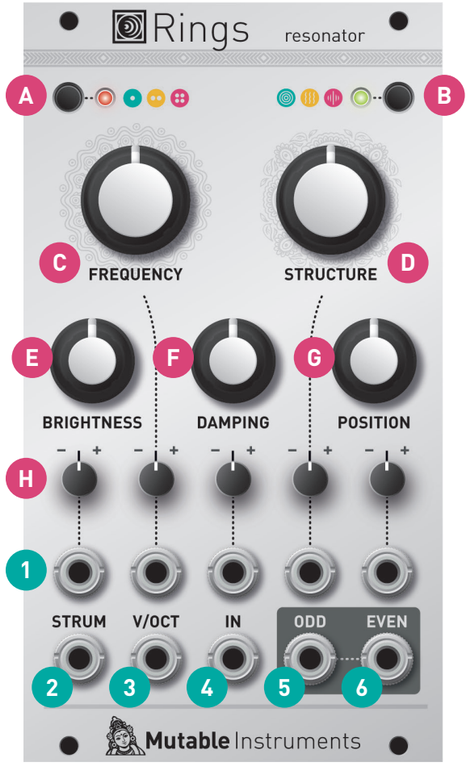


Front panel

Controls

A. **Polyphony setting**. Selects between monophonic, duophonic or quadriphonic operation.

B. **Resonator type.** Modal, sympathetic strings or non-linear/inharmonic string.

C. **Coarse frequency**. Quantized in semitones when a cable is patched in the **V/OCT** (3) input.

D. **Harmonic structure**. Frequency ratio between the partials of the modal resonator, detuning of the sympathetic strings, or non-linearity/inharmonicity of the string.

E. **Brightness**. Adjusts the level of higher harmonics in the signal, by the simultaneous action of a low-pass filter on the exciter signal (closed at 8 o'clock, fully open at 12 o'clock), and of the damping filter (or Q factor of the higher modes) on the rest of the course of the potentiometer.

F. **Damping**. Controls the decay time of the sound.

G. **Excitation position**. Controls on which point of the string/surface the excitation is applied. This setting will remind you of the PWM control of a square oscillator – or of the comb-filtering effect of a phaser.

H. **Attenuverters** for the CV inputs.

Inputs and outputs

1. **Resonator parameters CV inputs**. Note that the **FREQUENCY** CV input is normalized to a small constant voltage, allowing its attenuverter to be used as a fine frequency control when no patch cable is inserted.

2. **Strumming trigger input**, for polyphonic operation. Whenever a trigger is received on this input, the module freezes the currently playing voice, lets it decay, and starts a note on the next voice. This input is normalized to a step detector on the **V/OCT** input and a transient detector on the **IN** input.

3. **V/Octave CV input**. Controls the main frequency of the resonator.

4. **Audio input** for the excitation signal. Modular levels are expected! This input is normalized to a pulse/burst generator that reacts to note changes on the **V/OCT** CV input or triggers on the **STRUM** input.

5, 6. **Odd and even audio outputs.** In monophonic mode, these two outputs carry two complementary components of the sound (odd and even numbered partials with the modal resonator, dephased components due to picking position and pickup placement with the string resonators).

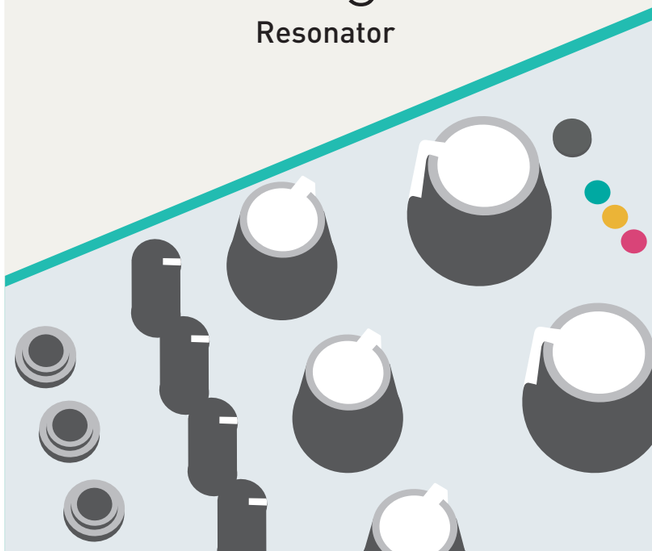
In polyphonic mode, they split the signal into odd and even numbered strings/plates.

