Euroracking the Doepfer Dark Time

The Doepfer Dark Time is an excellent choice of sequencer to use with a Eurorack system and in particular with a Moog Mother 32 based system but, whereas the Mother 32/DFAM and Subharmonicon are designed to fit into a standard Eurorack system or combined in a 2, 3 or 4 tier 60HP rack, the Doepfer is physically incompatible. This is a shame as functionally, it is an excellent compliment to any modular system but as well as not being rack mountable, this beautifully built sequencer has some other features that make it slightly awkward to use in a Eurorack system:-

1. Although the unit can be placed either vertically or horizontally using the lovely wooden side cheeks as ‘stands’, neither orientation is ideal as standing on a desk vertically, the front panel is too low to see and operate the controls and placed flat, the LEDs are hidden from view from the operator

2. The 12 patch points are all on the backplate making them only visible when the unit is placed vertically

3. Although the sequencer is very well specified with a generous feature set, there was one particular feature missing for me, namely ratcheting

It is unlikely that the sequencer will ever be produced in a Eurorack format as Doepfer have stated that based on their experience with the Dark Energy versus the A-111-5 where one sale of the module is corresponds to about twenty-five sales of the Dark Energy unit, this wouldn’t make sense!

A standard Eurorack module is 128.5mm high to allow it to fit inside a 3U high cabinet with a nominal height of 133.4mm which includes the rim of the mounting rails. The Doepfer Dark time has removable wooden side cheeks that leave a metal box 223mm wide x 135.5mm deep x 56.3mm high and that means that there is only a 2.1mm discrepancy in the height of the unit in comparison with the 60HP cabinet that houses the Mother 32, DFAM, Subharmonicon and any other set of modules installed in a matching Moog 60HP ‘skiff’ cabinet. This made me think that perhaps the sequencer could be slightly re-jigged to make it match the Moog units more closely and I am very pleased to report that indeed, it can.
I started by getting a good friend (we all need a friend like Scott!) who is a real craftsman when it comes to working in wood, to produce four new ¼” (6.35mm) wide wooden side cheeks based on the standard Moog versions but altered a fraction to match the dimensions of the Dark Time (see template later). The original wooden side cheeks are easily replaced by carrying out the following procedures on the next page.

1. Undo the four corner screws on the bottom plate of the Dark Time and remove the base

2. Take a photograph of the circuit board layout to ensure that everything goes back together correctly when re-assembled

3. Carefully unplug the two ribbon cable headers from the power supply circuit board (the daughter board that sits above the main board)

4. Undo the two screws on the back panel that hold the daughterboard in place and remove the board from the case

5. Undo the two screws that hold each of the side cheeks and remove the cheeks

6. Place the case on its left hand side on top of the new left hand side cheek and align the two carefully, paying particular attention to the top and front of the case then mark the position of the two mounting holes in the case onto the cheek

7. Repeat for the other new cheek

8. Drill 2mm holes through the marks in the two cheeks, ideally using a pillar drill to ensure that the holes are drilled perpendicular to the cheek

9. Turn the cheeks over and enlarge the holes from the other side using a 3mm drill bit

10. Attach the new cheeks to the case using 3mm x 12mm, bolts, nuts and washers

11. Reinstall the daughterboard paying careful attention the positioning of the ribbon cable at the top left of the board (now you understand one of the reasons for taking that photograph!) using the two mounting bolts in the rear of the case

12. Reattach the two ribbon cables to the daughterboard ensuring that they are correctly orientated to match your photograph

13. Refit the metal base plate

You now have a sequencer module that much more closely matches the appearance but not the width, of the Moog modules and is nicely angled for use. Optionally, you can make up a small Eurorack case using the third matching cheek as the right hand cheek of the new case and connect the two cases together to produce a single case the same width as a Mother 32/DFAM/Subharmonicon. This double case can then be installed in a standard 2, 3 or 4 tier Moog 60HP rack as the TOP unit. Such an additional small case will comfortably hold 14HP of Eurorack modules which can be used to resolve issues 2 and 3 above. For my own purposes, I made a matching 20HP mini-rack for testing purposes as I am some way off from adding to my already 6 x 60HP high rack!

