

The Circuit Slices **Ring+VCA** (CS045) is a dual-function module for Eurorack-compatible synthesizers. Packed in a narrow panel is both a quality classic analog ring modulator circuit and a basic linear VCA. Ring modulators typically are patched to a VCA – this ring modulator includes the VCA.

### Features and Specifications for the CS045 Ring+VCA

The “Ring Modulator” or “Balanced Modulator” or “4-Quadrant Multiplier”, circuit uses a quality Analog Devices AD633 chip

- Low feedthrough (+/-0.1% Yin and +/- 0.3% Xin typical)
- Low noise (90  $\mu$ V rms)
- No ‘Nulling’ adjustments are required
- See Analog Devices AD633 data sheet for complete chip specifications

The VCA, or “two-quadrant multiplier” circuit uses a transconductance chip

The VCA is trimmer-adjusted for unity-gain output with a 5V CV input (user adjustable trimmer)

The ring modulator output is “normal” patched to the VCA input

The VCA and Ring Modulator can be used separately – patching to VCA IN disconnects Ring OUT

Includes power cable and case screws

Reverse power protection

Low Power: +12 VDC @ 13 mA, -12 DC @ 13 mA, using a standard Eurorack 10-pin power connection

Connections: Standard 3.5mm jacks

Depth: 32 mm

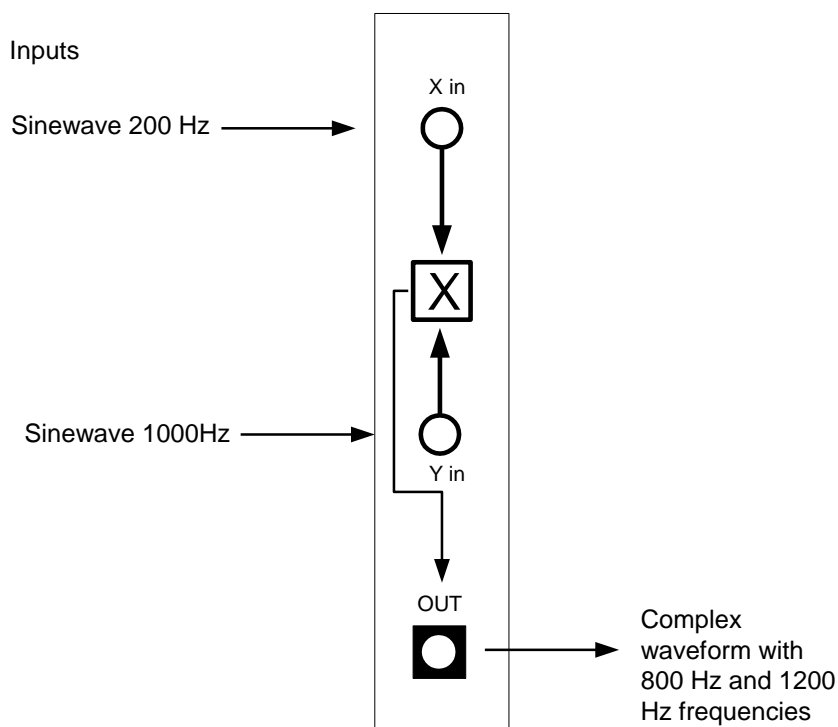
Narrow panel width: 4 HP

## Installation

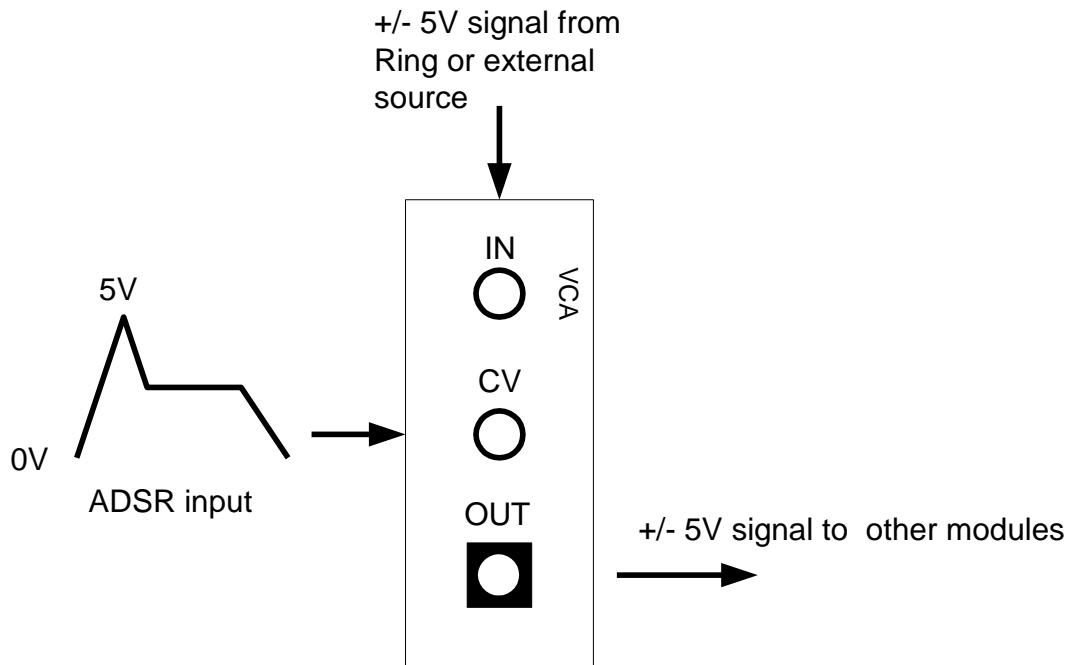
Simply route the supplied ribbon-cable power connector to your power bus and mount the panel using the supplied screws. Be careful making the connection to your power bus -- the red stripe on the ribbon cable must be toward the -12V pin on the power bus and the module. We supply a cable that has no strain-relief on the 10-pin connector, which keeps the module's overall width narrow.

## Using the Ring+VCA

Typically, this module is used for producing bell-like sounds. These are sounds with complex timbers (often with non-harmonic overtones) created from the sum and difference frequencies applied to the X and Y inputs of the ring modulator. The ideal ring modulator does not output the original X or Y input signals – only the sum and difference signals and harmonics. First try using X and Y