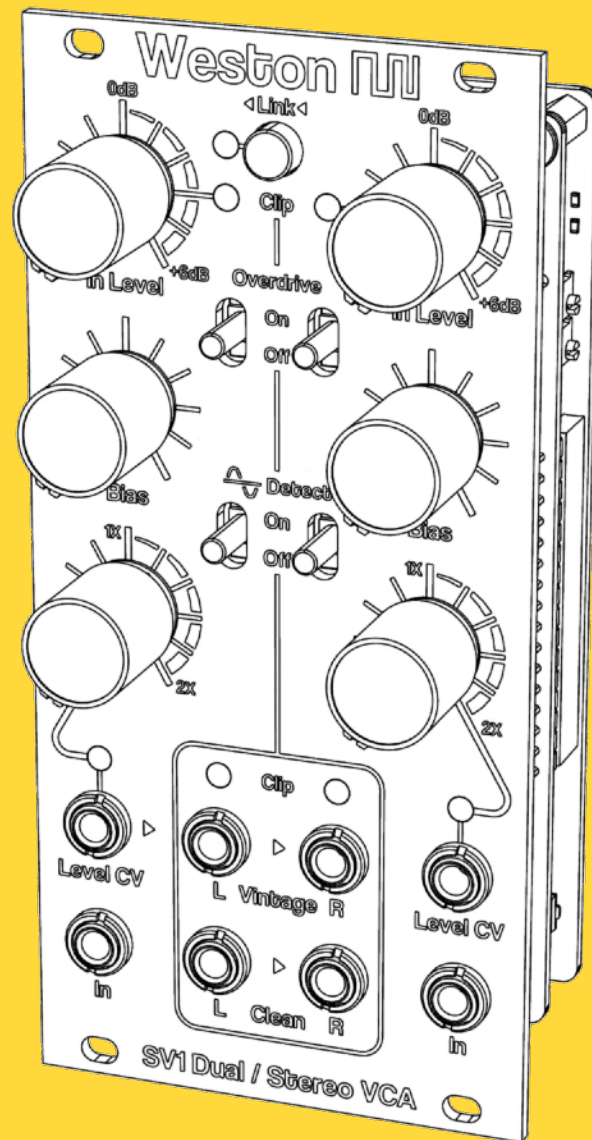


SV1

Dual / Stereo VCA

Eurorack Module

User Manual



Weston Precision Audio

Designed In Portland, Oregon

Revision 01 - May 31, 2024

TABLE OF CONTENTS

Panel Overview.....	3
Description & Specs.....	4
Using SV1	
Getting Started.....	5
Bias.....	5
Output Normal.....	5
CV Input.....	5
Overdrive.....	6
Zero-Cross Detect.....	6
Clip Indicators.....	6
Link (Stereo Mode).....	6
Other Ideas.....	7
Appendix	
Trimmer Adjustments	
(Service Only).....	8

SV1 Overview

Link Button

When engaged (LED is on), all left controls control both L and R channels

Input Clip Indicators

Lights up when your input signal is clipping the input stage. Input stage has large (rail-to-rail) input handling.

Input Level Attenuator

Adjustable from $-\infty$ to +6dB, with unity (0dB) at center detent

Bias Level

Adds 0 to 5V of offset or bias to CV to VCA.

CV Attenuator

Adjust the CV amount sent to VCAs from 0 to 2X, with unity (1X) at center detent.

