Analogsyntheszer & Serge Modular Synthesizer

Einführung

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Kurze historische Kontextualisierung

1948 Etude aux chemins de fer: Pierre Schaeffer

1954 Studie II: Karlheinz Stockhausen

1957 Music 1: Max Mathews

Bell Telephone Laboratories: Max Mathews schreibt das erste Programm für Computer-Klangsynthese. Das Programm hieß Music 1 und im selben Jahr ist auch das erste Computermusik-Stück von Newman Gutman entstanden: The Silver Scale (1957, Dauer: 20 Sek.). Das Stück wurde mit einer Sample-Rate von 10kHz und einer Bitrate von 12 Bit erzeugt.

Kurze historische Kontextualisierung

1961 Daisy Bell: John Kelly, Carol Lockbaum and Max Mathews

1967 John Chowning

Music 5 war das Programm, mit dem John Chowning ca. 1967 die FM-Synthese erfunden hat - eine Technik, die später im Jahr 1983 von Yamaha für den DX7 Synthesizer verwendet wurde.

Kurze historische Kontextualisierung

1962 Buchla and Associates

1967 Silver apples of the Moon: Morton Subotnick

1967 Erster Moog-Synthesizer

- Mort Garson, The Zodiac Cosmic Sounds (1967)

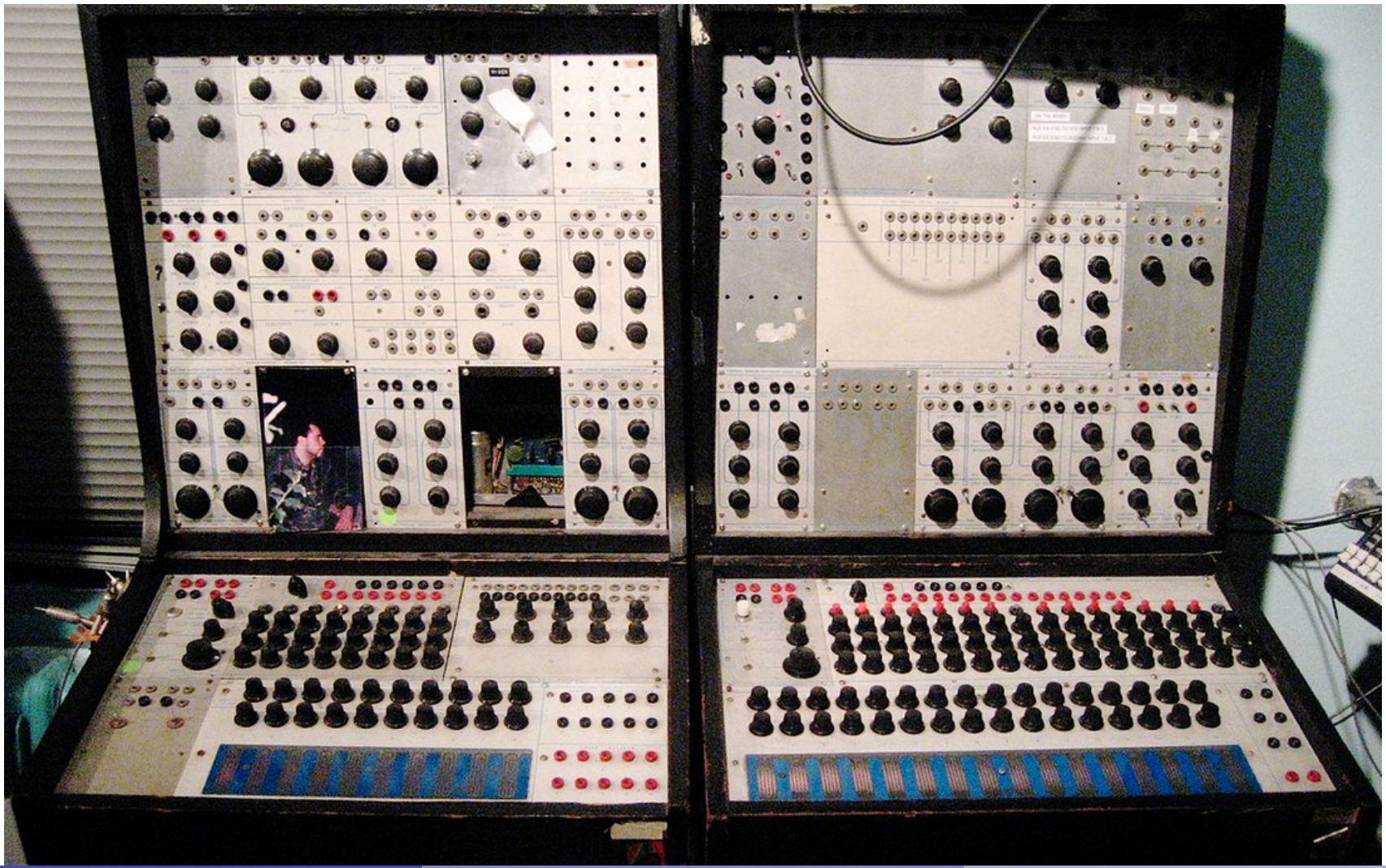
1973 Serge Modular

- Bob Ostertag plays the Serge 1978-1983

Modular Synthesizer

The first modular synthesizer was developed by German engineer Harald Bode in the late 1950s.

- Buchla 100 New York University



Control Voltage / Steuerspannung

- Klanggenerator WDR-Studio Köln um 1950

VC

- A voltage-controlled device is one whose parameters can be controlled by changing voltage.
- The concept of CV is fairly standard on analog synthesizers, but not its implementation. For pitch control via CV, there are two prominent implementations:
- CV control of parameters other than pitch usually follows the same pattern of minimum to maximum voltage. For example, Moog modular synthesizers use the 0 V - 5 V control voltage for all other parameters.

VC

- Volts per octave was popularized by Bob Moog in the 1960s, and was widely adopted for control interfacing. One volt represents one octave, so the pitch produced by a voltage of 3 V is one octave lower than that produced by a voltage of 4 V. Each 1 V octave can be divided linearly into 12 semi-tones.

	A1	A2	A3	B3	C4	D4	E4	A4	A5
Volts/octave (V)	1.000	2.000	3.000	3.167	3.250	3.417	3.583	4.000	5.000

- The voltages are linked by the formula

$$V_{Hz} = 2^{V_{oct}-1}$$

- Serge Modular uses 0 - 5 V as control voltage. In the series 73-75 there is no V/Oct.

Serge Modular

- Serge Tcherepnin (1941) is an American composer, musician and electronic mastermind of Russian and Chinese descent who grew up in France and in Chicago
- Serge Modular Music Systems was officially founded in 1973

Warum "Modular" heute?

When I showed up in New York City in 1978 with my newly assembled Serge and my friends Ned Rothenberg and Jim Katzin, I was fortunate to find several other like-minded new arrivals who eventually became known as the "New York downtown improvisors" (John Zorn, Eugene Chadbourne, Fred Frith, Polly Bradfield, Toshinori Kondo, Leslie Dalaba, Wayne Horvitz, and others). This gave me the unique opportunity to hone my improvising skills on the Serge in a collective context in gig after gig at a variety of off-the-map venues: a karate studio, the basement of a West Village pet store, CBGBs, Zorn's girlfriend's apartment (shows sold out at 5 audience members), etc.

I was not the first person to perform concerts on a modular analog synthesizer, but I may have been the first to fully devote myself to improvisation with a synth as my main instrument, and to play not with other synthesizer players but with saxophonists, guitarists, violinists and so on. It was not obvious how to go about doing that. The Serge had no keyboard but rather a collection of knobs and buttons with an overlay of tangled wires. Everything about these instruments suggested a music of slowly evolving patterns. But I wanted to go toe-to-toe with my friends in the angular, turn-on-a-dime improvisational style we were developing. Eventually I settled on an approach that involved a contact mic between my teeth that I could bite to generate triggers, a radio as a source of uncertainty, and a lot of patch cords hung around my neck for patching on the fly.

You could never get back anything you made on an analog synth. The dials were not precise enough, the configuration of patch cords too complex. Rule #1 of working with these instruments was to always have a tape recorder handy and to hit the record button if you had something you liked, because you would never get it again.

Before the 1980s were through, digital synthesizers had completely displaced the analog instruments. The digital systems were smaller, lighter, less expensive, and had presets so you could return to configurations you liked. MIDI made all the

Figure: Aus dem Booklet der CD: Bob Ostertag plays the Serge (1978-1983), 2014

Warum "Modular" heute?

digital synths compatible with each other. When digital systems came around, everyone quickly dumped their old analog systems (well, by "everyone" I mean the tiny handful of people who were seriously into the modular analog synths).

And yet, today there is a new generation of synthesizer players (many many times larger that my cohort) who look back longingly at the days of the modular analog instruments. They feel boxed in by the predictability of computers, so the unstable nature of the old systems is seen as a plus instead of a minus. The mouse and the trackpad feel so detached and generic that the old hardware knobs and buttons seem like a wonderful alternative. (That one surely comes as a total surprise to everyone from my generation: that decades later, with accelerometers and gyroscopes and Wii's and touch screens and much much more, knobs and buttons would be what people want!) And then there is that "analog sound" that is so fetishized in today.

Last year I started playing a Buchla 200e (a new modular synthesizer based on Don Buchla's instruments of the 1960s and 1970s) and discovered that in some ways I too prefer that instrument to the laptop-based instruments I have used for many years now, but this has little to do with knobs, buttons, patch cords, or the "analog sound."

First, old synthesizers were "instruments" in the sense that they make sound from the moment you turn them on to the moment you turn them off. You spend very little time fussing with operating systems, drivers, upgrades, version compatibility issues, crashes, and so on. You are using your ears almost the entire time you are in front of it.

Second, though the computer promises infinite software reconfigurability with just one piece of hardware, there is something liberating about playing a synthesizer that just is what it is. You cannot write more code to add another feature. You have to make use of the tools the inventor gave you. Again, what this ultimately leads to is more time using your ears. In other words, more music.

Warum "Modular" heute?

Most importantly, the way one has to think about music with a modular analog synth is very particular. You cannot do anything that could ever be represented by symbols, so "scores" are out of the question. They have nothing to do with the "timelines" of today's music software. They are definitely algorithmic, but they are not precise enough to involve mathematical calculation. And "patching" one of these things is emphatically not "programming." It involves a completely different sort of mind set. The closest I can come to describing it is that one has to think not in terms of math but of geometry: the modules generate shapes, and everything hangs on how you cause the shapes to overlap and intersect. For such highly engineered technology, the experience is surprisingly intuitive and spontaneous.

One final note about reverb: lots of the synthesizer in this recording is drenched in reverb, but not the kind you hear today, when you can buy an amazingly good sounding digital reverb for not much money and dial in anything from a "warm cathedral" to a "tiled bathroom." Nothing even close to that was available. If you were working in a studio, they might have run wires to a mic and speaker in the basement of the building, so that if the building's HVAC machines were not making too much noise you could add reverb by playing your music through the speaker in the cement-walled basement and recording it again by mic. But for playing on stage, your only option for adding reverb was to run your audio signal through some coiled springs. While the springs had the advantage that you could kick them and produce a thunderous explosion, they were hardly high fidelity. I would be so curious to hear the synth parts on this release with all the spring reverb stripped away, but alas that is not possible. And many younger players insist they are enthralled with the cheezy old reverb as much as with the old synthesizer itself. Who knew?

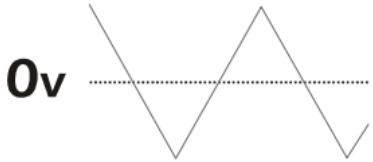
Serge Modular - Offiziele Hersteller

- CGS / Elby (3U)
- Random&Source (3U + 4U)
- Loudest Warning (4U)
- STS - Sound Transform Systems (4U) - aktuell nicht aktiv
- 73-75 (4U)
- Low-Gain Electronics (4U)

3U- oder 4U- oder 5U-Module

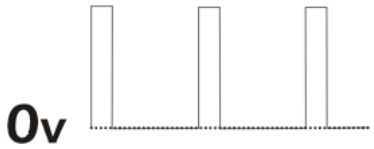
- 3U - Eurorackformat (Miniklinkensteckr)
- 4U - Buchla, Serge (Bananastecker)
- 5U - Moog, Synthwerk, Rob Hordjik (Klinkenstecker)

Serge-Farbsystem

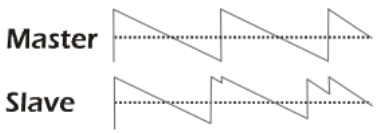


Black—Bi-polar AC-coupled voltages and signal (voltages that may swing between positive and negative, as in an audio signal)

Blue—Unipolar DC-coupled voltages (usually positive-only control voltages)

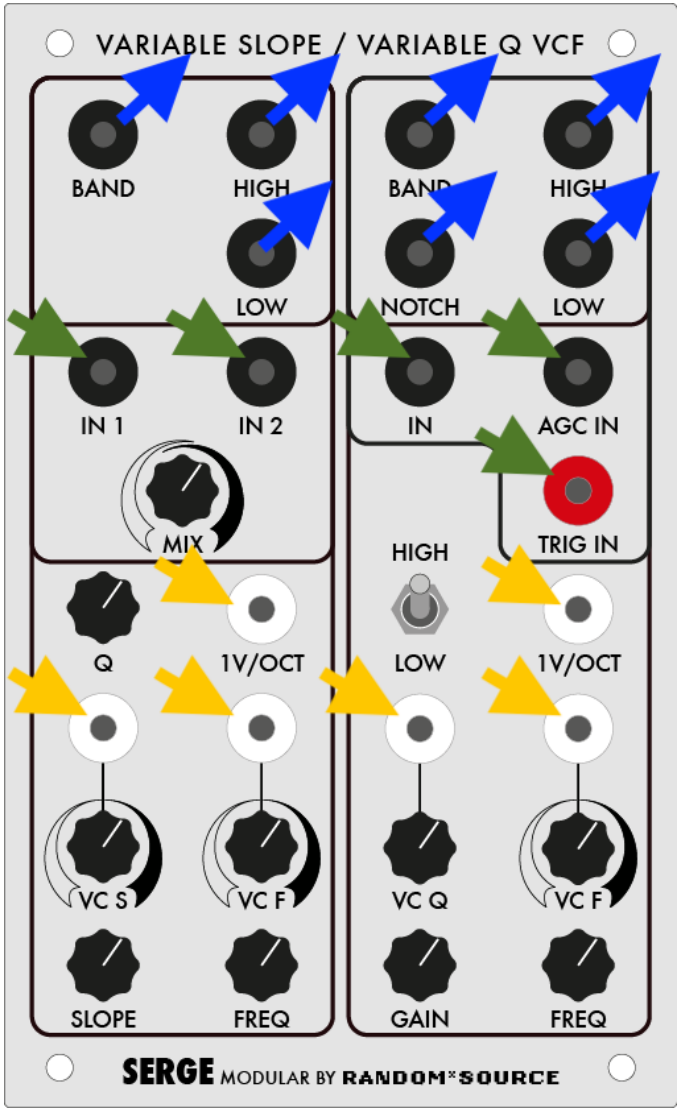


Red—Logic (triggers, gates, and other positive-going pulses)

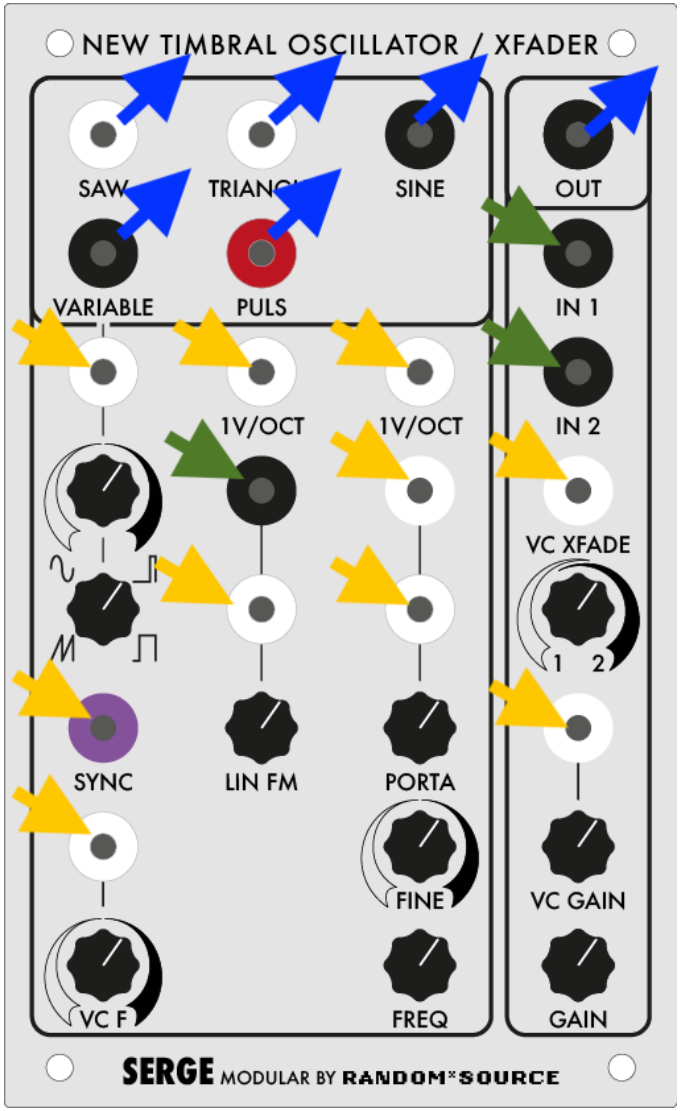


Violet—Synchronization, currently found only on voltage-controlled oscillators so that one master oscillator may “retrigger’ the waveforms of slave oscillators and help eliminate unwanted “beat frequencies.”