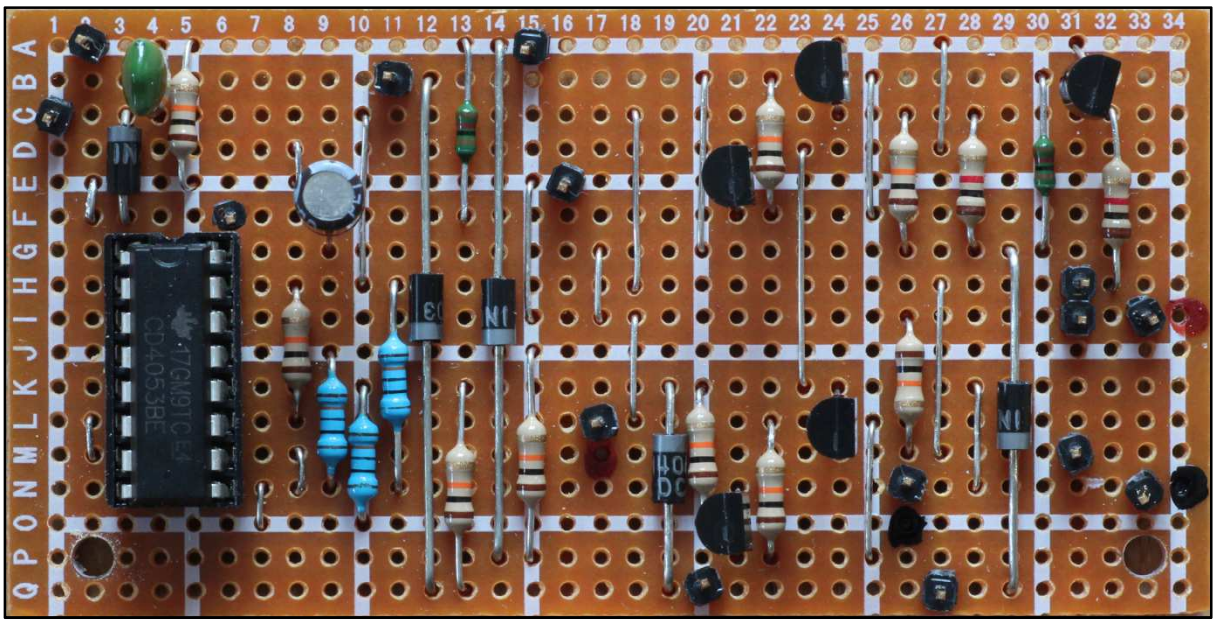
Patch Points

In Eurorack modules, we are used to having the patch points on the front surface where we can easily see them so the first module (4HP) resolves this issue. I reproduced the sequencer's 12 patch points in the rear panel of the new case and simply wired these to a new DIY 4HP module comprising 12 x 3.5mm mono sockets installed on a 4HP aluminium plate drilled with 6mm holes and finished with a printed and laminated label (see later). Short, straight - or even better, right angled - patch leads can then be used to patch the two units together, presenting the sequencer's patch points on the face of the new mini rack. At the same time, I installed a DC power socket in the rear panel and bought a 5v DC PSU to supply the new small case with power.