Left CV Input

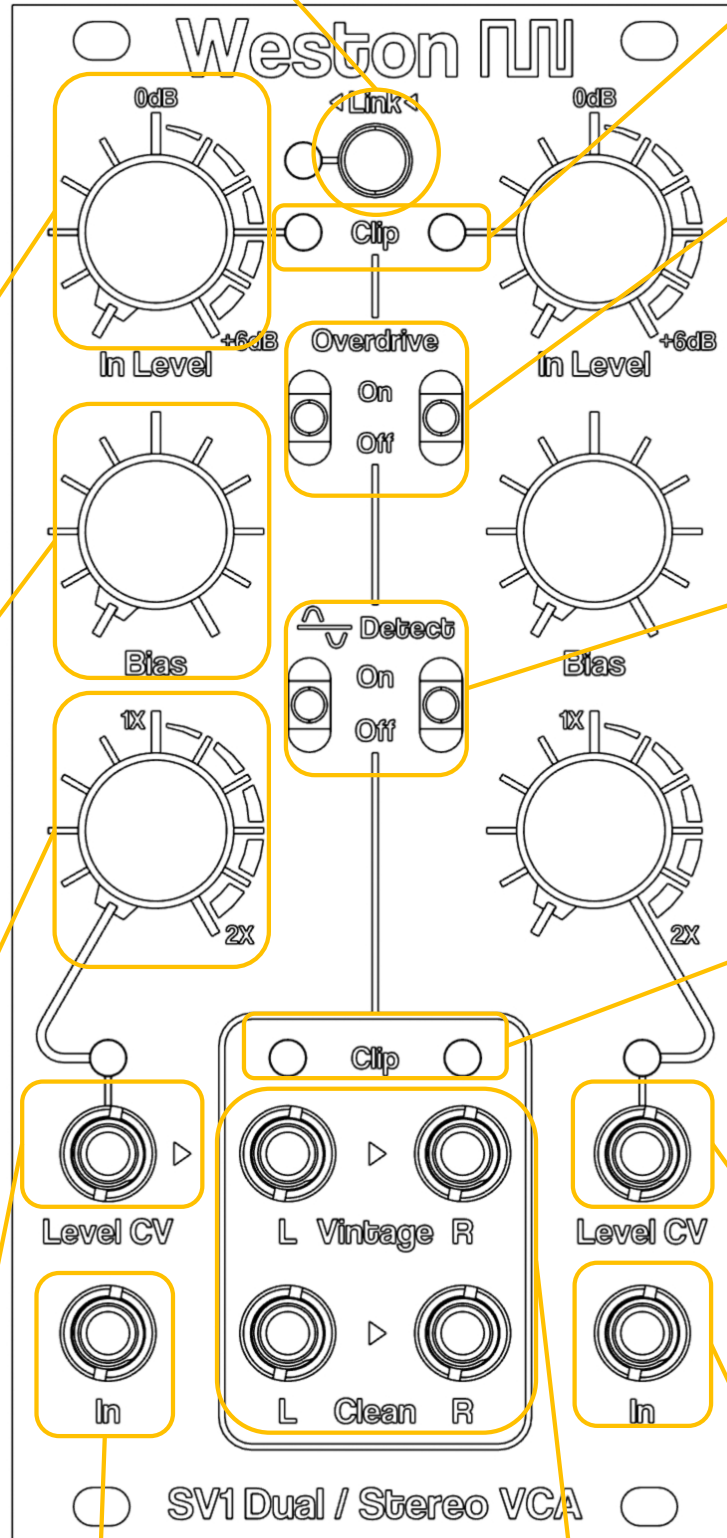
CV control for left VCAs. Normals to right side when no cable in right CV in.

Left Audio Input

Put your audio signal here!

Audio Outputs

If no cable is inserted to either L input, then R outputs will contain a mix of L and R audio in.



Overdrive switches

When on, adds +6dB to input of VCAs. Great for getting nice distortion from Vintage outputs!

Zero Cross Detect

When on, only allows CV to open VCA during zero-crossings. Removes clicks from fast envelopes on bassy signals.

Output Clip Indicators

Lights up when output stage of "Clean" (lower) VCA is clipping.

Right CV Input

CV control for right VCAs

Right Audio Input

Put your audio signal here!

DESCRIPTION

SV1 is a VCA (Voltage Controlled Amplifier) synthesizer module in Eurorack format. SV1 actually contains TWO VCAs per channel, and these outputs are available independently. One pair of VCAs are a vintage-style discrete bipolar transistor VCA using a vintage op amp output stage. The other pair of VCAs are a modern, 2164-based chip VCA using a more modern op amp for the output stage. The "Clean" VCAs excel at low distortion and precision, while the "Vintage" VCAs offer sonic coloring and tasteful distortion when pushed.

SV1 can be used as 2 separate VCAs, or as a stereo pair. Engaging the "Link" button allows both VCA's Audio In Level, CV attenuator, and Bias controls to be controlled by the left set of controls.

This module has several ways to boost and drive the signals into it, as well as a zero-crossing detector which allows click-free VCA processing of low frequency signals with fast envelopes. These features make SV1 a highly versatile dual or stereo VCA for any modular synthesizer setup.

