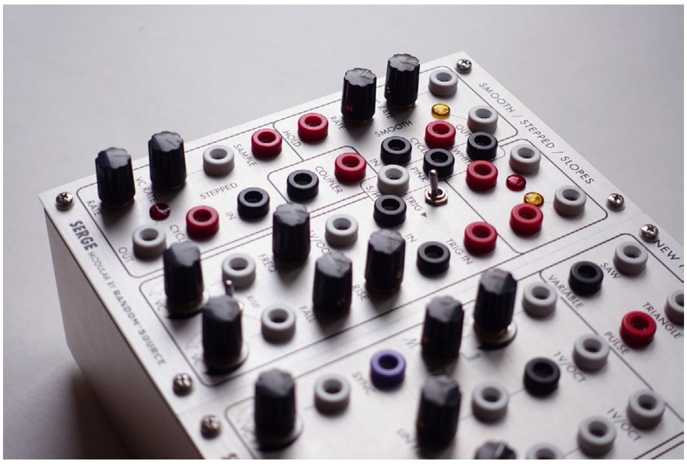
SERGE “Carnivore” SSG / DSG mk2 / Noise



“Carnivore” combines three key Serge modules in only 4 inches: a Serge Smooth & Stepped Generator (SSG), a Serge Noise Source and a Dual Universal Slope Generator mk2 in a slim, oscillator-oriented version covering the functionality of what’s sometimes called “VC TIMEGEN” oscillator (and more).

All Random*Source Serge modules are brought to you under license and in cooperation with Serge Tcherepnin.

Smooth & Stepped Generator (SSG)

According to the 1979 catalogue, the **SSG** “is a complex multi-functional module which can be patch programmed to provide various slew and sample functions.

The Smooth section will place a postitve and negative slew on input voltage transitions for lag effects, voltage controlled portamento and for low frequency filter applications.” In Cycle-mode (cycle jack patched to the input), the Smooth side “will oscillate yielding a voltage controlled traiangle wave LFO. A high level into the HOLD input will enable the Smooth Function to be used as a track-and-hold circuit with voltage controlled slew rate.

The Stepped funtion can be used as a sample-and-hold with voltage controlled slew rate limiting. In Cycle mode, a pulse applied to the Sample input will generate complex staircase waveforms for control voltage applications and for use as audio signals.

The Coupler is an internal comparator which compares the output levels of the Smooth and the Stepped Generators. This output is useful for generating complex control voltages or random voltages.

The Random*Source version of the Smooth & Stepped Generator provides an increased audio range of the Smooth Generator and a bipolar (“hot”) Coupler output in addition to the regular (unipolar) Coupler output. In combination with the S&H Source, this allows patching of the SSG as a Random Voltage Generator.

Noise Source

The Noise Source (NOI) provides both white and pink noise waveforms. The S/H SRC generates a special ("noisy") waveform as an ideal input for Sammple & Hold functions to produce random voltages of equal probability (similar to a 1/F distribution function).

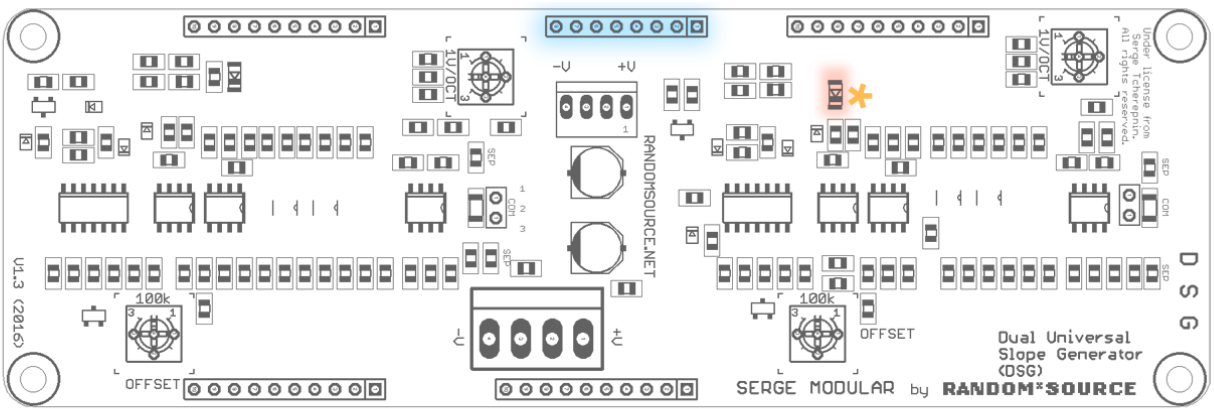
"Slopes" - DSG mk2 as "TIMEGEN" Oscillator

