nonlinearcircuits

FRISSON build & BOM

This is a chaos module based on the Mackey-Glass equations which were developed to show the delay in physiological systems when producing or reducing certain cells in response to variations in concentration of those cells. The result is a very complex and easily controllable chaotic pattern.

The basic Mackey-Glass system implemented into electronics is a nonlinear stage, a low pass stage and a delay stage connected in a loop.

In this circuit the delay stage is made of 8 Bessel filters, configured for sub-audio rates, which are voltage controlled via LDRs, this section is very similar to an 8 stage phase shifter. Each filter stage has an output to the front panel. There is also an external input to inject signals into the chaos which is rather interesting.

Controlling the Delay section with CV, or via the knob, sets the frequency of the chaos. The chaos knob changes the pattern. The module self-oscillates, so can run happily with no inputs. It may pause for a while if the Chaos knob is turned to maximum, but runs at other settings. When CV or other signals are injected it runs at all settings.

If the switch is flicked to CV Phaser, then the Bessel filter section can be used, along with the feedback pot, as a voltage controlled CV Phaser, with 8 differing outputs of slightly delayed and increasingly slewed versions on the original CV can be obtained.

The feedback pot only works in CV Phase mode, it is switched out of the circuit in Chaos mode.

The module can be built to operate at different frequency ranges, capacitor values are given in the Build Notes. I prefer the slowest version, but feel free to go your own way, or build all 3. You can try other values if you want to. Generally C2 should be approx. double the value of C1 and C3/4 (these are in parallel so add together) should be 10-20x greater than C2

There are a couple of resistors to mod if you feel like it. 7k5* sets the gain of the nonlinear stage. If you use a smaller value, say 3k3 to 4k7, the chaos is quite beautiful but much smaller amplitude, around 1-2V p-p. This would be nice for use in video synths. Also, with a low value for 7k5*, the chaos gets swamped by any incoming CV, if the input knob it turned up high.

The 10k* sets the resistance for the input signal, probably best to leave as is.
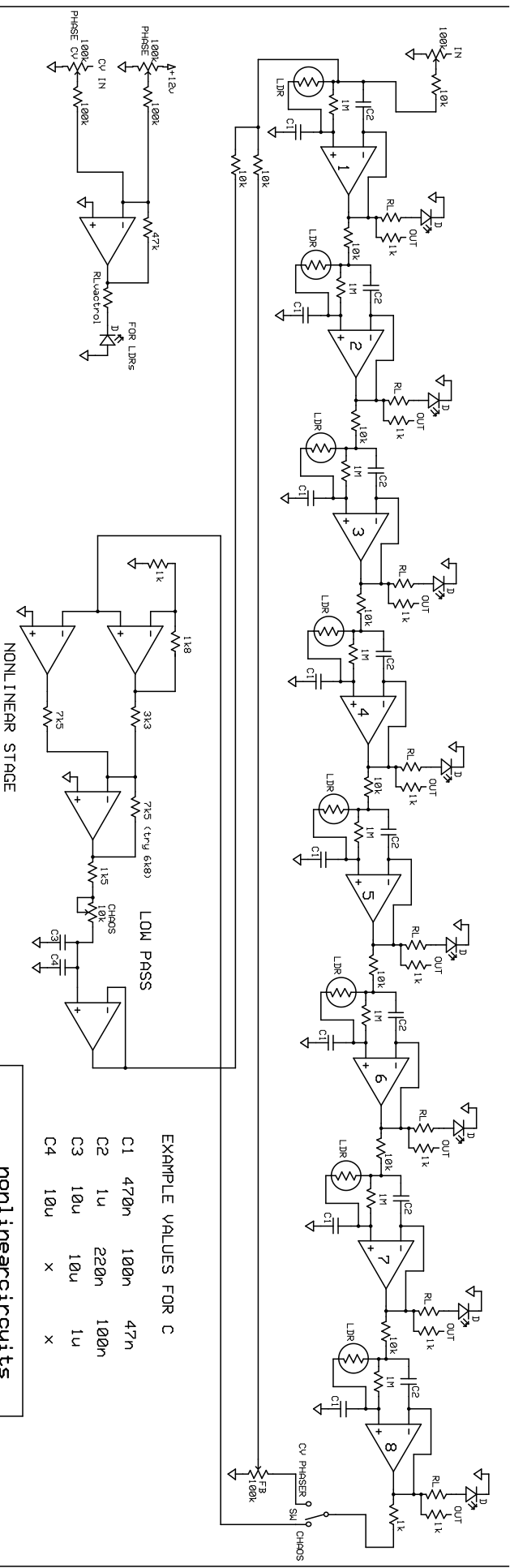
The 47k near the bottom of the PCB sets the gain for the LDR driver LED. If you find a lot of dead zone when turning the Phase knob, reduce this to maybe 33k, or increase RLvactrol.
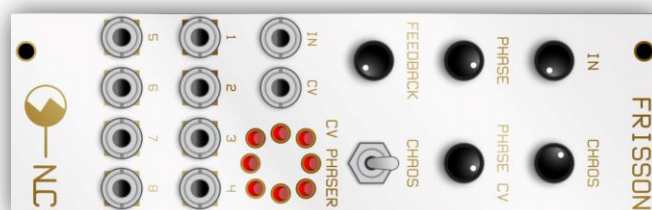
BOM — The Tayda & Mouser part numbers are given as examples