Important or helpful bits will be in red.

SPECS

Module Size: 12HP
Depth: 25mm (To back PCB), 33mm (To end of power connector)

VCA Response Type:

Linear

Audio Outputs:

250 Ohm Output Impedance

Inputs:

$\geq 100\text{k}\Omega$ Input impedance

Audio Inputs: DC Coupled

Power input:

+12V & -12V via standard 10 pin Eurorack connector. Protected against reverse polarity internally and with shrouded connector.

Power consumption (+12V / -12V):

Typ: 65mA / 60mA

Max: 75mA / 70mA

CV Input Voltage:

5V = 100% (0dB), 0V = 0% ($-\infty$ dB)

MAXIMUM LIMITS

Supply Voltage: +13.5V / -13.5V

All inputs: Up to power supply levels.

USING SV1: GETTING STARTED

After installing and powering up SE1 in your rack, using SV1 is as easy as patching an audio signal into one or both of the "In" inputs on the lower left and right corners of the module. Start by applying an audio signal to the LEFT audio in.

USING SV1: BIAS

With all the potentiometers fully counter-clockwise (CCW) and the "Link" button not engaged (LED is off), bring up the left "In Level" pot to the center detent, and the left "Bias" pot to full clockwise (CW). You should now hear your signal through both of the left outputs (Clean and Vintage) at unity gain. "Bias" is simply a fixed voltage 0-5V that is ADDED to the control voltage for each VCA.

USING SV1: OUTPUT NORMAL

With the same patch as the previous step, now add a different audio signal to the RIGHT audio input and listen (or watch with oscilloscope) to one of the RIGHT outputs and bring up the right "Bias" pot. You should hear a mix of the 2 audio signals. SV1 "output normals" the signals when none of the left outputs are used, making it act like a mixer. Now, insert a patch cord into either of the LEFT outputs. This will make the left audio disappear from the right VCA. In other words, installing a cord into a left output breaks the output normal to the

right outputs. The small triangle pointing from the left to right outputs indicates this normalizing chain of the VCA outputs.

USING SV1: CV INPUT

With an audio signal patched into the left input, turn the audio "In Level" pot to center (high noon) and the "Bias" to full CCW. Now patch an LFO sine wave or triangle to the "Level CV" input and bring the input attenuator to center (1X label). You should hear your audio signal modulated on the positive peaks of your LFO signal. Now back the CV attenuator to around the 7-o'clock position (ie 1/4 of the travel of the knob) and then gradually turn up the "Bias" pot to make the signal modulate using the full positive and negative swing of your LFO CV. This is one of the uses of the Bias control - offsetting, or adding a DC offset to a bipolar signal to make use of it. The following oscilloscope traces show the results.

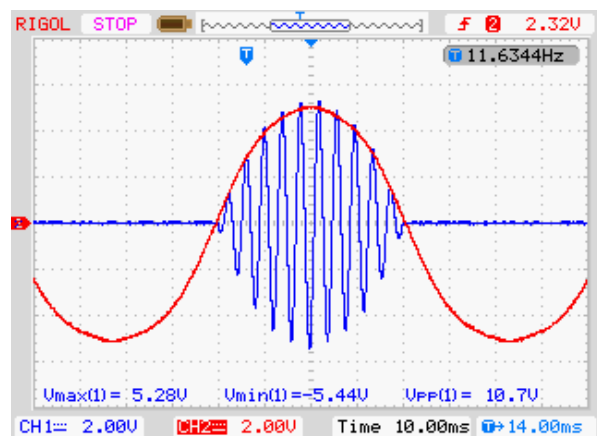


FIG 1: NO BIAS

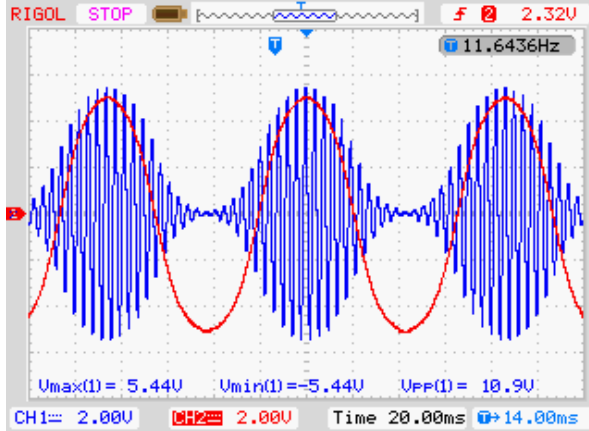


FIG 2: 2.5V BIAS ADDED (BIAS AT ABOUT CENTER)