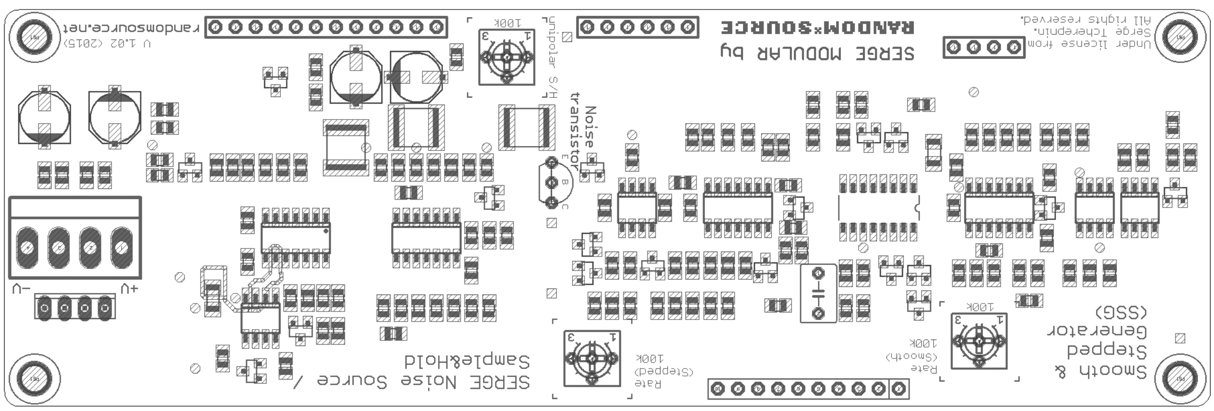
This 2" version of the Dual Universal Slopes Generator features a **left side** that's been condensed for use as an oscillator: it always cycles, generating a SAW wave (0 to 5V, white output, top) and a PULSE wave with a fixed pulse width (red output, top). Pitch is controlled via FREQ knob and 1V/Oct.