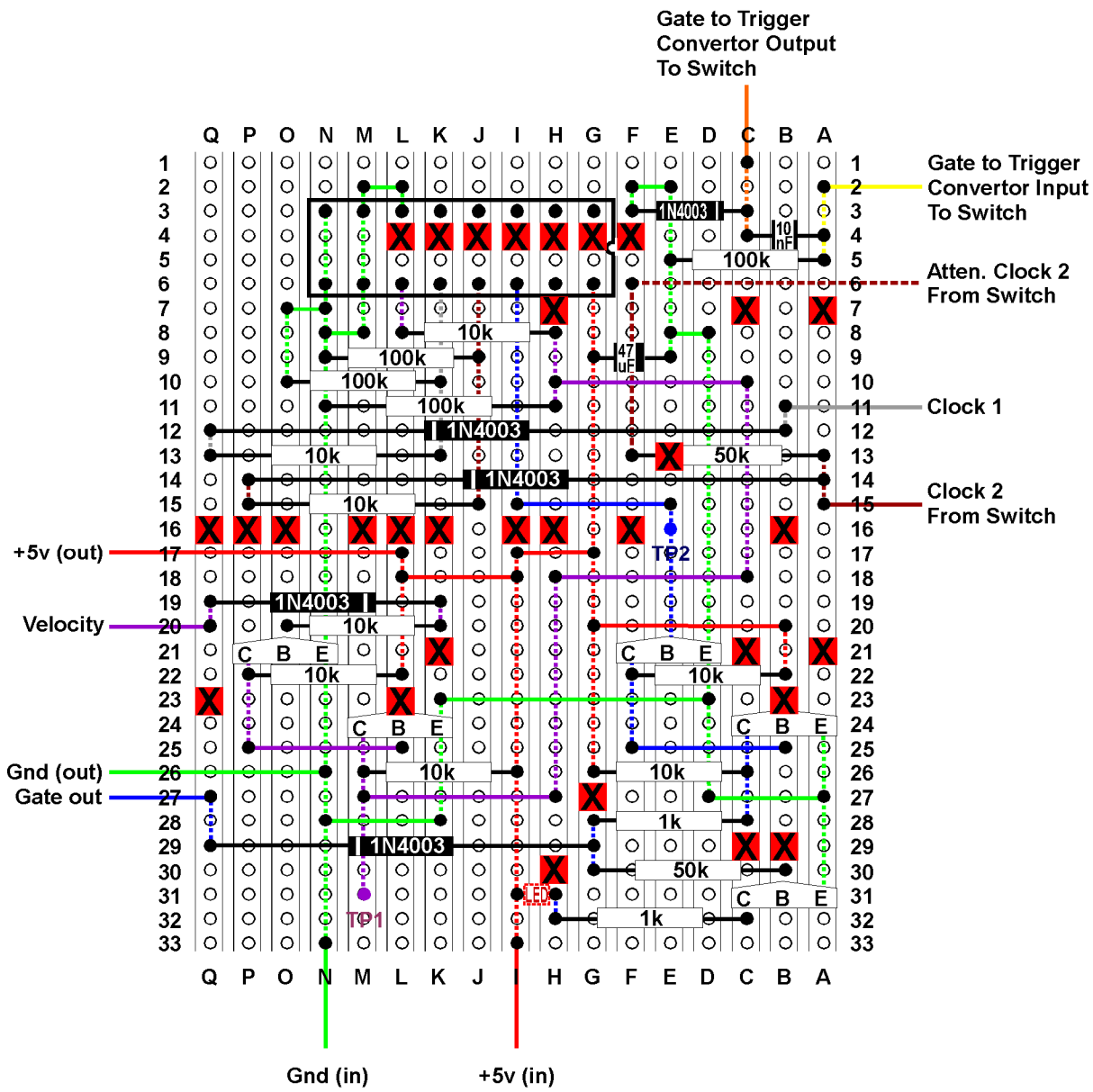
Ratchet feature

This took some research and experimentation to implement. In its very simplest form, a switch and two diodes can be used to combine the normal gate with one running at two or more times faster, at the press of a button but I wanted to automate the ratchets using a CV so something a little more elaborate had to be constructed. The Dark Time has a useful clock divider function that is invoked by using the 'FUNCTION' button and this in combination with the 'Clk Out' (Clock) output is now our ratcheted 'gate'.

The circuit diagram for the new Ratchet Module is shown later, along with a set of diagrams showing the Veroboard style component layout, links, track cuts, signal paths and connections to the outside world should anyone be interested in building this module.



Finished Circuit Board



Circuit Board Layout

This is how I constructed my circuit board:-

1. Start by using a track cutter (I used a 6mm drill bit installed in a craft knife handle) to cut the tracks in the positions shown. Ensure that all the copper is removed

2. Install the wire links in the positions shown (I used resistor component legs from a pile of resistors that I had in my miscellaneous component box)