inputs that are sine or triangle waveforms of different frequencies. Also, try using an amplified signal from a microphone for one ring modulator input and a sinewave for the other input for the classic – and a bit cheesy – robot voice. Better yet, try using the signal from a guitar or other amplified acoustic instrument.



While the ring modulator or 4-quadrant multiplier accepts signals that swing positive or negative, the VCA, or 2-quadrant multiplier, only accepts positive control voltages (in this case, 0 to 5V). The VCA input and output signals, are of course bipolar – the standard +/- 5V signal range -- with some headroom.



Remember also, that you can patch between the Ring out and VCA in. You might feed the Ring Modulator output to a VCF and patch the VCF output back to this module's VCA IN jack.

### User Adjustments

While you don't need to 'null' the ring modulator (that is, to adjust the circuit so that the inputs are not passed to the output), there are two circuit board trimmers for the VCA:

- TRIM1 controls the DC offset of the VCA output. Factory-set for minimum DC output offset.
- TRIM2 controls the VCA's initial gain. Factory set for a minimum output when 0V is applied to the CV input. 5V applied to the VCA's CV input produces unity gain.

The examples above are just the standard ring modulator configuration and only scratch the surface of the way you might use this device. This affordable little module will greatly expand the capabilities of any modular synthesizer. We know you will enjoy hours of experimenting, producing wild modulation sounds and dramatic "clangorous" effects, but try to work these ideas into a finished composition!

This module is limited-warranted for one year with parts, under normal use – not including the application of reverse or over-voltage power by customer. Return shipping to Circuit Slices from customer not included. Return to Circuit Slices, LLC for repairs. Circuit Slices, LLC reserves the right to replace the module if necessary. Please keep your receipt / packing slip for warranty information.

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