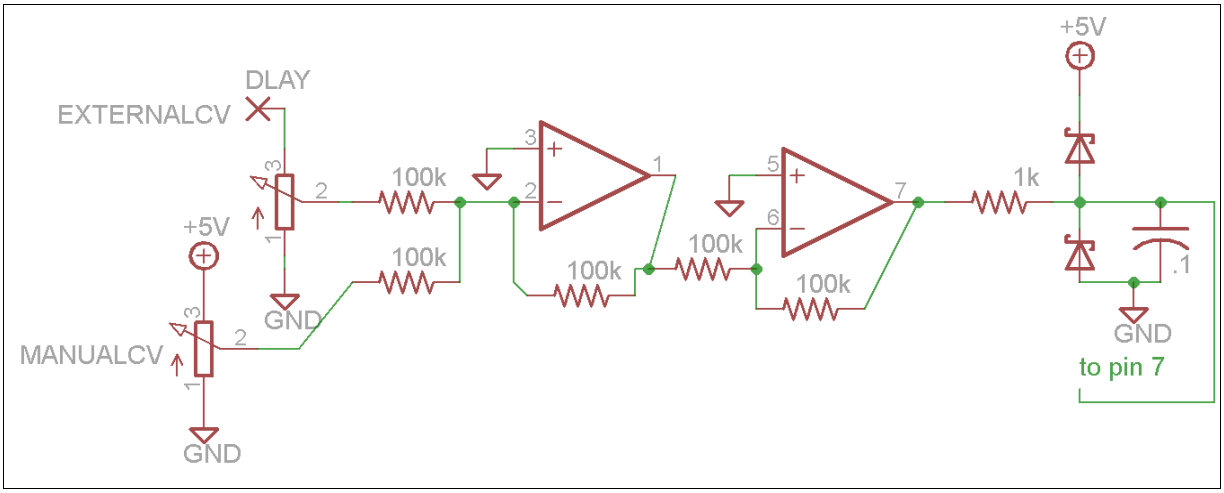
Controls:
1.Delay Time Knob: This sets the delay time and loop length.
2.CV Knob: This attenuates the CV input that is used to modulate the delay time.
3.Loop/Delay switch: This selects between Loop or Delay mode.
4.Range switch: In Delay mode this selects the range, and in Loop mode this selects between gated looping and normal.
5.Manual Input Button: This is a push button that simulates an input gate
6.Manual Reset Button: This is a push button that simulates a reset gate.

II. Electronics Description.

A.The Microcontroller

On the right we see the pin out of the 12F685 microcontroller. The things these pins connect to are explained in the next few diagrams.





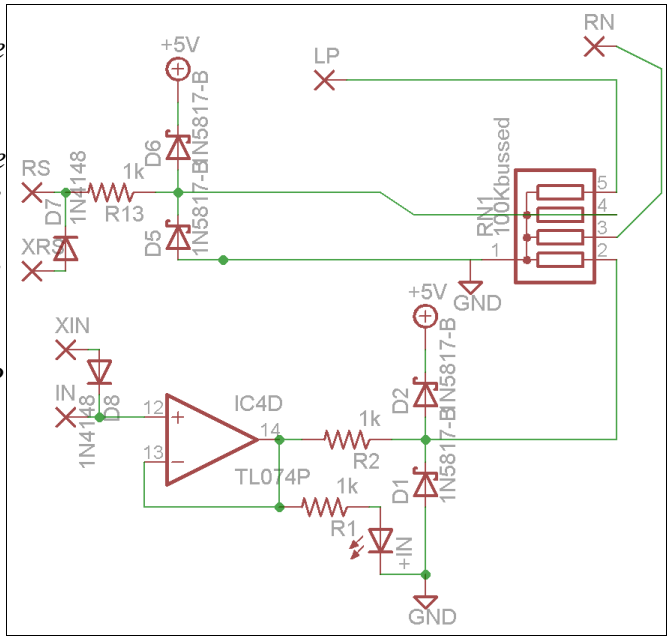
B.Analog Input Circuitry

Above we see the analog input circuitry, which is just the Delay Knob and the external CV that modulates it. On the left we see the two pots for these controls and the input wiring pad for the CV marked "DLAY." The 100K resisters and two op-amps form a non-inverting mixer for these signals. The 1k resistor and two schottky diodes provide over voltage/under voltage protection for the microcontroller. The .1uf cap filters out very high frequency noise.