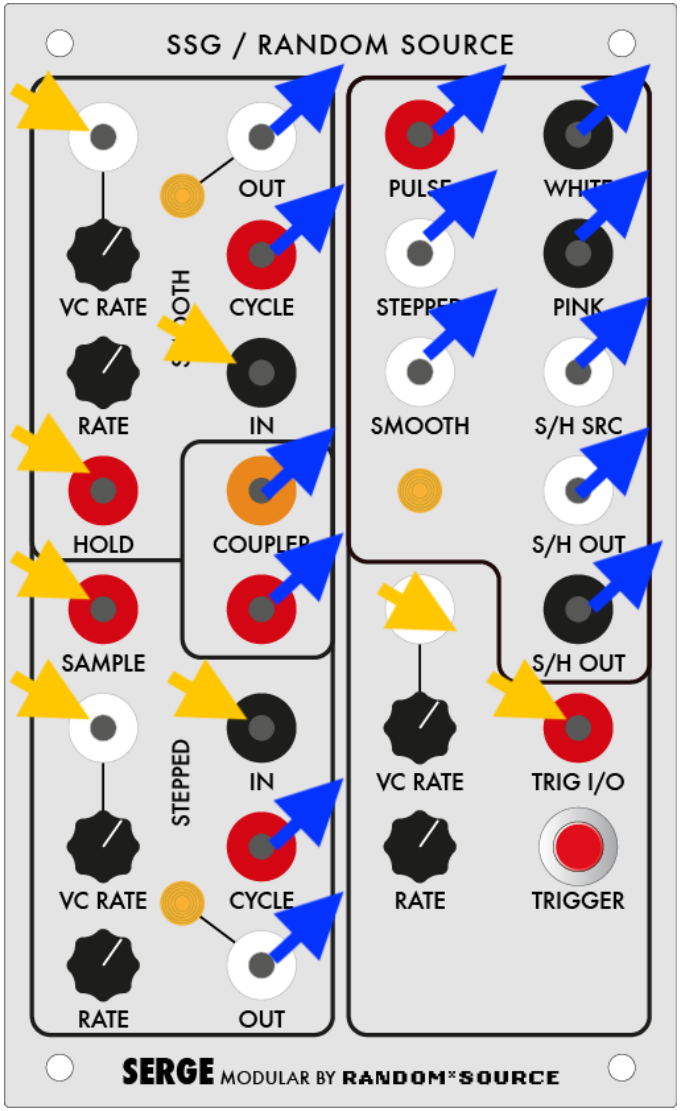
Eingänge und Ausgänge



Eingänge und Ausgänge



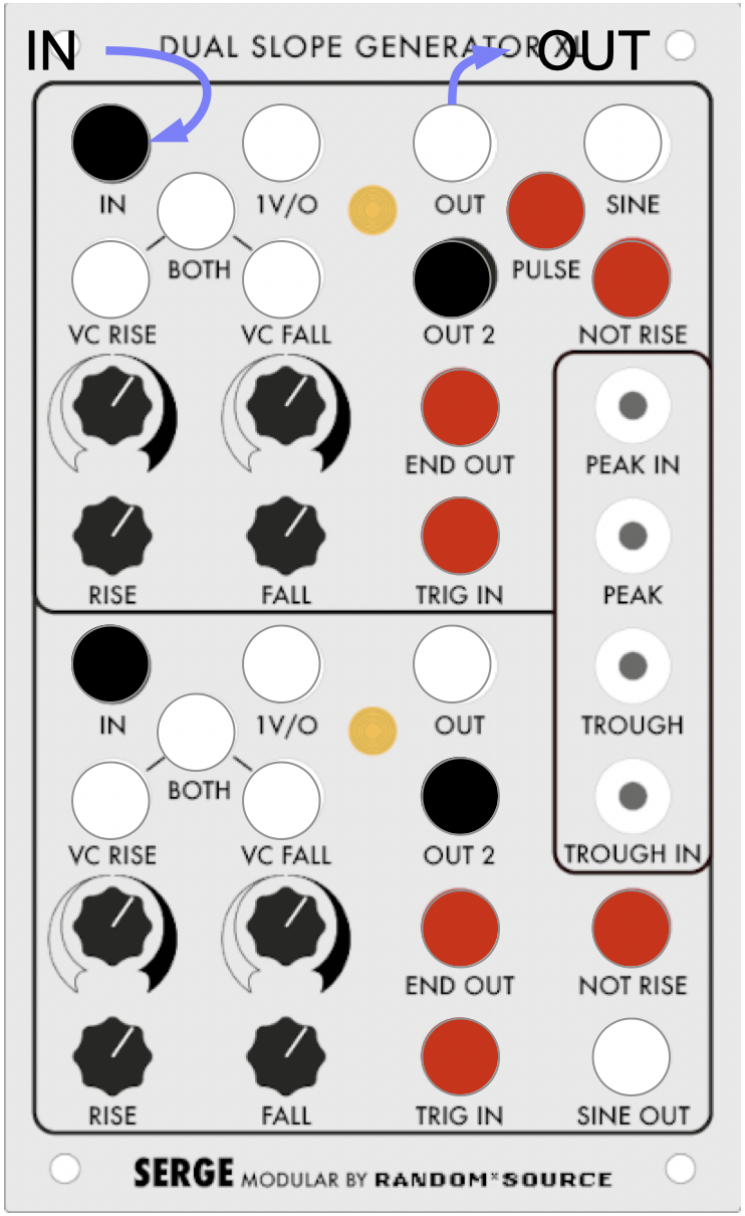
Eingänge und Ausgänge



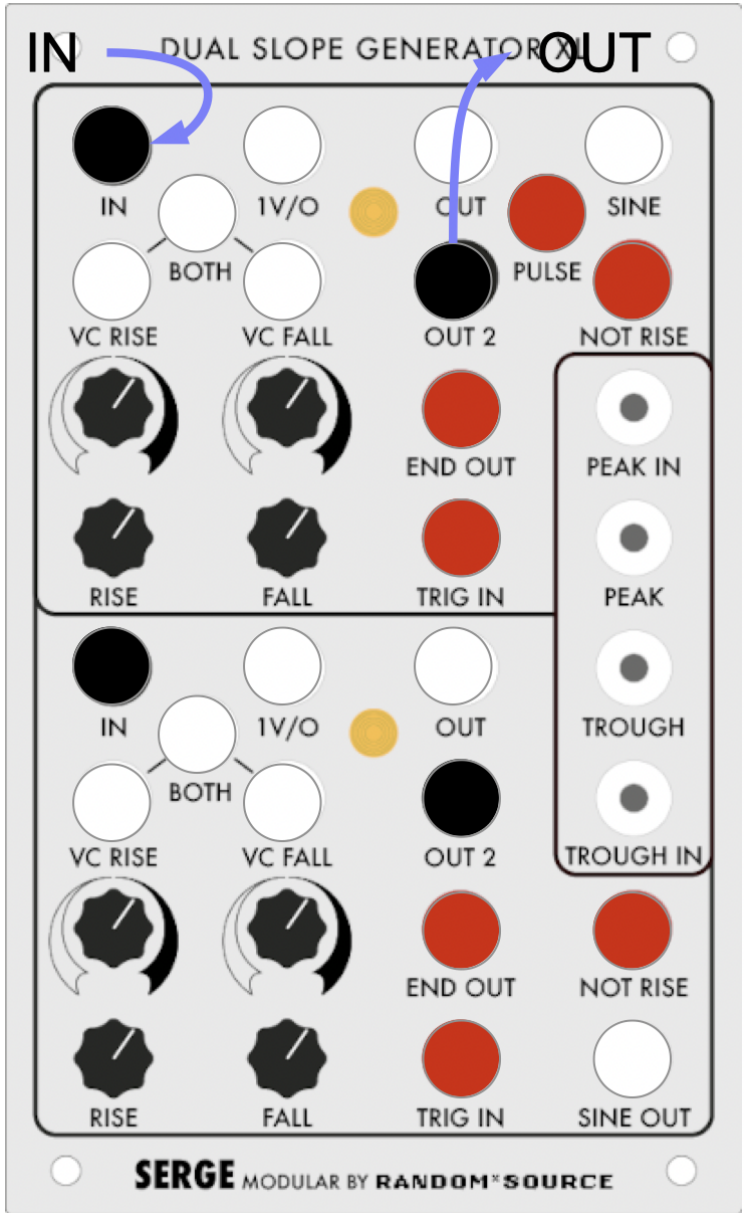
DUSG - Dual Universal Slope Generator

- Patch Progamming

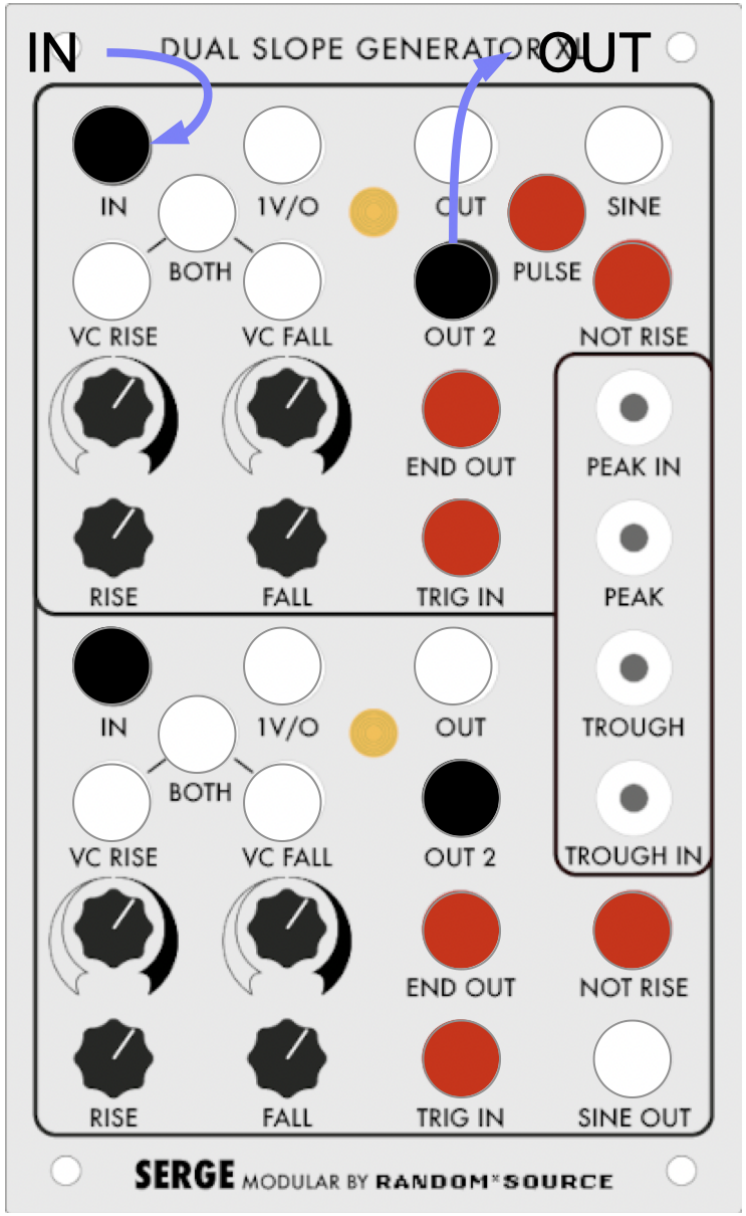
Slew / Portamento



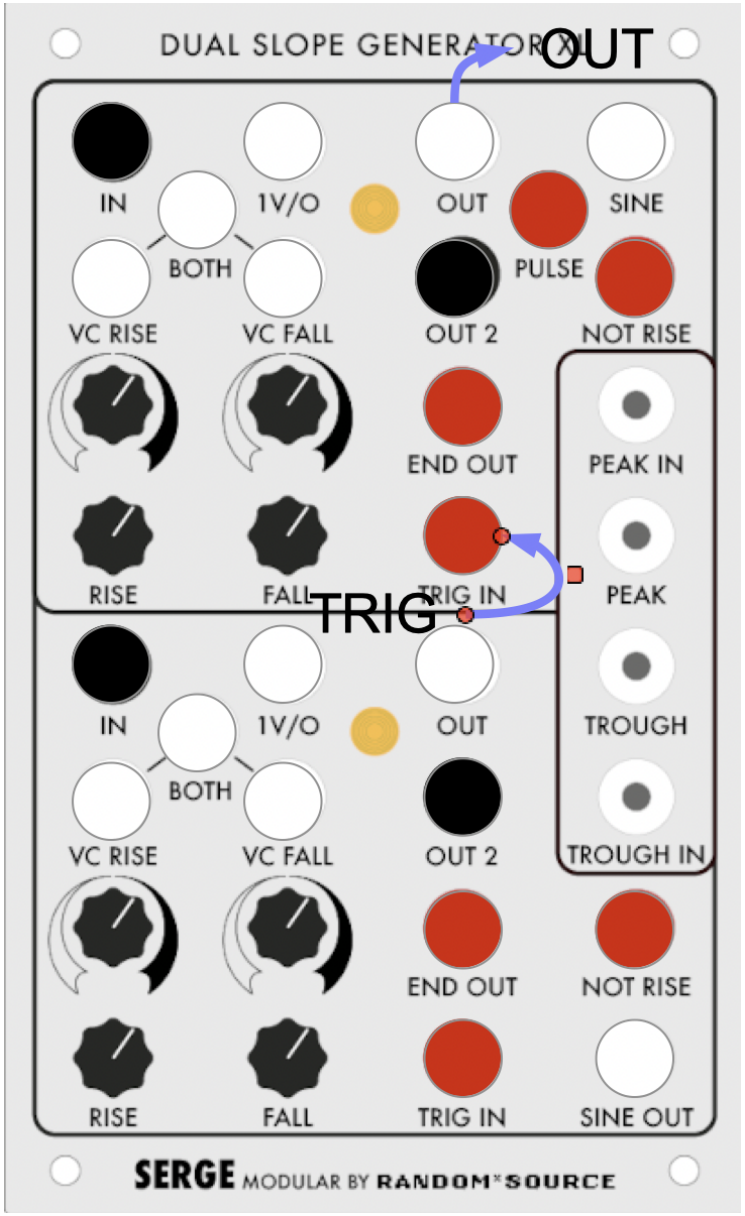
Filter (LPF)


IN
DUAL SLOPE GENERATOR
OUT
IN
1V/O
OUT
SINE
BOTH
PULSE
VC RISE
VC FALL
OUT 2
NOT RISE
END OUT
PEAK IN
RISE
FALL
TRIG IN
PEAK
IN
1V/O
OUT
TROUGH
BOTH
VC RISE
VC FALL
OUT 2
TROUGH IN
END OUT
NOT RISE
RISE
FALL
TRIG IN
SINE OUT
SERGE MODULAR BY RANDOM SOURCE