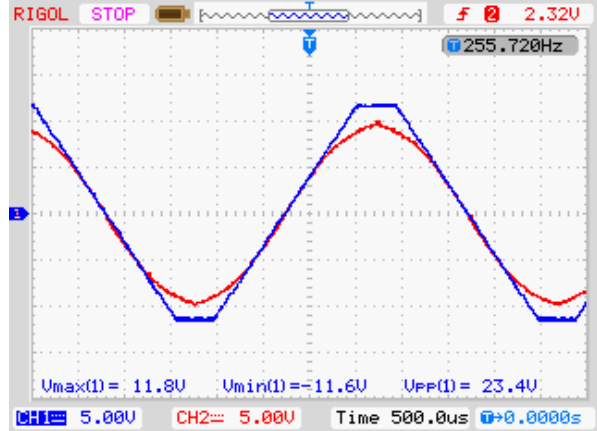


FIG 3: OVERDRIVE. BLUE TRACE IS CLEAN OUTPUT AND RED IS VINTAGE. NOTE THAT CLEARLY THE CLEAN VAC'S OUTPUT STAGE HAS BEGUN TO CLIP

USING SV1: OVERDRIVE

The "Overdrive" switches on SV1 double (+6dB) the input signal to each channel's VCAs. The result of this is different for each type of VCA. For the Vintage VCA, the input section adds significant distortion to the signal when overdriven, whereas the Clean VCA has larger input range and will mostly simply get louder with "Overdrive" enabled (until the output stage clips).

The following oscilloscope traces show the difference, with an input signal of a 10 Volt peak-to-peak triangle wave as an input signal. Bias is set to full CW.

The flat tops in the blue trace of figure 3 show that the Clean VCA's output stage has begun to clip.

USING SV1: ZERO-CROSS DETECT

The switches marked "Zero Cross Detect" (where zero crossing is shown as a symbol of a wave passing through zero on the front panel) enable or disable a circuit which only allows that channel's VCAs to sample a control voltage when the input wave is crossing zero volts.

The reason for this function is because when very fast attack envelopes are fed to any VCA with a clean input signal (especially low frequency basses like sines or triangles), a significant amount of "click" is generated as the VCA opens at various abrupt transitions of the input waveform. **The zero-cross detect circuit eliminates these clicks in fast envelope CV situations.** Note that the zero-cross detect circuit for each channel affects both the Vintage and Clean VCA of that channel. The

following oscilloscope traces show the effect of this visually:

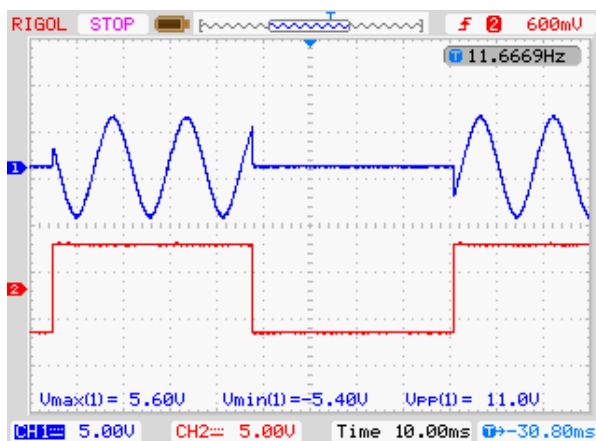


FIG 4: ZERO-CROSS DETECT TURNED OFF. RED TRACE IS CV SIGNAL AND BLUE IS CLEAN VCA OUT. NOTE THE HARSH AND INCONSISTENT WAVE STARTS AND ENDS. THIS CAUSES CLICKING ARTIFACTS.

