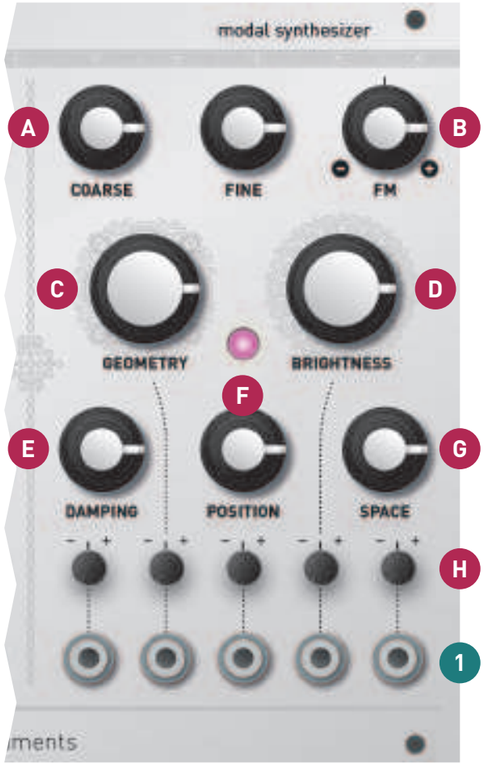


Resonator section

Controls

A. **COARSE** and **FINE** frequency controls. They control the fundamental frequency of the resonator's frequency response. **COARSE** is quantized by semitone increments.

B. Attenuverter for the **FM** CV input.

C. Instrument **GEOMETRY**. This parameter adjusts the frequencies, gains, and Q-factors of the resonator's filters in order to simulate various structures and materials. As you rotate this knob, you'll find:

Plates (metal)
Strings (steel, nylon)
Bars and tubes (glass, wood)
Bowls (glass, metal)

D. **BRIGHTNESS**. Controls the damping of high frequencies. Low values of this parameter simulate materials like wood or nylon. High values simulate materials like glass or steel.

E. **DAMPING** controls how quickly energy dissipates through the material. Modulating this parameter by CV can recreate the effect of damping or muting the sound by blocking the vibrating surface with the hand.

F. **POSITION** controls on which point of the structure the excitation is applied. Applying the excitation right in the middle of the surface will cause even harmonics to cancel each other, resulting in a hollow sound reminiscent of a square wave. **POSITION** is nature's PWM/phaser effect!

G. **SPACE.** Stereo control and reverberation.

When this knob is set to its minimum position, the left channel contains the exciter output, and the right channel the resonator signal - for further external mixing.

As **SPACE** increases, a stereo effect is created by picking up the vibrating surface's sound at two different positions. Past 12 o'clock, **SPACE** controls the amount and decay time of an algorithmic reverberator applied to the resonator signal.

H. Attenuverters for the CV inputs.

Inputs and outputs

1. CV inputs for the five resonator parameters.

Tips and Tricks

The resonator can behave like a formant filter. Feed a sawtooth or narrow PWM signal to one of the external inputs, set **BRIGHTNESS** to a low value, **DAMPING** to a low value, and modulate **GEOMETRY** to go through various configurations of formants. Then sweep the main frequency.

A very high CV on the **SPACE** CV input causes the reverb to have an infinite decay (freeze effect).

Check the online reference manual for the V/Oct calibration and firmware upgrade procedures.

Some internal parameters are slightly modulated by the serial number of the processor. Each module is unique!



Mutable Instruments

Elements

Modal synthesizer



Installation

Elements 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 **10mA** from the **-12V** rail and **130mA** from the **+12V** rail.

Online manual and help

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

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

Understanding modal synthesis

To imitate nature and acoustic instruments, modal synthesis breaks down the creation of sounds into two steps:

1. Synthesizing a noisy and/or percussive **excitation** signal, which represents the raw energy transfered to the instrument by the musician when (s)he bows, blows or strikes it.