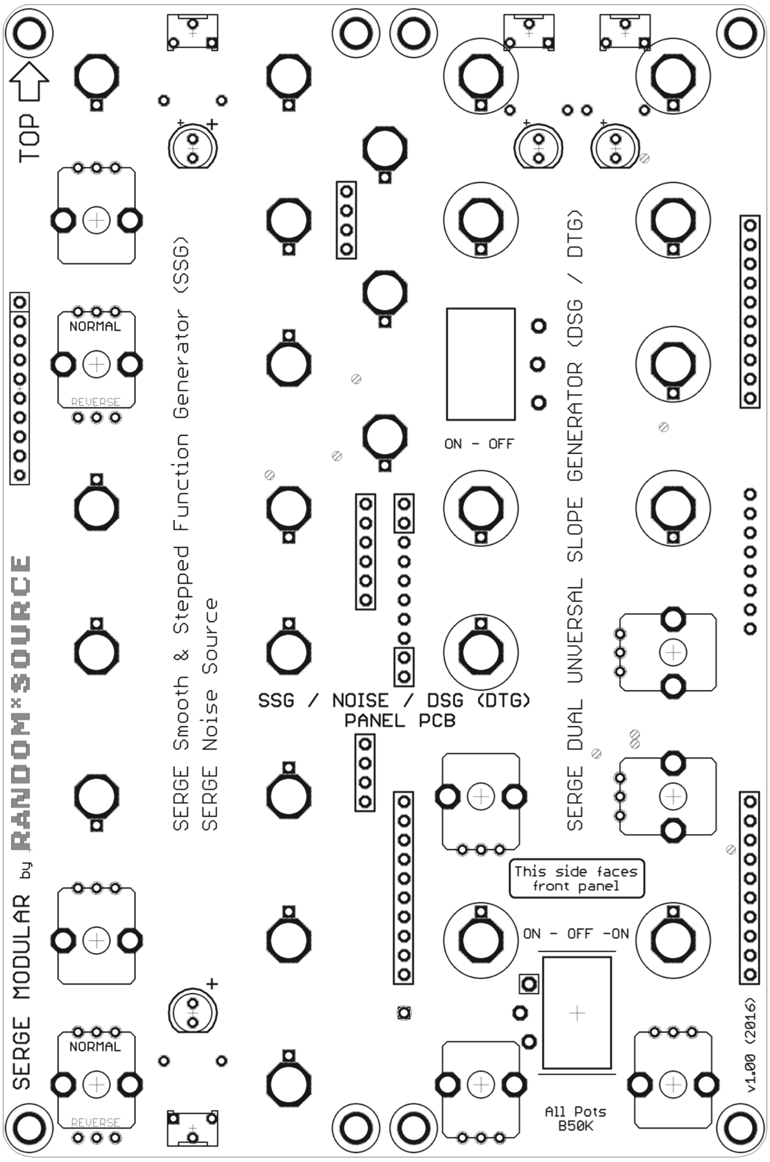
The right side does not cycle by default - patch the red (GATE) out into TRIG IN for cycle mode - but can be triggered from the left side by using the TRIG switch. This causes the right side to be sync'd by the left side. Both rise and fall of the right side can be manually set to create anything from a sawtooth wave to triangle to a reverse sawtooth (or anything in between). By using the lower switch, a control voltage can be set to affect RISE, FALL or BOTH slopes.

Both sides feature (black) audio INs for filtering effects etc.

The Random*Source Serge "Carnivore" 4x4 kit consists of a front panel, a component pcb serving as an interface to the front panel as well as two main pcbs (one for the SSG, one for theDSG), each of which already contains most of the parts in surface-mount technology (SMT).







Please note:

- Both the SSG and DSG pcbs exist in different versions with different funcionality. For Carnivore you must use an SSG pcb that does **not** only contain parts in the upper area. The **DSG pcb must be the "contemporary version"** - the **spot marked** * in the picture above must not be empty. If you ordered other Serge modules, too, don't mix up the pcbs.
- **Connect only the pins within the white rectangular boxes** marked on the panel pcb. **Ignore the ones marked blue in the picture above**.
- **Use antistatic precaution** when handling the pcb - don't touch the small SMD parts and ICs with your hands.
- Only these parts have to be soldered in: trimpots, 220nF Film capacitor, pin stripes to connect the main pcb to the component pcb, MTA power headers (see pictures above).

- LED: To set / control LED brightness, install either trimpots ("LED") or resistors (e.g. 2k) on the component pcb - do not install both! **Use low current LED**s - at least 100-130mcd or ultra-bright LEDs (60°) plus a **trimpot of (only) 2k or (or a 2k resistor) for (fairly) bright LEDs (**100-150mcd). If you use ultra-bright LEDs, a 5k trimmer might make sense, higher values for the trimpot are probably not needed (but work also).
- The component pcb contains some potentiometer footprints that allow you to chose the direction in which the potentiometer works. Use the "NORMAL" orientation (as marked on the pcb) unless you have a good reason not to.