3. Install the resistors and diodes (making sure that the orientation of the latter is correct)

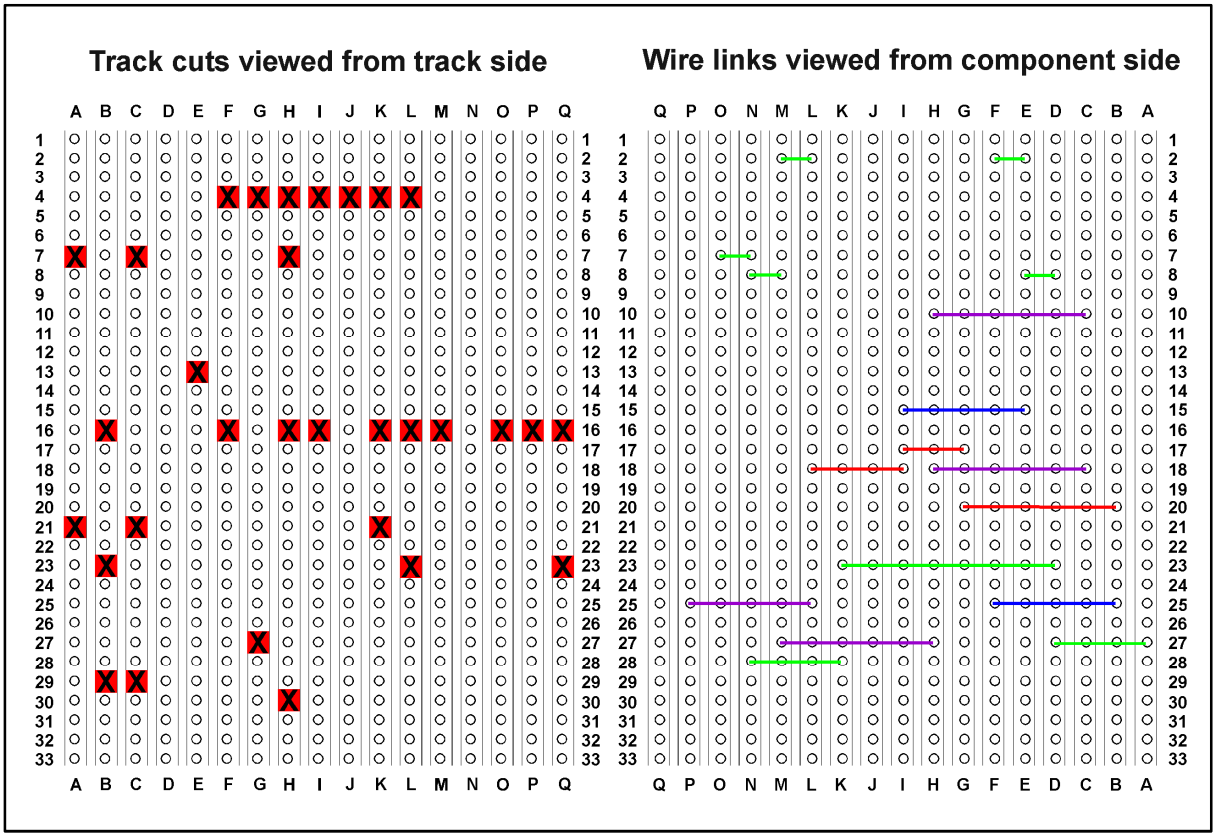
4. Install the 16 pin IC socket

5. Install the individual ‘header’ pins

6. Install the transistors

7. Install the capacitors

8. Double check the positions of all cuts and components and check for any solder bridges between the tracks



Track cuts (left) and links (right)

This is how I constructed my two new Eurorack modules which assumes that you have already constructed a suitable Eurorack mini case using the new wooden cheeks:-

1. Print out the templates for each module and the rear panel on standard self adhesive label material – note that my ratchet module is different as I added test features not required for this project

2. Affix the module labels to two 8HP blanks

3. Affix the rear panel label to the rear panel of your new mini case

4. Drill suitable holes for each item of hardware using the templates as an accurate guide

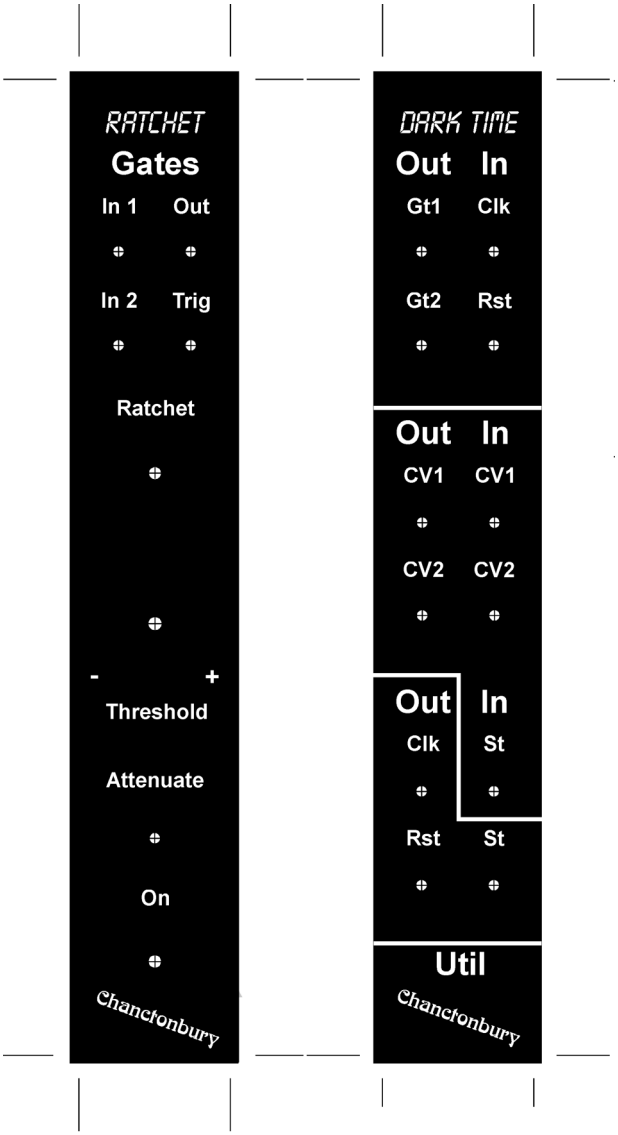
5. Remove the template labels and de-grease the drilled panels