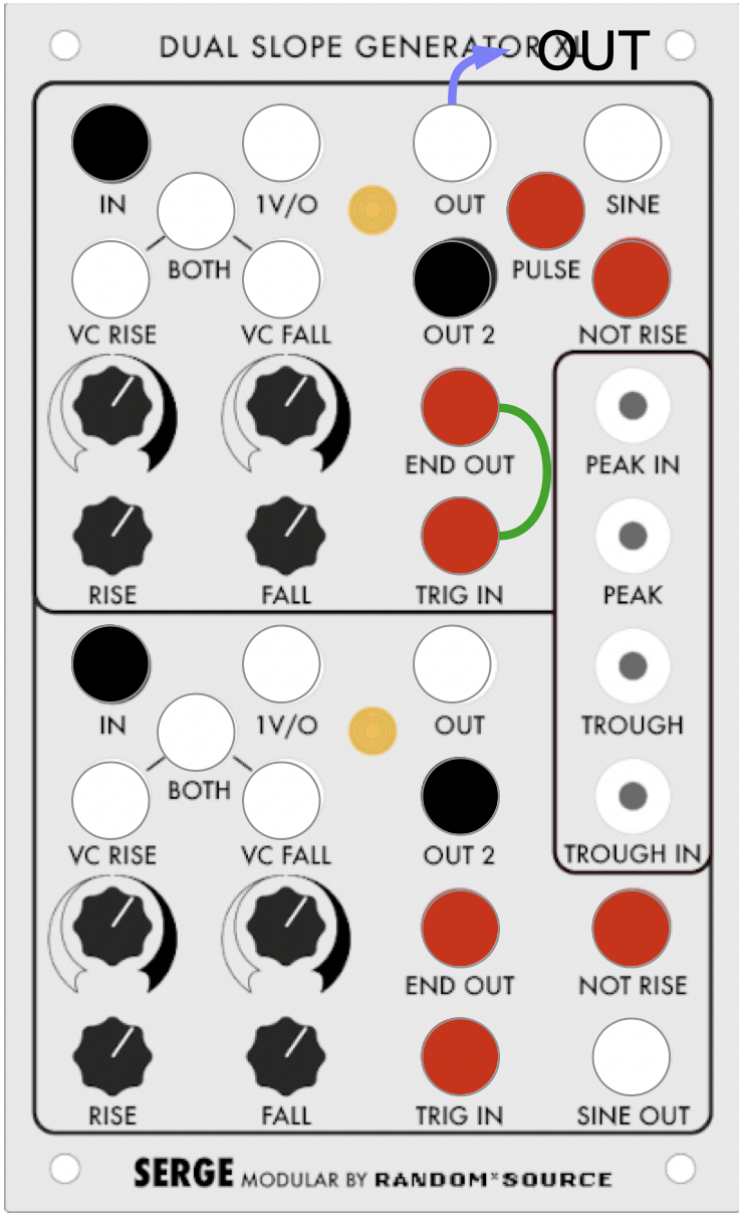
Envelope Follower / Gate (Low Pass Gate)



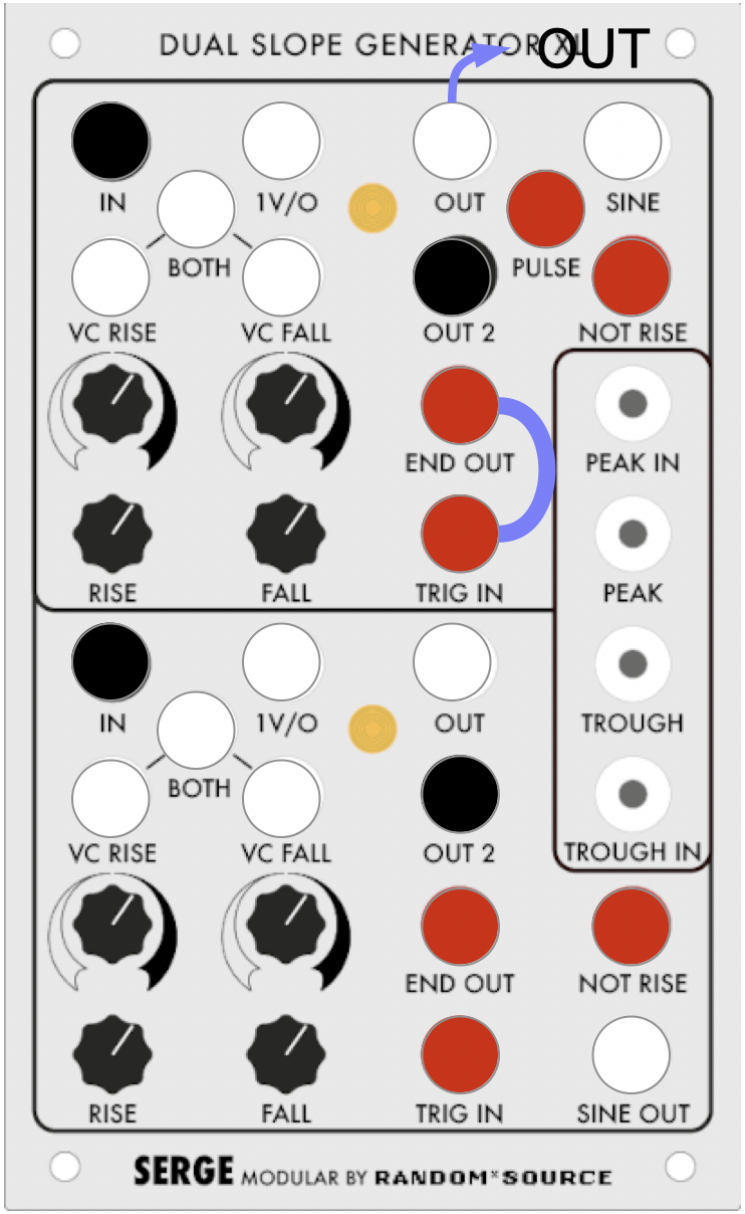
Simple Envelope Generator



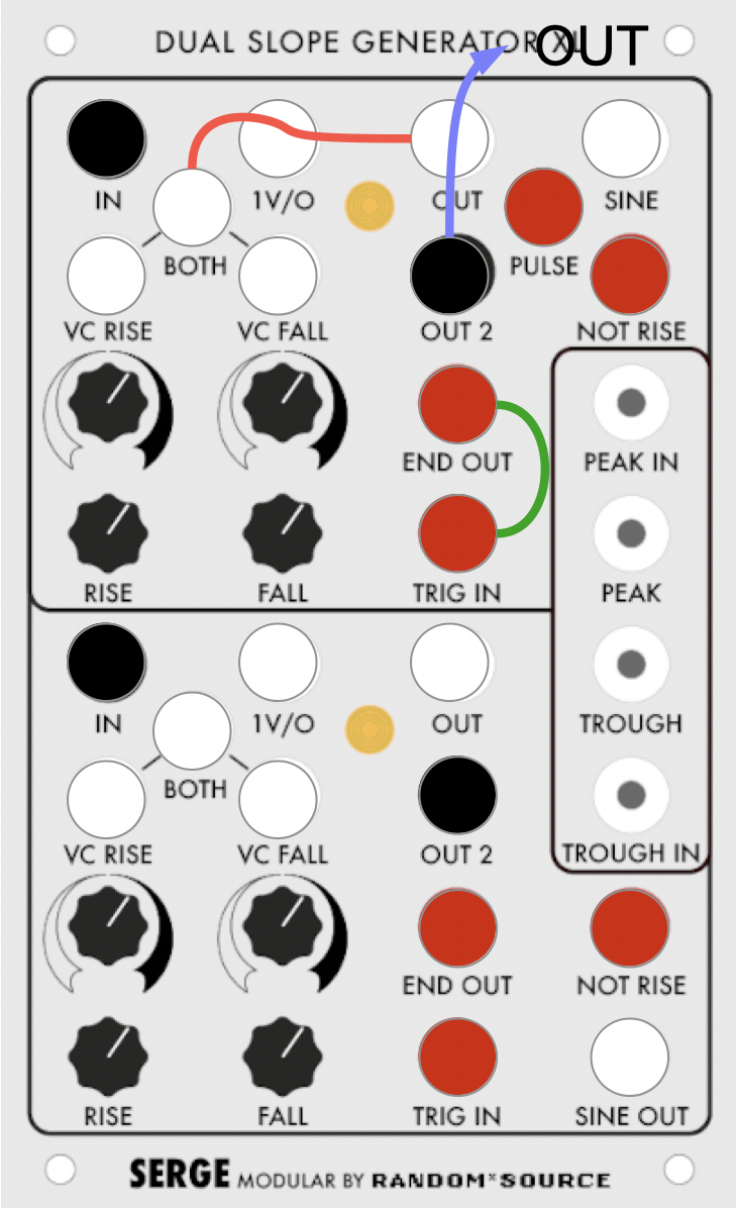
Low Frequency Oscillator - Triangle



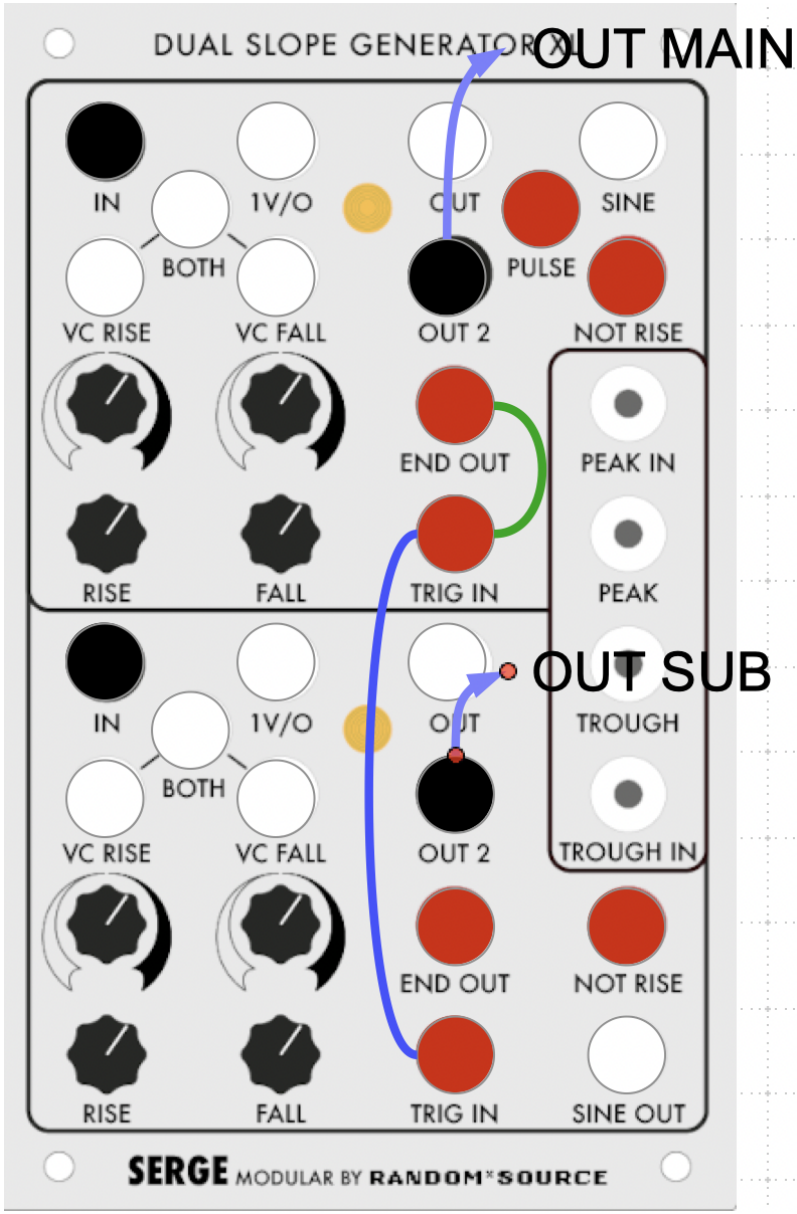
VCO


DUAL SLOPE GENERATOR X
OUT
IN
1V/O
OUT
SINE
BOTH
PULSE
VC RISE
VC FALL
OUT 2
NOT RISE
END OUT
PEAK IN
RISE
FALL
TRIG IN
PEAK
IN
1V/O
OUT
TROUGH
BOTH
VC RISE
VC FALL
OUT 2
TROUGH IN
END OUT
NOT RISE
RISE
FALL
TRIG IN
SINE OUT
SERGE MODULAR BY RANDOM SOURCE

VCO Complex Oscillator



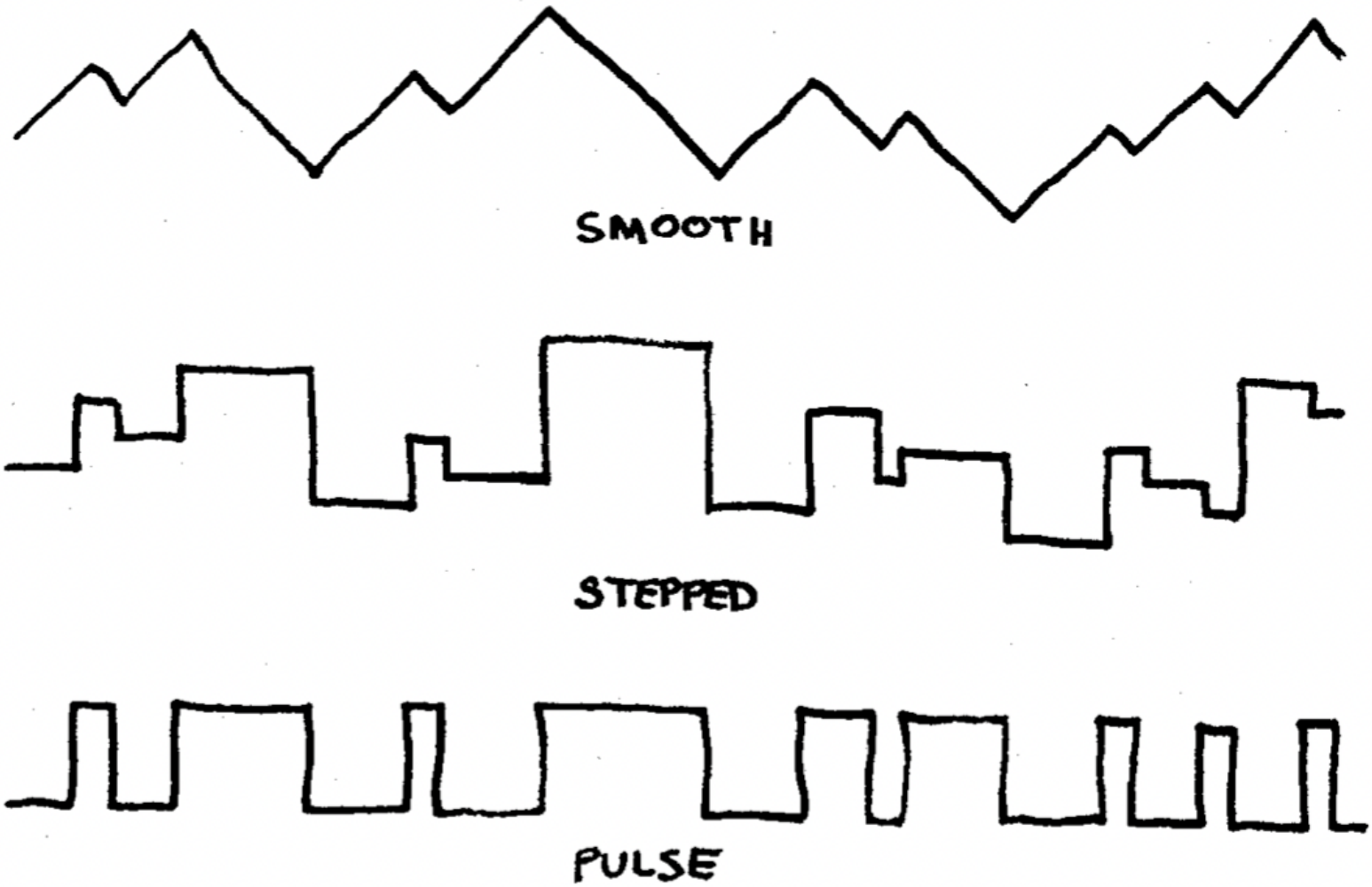
Sub-Harmonic Oscillator / Frequency Divider



