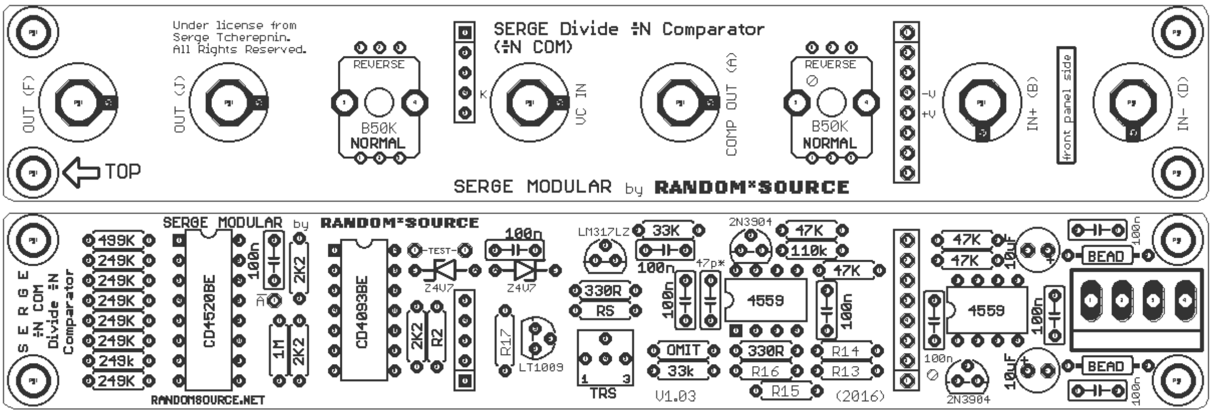
SERGE Divide by N Comparator (÷N COM)

The ÷N COM is a rare, much sought-after and very essential Serge module covering a number of functions: comparator, voltage-controlled pulse divider, and voltage-controlled staircase generator.

The Random*Source version of the Serge ÷N COM consists of a main pcb and a matching component pcb serving as an interface to the front panel.

Main pcb (v 1.03) and panel pcb:



Please note:

- The pcb provides for a precision voltage source that should be set up (using the trimmer) so that the CMOS parts are run on a (stabilized) exact **voltage (around 5.116V)** - as Serge explains: “One of the features of the NCOM is its adherence to the 1V octave rule, which permits directly plugging the staircase out into a VCO and getting a whole tone scale.”
- The pcb uses a precision voltage source against changes and ripple in the supply voltages.
- The component pcb contains footprints so that that pots can be inserted to work in either direction (“normal” and “reverse”), “normal” should give the expected pot behavior.
- **Earlier versions of the pcbs contain some errors and are not recommended to be used. Please contact R*S about a replacement in case you have a version < 1.03**!
- Big thanks to Phisynth and Guy D.!
- Board is designed to be powered by a +/-12V stabilized PSU only. (+/-15V is untested).

Bill of Materials

The following values are suggestions and may deviate from other / older versions of the ÷N COM: - this is DIY!

Resistors (1%)

2	10R	F1, F2	alt: FERRIT BEAD
2	OMIT	R2, R18	* do not install *
1	330R RS	R26 - marked "RS"	install 330R + 100R trimpot for the 5.15 voltage source
3	330R	R25, R31, RS	
2	2k2	R1, R9	
1	15k	R16	
2	33k	R11, R27	alt: 10k + Zener Diodes (see below)
4	47k	R4, R6, R7, R8	
2	51k1 (47k)	R13, R15	
1	110k	R5	
1	121k (110k)	R14	
7	249k	R3, R10, R12, R21, R22, R23, R24	1% or better - ideally closely matched
1	499k	R20	1% or better
1	1M	R19	
1	6M8	R17	
1	100R	TS (Precision Voltage)	Trimpot (Bourns 3362P or anything that matches the footprint) to adjust the Voltage to 5.156V - or any value that yields the desired 1V/Oct scaling of the stepped output (tune sending the stepped output into the 1V/Oct input of an oscillator). Use a good DMM and measure between the two test pads ("- TEST -").