synthCube will carry full and partial kits as well

VALUE	QUANTITY	DETAILS
100nF	2	0805 Tayda: A-3511
10uF	2	0805 25V or higher voltage rating Mouser:963-TMK212BBJ106MG-T or similar
C1	8	0805 see chart below
C2	8	0805 see chart below
C3	1	0805 see chart below
C4	1	0805 see chart below
1k	10	0805
1k5	1	0805
1k8		0805
3k3		0805
7k5	2	0805
10k	10	0805
47k	1	0805
100k	2	0805
1M	8	0805
RL	8	0805 select resistor to suit LED brightness, probably 2k2 for bipolar LEDs
RLvac	1	0805 select resistor to suit LED driving the LED in the black box, try 2k2 to 4k7 for diffused red LED
TL072 / TL082	5	Tayda: A-1139
TL074 / TL084 / LF347	1	soic Tayda: A-1140
LDR	8	GL5516 or whatever
3mm bipolar LEDs	8	Tayda: A-1076 or get diffused red/blue off ebay or Aliexpress
3mm LED	1	diffused red, yellow or green for driving LDRs (not blue)
Eurorack 10 pin power connector	1	Tayda: A-198 cut to size
Schottky diodes	2	I use MBR0540 in a sod-123 package. Any with 30V+ and 0.25A+ ratings will do. **dot on PCB indicates CATHODE (stripe on component).**
PJ-3001F 3.5mm Mono Phone Jack	10	Tayda: A-2563 or Thonkiconn Jacks (PJ301M-12) from Thonk, Synthcube or Modular Addict
10k pot	1	Tayda: A-4728
100k pots	4	Tayda: A-4729
on-on toggle switch	1	tayda: A-5389
20 Pin 2.54mm Single Row Female Pin Header	2	Tayda: A-1310
15 Pin 2.54mm Single Row Female Pin Header	2	Tayda: A-1669
40 Pin 2.54mm Single Row Pin Header Strip	2	Tayda: A-197 snap into 15 and 20 pin sections, get spares

C1-C4 selection chart

If not sure, go for Slow

	Slow	Medium	Fast
C1	470n	100n	47n
C2	1u	220n	100n
C3	10u	10u	1u
C4	10u	nothing	nothing

Additional notes:

1. The chips, resistors, caps are cheapest from Tayda. Schottky diodes, CMOS & 1uF, 10uF 25V 0805 caps from Mouser/E14/Farnell/etc.

2. Join the Nonlinearcircuits Builders Guild on FB: https://www.facebook.com/groups/174583056349286/ and ask questions there if you have any. If you prefer not to FB then email is fine.

3. Build tip – before soldering the upper PCB, install the pin header strips in the bottom PCB and solder them in. Use the top PCB to hold them in place when soldering, so the pin headers are straight with minimal gaps for light leakage. Use a spare thumb to press the PCB down when soldering the 1st pins on each side, to keep it nice and tight.

Title block:

FRISSON v2

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andrew f

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EXAMPLE VALUES FOR C

C1	470n	100n	47n
C2	1u	220n	100n
C3	10u	10u	1u
C4	10u	x	x

Labels throughout circuit:

PHASE CV
PHASE 100k
CV IN 100k
+12v
47k
RLvactrol
D
FOR LDRs

NONLINEAR STAGE

1k
1k8
7k5
3k3
7k5 (try 6k8)
1k5
CHAOS 10k
C3
C4
LOW PASS

IN
100k
10k
LDR
C1
1M
C2
10k
10k

Op-amp stages numbered: 1, 2, 3, 4, 5, 6, 7, 8

Each stage: LDR, C1, 1M, C2, 10k, RL, OUT, D, 1k

FB 100k
CV PHASER
SW
CHAOS

GND IN

Me

GND

CV

SC
S3

ON-ON

L4
GND

L5   L3 L6 L2   L7 L1 L8 4   8   3   7   2   1

6   5

IN

-CV

100k

POTS & JACKS GO ON OTHER SIDE

FRISSON BTM 1

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IN   10k

100k   CHAOS

PHASE   100k

100k   Pcv

FB   ON-ON

100k

IN   CV