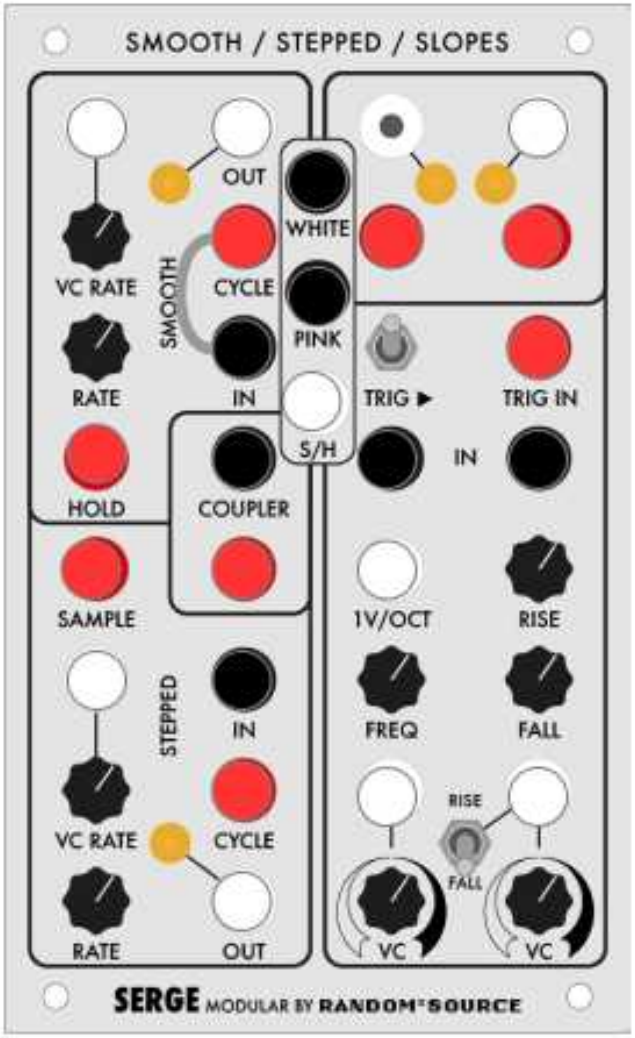
Patch Programming with the SSG

- Smooth and Stepped Generator

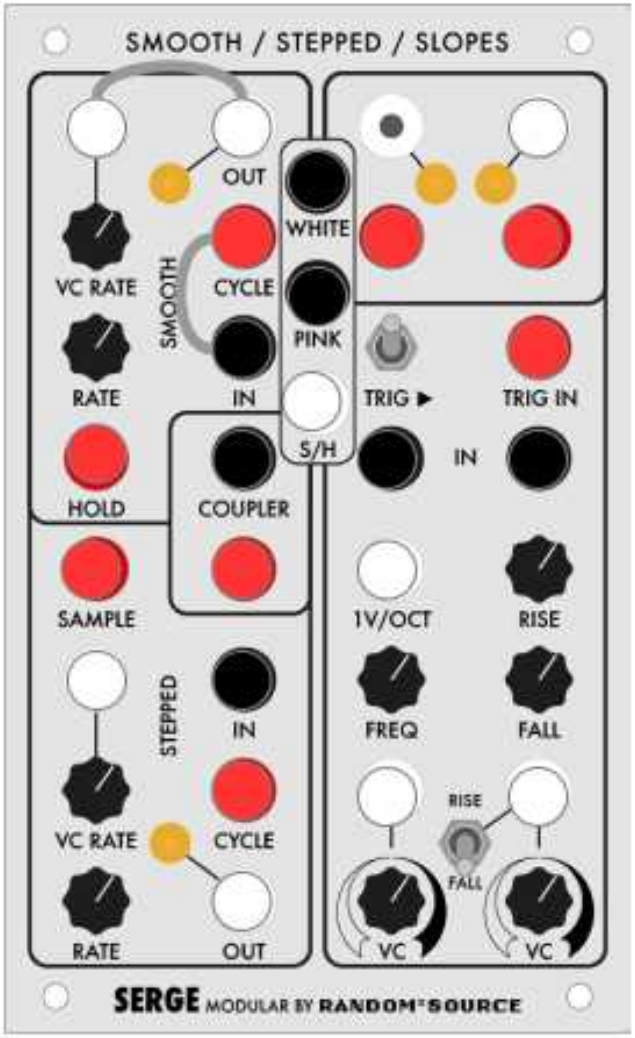
Smooth / Stepped / Pulse



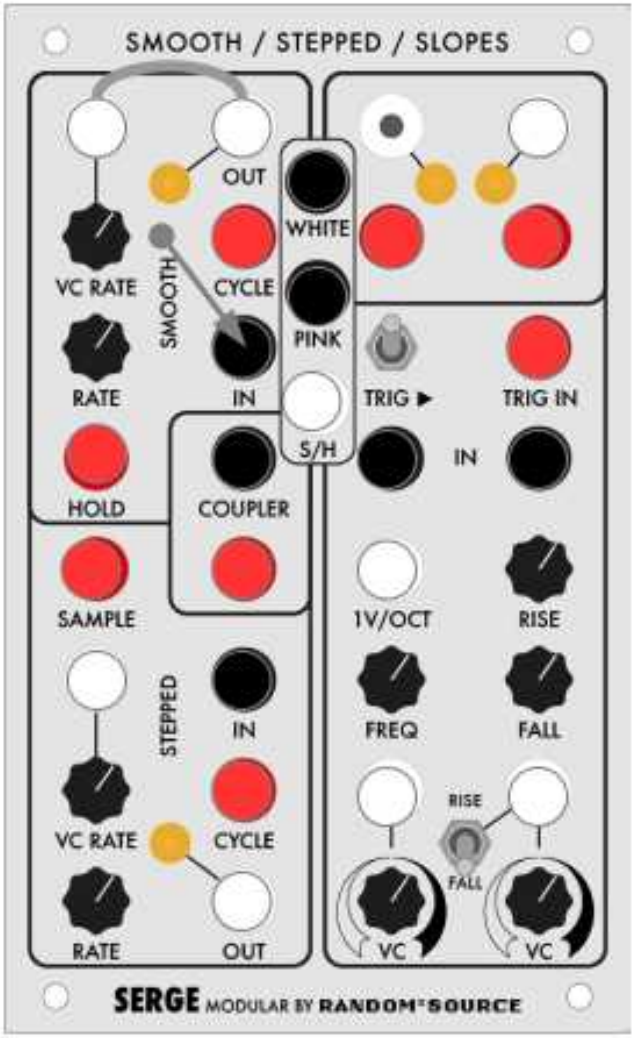
Triangle Oscilator (VCO / LFO)



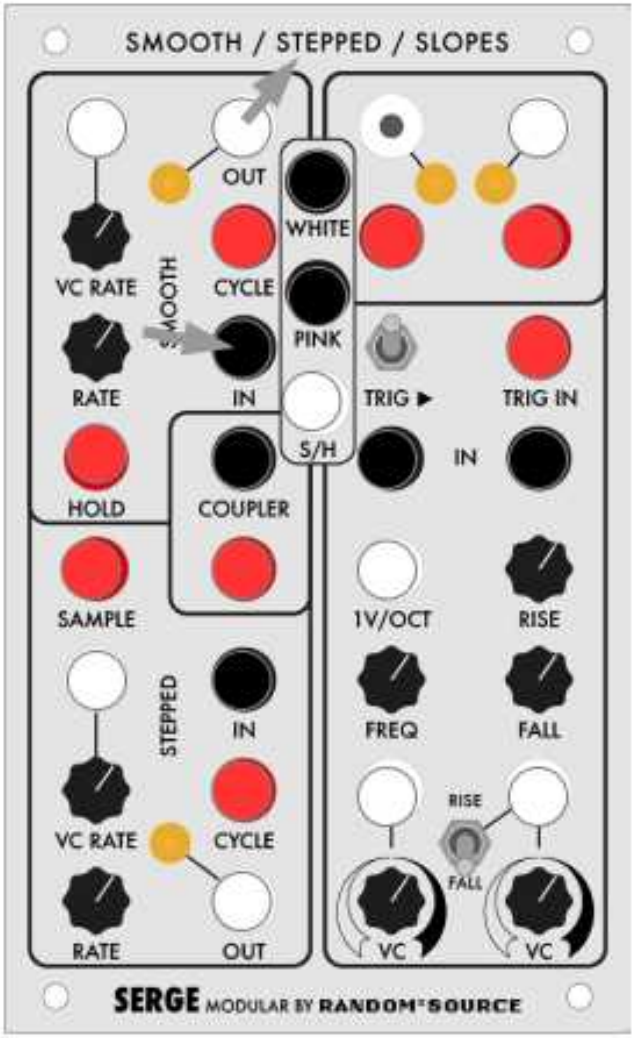
Pointy Oscilator (VOC / LFO)



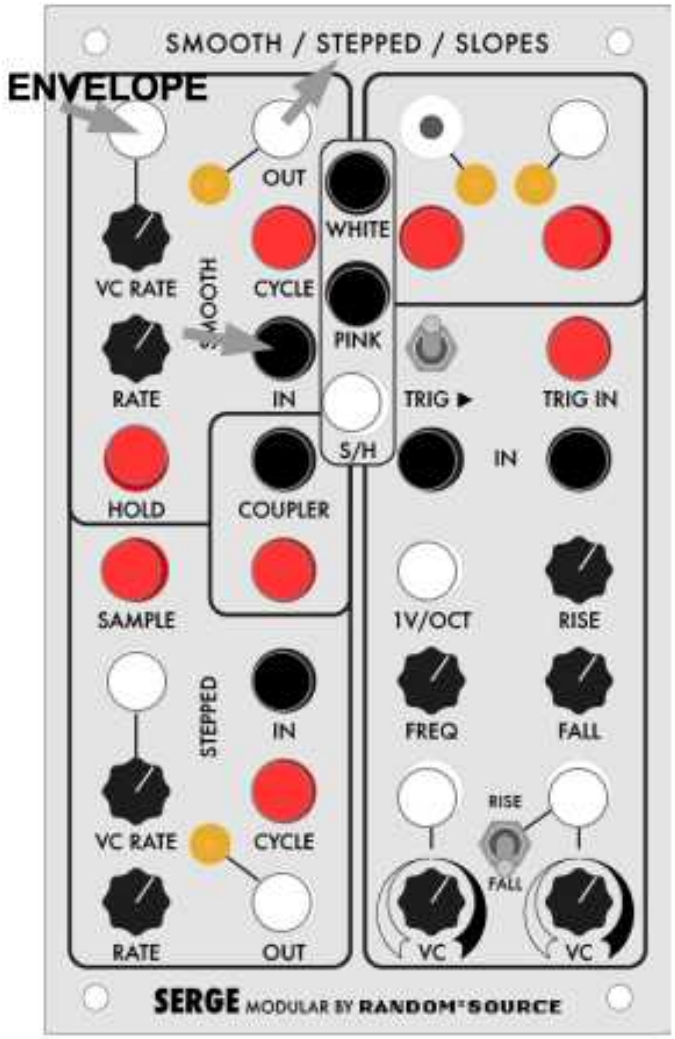
Glide / Smooth (pointy)



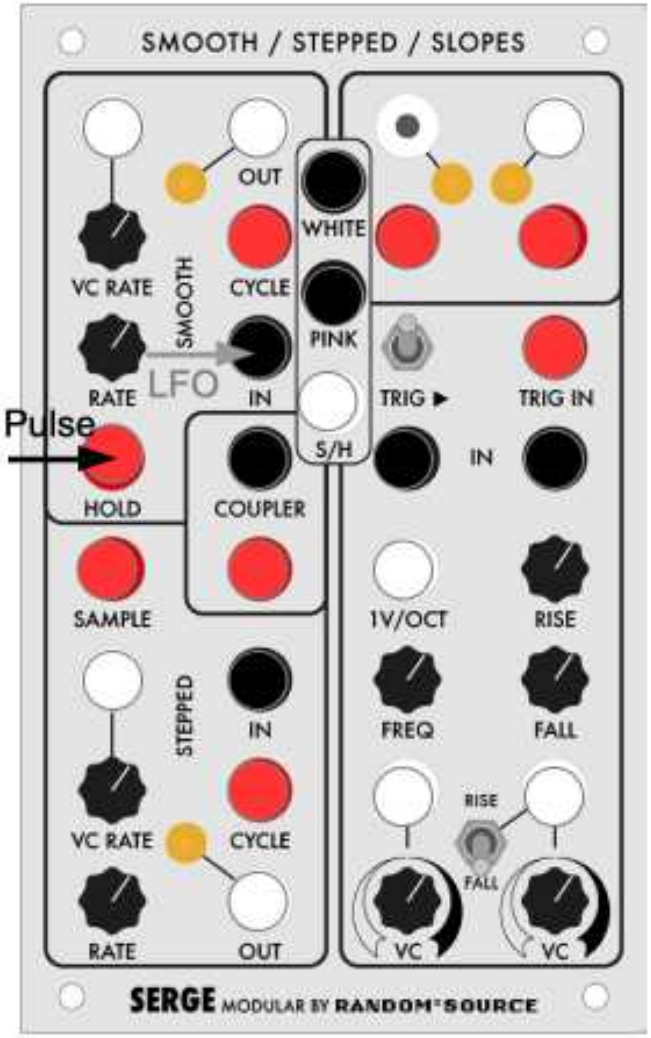
Simple Filter (LPF)