Bill of Materials

Trimmers

2 + 3	100k	DSG: Offset SSG: Rate Smooth, Stepped, unipolar S/H	Trimpot (Bourns 3362P, Vishay T73YP104KT20 or similar) DSG: to adjust the uni-polar output to a range of 0V to 5V SSG: see calibration info below
2	5k	DSG: 1V/Oct	Trimpot (Bourns 3362P, Vishay T73YP502KT20 or anything that matches the footprint) to adjust the tracking of the 1V/Oct input. Single turn is sufficient.
2 + 2	2K or more	DSG and SSG: LED brightness (instead of RLED resistors) - on panel pcb -	Trimpot (Bourns 3362P or Vishay T73YP202KT20 or anything that matches the footprint) to adjust the LED brightness. Pick value depending on LED (see text). Optional - use trimpot or LED resistors (not both!)

Transistors

1	PNP e.g. BC560*	Noise transistor *pick for best sound ;-)	Use through-hole or SMT (check if SMT is already installed!): TH: e.g. BC560C, PN4250 SMT: BC860C, BC857C

Resistors

(4)	(2k*)	RLED*	Pick according to LEDs and desired brightness only if not using trimmers for LED brightness!

Capacitors

1	220n	SSG	Film (Wima MKS-2-5 or similar) or C0G

Headers / pin connectors - DSG side

-	SIL header 8pol	OMIT - NOT NEEDED!	(8-pin connector, links main pcb to component pcb)
4	SIL header 10pol		10-pin connector, links main pcb to component pcb

Headers / pin connectors - SSG side

1	SIL header 4pol	Only connect the pins within the marked white boxes on the panel pcb and ignore all others!	pin connectors/headers, linking main pcb to component pcb - using precision strips allows to break off pieces as needed
1	SIL header 6pol		
1	SIL header 10pol		

Misc

2	MTA-156		MTA-156 power connector
8	Banana Jacks RED	HOLD, SAMPLE, CYCLE, COUPLER (top), DSG: TRIG IN, PULSE OUT, GATE OUT (lower outputs),	Emerson-Johnson Mouser: 530-108-0902-1 (red) or Thonk
7	Banana Jacks BLACK	4x IN, ("hot") COUPLER (bottom) (black), WHITE, PINK	Emerson-Johnson Thonk / Mouser: 530-108-0903-1 (black)
10	Banana Jacks WHITE	CV / unipolar	Emerson-Johnson Thonk / Mouser: 530-108-0901-1 (white)
4	LED 5mm	low current	pick color to suit LED lens
4	LED lens 5mm		VCC, Mouser 593-3000R (red), 593-3000A (amber) ...

4	Potentionmeter 50k	SSG: linear (B50K)	Alpha 9mm vertical pcb mount available from Thonk, Tayda
5	Potentionmeter 50k or 100k	DSG: linear (B50K or B100K)	Alpha 9mm vertical pcb mount
1	SPDT Switch (2 positions)	ON - OFF / ON - ON DSG: TRIGGER >	NKK M2012SS1W01 (no cap) or NKK M2012SS1W01-BB (white cap) or similar
1	SPDT Switch (3 positions)	ON - OFF - ON DSG: RISE / BOTH / FALL	NKK M2013SS1W01 (no cap) or NKK M2013SS1W01-BE (yellow cap)
9	Davies knobs		1900H - Thonk

Noise Considerations

Modern transistors are designed to be low-noise which is counter-productive to the generation of noise required for a noise source. So **for through-hole transistors it is recommend to use a socket** so you can easily swap and compare sound and level. Also the noise behavior may change with temperature, so you may want to wait a bit for the transistor to warm up. Needless to say, don't install both the SMT and a through-hole version of the noise transistor.

DSG mk2 Configuration

The DSG mk2 might be pre-configured to be used in a (full) DSG with separate control over Rise and Fall. This is done **To use the pcb in a 2" version, you (may) have to change this setting.**

SEParate control of Rise / Fall: two 0R resistors (SEP) act as links / jumpers and COM is open.
COMmon CV control: no SEP resistors installed and COM is linked with a 0R resistor (or jumpered).