C.Digital Inputs.

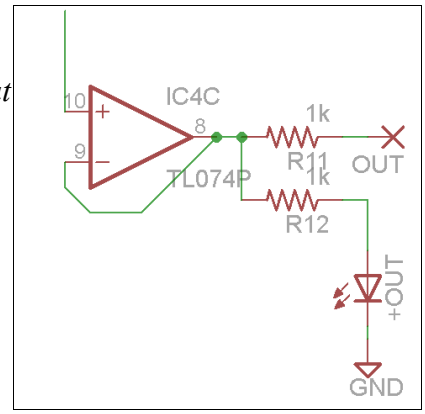
On the right are the digital inputs, all the gate inputs and the switches. On the bottom is the input. "IN" should be connected to the pushbutton and "XIN" ("eXternal IN") should be connected to the tip of the input jack. The diode keeps positive pulses from the pushbutton from being fed into circuitry fed into the input. These signals are buffered and then sent to light up an LED and then to a voltage limiting circuit like on the analog input. It's then sent to a 5 pin SIP resistor buss. The resistor to ground keeps the pin on the microcontroller at 0V when no pulse is inputted.

Next is the Reset input which is just like the input circuit only without the buffer and LED. Above that are the Loop and Reset inputs. These should both be wired to toggle switches that are turning off or on a +5V supply.



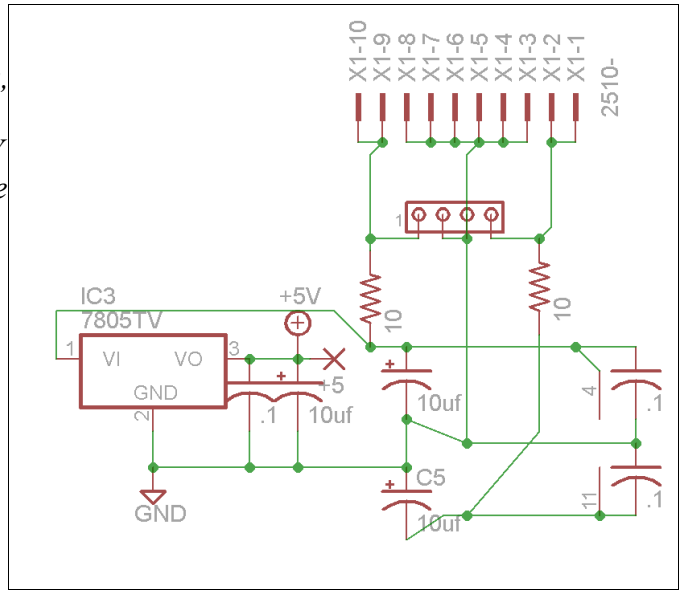
D. Output Circuitry.

The output circuitry is very simple. An op-amp buffers the output of the PIC, and then lights up an LED and goes to the output jack through a 1K resistor.



E.Power Circuitry

On the top we see two power connecters, a 10-pin for Eurorack and a 4-pin for MOTM. This circuit works with either +/-12V or +/-15V with no modification. The positive and negative power rails are each filtered through a 10 ohm resistor and a 10uf capacitor. Each rail is sent to the quad op amp with a pair of decoupling caps. The positive rail then goes to a 7805 voltage regulator. The +5V supply then sent to the PIC's power supply and to a wiring pad for wiring up switches.