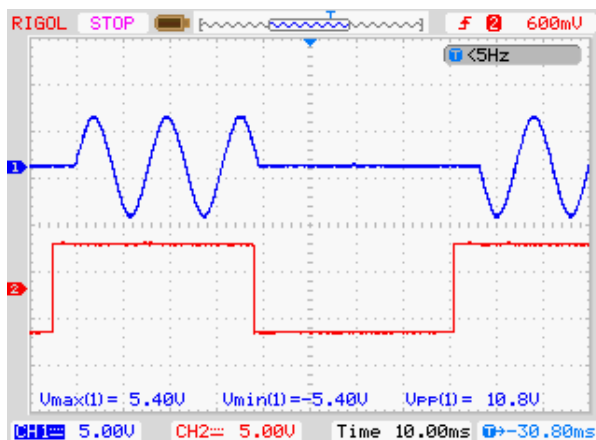


FIG 5: ZERO-CROSS DETECT TURNED ON. NOTE NOW THE WAVE START AND ENDS ARE CLEAN AND CONSISTENT, STARTING AT ZERO VOLTS. NO MORE CLICKS.

USING SV1: CLIP INDICATORS

SV1 has 2 sets of clip indicators. The upper ones show if that channel's input buffer stage (which is before the VCA input) is clipping. The input buffers are rail-to-rail signal handling, so this light

will only come on when they are seeing a signal of around 24V peak-to-peak, thus offering the maximum amount of input headroom in Eurorack format.

The lower clip indicators show when that channel's CLEAN VCA has begun clipping. The Clean and Vintage VCAs have the same clip voltage range, but due to the different topologies and input stages, **the Clean VCA's output will clip first, before the Vintage, thus the LED indicators show the Clean VCA's clip status.**

Note, there is no possible damage to the module from clipping either or both stages, so **do not worry about bricking the LED clip indicators, should you wish to highly mangle your sound!**

USING SV1: LINK (STEREO MODE)

The button marked "LINK" is what switches SV1 from a dual VCA to a Stereo VCA. When "LINK" is engaged (LED is lit and button is down), the LEFT channel's Audio Input Attenuator, Bias Knob, and CV Input Attenuator all simply control BOTH channels.

In other words, "LINK" make SV1 act as a stereo pair of VCAs, whereby all of the lefthand controls apply to the stereo pair.

USING SV1: OTHER IDEAS

With the basics of SV1 now covered, you'll no doubt want to go play around with some patches in your modular. Here are some ideas that you might explore:

- Extra distortion in series: Patch the Vintage output of left channel into the audio input of right channel. Turn Overdrive on for both channels.
- Stereo Waveshaping: Patch the sine or triangle output of a VCO into both audio inputs and then play with patching other different outputs (saws, squares, etc..) into the CVs of left and right channel.
- Amplitude Modulation: Patch audio rate signals into the CV input to "chop up" other audio signals. This is known as AM or Amplitude Modulation.

You'll no doubt find other uses for this VCA module....Enjoy!

APPENDIX: TRIMMERS (SERVICE ONLY)

SV1 has several trimmers for each channel, which have been adjusted at the factory. Normally these will not ever need to be adjusted, but this section explains their purpose in case of adjustment:

INPUT GAIN (located on pots PCB. 1 for left channel and 2 for right channel).

These trimmers adjust the gain of the input stage. The output of the input stages can be monitored at test point TS1 for the left channel and TS2 for the right channel. They should be adjusted so that unity (1.0) gain is achieved when the input level pot is at center (detent) position. The right channel has TWO trimmers, one for the right channel routed through the right input level pot, and the other is for when it's routed through the left input level pot. They are labeled "UNLINKED" and "LINKED", respectively.

VINTAGE VCA GAIN (located on top edge of main (bottom) PCB.

These trimmers adjust the gain of the left and right VINTAGE VCAs. To adjust, patch a 10 Vpp wave into both audio inputs and adjust inputs to center. Adjust Bias to full CW. Monitor each Vintage output and adjust gain so that the output matches the input amplitude.

VINTAGE VCA CVR (located on top edge of main (bottom) PCB.

These trimmers adjust the Control Voltage Rejection (CVR) of the VINTAGE VCAs. To adjust this, make sure no audio is patched into the audio inputs and turn Audio Input Attenuators to full CCW and Bias knobs to full CCW. Patch a audio rate square wave from an oscillator into each CV input and set the CV Input Attenuators to center. Monitor each channel's Vintage output and adjust trimmer to minimize CV throughput.

REVISION HISTORY

01: Initial release.