For the Carnivore module, top should be "SEPerate" (two 0R resistors at SEP spots) and (only) the lower half of the pcb has to be set to COMmon mode (in the area near the power connector):

1. **Remove the two 0R (zero ohm) resistors** at the two spots marked **SEP** (left and right of COM) - you can use one of them in the next step. (To remove an SMT resistor, use a fairly big blob of solder on the tip of your iron to heat both sides of the resistor at the same time and push is out quickly.)

2. **Set a jumper at COM** or solder in a 0R resistor onto the pads underneath the COM rectangle.

For Carnivore, you do not need to change the setting of the upper side.

Building

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

1. Mount the Banana jacks, the LED lens and the switches onto the front panel. If you use retention rings for the LED lenses, attach the ring to the lens. (**Do not mix up the switches!**)

2. Screw (10mm) spacers to the panel pcb if desired - this is easiest done while the panel pcb is not yet attached to the front panel.

3. Main pcb and panel 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 panel 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 (panel pcb). Also make sure the pcbs have the right orientation (so that the pots will sit outside!). Solder all the pins in while keeping the sandwich together - this avoids any misalignments.

4. Carefully separate the sandwich - if you used precision sockets, this may not to too easy - they stick together nicely (giving a good connection).

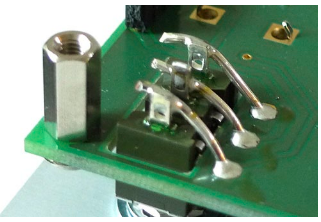
5. Solder the LED trimpots or resistors onto the panel pcb. Solder short pieces of (stiff) wire - about 10mm long - into the pads for the switches. These should stick up in the air on the sidefacing the main pcbs and should only go through the pcb as much as required to solder them in (i.e. should not stick out much on the other side).

6. Mount the pots onto the component pcb. Pots should sit on the side marked on the pcb - this side faces the front panel. Don‘t solder them in yet. Stick the LEDs into the component pcb - the long leg must be at the + side.

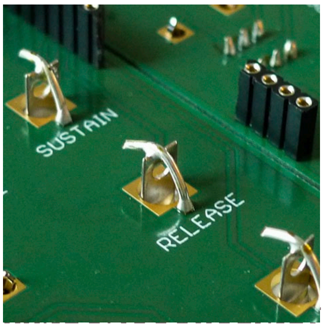
7. Carefully mount component pcb (with the pots and LEDs inserted) onto the front panel. First slide / push the LEDs into the LED lens - all the way, this may take a bit of force. You may then have to wiggle each pot a bit to get the pots through. Make sure the threads of the pots go through completely and the pots sit right at the front panel. Screw the pots to the panel to make sure of that.

8. Once everything is nicely in place, especially the LEDs sitting inside (and not on top) of the LED lenses, solder the LEDs and the pots onto the component pcb (while the front panel is attached).

9. Solder the switches in by soldering the air-wires onto the correcponding contacts:



10. Solder the banana jacks in. You can either solder them directly to the surrounding vias (rings 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:



11. Solder the through-hole parts onto the main board.

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 :-)

SSG Calibration

There's one trimmer for each side that - among other things - determins the range covered by the RATE potentiometers. The most efficient way for the Smooth Generator seems to be:

1. Turn on Cycle mode by patching CYCLE into IN and turn up the RATE pot to maximum.

2. Try to increase the speed / frequency of the cycle using the trimpot. From a certain point on, the trimmer will not have any effect on the speed / frequency any more. Turn back the trimmer to find the spot where it is about to slow down the cycle. Keep the trimmer right at the point where the speed is still maximum.

For the Stepped Generator the procedure is basically the same, but you have to run a (high frequency) pulse wave into the SAMPLE jack (the Stepped side doen't cycle without a pulse into SAMPLE). Observe the output (using an oscilloscope if possible). As on the Smooth side, adjust the trimmer for the spot where the speed is still as fast as possible. If you turn back the RATE pots to minimum, the CYCLE should now be very slow on each side.