Capacitors

1	47p*	C*	Use larger value e.g. 1nF, I used 220p which seems to work nicely, too.
9	100n	C3, C4, C5, C6, C7, C8, C9, C10, C11	Bypass caps
2	10uF	C1, C2	Electrolytic (or 22uF) >= 25V, 2.5mm ls

ICs

2	4559	U2, U5	NJM4559D or RC4559P
2	2N3904	Q1, Q2	NPN Transistor
1	CD4093BE	U1	Quad 2-input NAND schmitt trigger
1	CD4520BE		Dual binary up COUNTER
1	LM317LZ		Positive VOLTAGE REGULATOR
1	LT1009C	U7	Precision Shunt
2	ZENER 4.7V	D1, D2	Optional: Zener Diodes as CMOS input protection Install "4V7" if you use 10k for R11, R27.

Misc

1	MTA-156		MTA-156 power connector
1	SIL header 8pol		pin connectors, linking main pcb to component
1	SIL header 5pol		pcb - using precision strips allows to break off pieces as needed
3	Banana Jacks	COMP_OUT_A, OUT_F, OUT_J (red)	Emerson-Johnson Mouser: 530-108-0902-1 (red) or Thonk
3	Banana Jacks	CV / unipolar (blue or white) IN-_D, IN+_B, VC_IN_G	Emerson-Johnson Thonk / Mouser: 530-108-0910-1 (blue), 530-108-0901-1 (white)
2	Potentionmeter 50k	linear (B50K or B100K)	Alpha 9mm vertical pcb mount available from Thonk, Tayda, Mouser ...

Building

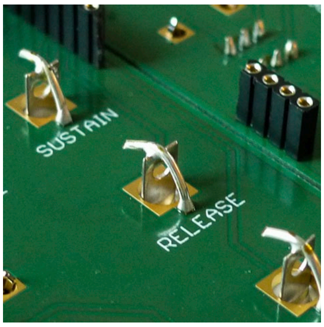
This is simply a suggestion - you might find a different workflow more practical:

1. Mount the Banana jacks onto the front panel.
2. Use a side-cutter to separate main pcb and component pcb.
3. Mount the pots onto the component pcb. Pots should sit on the side facing the front panel (as marked on the board). Don‘t solder them in yet.
4. Carefully mount the component pcb (with the pots inserted) onto the front panel. You may then have to wiggle each pot a bit to get the pots through. Make sure the threads of the pots go through completely and the pots sit right at the front panel. You can even screw the pots to the panel to make sure of that, but you will have to unscrew them again later.
5. Once everything is nicely in place, solder the pots onto the component pcb (while the front panel is attached). DO NOT SOLDER THE BANANA JACKS YET!
6. Stuff the main board, beginning with the resistors, then caps etc.
7. Main pcb and component pcb are to be connected through precision DIP socket and pins. It is recommended to use the pins on the main pcb (facing down, soldered from above) and the pin sockets on the component pcb (standing up, soldered from the front panel side). Break or cut off the pieces you need and stick them together so that main pcb and component pcb form a nice sandwich (don‘t solder yet). Check that you didn‘t leave out any pins / holes and that the sockets are all on the same side (component pcb). Solder all the pins in while keeping the sandwich together - this avoids any misalignments.
8. Carefully separate the sandwich - if you used precision sockets, this may not to too easy - they stick together nicely (giving a good connection).

9. Mount the component pcb onto the front panel again and screw on the pots from the front side.

10. Make sure everything is in place.

11. Solder the banana jacks in. You can either solder them directly to the surrounding vias (i.e. the ring around) or - which makes removing easier should you ever need to do that - by inserting a stiff (bare) wire into the little hole (via) and solder that wire to the top of the banana jack:



12. Attach any screws / spacers if desired and mount the main pcb onto the component pcb.

13. Connect a power cord supplying +12V, GND, GND, -12V to the MTA-header on the main board and you should be ready to go :-)

Calibration

Using TS, the **voltage for the CMOS parts** can be adjusted to precisely. The theoretical value should be 5.155V, however, I found that 5.115V worked best in my case. Use a good digital multimeter and measure the voltage between the 2 test pads (next to the 4520 IC, marked " - TEST -" and adjust the trimmer. You can also run the stepped output into the 1V/Oct input of a VCO and adjust the trimmer so that the pitch of the oscillator stepping up stays in tune.

(Version 01 June 2016)