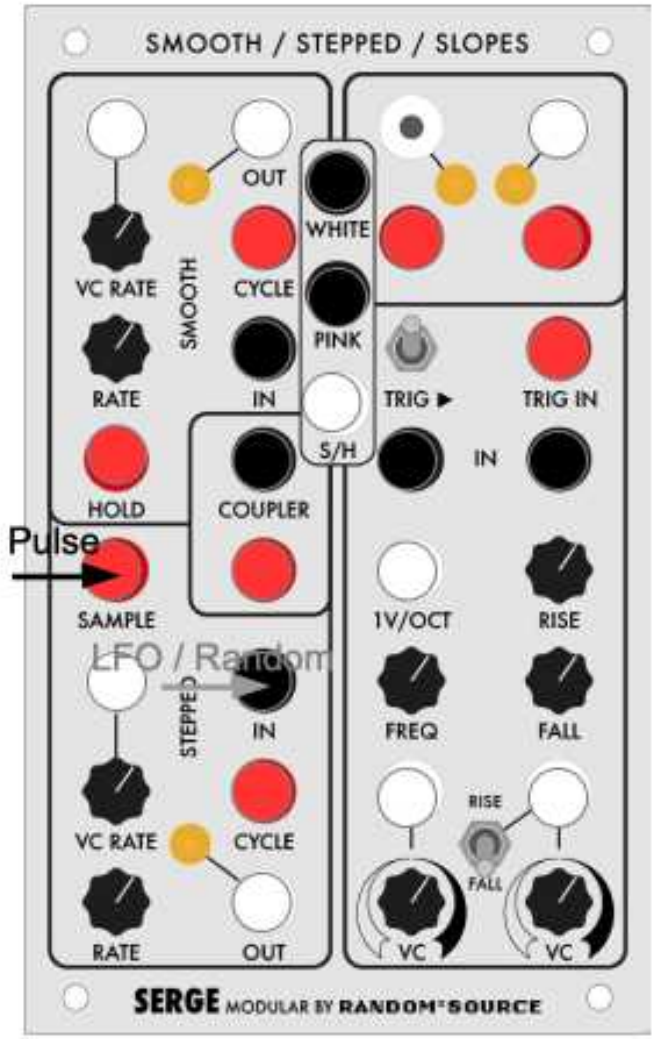
Low Pass Gate



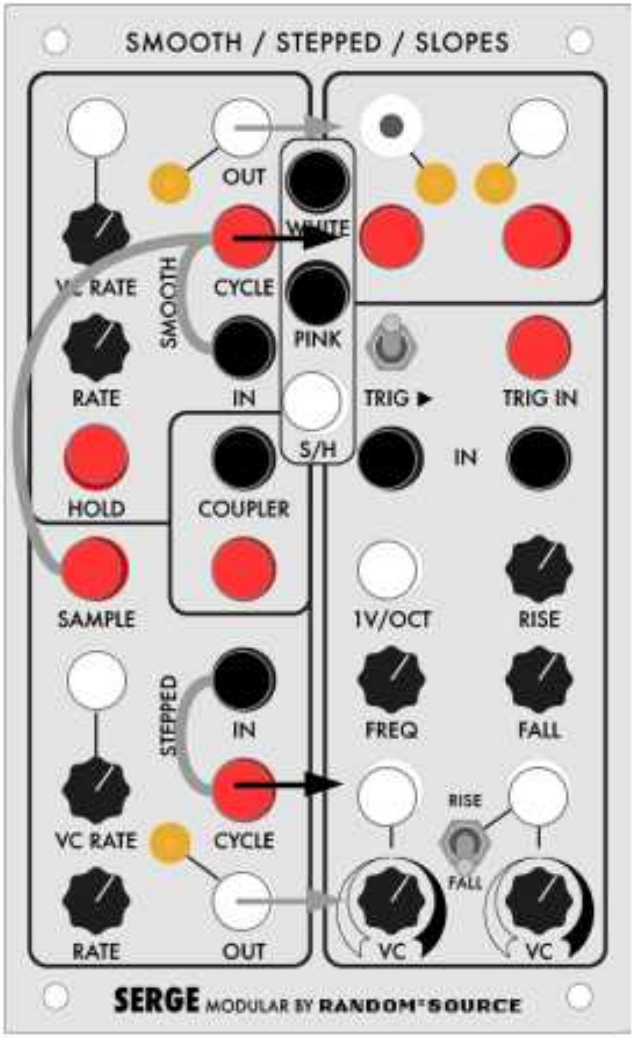
Through and Hold



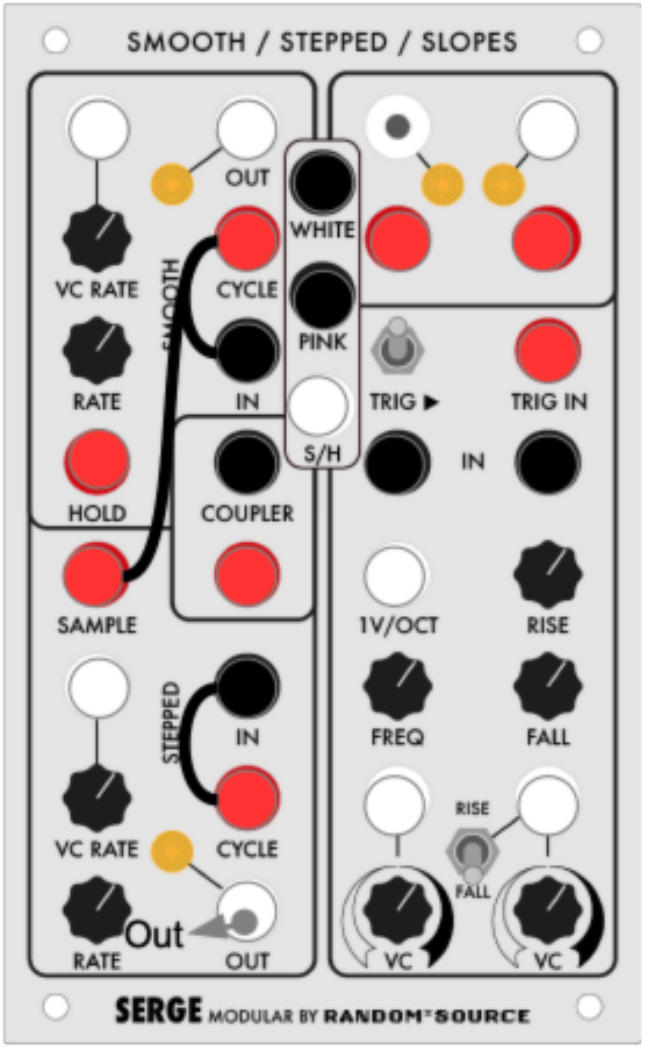
Sample and Hold



Frequency Divider



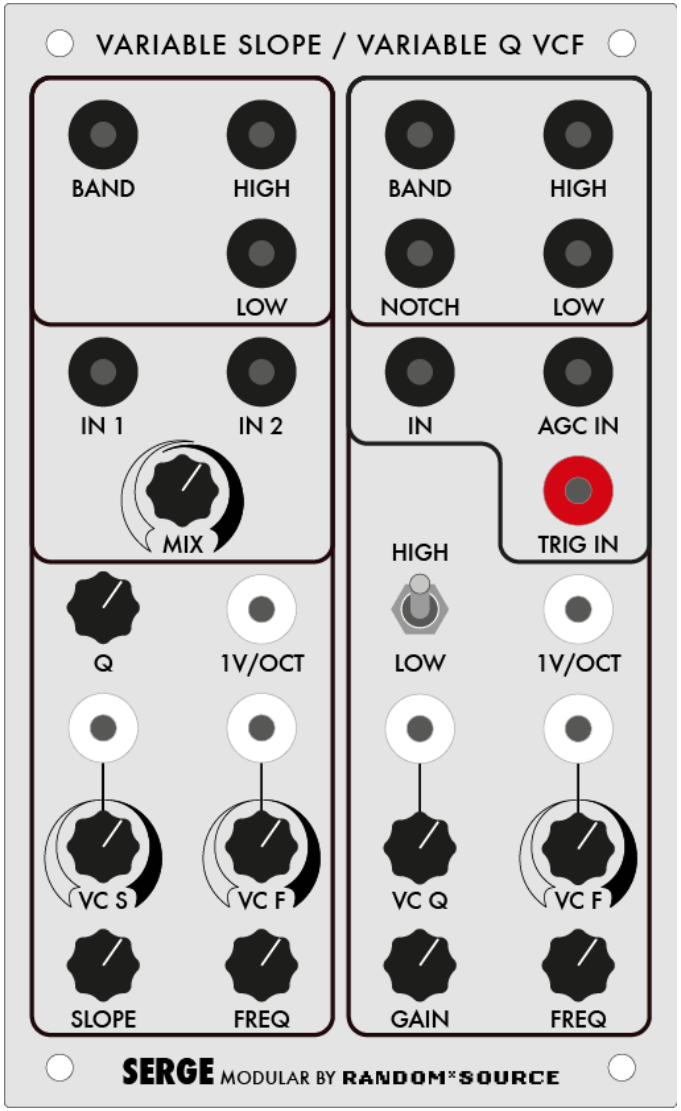
Staircase Generator / Interpolator



The Coupler / Hot

- both SMOOTH and STEPPED in cycle mode
- as Rhythm generator
- as oscillator (Pulse Width Control)

Serge Variable Q VCF



Inputs

- IN - affected by GAIN-Potentiometer
- AGC IN [Auto Gain Control] - not affected by GAIN-Potentiometer
- TRIG IN - Ping-Input for impulses

Outputs

- 12 dB Filter / Octave
- BAND - Band pass
- HIGH - High pass
- LOW - Low pass
- NOTCH - Band reject

Control

- 1V/Oct - for pitched frequencies
- VC F - frequency, range controlled by potentiometer
- VC Q - resonance

