

LjunggrenAudio RYO 3xVCA
a Triple linear VCA in 4hp

Quickstart – what is the 3xVCA and how do I get going?

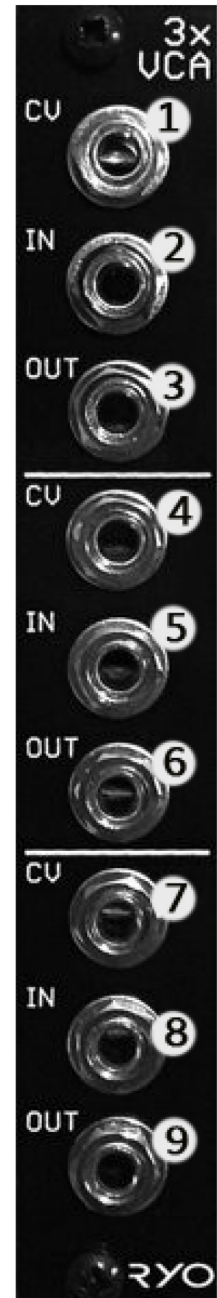
The 3xVCA is a simple and space-efficient voltage controlled amplifier for processing of control voltages as well as audio with precision and a good clean sound.

This module gives you no less than three fully independent DC coupled linear VCAs with very similar response between each VCA in the same module and between other modules of this type.

RYO 3xVCA

- 1 Control voltage input.
- 2 DC coupled signal input (linear response.)
- 3 Signal output, (If modded then will be normalled to vca below).
- 4 Control voltage input.
- 5 DC coupled signal input (linear response.)
- 6 Signal output, (If modded then normalled to vca below).
- 7 Control voltage input.
- 8 DC coupled signal input (linear response;
If modded will be expo if no connect to out above).
- 9 Signal output.

Width: 4hp



Installation

To begin installation, please make sure that:

- you have a standard pinout eurorack bus board
- you have +12V and -12V power rails on that bus board [no +5V supply is required]
- the power rails are not overloaded

!!!Before installing this module disconnect the power from your system!!!

- Double check the polarity of the ribbon cable - The red stripe should be aligned with the -12V rail, on both the module and on the bus board

[we use shrouded headers but it's still possible a cable has been assembled with the stripe on the wrong side of the shroud so always double check!].

Also make sure when using busboards without shrouded headers that the pins aren't transposed a row vertically or horizontally – all pins should insert into holes on the cable.

Although we use both PTC fuses and schottky diodes to provide reverse polarity and excess current protection, we do not take any responsibility for damages caused by wrong power supply connection!

After you have connected everything, double checked it and ensured your case is closed such that no power lines can be touched by your hand or any stray cables drop into holes, turn on your system and test the module

The 3xVCA, like the 2xVCX, uses LM13700 OTA ICs at its core for precision control over CVs, clean sound with audio and low noise floor; All the outputs are buffered to avoid voltage droop regardless of what cables/modules are following the 3xVCA in the chain.

The 3xVCA can be calibrated to be fully open at any control voltage up to the Eurorack standard maximum of +10V, but by default it is set to +5V so giving more than 1.0x gain when receiving +8V Doepfer A100 Eurorack envelope signals.

The 3xVCA is a novice-friendly project, it is a low part count build that only requires basic experience in PCB soldering and module assembly:

The 3xVCA is great for adding extra life and dynamics to CV modulations as well as for regular audio duties such as a good sounding Amplitude Modulation all the way thru the audio spectrum.

The module requires calibration in several steps, achieved precision depends on the precision of your multimeter. Although it can be calibrated for any input cv, instructions are only provided for either 5V or 8V CV. Assembled modules are calibrated to 1.00x gain (0dB) at 5.00V CV, that means 8.00V CV will give a 1.65x gain (4.35dB).

The amplifier has an a linear response to control voltages, but also detailed in the associated documentation is a very simple modification which allows the 3xVCA to become both linear and exponential by normalizing the VCAs in a cascading fashion.

The amplifier accepts both DC and AC signals, from static offset CVs right past audio frequencies up to 50+kHz.

The module is split into 3 VCA sub-modules – it has one audio input, one audio output and a CV input for each VCA; If VCA initial is required, an external offset will have to be summed to the input CV signal and likewise if the input CV needs attenuation this will have to be achieved off-board.

Dimensions

Height:	3U [128.5mm],
Width:	4HP [20mm],
Depth:	51mm (with power cable attached)
Weight:	35g (approx w/cable)

Current consumption

+12V rail	26mA
-12V rail	21mA
+5V rail	no +5V supply required

Basic specifications

total frequency controllable range	DC to 50kHz
max input/output audio signal	20Vpp
CV input range (calibrate to preference)	0V to +10V max
Max gain	0dB gain @+5V present at CV in +8V CV gives 1.65x gain (4.35dB)

Nominal Impedances

Audio signal input:	100k ohm
Audio Signal output:	1k ohm
CV input:	100k ohm

Patch ideas:

Although uses of VCAs in patch examples and ideas are found readily online and in some books, even those familiar with using may not know some of these other less obvious ways to use the VCAs in patches in your modular rig:

below i've included some inspiring words and links to videos showing patches that can be achieved with VCAs; and, as ever, experiment – RY0 modules are designed with all necessary protection and fail-safes so you can just start plugging in patch cables and see what happens!

Dynamic modulation of CV inputs:

many modules have CV inputs allowing modulation of various parameters, and likewise, many modules generate CVs which can be used as sources of modulation.

Putting a VCA in the CV-path of this source/destination pair can give a much more interesting and varied range of sounds and modulation options by adding a time dependent element such that as your patch progresses and flows the sounds that emerge are more varied and rich.

Try putting a VCA in between any CV-source/destination you can think of and modulate the VCA with an LFO, EG or Sequencer to make it vary as time passes.

Add extra dynamic control to audio outputs:

Try using an extra VCA in the audio path modulated by another EG, on top of the commonly used note volume EG/VCA combo to allow further volume modulation by, e.g. velocity data.

Distortion:

using the default voltage setting of 5v, you can amplify signals up to 2x using a +10V signal, creating clipping and distortion.

AM synthesis:

Classic yet oft-forgotten, AM synthesis is an old west-coast trick simply involving audio rate amplitude modulation of one oscillator with another. Using precise ratios of modulator to carrier, one can achieve granular formant synthesis, creating vowel-like timbres.

Compression:

Along with an RY0 (N)AND used as an inverter and AND gate, a VCA can be used as the dynamics-altering element of a compressor setup. Mult the signal to be compressed to an envelope follower and a VCA input, run the envelope and a static voltage into the AND gate, invert the output, and use it to control the VCA's level. Parts of the envelope above the static voltage will be used to turn the VCA level down dynamically.

Insert patch ideas here:

This video published by Ben of divkidmusic.com:

[DivKid breakdown of 3xVCA](#)

shows the perks of it's signal normalizing turning this triple linear VCA into a versatile multi response VCA. The normalizing is a modification that we make to all assembled 3xVCAs and is detailed in the associated documentation for all DIYers.