

# SERGE

## Divide by N Comparator (÷N COM) for Eurorack

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 ÷N COMPARATOR consists of two sections - a comparator (right side) and a voltage-controlled pulse divider (left side). The ÷N output of the pulse divider sends out a pulse on every N-th comparator pulse where N is a number from 1 to 31. N can be (pre-)set with the divider's control knob (1 ÷N) and can be changed with a control voltage. The VC knob (attenuator) on the bottom of the left side determines how much effect the control voltage has on "N". In addition, the divider generates a staircase waveform with N steps. This can be used to produce whole-tone steps when run into the 1V/Oct input of a VCO or as a stepped control voltage to change for instance the cutoff of a filter.



is generated ), Pulse width modulation or Rectifying a waveform (e.g. a sine or triangle wave). More uses are explained in the original 1983 Serge catalog:

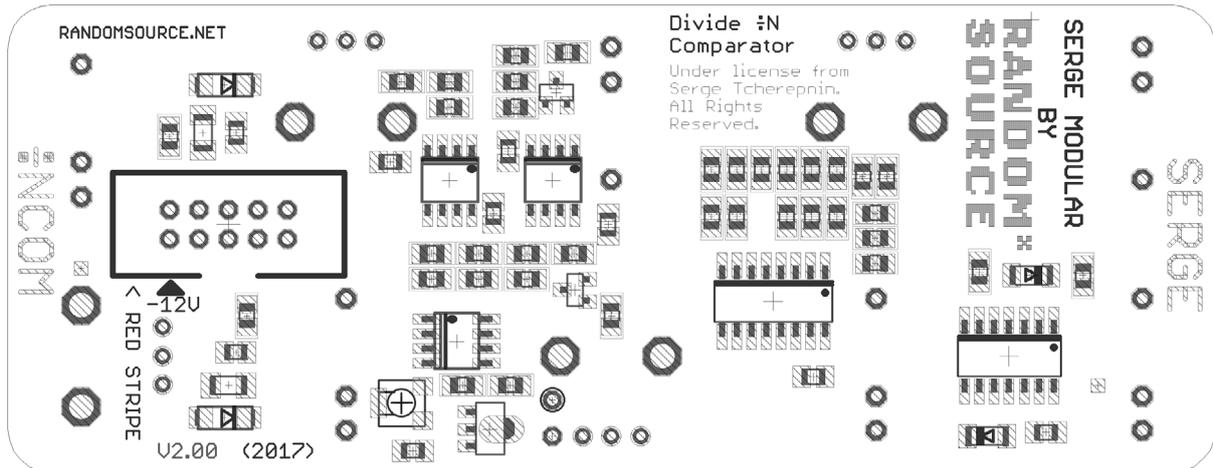
*For audio frequencies the divider can be set to output sub-divided frequencies with digital precision: Output frequency depends on "N". If "N"= 2, 3, 4, etc. the output frequencies will be an octave, an octave and a fifth, or two octaves below the input, respectively. Because "N" is voltage controllable, arpeggios and various melodies can easily be programmed. The nature of this type of division (Integer division) results in frequencies that fall along the sub-harmonic series, a series that has great tonal charm.*

*For sub-audio frequencies. the divider acts like a counter. Outputting a pulse only after "N" number of input pulses. Input pulses can be fairly random or regular. This capability is especially powerful for determining tempos and rhythmic patterns when using several sequencers (especially if the "N" VC input is taken from one of a sequencer's rows of controls ). In a more random situation, using a microphone preamp / detector as input, the divider might be set to count how many times a sound of a certain loudness will have occurred and be set to trigger an event upon reaching the count. Since the count can be made variable (from 1 to 31), fairly complex and subtle interactions can be generated.*

The Random\*Source version of the ÷N COM for Euro is a licensed and authorized adaption of the original Serge design. Compared to the original module it features a largely increased accuracy, a precision voltage source and 2 added attenuators.

The Random\*Source ÷N COM kit (SMT version) consists of a front panel and a pcb including all SMT parts which also acts as an interface to the front panel.

Main pcb (v 2.00):



### Please note:

- The pcb provides for a (new) precision voltage source that should be set up (using the trimmer) so that the CMOS parts are run on a (stabilized) **exact reference voltage** - 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.” You can either calibrate this voltage to 5.155V using a (precise) digital multimeter or by plugging the STEP OUT into a (calibrated) oscillator such as a Serge NTO and adjust the trimmer so that the oscillators output is tuned to whole tones.
- Use antistatic precaution - try to avoid touching the SMT parts.
- Board is designed to be powered by a +/-12V stabilized PSU only. (+/-15V is untested).
- Big thanks to Phisynth and Guy D.!

### Bill of Materials

#### Misc

1 Euro Power header	MTA-100 power connector, Reichelt: WSL 10G
6 Thonkiconn Jacks	3.5mm Jack Sockets (PJ301M-12) from Thonk
4 Potentionmeter 50k linear (B50K)	Alpha 9mm vertical pcb mount available from Thonk, Tayda, Mouser ... B100K should also work

## Building

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

1. **Solder the power connector to the pcb.**
2. **Mount the Thonkiconn jacks and the pots onto the pcb. Pots should sit on the side facing the front panel (as marked on the board). Don't solder them in yet.**
3. **Carefully mount the pcb (with the pots etc. 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. Screw the jacks and pots to the panel to make sure of that.**
4. **Once everything is nicely in place, solder the pots and jacks (while the front panel is attached). Make sure you don't spill any solder on the SMT parts.**
5. **Connect a power cord supplying +12V, GND, GND, -12V to the power-header on the main board and double check the direction of the power header before you turn power on.**
6. **You should be ready to calibrate and go :-)**

## Calibration

Using TS, the **voltage for the CMOS parts** can be adjusted to precisely to 5.155V. 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.

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