

Vulpus Labs

Switcheroo

Introduction	2
Theory of Operation	3
Suggested uses	3
Controls	4
Credits and Acknowledgements	6

Introduction

Switcheroo is a pattern-based step sequencer. Each step, it selects one of four inputs to send to its output, smoothly crossfading between signals whenever the input source is switched.



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The length of the crossfade is controllable via a knob and can be modulated with a control signal. Each input has its own volume control, and its volume can also be modulated with a control signal, enabling some complex rhythmic effects.

When applied to control rather than audio signals, the crossfade produces a "glide" effect, smoothly interpolating between signal levels.

In addition to the main output jack, each input has its own trigger output, which receives a trigger signal when that input is selected by the switcher.

Stepping is driven by an external clock signal, and the number of steps can be set between a minimum of two and a maximum of sixteen.

Theory of Operation

Switcheroo takes the signals from its four input jacks into four "channels", each of which has its amplitude controlled by one of the four volume knob / CV input pairs. At any given moment, either the signal from one channel or one or more crossfades between channels is being sent to the output jack. A combination of fast tempo and long crossfade length will result in overlapping crossfades, and up to 16 can be active at once.

The step sequencer selects the channel to be sent to the output at each step, and starts a crossfade whenever the channel at the current step differs from channel at the previous step. At least a very short crossfade (about 2ms) is typically necessary to avoid "clicking" when switching between audio-rate signals, so this is the minimum configurable. The crossfade curve is a simple parabola. With longer crossfades (up to the maximum of 250ms) there will be a brief audible overlap between the two channels.

Whenever the channel switches, a trigger signal (5v for 1 sample) is sent to that channel's corresponding trigger output. The signal is not repeatedly triggered if the same channel is selected for consecutive steps, but only fires on a channel switch. Switcheroo can be used purely as a step sequencer driving these triggers, with no inputs connected, but this (intentional) behaviour should be born in mind.

Stepping is controlled by an external clock signal: either a single 5v trigger, or an LFO (the sequencer will step when the input signal switches from 0 or -ve to +ve).

If a positive signal is received by the reset input, the sequencer will immediately jump back to the first step.

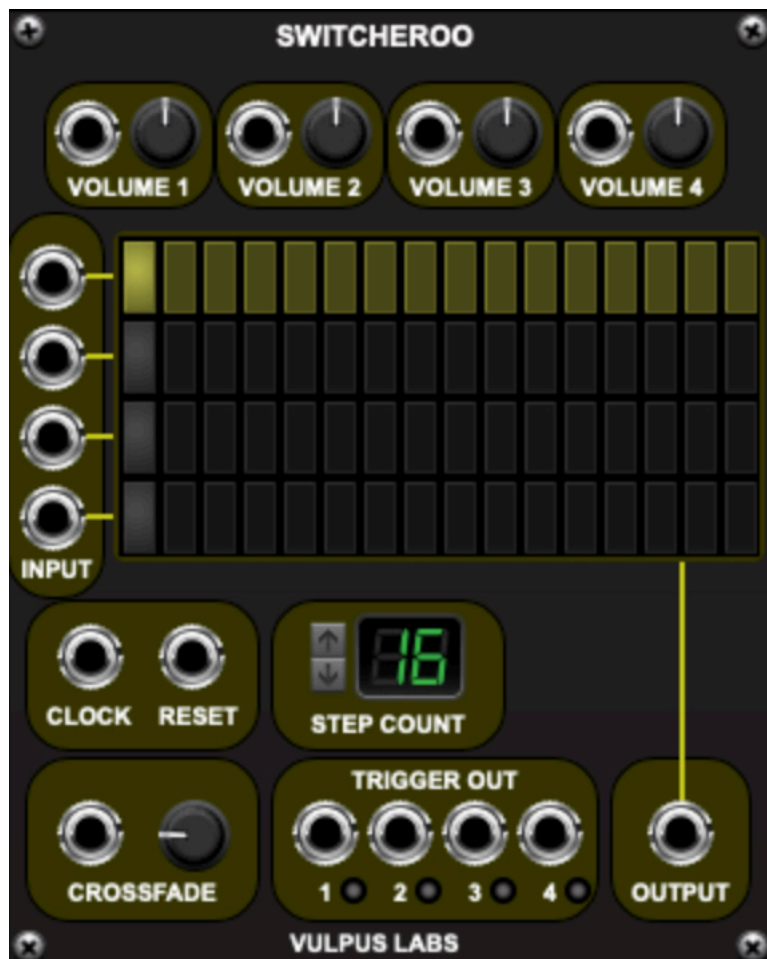
Suggested uses

Some possible uses of Switcheroo include:

- **"Trance Gapper"** - route the same source into multiple inputs, adjusting or modulating the volume of each, and use the grid to produce rhythmically patterned volume modulation effects
- **Rhythmic modulation** - route the same input source into multiple effect chains, and use the grid to switch rhythmically between their outputs, e.g. alternating between a clean and a distorted or filtered signal.
- **Source interleaving** - interleave multiple input sources, e.g. a guitar and a sequenced synth pattern, or oscillator tones tuned to different pitches for an

arpeggiation effect with timbral variation. For a more complex patch, feed a repeating sequence of 5 steps and a repeating sequence of 7 steps into two inputs, and switch between them with a pattern of 9 steps, resulting in a combined pattern that will repeat every 315 steps.

Controls



To the left of the module display are four **INPUT** jacks, to which the inputs to be switched between should be connected. Unconnected inputs will emit a silent/0v signal when switched to.

Along the top are the four **VOLUME** knobs, which can be used to cut the volume of each input down to 0%, or boost it up to 200%. The input jacks next to these knobs can be used to modulate the volume parameter with a control signal: at -5v, the value is scaled down to 0, at 5v it is scaled up to the value set on the knob.

In the centre of the module is the **STEP SEQUENCER** itself, an array of 16x4 cells. Each row matches up to an input, and each column matches up to a sequence step. Click on an unlit cell and the input selector for that step will be set to the input for that row. As the sequencer steps forward, the column representing the current step is illuminated.

Directly below the sequencer, the **STEP COUNT** controls how many steps the sequencer will advance through before returning to the first step.

Below the main **INPUT** jacks are the **CLOCK** and **RESET** trigger inputs. Each is triggered by an input rising above 0v, so either a trigger signal or an LFO can be used. When **CLOCK** is triggered, the sequencer advances a step; when **RESET** is triggered, it returns immediately to the first step.

In the bottom left corner, the **CROSSFADE** control sets the length of crossfade when switching inputs between 2ms and 50ms. The control input jack next to it scales this value in the same way as the volume control jacks.

Finally, there is the main **OUTPUT**, to which the signal from the selected **INPUT** is sent, and four **TRIGGER OUT** jacks to which a trigger value (5v) is sent whenever the sequencer switches to the corresponding input.

Credits and Acknowledgements

Switcheroo was written by Dominic Fox in December 2022.

Steven Sauvé's remarks as a beta tester are once again appreciated, as is the detailed commentary of Steve W.

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