If you installed trimpots for **LED brightness** on the component pcb, adjust them according to taste.

DSG Calibration

LEFT side (= top half of pcb) cycles on itself, so you can directly start calibrating.
RIGHT SIDE: Patch GATE OUT into TRIG IN to start CYCLE mode (acting like an oscillator).
From the original kit instructions:

Turn the RISE and FALL knobs to center position or above. Patch the OUT(put) into an audio mixer or Output Module to monitor the output. There should be a triangle wave present which can be changed to a sawtooth wave of lower frequency by turning down either the RISE or FALL knob. The frequency and timbre will depend upon the settings and the shape as set by the relationship between the Rise and Fall times.
Starting from a middle position, adjust the **OFFSET trimmer** so that the OUTput is in the range of 0V to 5V. The module will most likely stop cycling towards either end of the trimmer - if this happens, move the trimmer a bit back towards the center, unplug the patch cord between GATE OUT and TRIG IN and plug it in again - that should bring the cycle back.

Adjust **LED brightness** according to taste - make sure you don't turn the brightness up too much (i.e. trimmer setting shoud be at least 1k unless you use white or blue LEDs).

Using the trimpots on the main pcb the **1V/Oct tracking** can be adjusted. However, be aware that by design the tracking of this module will not reach the range covered by dedicated oscillators. To adjust the tracking of the RIGHT side, set the wave to an inverted Sawtooth (negative ramp, Rise is as steep as possible) and calibrate for the lower range (up to 440Hz).

SSG: First Steps

The SSG is a complex, highly versatile module which allows for a wide range of uses and abuses both in the audio and CV range, so it may require some time and experimenting to familiarize oneself with it - don't expect the module to reveal its secrets and power in a few minutes after you first power it up. Here are some very basic ideas to start with:

1. Patch the **CYCLE** jack into the **IN** of the Smooth section - the Smooth side then produces a triangle wave from about 0V to 4 to 5 V (depending on frequncy), the LED should indicate that. The **Rate** pot determines the frequency of the cycle / output - the range is very wide, going from below 1 Hz (depending on calibration above, possibly far below 1 Hz) to appr. 4 kHz. The **Cycle jack** provides a corresponding Pulse wave output.

2. Patch the **CYCLE** jack into the **IN** of the Stepped side as well. Unlike the Smooth side, the Stepped side will not generate an output in Cycle mode (=LED stays dark) unless a Pulse wave is fed into the **Sample** jack. Patch a pulse wave - e.g. the **Cycle** output of the Smooth side - into the **Sample** jack to bring the stepped side to life. The stepped side is essentially a sample-and-hold circuit, the **Rate** knob determines how long each step is at the Stepped output. Changing the frequency of the pulse going into the **Sample** input and/or changing the **Rate** affects the output.

3. The Smooth Side can be used as a **Lowpass filter**. Feed an audio signal (e.g. a saw or pulse wave from an oscillator) into the **IN jack** (while not cycling) and listen to the signal coming from the **Smooth out** while you turn the **Rate knob**. At maxium position (full CW) the signal should sound pretty much unfiltered, turning the Rate down (counterclockwise) the harmonics get filtered / smoothed out, at minimum position the signal will disappear altogether.

4. Using the VC input jack in the same setup as before, this filter effect can be used to achieve the effect of a **Lowpass Gate / VCA**. Send an CV envelope (e.g. from a DUSG or an Extended ADSR module) into the VC jack and turn the VC knob sufficiently high. Tune the Rate pot to a position so that the output is silent when no CV is applied but clearly audible when the envelope is high. This causes a VCA effect, but the envelope not only determines the amplitude, but also the amount of filtering applied (like a lowpass gate).

Power Consumption

total ≈ 135mA @ +12V and ≈ 105mA @ -12V
SSG + Noise: ≈ 50mA @ +12V and ≈ 40mA @ -12V
DSG mk2: ≈ 85mA @ +12V and ≈ 65mA @ -12V

(Version 11 January 2016)