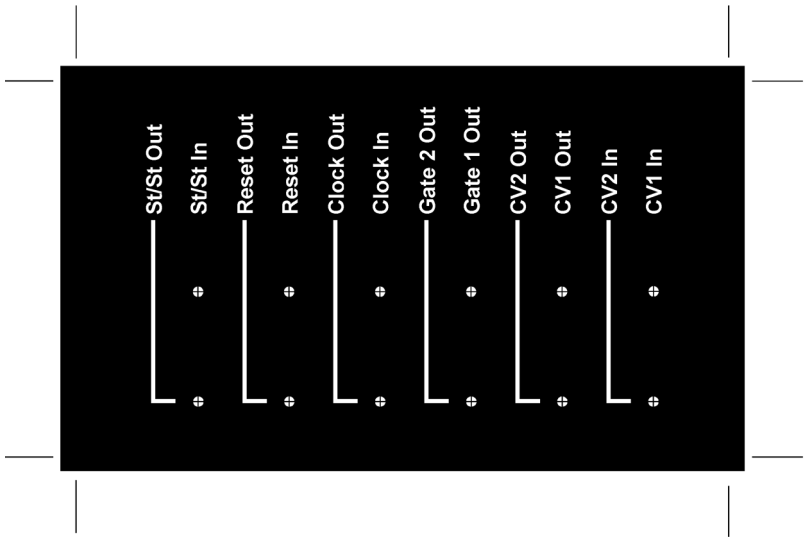
6. Print out a second set of self adhesive labels and cover them with matt transparent ‘Fablon’ type sticky back material to protect the label surface

7. Affix the completed labels to the two modules and rear panel

8. Use a fine craft knife to cut out the holes through the labels

9. Install the various hardware components and wire them up as shown later





Correct size label templates

Completed 20HP case

How to patch the Dark Time sequencer to the ratchet module

1. Press the ‘START/STOP’ button to STOP the sequencer

2. Press and hold the ‘FUNCTION’ button and adjust the ‘CLOCK’ knob to illuminate the top six LEDs on the first row of steps

3. Patch **Gate 1 Out** to **In 1** on the module

4. Patch **Clk Out** to **In 2** on the module

5. Patch **CV2 Out** to **Trig** on the module for CV triggering of ratchets or leave Trig un-patched for manual triggering of ratchets using the push button

6. Patch **CV1 Out** to **Pitch CV** on your synth

7. Patch **Out** on the module to **Gate In** on your synth

How to enable ratchets on Dark Time

1. Set **Sync** to Internal
2. Set **Link** to 2x(1-8)
3. Set **Quantize** ON
4. Set **Transpose 9-16** to 0
5. Set the **Step Levels** on the top row to the required notes to produce a maximum 8 step sequence
6. Set all the **Step Levels** on the bottom row to 0
7. Set the **Attenuate/On** on the module switch to ON
8. Set the **Threshold** knob on the module fully clockwise
9. Press the **START/STOP** button to start the sequence running
10. Turn the **Step Levels** of the matching steps on the bottom row that you want to ratchet to between 5 and 7 to enable the ratchets

Setting the **Threshold** level on the module to a lower level and increasing the level of one or more steps on row two of the sequencer will allow you to have two or more 'levels' of ratcheted step selected by the threshold level.

Additional Notes – Ratcheting the Moog DFAM

So far I have only discussed using the ratchet module with the Dark Time sequencer but if you have a clock divider module or, like me, a Disting 4, you can also generate ratchets using a Moog DFAM.