2. Processing this excitation by a **resonator** modeling the vibrating structure itself and its environment - be it a string, tube or plate. Properties such as its size, tuning, shape and material can be simulated by adjusting the parameters of the resonator.

Control and exciter section

Overview

Three generators are available to build an excitation signal:

BOW produces a continous, granular scratching noise, which is smoothed by a built-in low-pass filter; and a purer tone interacting with the resonator frequency.

BLOW produces a continuous granular noise, whose pitch and colour can be altered.

STRIKE plays samples of percussive attacks, or synthesizes bursts of impulsions. These sounds are sculpted by a low-pass filter.

The **BOW** and **BLOW** signals are enveloped by a built-in ADSR contour generator.

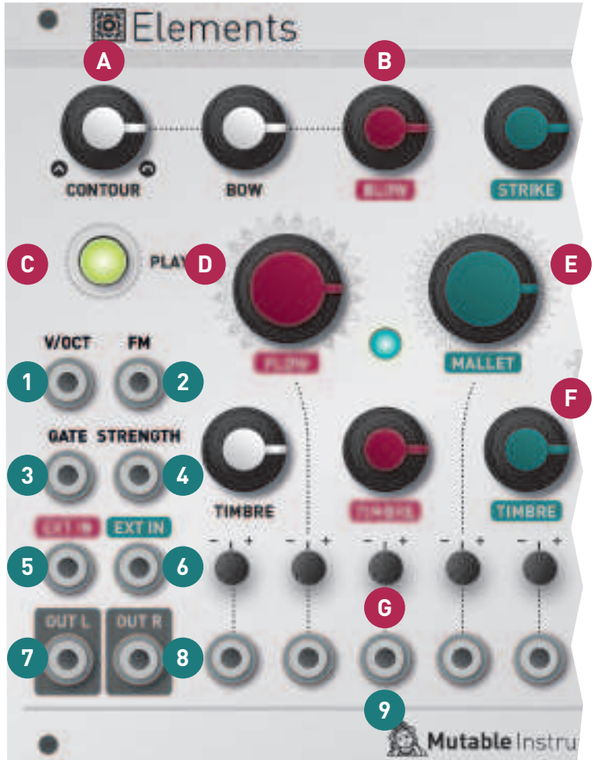
Controls

A. ADSR **CONTOUR**. Morphs through preset shapes.

B. Excitation mixer. Adjusts the level of the **BOW**, **BLOW** and **STRIKE** generators.

C. Press and hold this button to trigger the exciter. This is equivalent to sending a positive gate to the **GATE** input.

D. Air **FLOW**. Scans through various flavours of noise. Controlling this parameter with a CV (for example, from a slow LFO), will create an evolving texture reminiscent of a turbulent air flow.



E. MALLET type. This parameter controls the type of percussive noise produced by the **STRIKE** generator. Several synthesis models are featured along the path of this knob: samples; damped mallet model; plectrum model; and bouncing particles.

F. TIMBRE. Tone colour (filter cutoff, sample playback speed, or granulation rate) of each excitation generator.

G. Attenuverters for the CV inputs.

Inputs and outputs

1. 2. Main **V/OCT** CV input, and **FM** CV input. They control and modulate the note to which the resonator is tuned.

3. **GATE** input. Triggers the **STRIKE** generator and starts the course of the **BOW/BLOW** envelope.

4. **STRENGTH** CV input. This CV boosts or attenuates the amplitude of the three exciters, with a gain of +3dB/V. Ideal for velocity control or accentuation by a sequencer.

5. 6. Resonator external audio inputs. Before being sent to the resonator, the signal from the first input goes through the **BOW/BLOW** envelope and diffuser; while the second input signal does not undergo any further processing.

7. 8. Stereo audio output. Depending on the position of the **SPACE** knob, this consists of either the individual exciter/resonator components, or a true stereo pair with reverberation.

9. CV inputs for the five exciter parameters.