BMC027. Rando-Rhythms.
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If you have any questions, or need help trouble shooting, please e-mail
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I. Features/Controls

   The Random Rhythms module is a compositional tool for synthesists. It randomly generates rhythmic patterns and outputs them as triggers. It has four channels of rhythms. All channels are driven by a single clock input. The length of the rhythmic pattern and the level of rhythmic subdivision for each channel can be adjusted separately. Length is determined by counting the number of clock inputs before resetting the sequence, the minimum number is 2 and the maximum number is 128. The level of rhythmic division is between x2 clock speed to /32.

KNOB BASED CONTROLS
1.Length. This knob sets length of each pattern, it works in conjunction with the "set length" button corresponding to each channel.
2.Division.This knob sets division of each pattern, it works in conjunction with the "set division" button corresponding to each channel.

BUTTON BASED CONTROLS
1-4. Set Length. This button is repeated for each channel. When pressed, the position of the Length knob is read and the corresponding length is assigned to that channel.
5-8. Set Division. This button is repeated for each channel. When pressed, the position of the Division knob is read and the corresponding division is assigned to that channel.
9-12. New Pattern. This button is repeated for each channel. When pressed, a new pattern is randomly generated for that channel.
13. New ALL. This button creates a new pattern on all channels.

INPUTS/OUTPUTS/OTHER
1-4. New Pattern Input. These inputs work in parallel with the New Pattern buttons, when a trigger or gate is inputted, a new pattern is generated for that channel.
5-8. Trigger Outputs. These are the trigger outputs for each channel.
9. Clock Input. This is the input for the clock which drives each of the outputs.
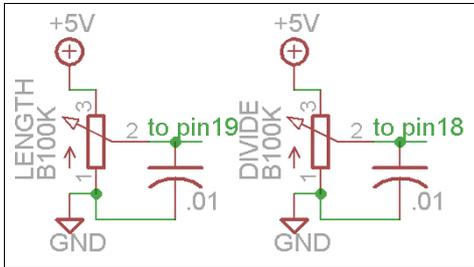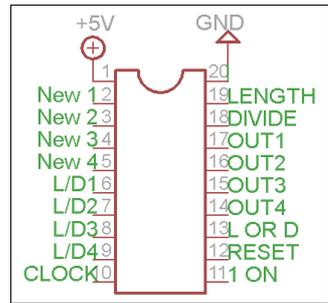*10.Reset Input. Whenever a rising edge of a trigger or gate is detected on this input, it sets it so that all outputs will play the first beat of their sequence on the next clock input.*
11.1 ON switch. This is a toggle switch, when activated it sets the 1st beat of output 1 to always be on, instead of being left to chance. The rest of the pattern is still randomly generated.
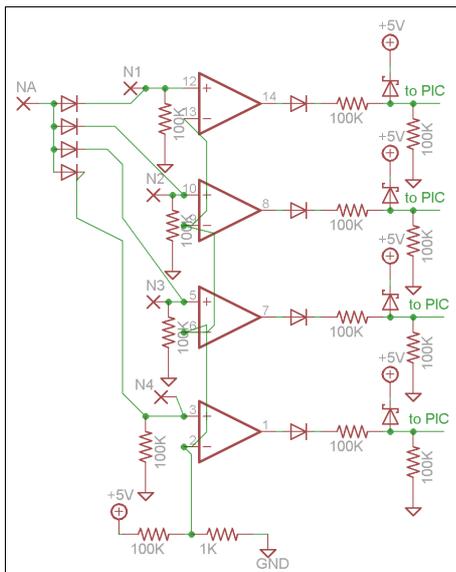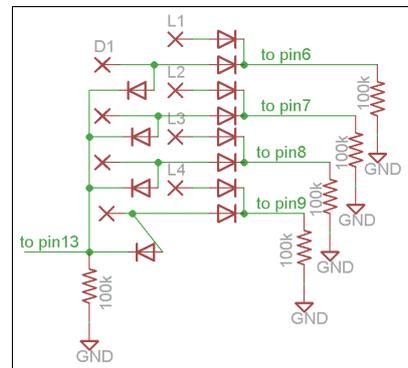*12.New ALL. This input works in parallel with the New All button.*

II Schematics

A.Pinout. *To the right is the pinout for the 16F685 Microcontroller at the center of the design. All of the other schematics are either inputs or outputs for this chip. Pints 19 and 18 are analog inputs, 17-14 are digital outputs and 13-2 are all digital inputs. Pins 1 and 20 are power supply pins.*
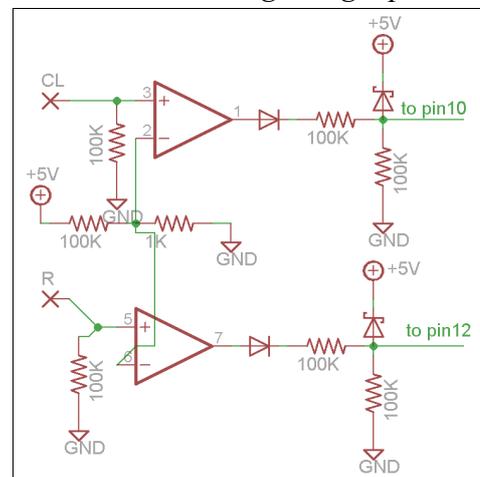
B.Analog Inputs. *To the left is the schematic for the two analog inputs. These circuits are identical, each consists of just a pot wired as a potential divider in order to provide between 0 and 5V to the PIC and a .01uf capacitor to filter noise off of the pin.*