Resonant Equalizer

New Timbre Oscillator

TKB

Keyboard

16-Step Sequencer

64-Step Sequencer

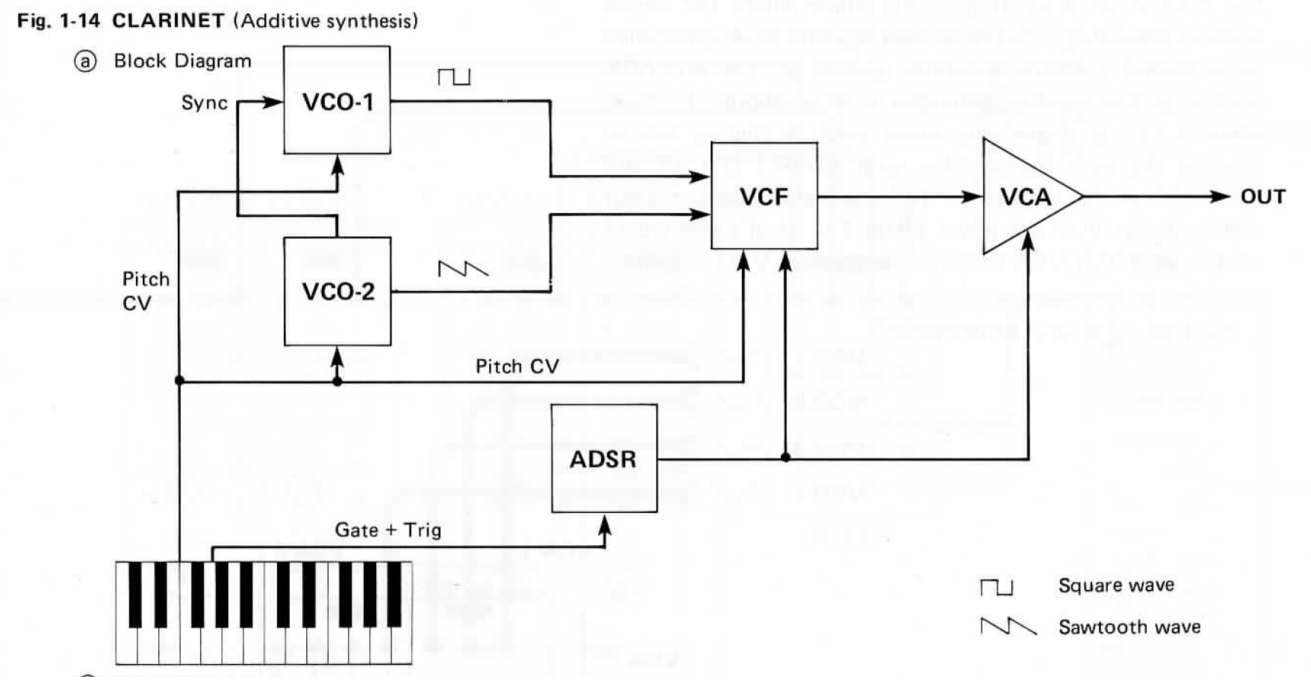
Trigger

Random Source

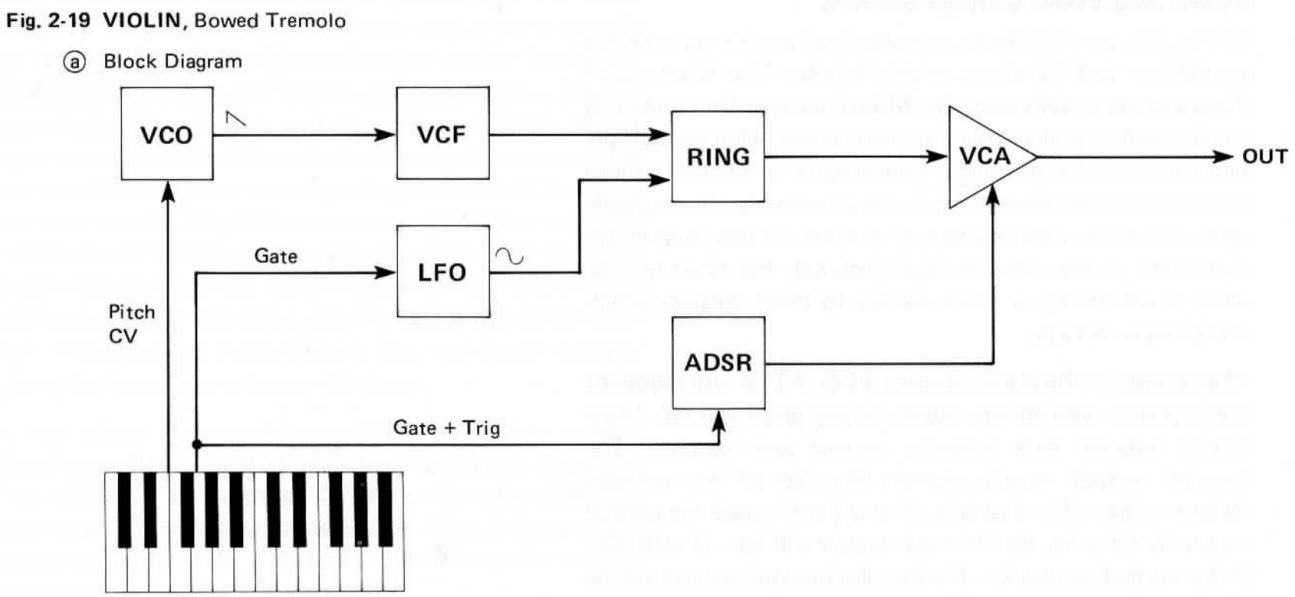
"Infinit" Melody

16- or 64-Step-Waveform

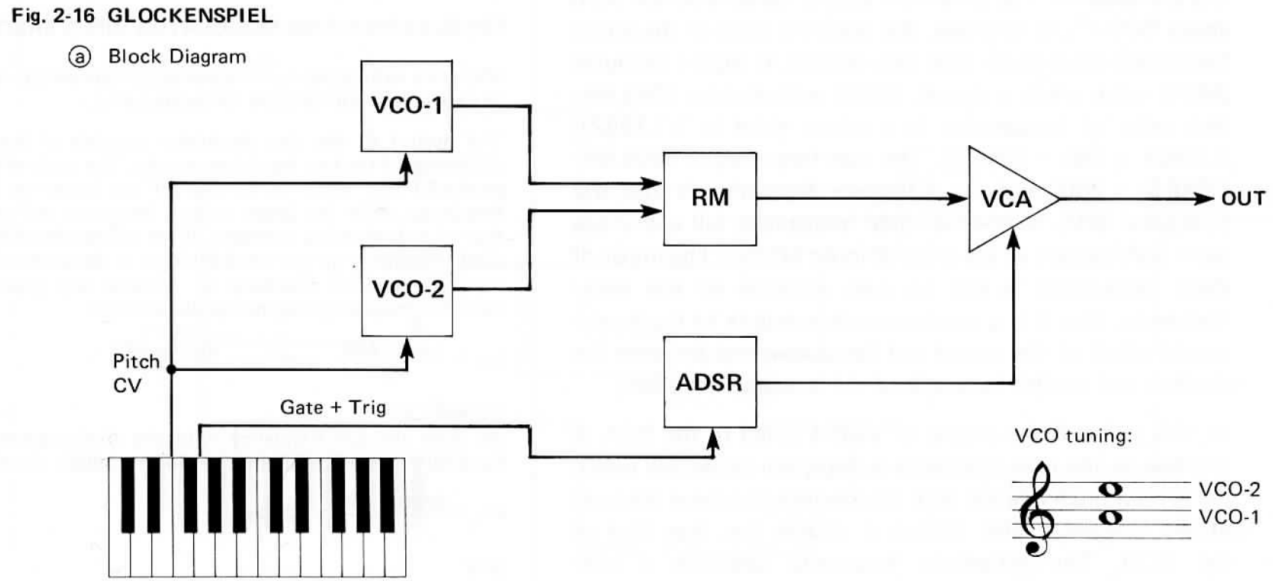
Simple Patches - Clarinet



Simple Patches - Violin

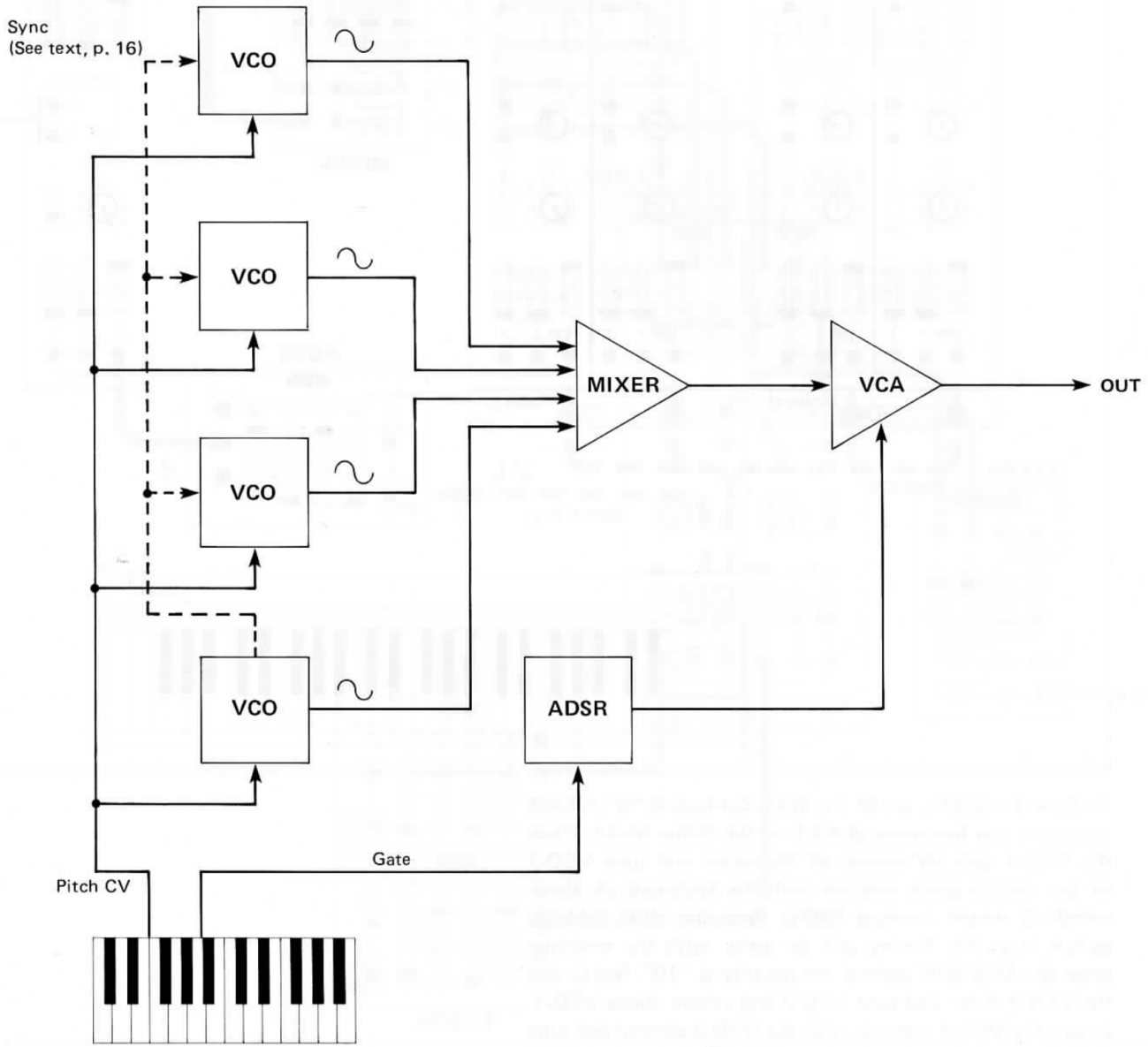


Simple Patches - Glockenspiel

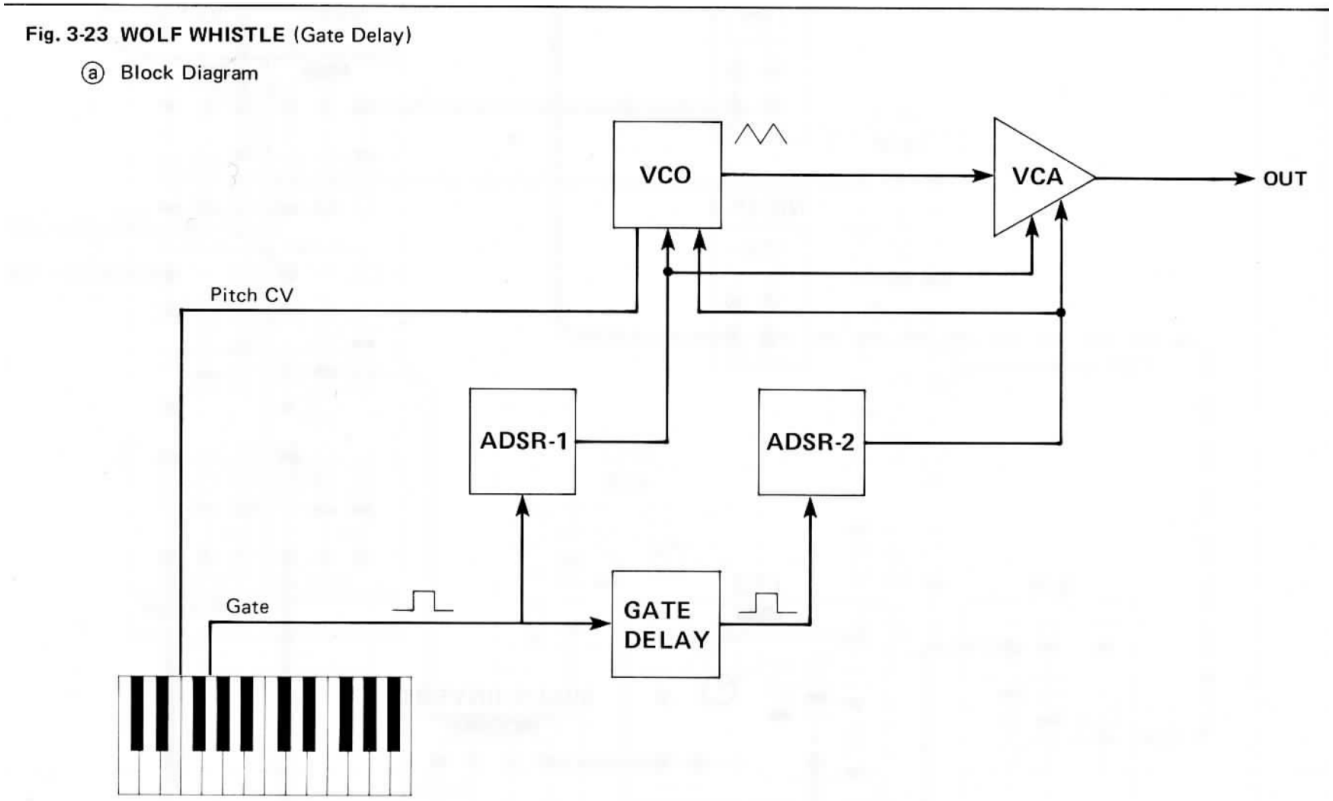


Simple Patches - Additiv Synthesis

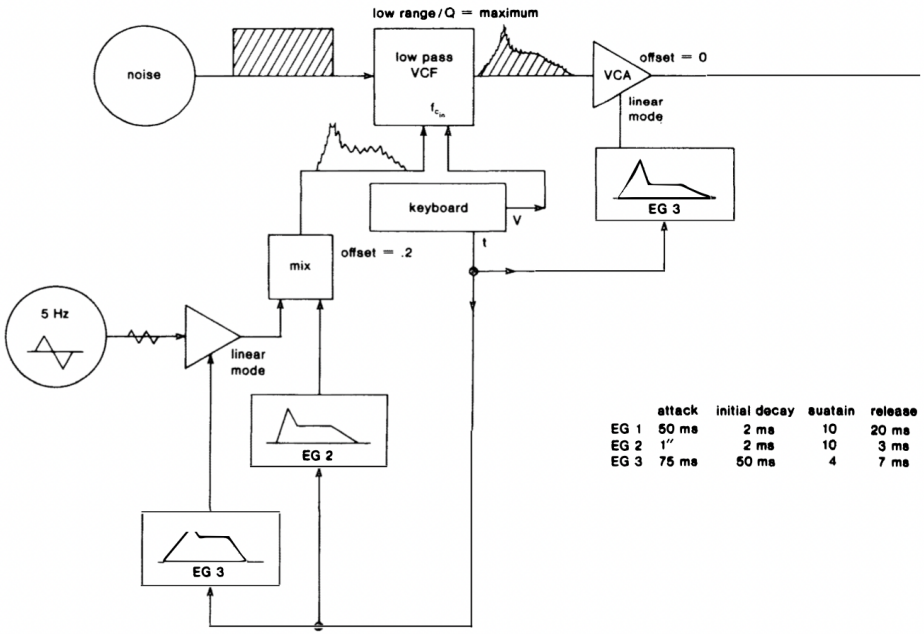
Fig. 1-11 Additive Synthesis Block Diagram



Simple Patches - Wolf



Isao Tomita: Whistle Patch



	attack	initial decay	suatain	release
EG 1	50 ms	2 ms	10	20 ms
EG 2	1″	2 ms	10	3 ms
EG 3	75 ms	50 ms	4	7 ms

Figure 9.45. "Whistle patch" designed by Isao Tomita

Steel Drums Corps

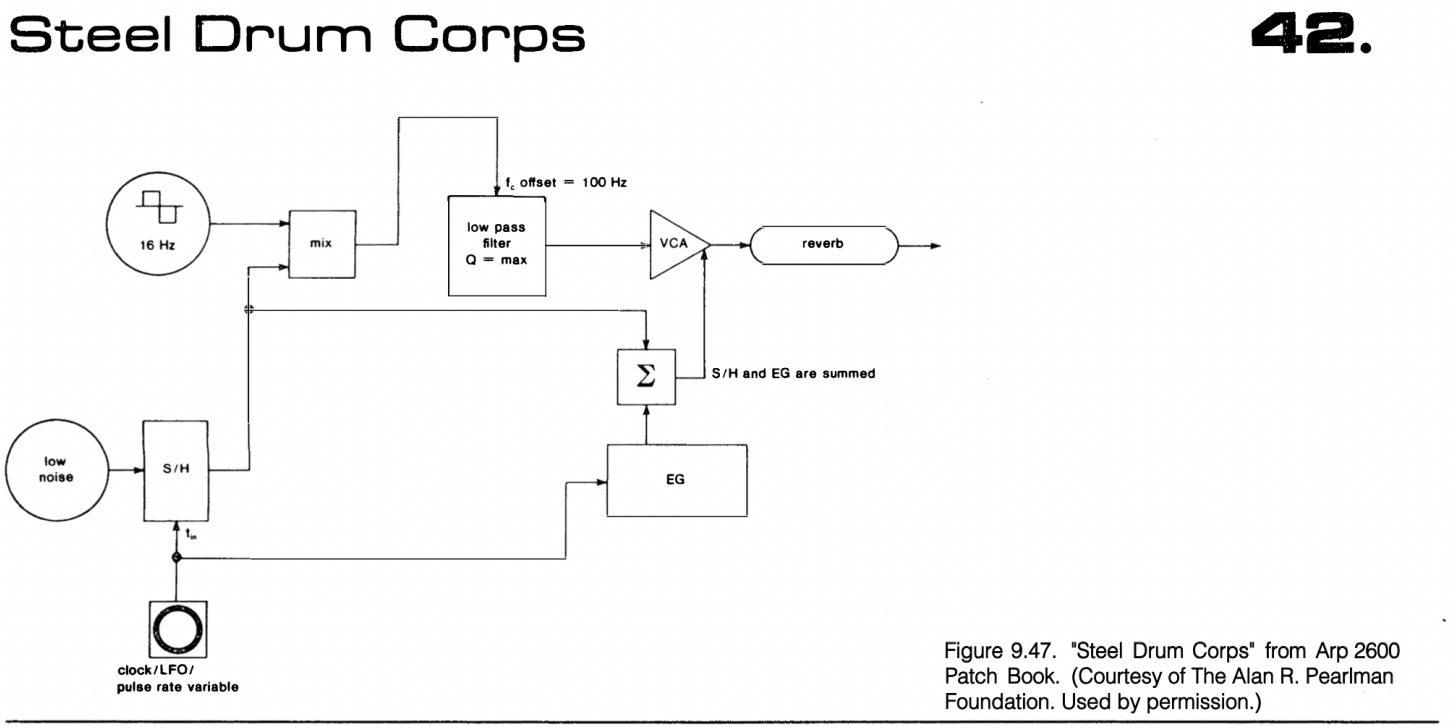


Figure 9.47. "Steel Drum Corps" from Arp 2600 Patch Book. (Courtesy of The Alan R. Pearlman Foundation. Used by permission.)

Gong [Roland Synthesizer]