III. Construction
A.Parts List

Semiconductors

Value	*Qty*	*Notes*
12F683	*1*	*Should have come with your PCB*
TL074	*1*	
1N4148	*2*	*or other small signal diode*
Schottky Diode	*6*	*SD101c, 1N914 or similar*
7805 Voltage Regulator	*1*	*TO 220 Package*
LED	*2*	*3mm. Should be installed sideways, see note below.*

Resistors

Value	*Qty*	*Notes*
10 ohm	*2*	*All resistors 7.5mm lead spacing unless otherwise noted*
1K	*6*	
100K	*5*	
100K Array	*1*	*5 pin SIP bussed array. Or 4 axial resistors stood up.*
B100K Pot	*2*	*PC Mount 16mm*

Capacitors

Value	*Qty*	*Notes*
.1uf	*4*	*ceramic disk, 2.5mm lead spacing. Value non-critical*
10uf	*3*	*Electrolytic*

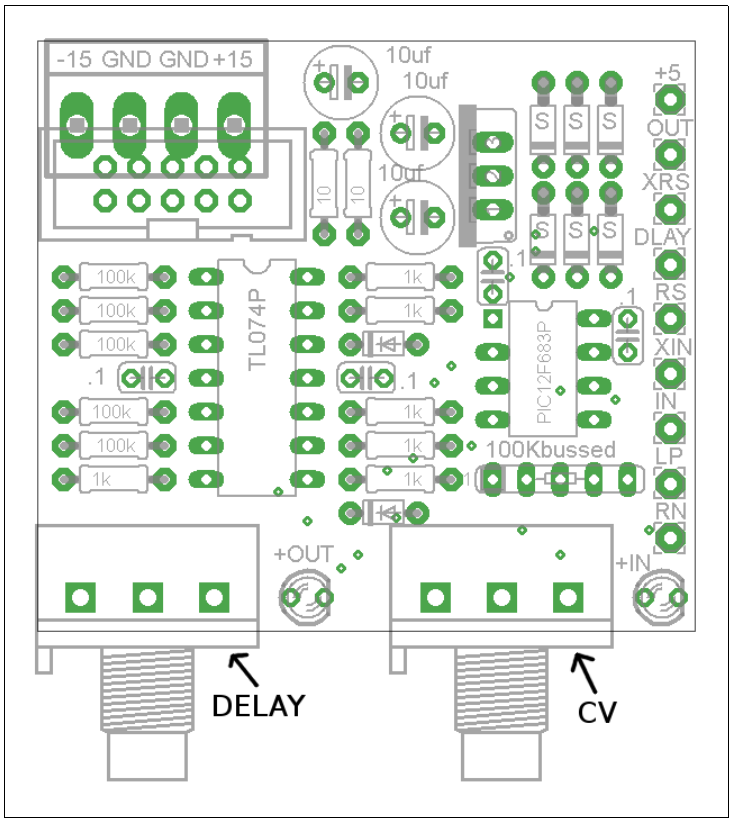
Other

Value	*Qty*	*Notes*
8 Pin socket	*1*	*DIP Socket*
14 pin socket	*1*	*DIP socket*
Power Connecter	*1*	*MOTM or Eurorack*
Jack	*4*	
Toggle Switch	*2*	*SPST or SPDT*
Pushbutton	*2*	*Normally off, momentary SPST*

B.The PCB/Wiring Information

The PCB is 50mm x 40mm. The pots are spaced 1 1/16" apart. Labeling of the two pots was accidentally left off the PCB, but are marked in this diagram. The wirepads should be wired like the following:

RN= To center of Range switch.
LP=To center of Loop switch.
IN=To one side of In button
XIN=To input jack
RS=To one side of Reset button
DLAY= To input jack
XRS= To Reset jack
OUT= To output jack
+5 = To one of the outside lugs on the Range and Loop switches, and to the remaining lugs on the Input and Reset buttons.



C.Installing LEDs Sideways

The PCB indicates that the LEDs 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.