How to patch the DFAM's sequencer to the ratchet module

1. Press the 'RUN/STOP' button on the DFAM to STOP the sequencer
2. Patch **Trigger Out** on the DFAM to a Mult
3. Patch one socket of the Mult to **In 1** on the module
4. Patch another socket of the Mult to the **X** socket on the Disting 4
5. Patch the **B** socket on the Disting 4 to **In 2** on the module
6. Patch **Velocity Out** on the DFAM to **Trig** on the module for CV triggering of ratchets or leave Trig un-patched for manual triggering of ratchets using the push button
7. Patch **Pitch Out** on the DFAM to **Pitch CV** on your synth
8. Patch **Out** on the module to **Gate In** on your synth

How to enable ratchets on the DFAM

1. Set the Disting 4 to algorithm B6 (Clockable LFO)

2. Use the **Z** knob to set the ratchet count (1-16)

3. Set the **Step Levels** on the top row to the required notes to produce a maximum 8 step sequence (if you have a Quantizer module, this will make things easier!)

4. Set all the **Step Levels** on the bottom row to 0

5. Set the **Attenuate/On** on the module switch to ATTENUATE to enable the Gate-to-Trigger converter

6. Set the **Threshold** knob on the module fully clockwise

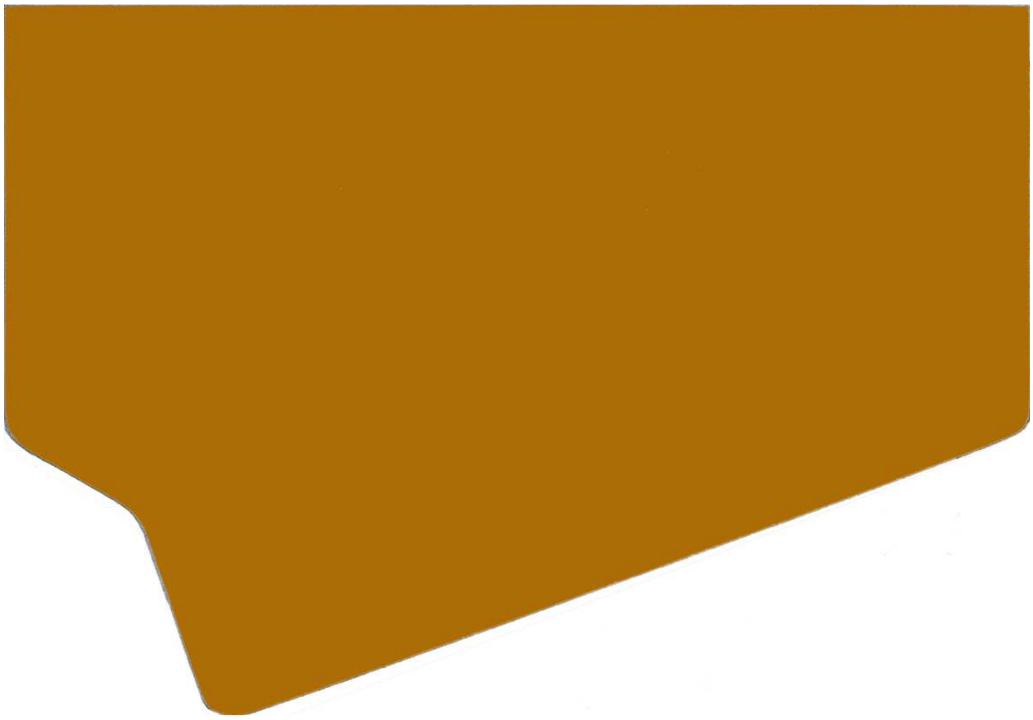
7. Press the **RUN/STOP** button to start the sequence running

8. Turn the **Step Levels** of the matching steps on the bottom row that you want to ratchet to between 5 and 7 to enable the ratchets

