magnetismo

SFE devices

A twisted take on the classic resonant equalizer, for Ableton Live. Ten bands whose centres do not move: 29, 61, 115, 218, 411, 777 Hz, 1.5, 2.8, 5.2 and 11 kHz. Every step between them is a major seventh, except the outer two, which sit an octave from their neighbour.

The bands do not run in parallel. They share one mixing bus, and every dial crossfades between the input and that bus. At centre the two are the same number, so the device is flat and the bank is silent at the same time. Because all ten sit in one loop, a dial changes what the other nine do.

THE CURVE

The strip in the header is the response of the bank, worked out from the shared loop rather than from ten bell shapes laid over each other, so it shows what the device does and not an idea of it. It follows the ten dials, **resonance**, **shift**, **scale** and **root**, and it recomputes at the sample rate the set runs at.

Frequency runs logarithmically from 20 Hz to 16 kHz across the full width, and the ten notches on the line mark the band centres, so they move with **shift** and with the scale. Level is compressed rather than linear: small moves stay visible in a strip 29 px high while a resonance peak still fits the same picture. Past 60 dB the curve is pinned to the frame and the pinned run is marked white.

THE TEN BANDS

One dial per band, minus 24 to plus 24 dB. The two rows are the two comb outputs: **up** carries **61 Hz**, **218 Hz**, **777 Hz**, **2.8 kHz** and **11 kHz**, **down** carries **29 Hz**, **115 Hz**, **411 Hz**, **1.5 kHz** and **5.2 kHz**.

POSITION	WHAT THE DIAL DOES
centre	flat, bit for bit
9 to 3 o'clock	calibrated boost and cut to plus or minus 12 dB, accurate to a thousandth of a decibel
past 3 o'clock	the band narrows and rings on. The level stops near plus 24 dB while the width keeps falling
past 9 o'clock	the notch narrows. There is a floor to how far a band can be cut

Q is 2.1 at 29 Hz and 11 kHz and 2.95 at the other eight. Centre frequency and bandwidth are both corrected for the sample rate. At 44.1 kHz the top band still comes out narrower than its 2.1, at higher rates less so.

LOOP

- **input**: level in front of the bank, minus 24 to plus 24 dB. Fully up the sum drives into the soft clipper.
- **resonance**: raises the Q of all ten bands at once, 0 to 100. At the top of the travel the damping crosses zero and the bands sustain themselves. A brake tied to each band's own level holds that at a steady amplitude, so the dial sets how loud the ringing settles.

- **shift**: moves all ten bands together, minus 12 to plus 12 semitones. Plus or minus 11 is one band step, plus or minus 12 an octave. Bands pushed above Nyquist fade out rather than folding back. With a scale selected, **root** takes over this job.
- **feedback**: 0 to 100, output back to input. Fully up the loop sits near oscillation and what the bands boost builds up on its own.
- **phase**: sign of that feedback. `+` builds up, `–` cancels and thins the signal out.
- **mix**: dry to wet, 0 to 100. At 0 the bypass is bit exact.
- **level**: output level, minus 24 to plus 12 dB. Below full scale the signal is untouched; a soft knee only takes hold far above it.
- **limiter**: threshold, minus 24 to 0 dB, with the gain made back up. At 0 dB the limiter is bypassed.

OUTPUT

- **output**: `equalizer` is the direct signal plus all ten bands. `comb up` is 61, 218, 777 Hz, 2.8 and 11 kHz without the direct signal, `comb down` is 29, 115, 411 Hz, 1.5 and 5.2 kHz without it. `comb up + down` puts the two combs on left and right and feeds the bank from the mono sum, so the two sides differ by band.

In the two comb modes the bank is silent while the dials sit at centre, because that is where the crossfade cancels.

SCALE

- **scale**: `free` keeps the major seventh grid, which emphasizes no key. `minor` and `major` snap each band to the nearest degree of a pentatonic scale. No band moves further than 1.2 semitones, so the spacing, and with it the behaviour of the loop, is kept.
- **root**: the root note of that scale, C to B. It replaces **shift** while a scale is selected and moves in whole semitones.

The tuning holds for the band centres, which sit exactly on their degree. The resonance is a property of the shared loop, so with **resonance** up it rings beside a band. The measured distance from the degree is at most 87 cents with **resonance** at 0 and up to 307 cents at **resonance** 70. The scale reads clearest with the band dials past 3 o'clock and **resonance** low.

PLATE

- **plate**: a plate reverb behind the equalizer, dry to wet, 0 to 100. Its reverb time is fixed and long. At 0 the tank is not computed.

PUSH

Four banks: UP, DOWN, OUTPUT, LOOP.