C.Length/Divide button inputs. *To the right is the schematic for the Length/Divide button inputs. This matrix of diodes is used to allow for 8 buttons to be read by 5 pins on the microcontroller. Pin 13 is attached to all of the Divide buttons and tells the microcontroller whether or not the button being pressed is Divide or Length. Pins 6-9 tell the microcontroller which channel's button is being pressed.*
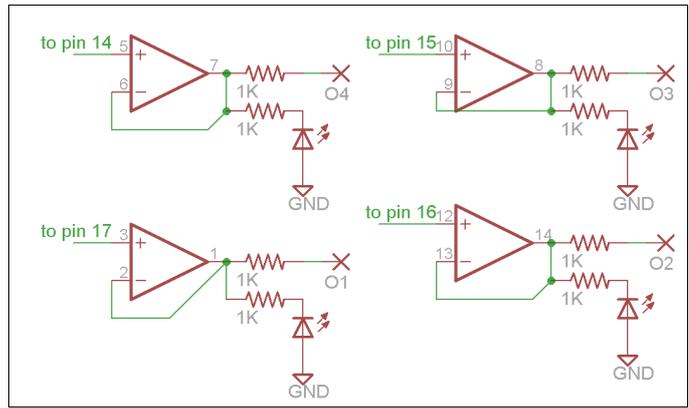
D.New Sequence inputs. *On the left is the schematic for the new sequence inputs. On the far left is the "NA" wirepad which connects to the "New All" button and input jack, this wirepad is connected via diodes to each of the individual new input circuits. Each of these circuits is identical, there is a wirepad which connects to the corresponding button/input jack which is connected to a 100K tie down resistor and an op-amp wired as a comparator. the output of each comparator is sent through a diode, a 100k resistor, then to a schottky diode to limit the voltage to between 0 and 5V and then a 100K tiedown resistor to keep the voltage on the input pin at ground when there is nothing being inputted.*
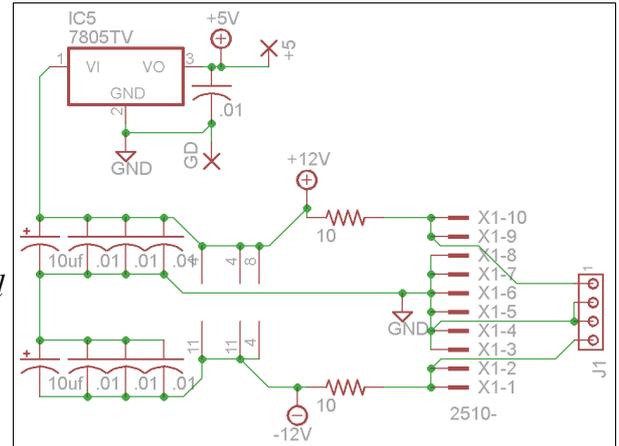
E.Clock/Reset Inputs. *To the right are the Clock and Reset input circuits. The comparators and voltage management components are identical to those in the New Sequence Inputs.*

F.Outputs. *To the right are the outputs. Each is identical, it consists of an op-amp wired as a buffer whose output is going to an indicator LED and an output jack.*

G.Power. *To the right is the power supply schematic. On the far right of the diagram are the connecter footprints. The positive and negative power rails are each filtered with a 10 ohm resistor and a 10uf electrolytic. Each of the power pins on the op-amps is then filtered with a .01uf capacitor. The positive rail is then connected to a 7805 voltage regulator to provide +5V for the microcontroller and associated circuitry.*

III. Construction
1. Parts List.

SEMICONDUCTORS

Name/Value	QTY	Notes
16F685	1	Should have come with your PCB
TL074	2	DIP packaging
TL072	1	DIP packaging
1N4148	22	or similar sitching diode
1N60P	6	or BAT42, other schottkys
LED	4	3mm
7805	1	TO-220 packaging

RESISTORS

Name/Value	QTY	Notes
100K	7	1/4W
1K	8	1/4W
10 ohm	2	1/4W
13 pin bussed array	1	100K, or make your own using 12 100K resistors
7 pin bussed array	1	100K, or make your own using 6 100K resistors
B100K Pot	2	16mm PCB mounted

CAPACITORS

Name/Value	QTY	Notes
.01uf	9	Ceramic disc 2.54mm lead spacing
10uf Electrolytic	2	

OTHER

Name/Value	QTY	Notes
Power Connecter	1	MOTM or Eurorack style
8 pin DIP Socket	1	
14 pin DIP Socket	2	
20 pin DIP Socket	1	
Pushbutton	13	OFF-(ON) type
Jack	11	
Toggle Switch	1	SPST or SPDT

To the right is the PCB for this project. It is 75mm x 54mm, the mounting holes are spaced 71mm apart and the pots are spaced 1 13/16" apart.

On the next page is a wiring diagram for this project. Below is a diagram of how to install the LEDs.

1. Place

2. Cut

3. Bend

4. Solder in

+5V

L4 L3 L2 L1

D4 D3 D2 D1

N4 N3 N2 N1

NA

O4 O3 O2 O1

R 1 IN