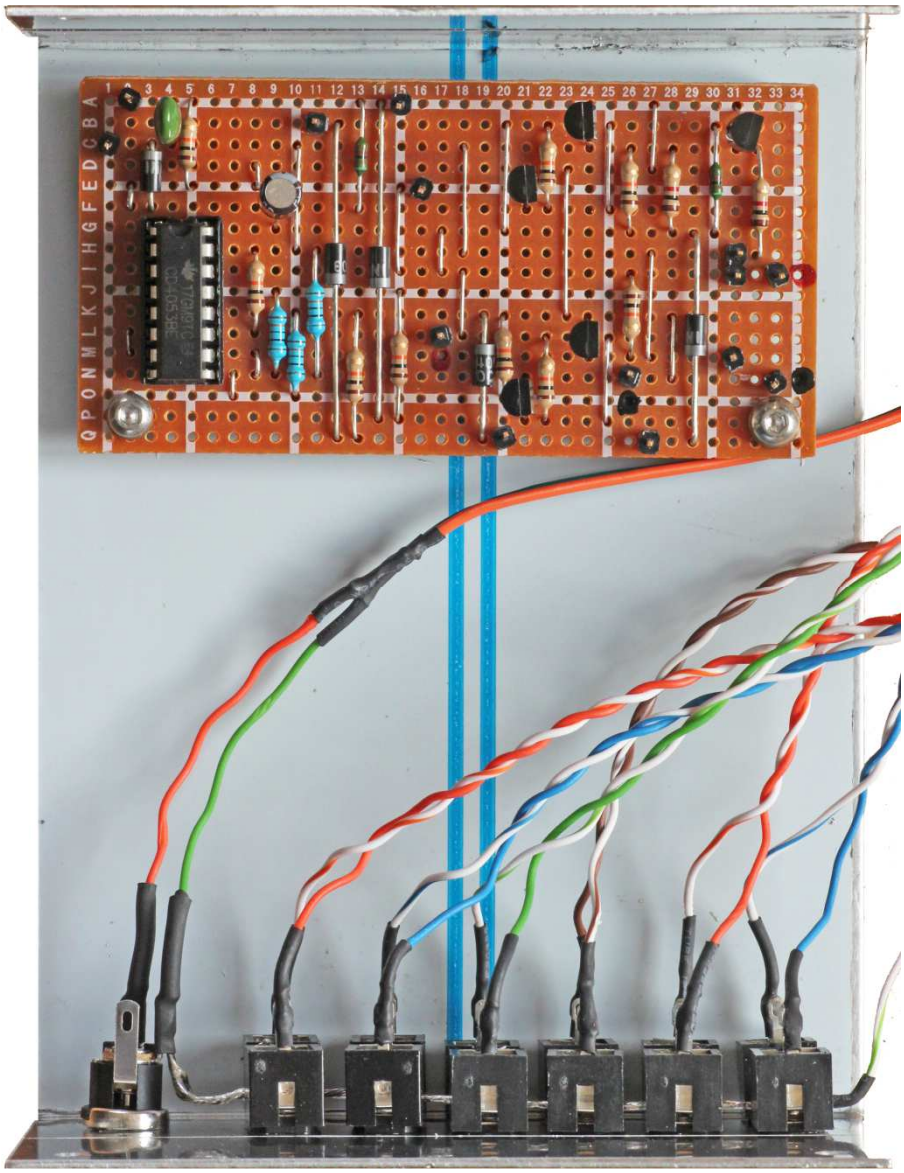
Setting the **Threshold** level on the module to a lower level and increasing the level of one or more steps on row two of the sequencer will allow you to have two or more 'levels' of ratcheted step selected by the threshold level.