Note that you need to plug a cable in the **EVEN** (6) output to actually split the two signals – otherwise they will be mixed together and sent to **ODD** (5).

Mutable Instruments

Rings

Resonator



About Rings

Rings is a resonator, the essential ingredient at the heart of several physical modeling synthesis techniques. The resonator transforms an external, unpitched excitation audio signal into a full-bodied pitched sound. **Rings** is the bar, the tube or the bunch of strings you cause to vibrate with a bursty external signal.

Installation

Rings requires a **-12V / +12V** power supply (2x5 pin connector). The red stripe of the ribbon cable (-12V side) must be oriented on the same side as the "Red stripe" marking on the board. The module draws **5mA** from the **-12V** rail and **120mA** from the **+12V** rail.

Online manual and help

The full manual can be found online at
mutable-instruments.net/modules/rings/manual

For help and discussions, head to
mutable-instruments.net/forum

Please refer to the online manual for detailed information regarding compliance with EMC directives

Resonator types

Modal resonator

The principle of modal synthesis is to simulate the phenomena of resonance at play in vibrating structures (such as bars, plates or strings) which are described by a set of modes.

Each mode corresponds to a harmonic or partial in the spectrum of the sound, and is modeled by a band-pass filter. The Q factor of the filter determines how sustained the oscillations of the corresponding partial are.

Various materials or structures are characterized by different relationships between the frequencies of their modes, which **Rings** recreates.

Sympathetic strings

String instruments such as the sitar or sarod make use of strings that are not directly struck or plucked by the musician, but that simply respond to the vibration of the other strings, and add extra overtones or undertones to their sound.

Rings simulates this phenomenon with a bunch of virtual strings (synthesized with comb filters), allowing the addition of extra tones to an audio signal. The tuning ratio between these strings can be altered.

Non-linear/inharmonic strings

This is an extended version of the Karplus-Strong recipe with potatoes and onions (tuned comb filter, absorption filter), but also chili powder and coriander (non-linearities and dispersion all-pass filter).

Polyphony and "strumming"

Rings' polyphony can be set to one, two, or four notes.

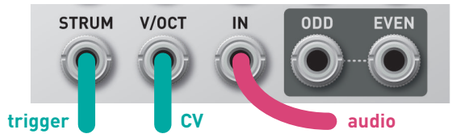
Enabling four-note polyphony doesn't mean that four CV input jacks will magically appear on the module, but simply that four notes played in sequence will nicely overlap without cutting each other's tails.

To play chords, you will need to "strum" the module by playing a rapid sequence of notes.

Making the right connections

Ideally, **Rings** would need three input signals:

- A trigger signal in the **STRUM** input, to indicate when the currently playing note should fade away, and when a new note is starting.
- A CV signal in the **V/OCT** input, to control the note frequency.
- An audio signal in the **IN** input, which will hit, strike or caress the resonator.



Because it might not always be possible to get these three signals from your system, **Rings** makes the following assumptions:

(1) If no patch cable is inserted in the **IN** audio input, the module will synthesize its own excitation signal whenever a note is strummed. This excitation signal is either a low-pass filtered pulse, or a burst of noise depending on the resonator type.

(2) If no patch cable is inserted in the **STRUM** audio input, the module will determine that a new string should be strummed either by:

- Detecting note changes on the **V/OCT** input. Or:
- Detecting sharp transients of the **IN** audio signal when nothing is patched in the **V/OCT** input.

As a result...

You can play **Rings** with just the note CV signal taken from a sequencer or stepped random module. The module will produce a suitable excitation signal internally, and will switch strings for every new note.