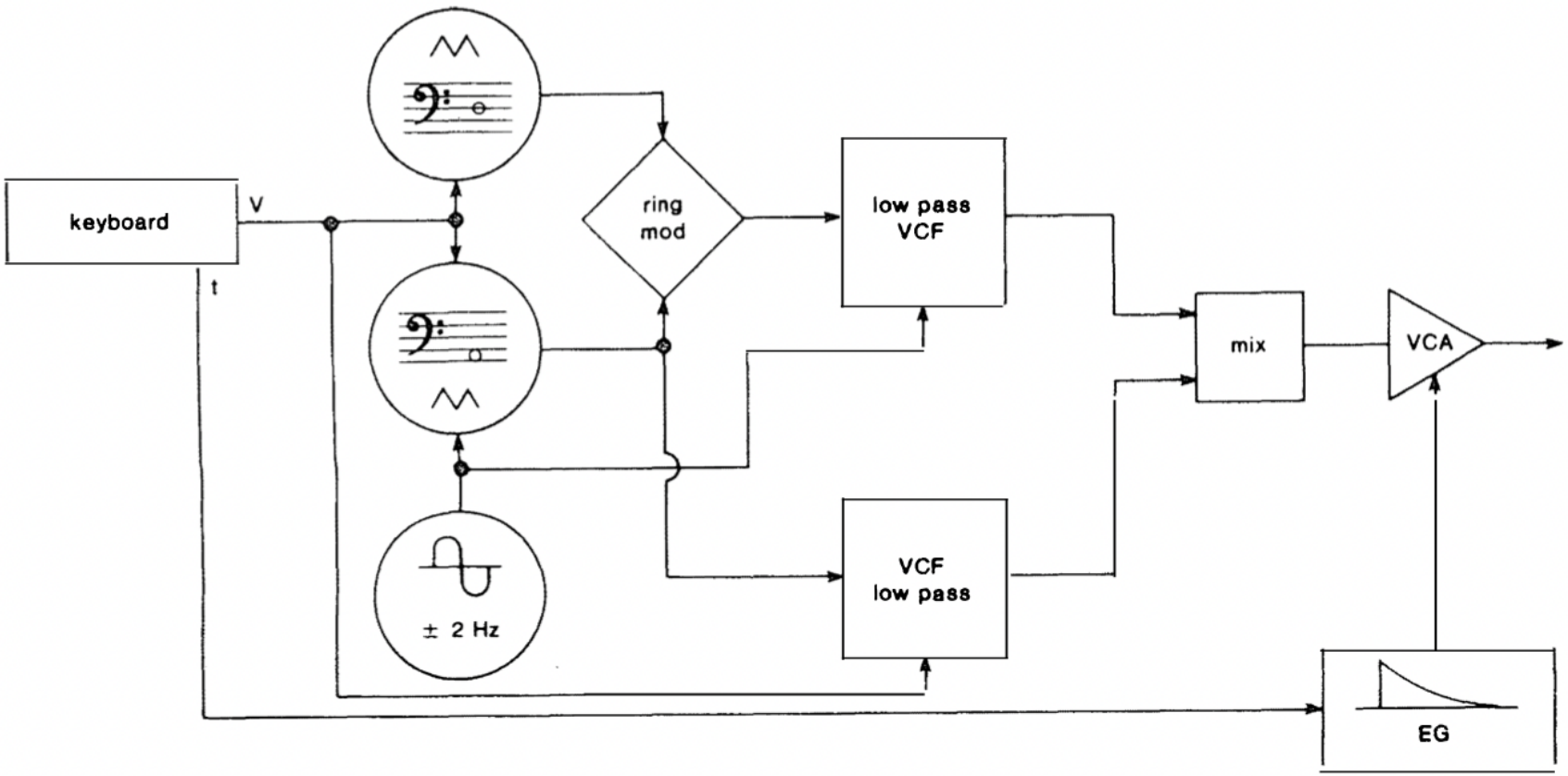


Figure
System
Roland

Frank McCartey: Stochastic Arp

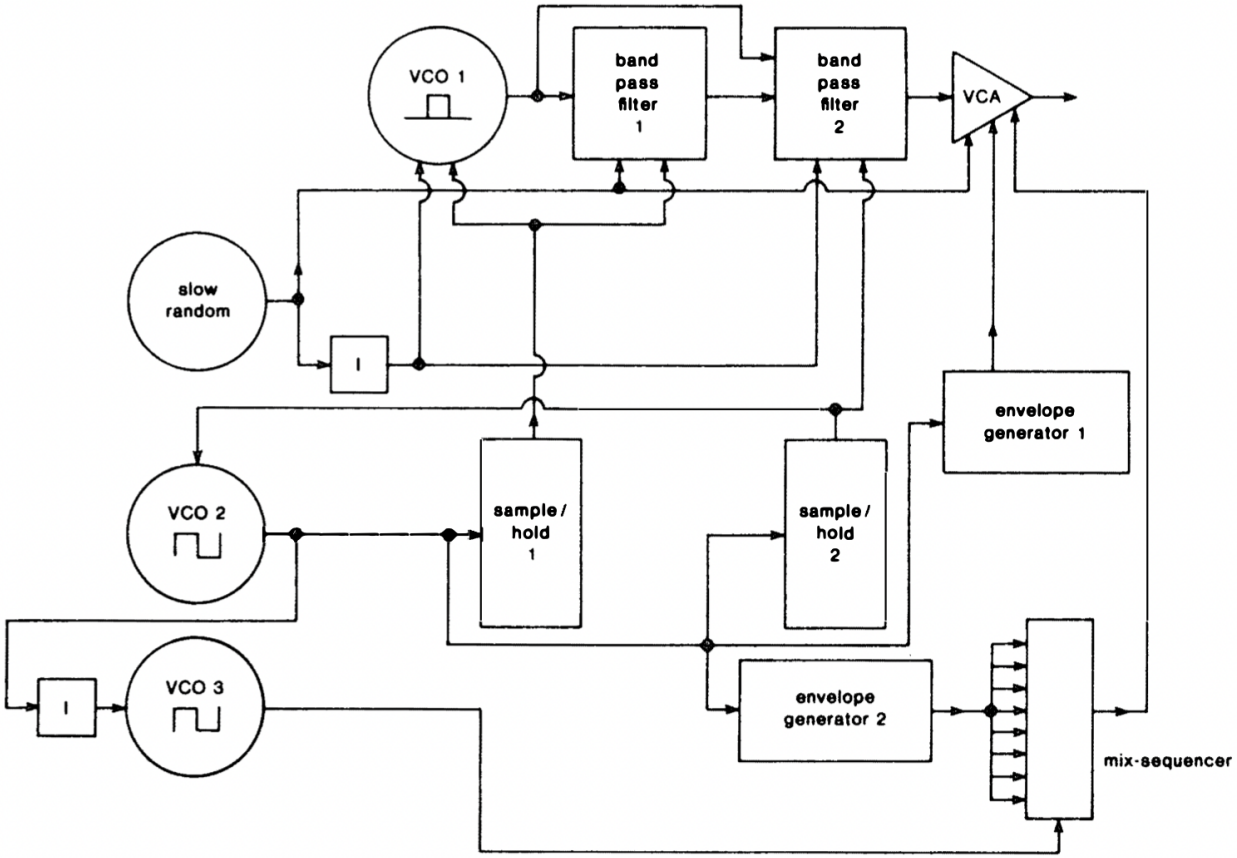


Figure 16.2. *Stochastic Arp* by Frank McCarty

Akarui Tsuki - Instrument 3

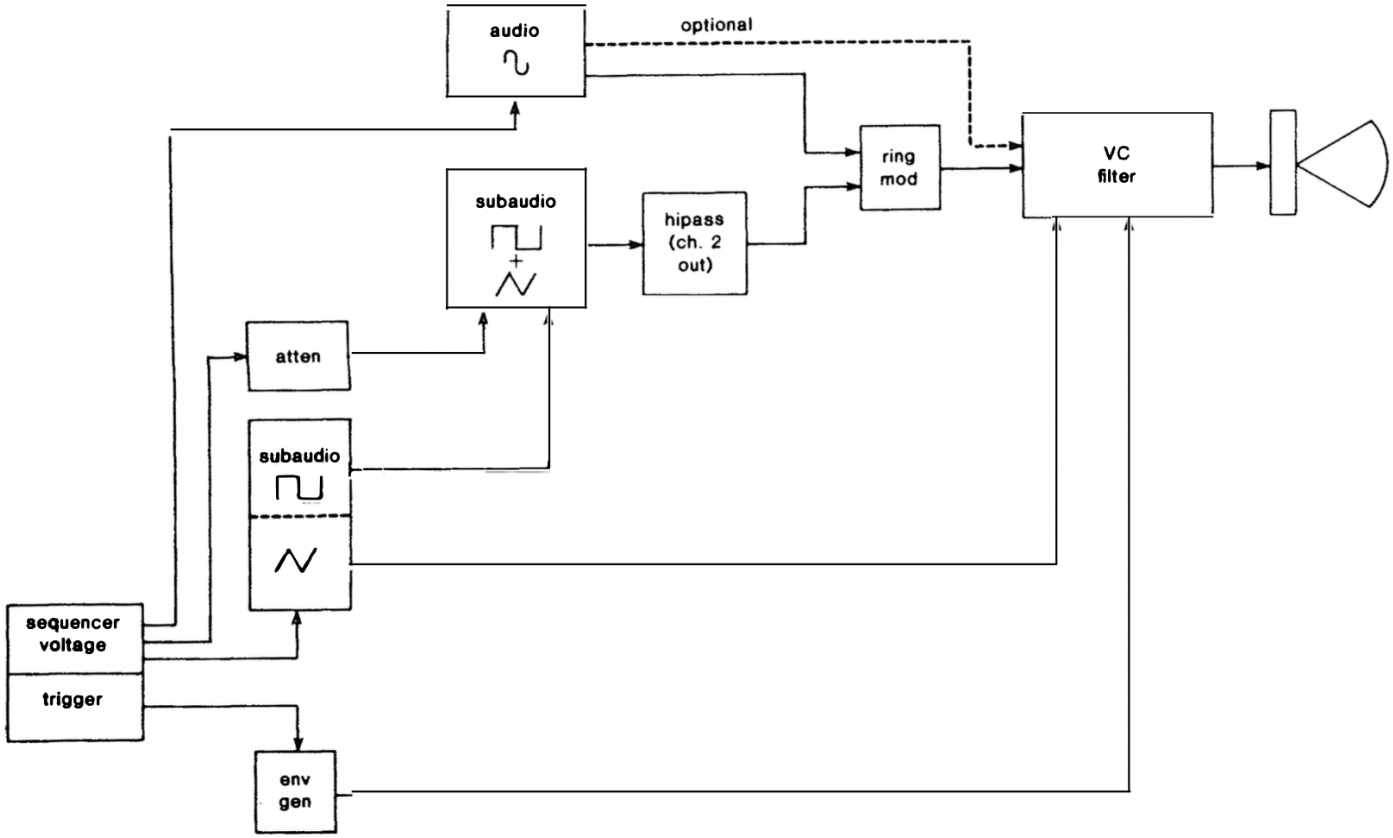


Figure 16.8. *Akarui Tsuki*-Instrument 3 (variant) by John Strawn

Akarui Tsuki - Instrument 2

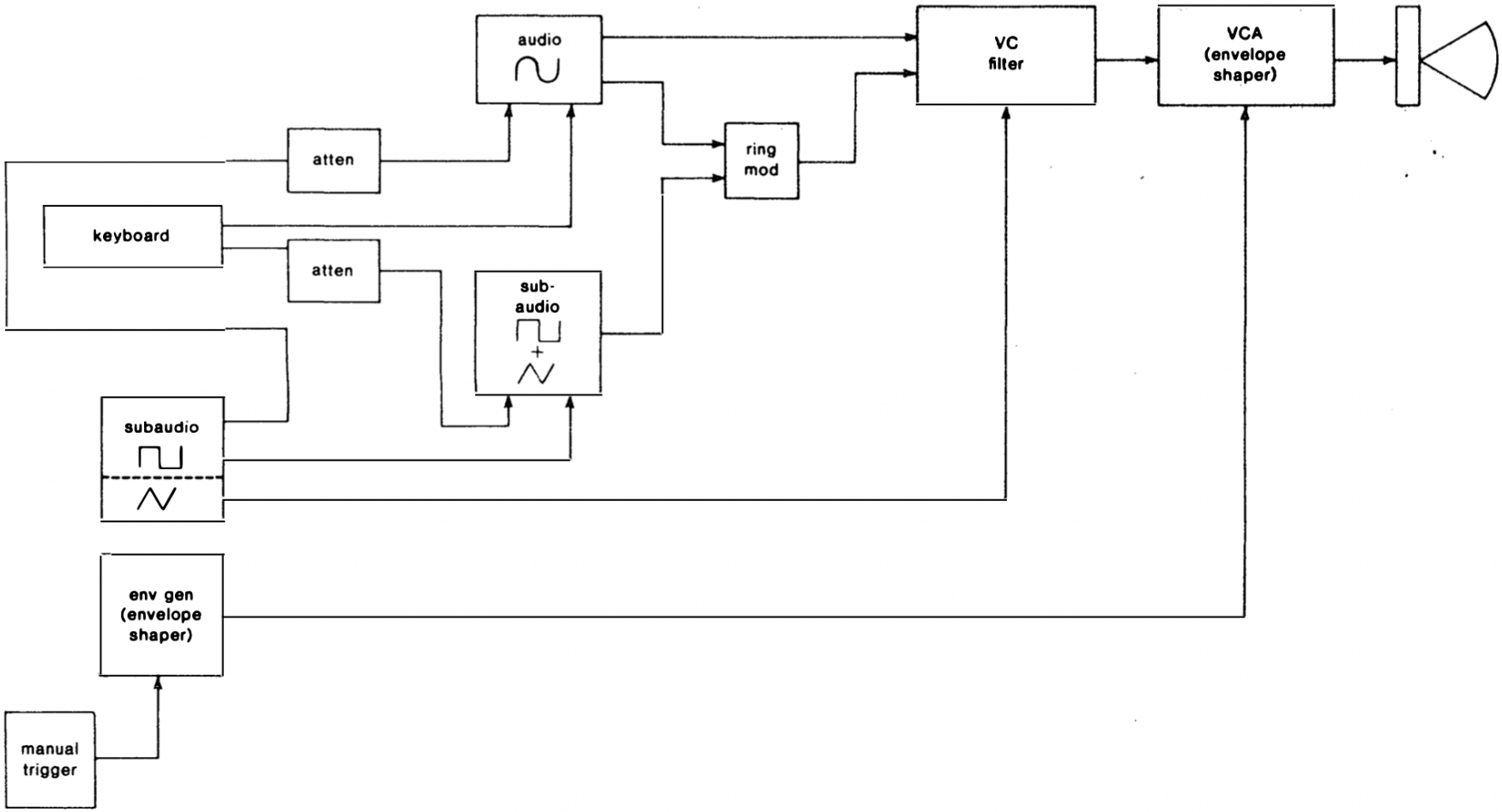
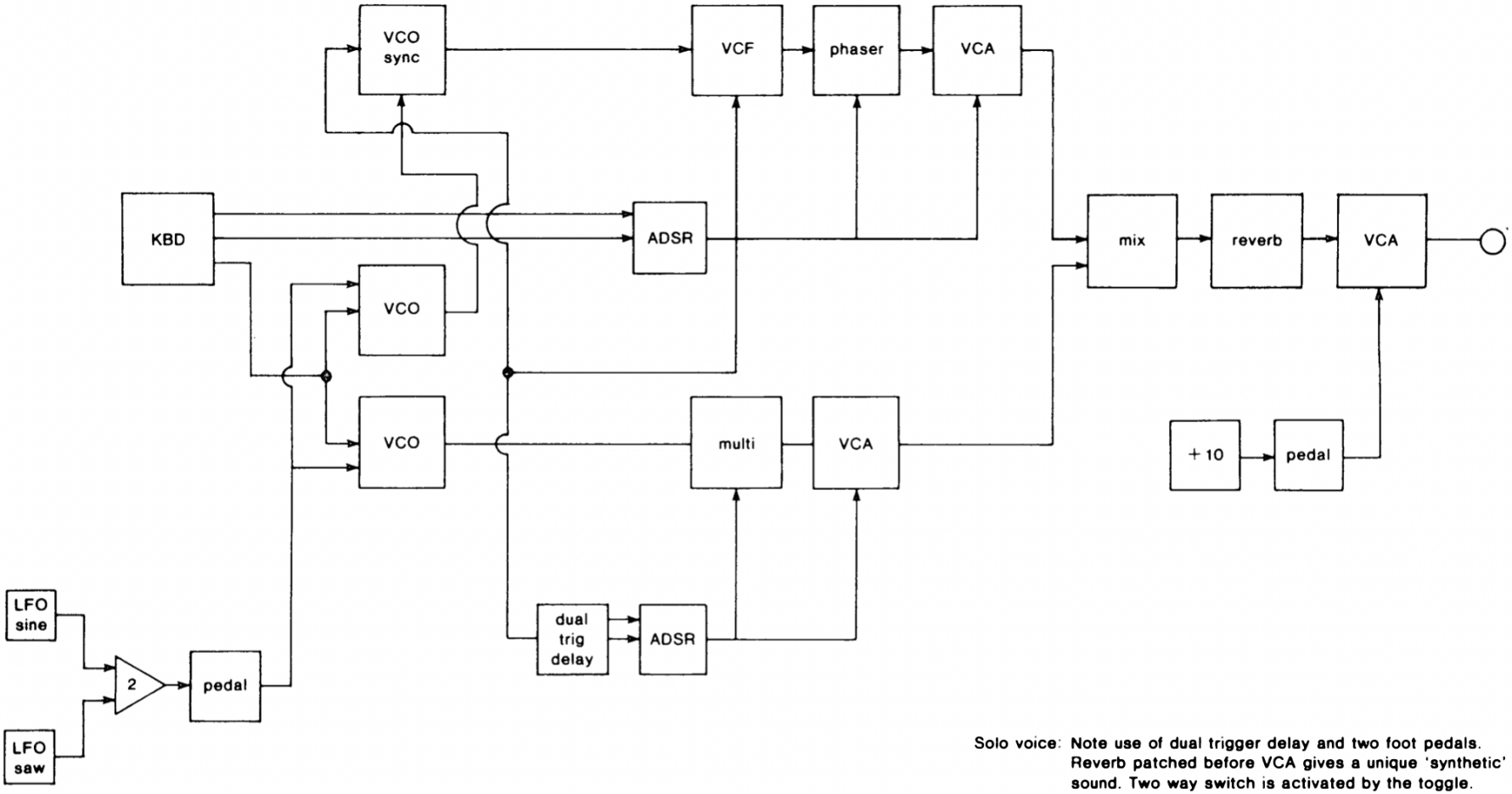


Figure 16.10. *Akarui Tsuki* - Instrument 2 by John Strawn

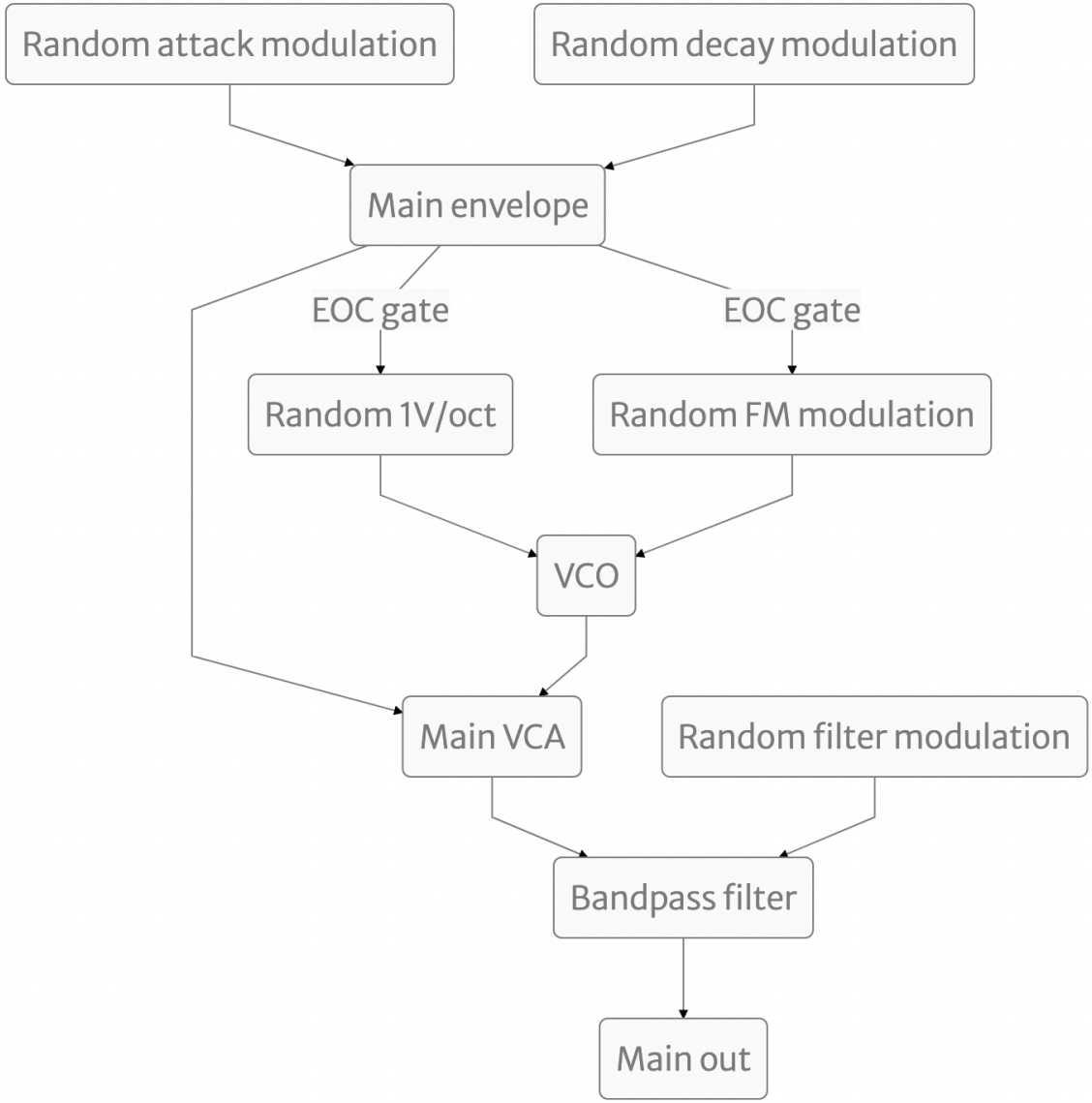
Mark Styles: Orion Rising

Diagram 1:



Solo voice: Note use of dual trigger delay and two foot pedals. Reverb patched before VCA gives a unique 'synthetic' sound. Two way switch is activated by the toggle.