BOM

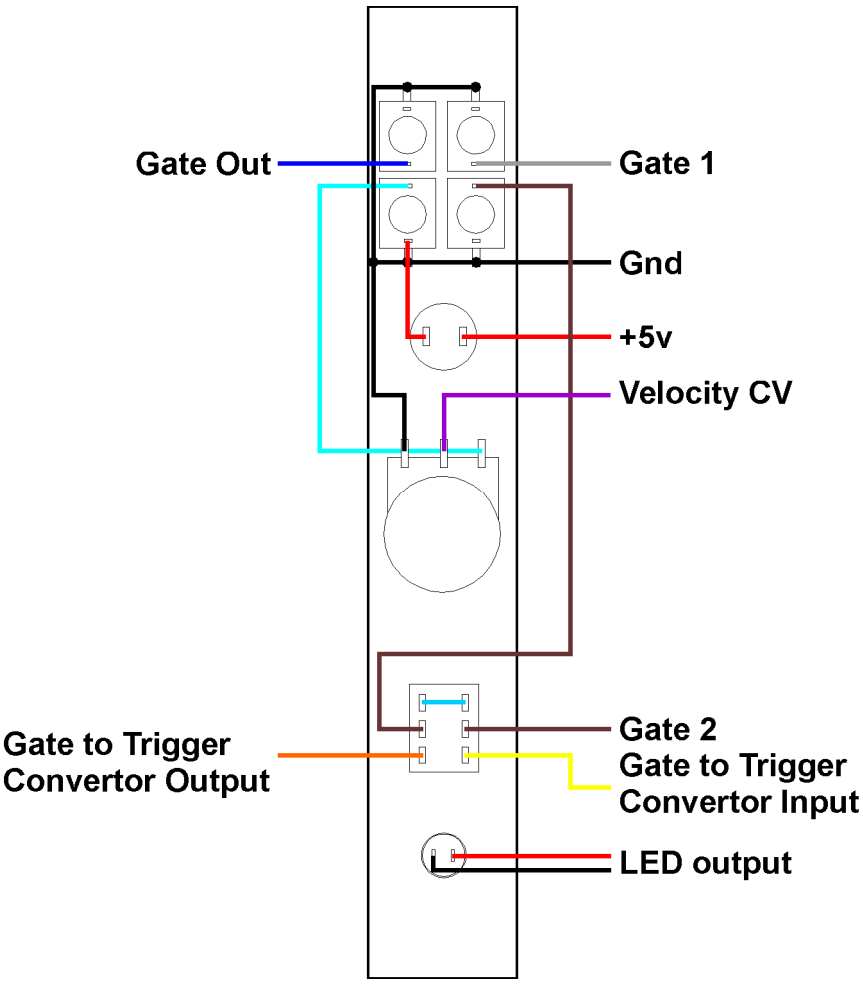
Component	Quantity	Type
IC	1	CD4053B Multiplexer
IC Socket	1	DIP Pin 16
Transistor	5	BC549B General Purpose NPN
Diode	5 1	1N4003 LED
Resistor	2 8 2 4	1K 10K 50K 100K
Potentiometer	1	50K linear
Capacitor	1 1	47uF electrolytic 16v 10nF Mylar Polyester film
Copper Strip-board	1	17 row x 33 hole
Switch	1 1	DPDT mini toggle SP Momentary Push
Power Socket	1	2.1mm x 5.5mm panel mount
5v DC PSU	1	2.1mm x 55mm DC plug
Header Pins	15	0.1"
Jumper Wires	12	0.1" Female for connecting hardware to circuit board
Connecting Wire	3m	Stranded Cat 5 is suitable
Case Components	1	Wooden side cheeks, aluminium sheet, Eurorack rails
Control Knob	1	¼" (6.35mm Vintage design – Thonk UK Mini Knob)



¼” (6.35mm) thick wooden cheek Template

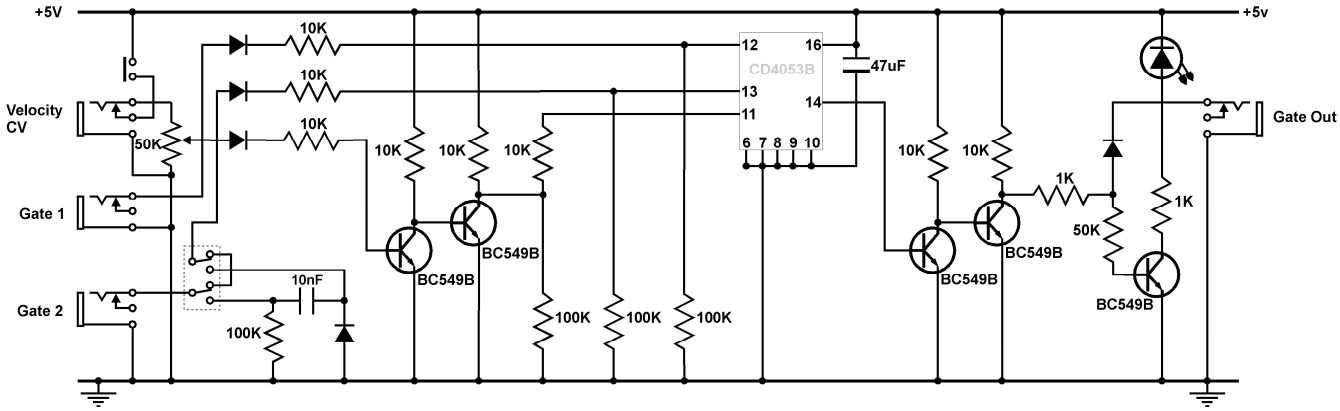


The circuit board installed and the rear panel wiring



Wiring of hardware on back of 8HP panel

The output signal, LED and power cables are jumper cables with female connections to attach to the header pins on the circuit board.



Circuit diagram of ratchet module

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