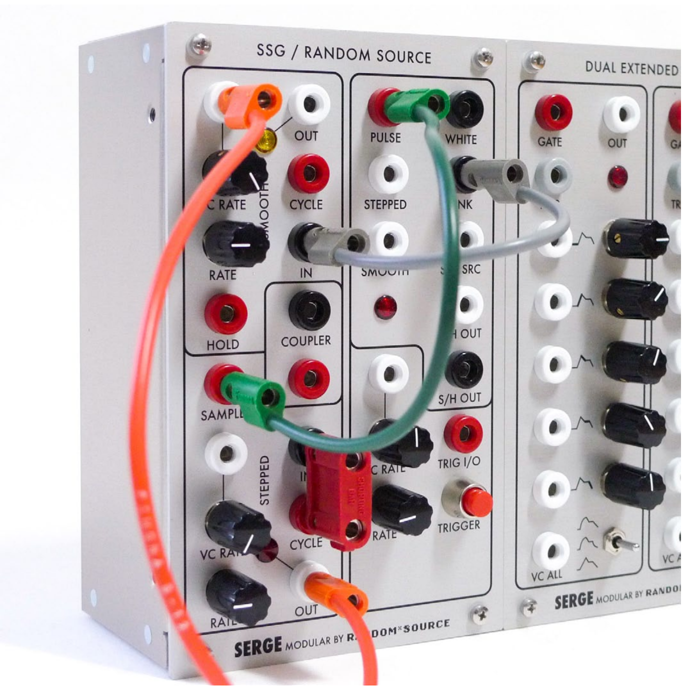
SERGE Smooth & Stepped Generator (SSG)

The Serge Smooth & Stepped Generator (SSG) is an essential part of the Serge system. According to the 1979 catalogue, “it 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.

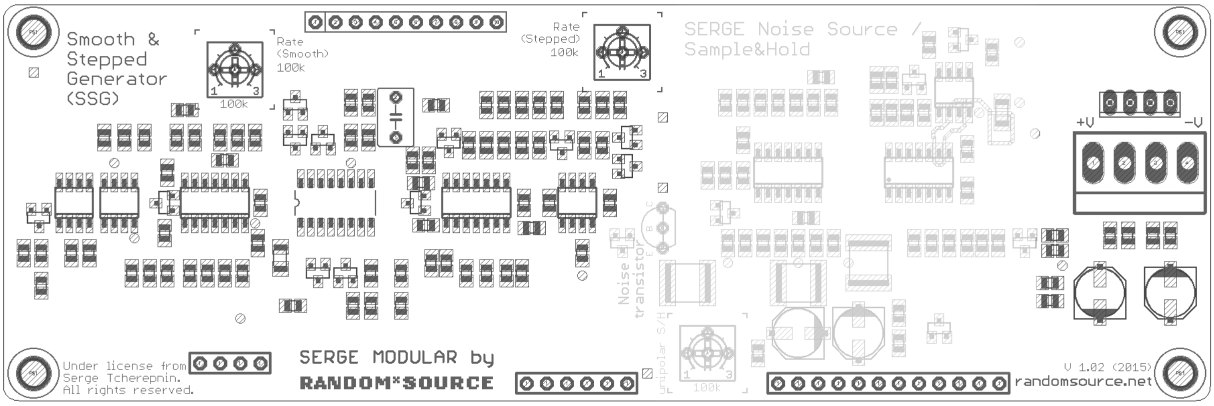
The Stepped funtion can be used as a sample-and-hold with voltage controlled slew rate limiting. In Cycle mode, a pulse applied to the Sample input will generate complex staircase waveforms for control voltage applications and for use as audio signals.

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 is a licensed and authorized adaption of the original Serge design that provides an increased audio range of the Smooth Generator and a bipolar (“hot”) Coupler output in addition to the regular (unipolar) Coupler output.

The Random*Source SSG + Random Source (RS) 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 the RS), each of which already contains most of the parts in surface-mount technology (SMT). **This document only describes the SSG side**.

Random Source and SSG essentially use the same main pcb, however, the SSG version only contains parts in the upper area whils the RS requires the fully installed pcb (i.e. also the lower area containing the Serge Noise Source and Sample&Hold).



Please note:

- The Random*Source SSG pcb is available in different configurations - **for the "normal" SSG, the pcb version that only contains the upper parts is sufficient** (i.e. not the ones greyed-out in the picture above).
- Orientation of the main pcb: **power header is at the bottom** (when looking at the module up-right, e.g. in a rack).
- **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 header (see picture 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 (max 2mA) LED**s - resistor on board), when using blue or white this is less relevant.
- 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	100k	Rate Stepped, Rate Smooth	Trimpot (Bourns 3362P, Vishay T73YP104KT20 or anything that matches the footprint). See calibration info below.
2	2K or more	LED brightness (instead of RLED resistors)	Trimpot (Bourns 3362P or Vishay T73YP202KT20 or anything that matches the footprint) to adjust the LED brightness. Pick value depending on LED (see text).
Resistors			
2	(2k*)	RLED*	Pick according to LEDs and desired brightness if not using trimpots.
Capacitors			
1	220n		Film (Wima MKS-2-5 or similar) or C0G
Misc			
2	LED 5mm	low current (max) 2 mA	pick color to suit LED lens.
2	LED lens 5mm		VCC, Mouser 593-3000R (red), 593-3000A (amber) ...
1	SIL header 4pol		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		
5	Banana Jacks	2x CYCLE, HOLD, SAMPLE, (normal) COUPLER (red)	Emerson-Johnson Mouser: 530-108-0902-1 (red) or Thonk
2	Banana Jacks	2x IN, (“hot”) COUPLER (black)	Emerson-Johnson Thonk / Mouser: 530-108-0903-1 (black)
4	Banana Jacks	2x CV, 2x OUT (blue or white)	Emerson-Johnson Thonk / Mouser: 530-108-0910-1 (blue), 530-108-0901-1 (white)
4	Potentionmeter 50k	linear (B50K)	Alpha 9mm vertical pcb mount available from Thonk, Tayda
1	MTA-156		MTA-156 power connector

Building

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

1. Mount the Banana jacks, the LED lens and the switch onto the front panel. If you use retention rings for the LED lenses, attach the ring to the lens.

2. 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.

3. 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. You can even screw the pots to the panel to make sure of that, but you have to unscrew them again later (for Step 5).

4. 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). DO NOT SOLDER THE BANANA JACKS YET!

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

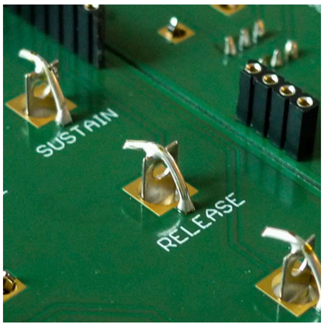
6. Main pcb and component pcb are to be connected through precision DIP socket and pins. It is recommended to use the pins on the main pcb (facing down, soldered from above) and the pin sockets on the component pcb (standing up, soldered from the front panel side). Break or cut off the pieces you need 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.

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

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

9. Make sure everything is in place.

10. Solder the banana jacks in. You can either solder them directly to the surrounding vias (ring round) 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. Attach any screws / spacers if desired and mount the main pcb onto the component pcb.

12. 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

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.

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

Power consumption: <=30mA @ +12V and <=30mA @ -12V

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