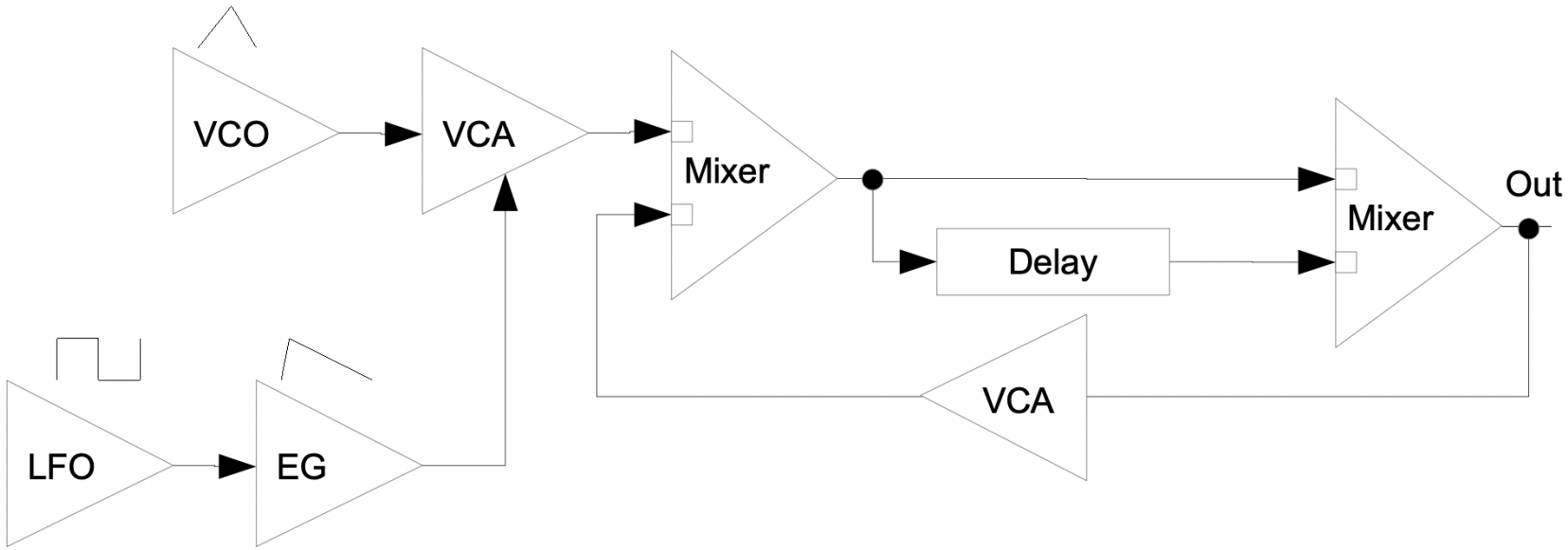
Simplified Krell Patch (Todd Barton)



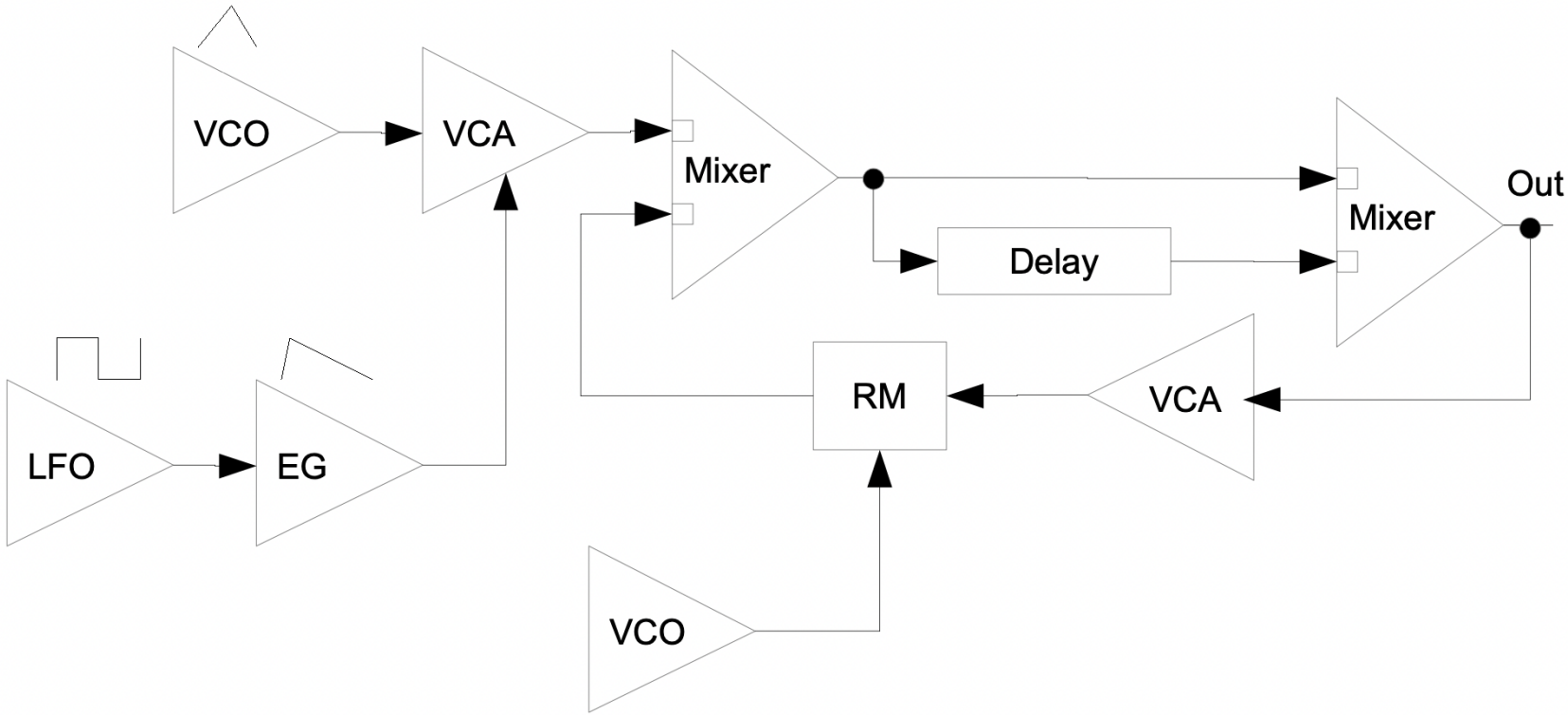
Jaap Vink & Feedback

- Jaap Vink in the 1970s at the Institute of Sonology in Utrecht

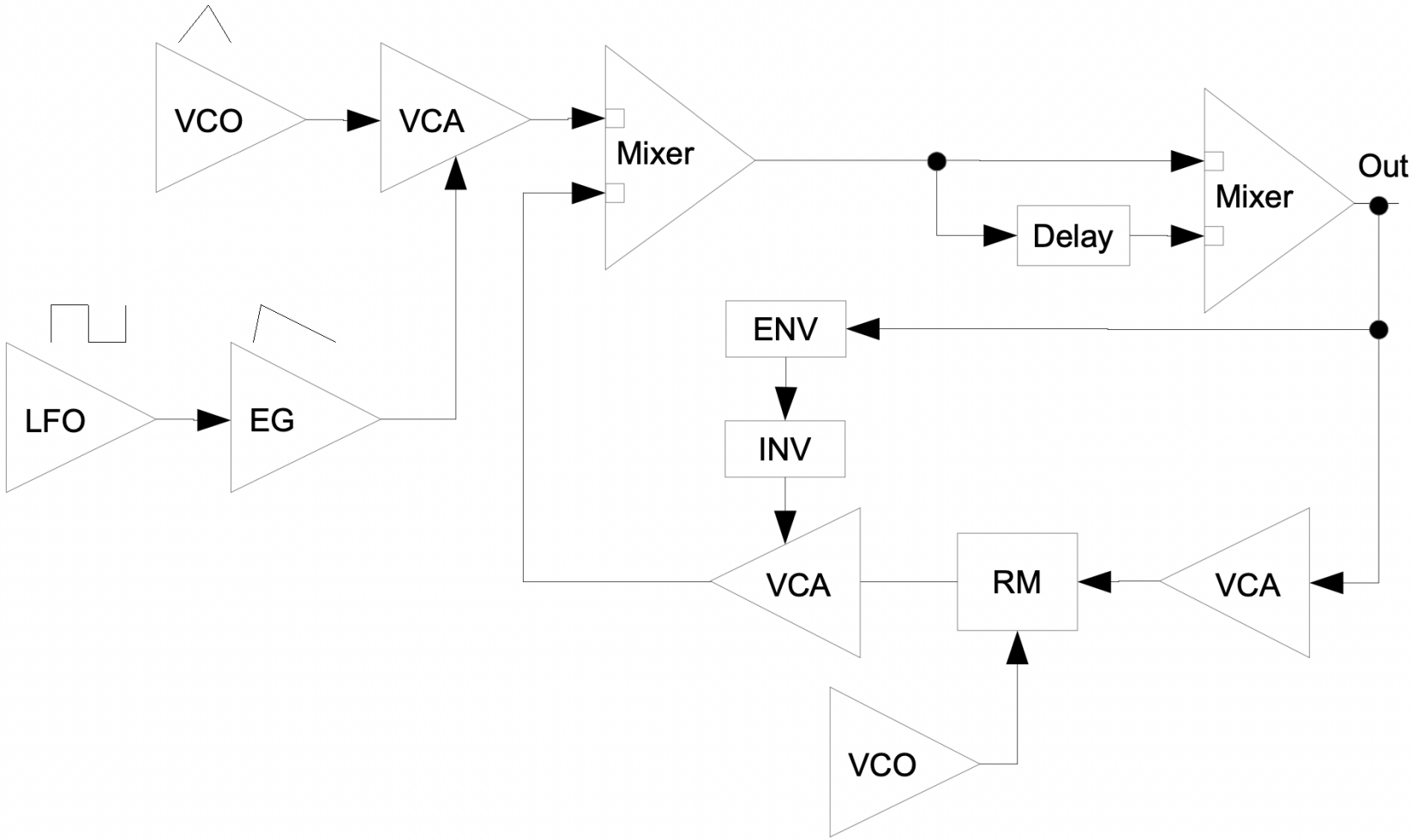
Ring Modulated Feedback



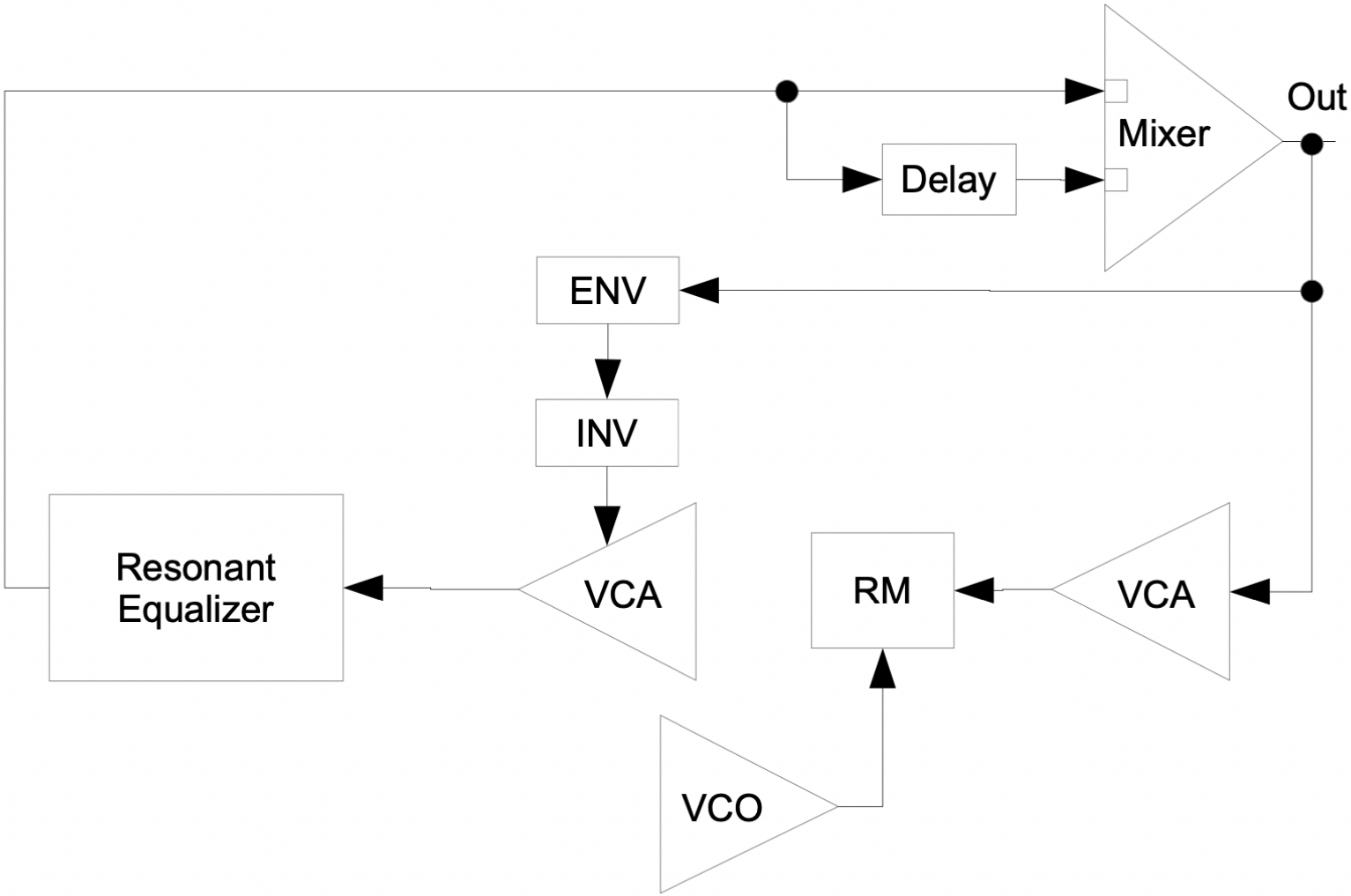
Ring Modulated Feedback



Ring Modulated Feedback



Ring Modulated Feedback



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- Strange, Allen. Electronic Music - Systems, Techniques and Controls. 1983/2022

Musik

- THOMAS ANKERSMIT (1979): Live at La Muse en Circuit (2023)
- Bob Ostertag plays the Serge 1978-1983

Serge online resources

- Basic Feedback von La Synthèse Humaine
- Benjolin
- Hordijk Feedback Patch von Todd Barton
- Serge: "a range of experiments" von djangosfire
- Eco-Simulation for Serge Modular