VEIRA

FM SYNTHESIZER

VEIRA FM Six

User Manual

The sound of classic six-operator FM under VEIRA's own name and face: six sine operators in 32 algorithms, the 0 to 99 values FM programmers know, a clean MODERN engine or the grain of 80s digital FM, simple to play and fully programmable.



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Welcome

Thank you for choosing **VEIRA FM Six**. It makes the sound of classic six-operator FM synthesis: glassy electric pianos, bells and mallets, punchy basses, bright brass, plucks, organs and pads, the sounds that defined the 80s and still cut through a mix today.

FM, frequency modulation, makes sound in an unusual way. There are no filters and no samples: six sine waves, called **operators**, bend each other's phase, and the harder one pushes another, the brighter the sound. Because every operator has its own envelope, the brightness itself moves as a note plays, which is why FM sounds so alive on a struck or plucked note.

VEIRA FM Six is built to be simple on the surface and deep underneath. The PLAY page shows the sound and gives you a dozen macros that shape any preset (brighter, faster, longer, wider) without touching an operator. The EDIT page holds every operator, the 32 algorithms, the envelopes and the keyboard scaling, with the 0 to 99 values FM programmers expect.

What makes it different

- **Classic six-operator FM, written from the published mathematics.** Six operators, 32 algorithms, feedback, four-rate envelopes, velocity and keyboard scaling, a pitch envelope and an LFO, all with the familiar 0 to 99 values. No code, table or patch is taken from any instrument.
- MODERN **or** VINTAGE**.** MODERN is clean: computed at twice the rate, with no aliasing to speak of. VINTAGE is the grain of 80s digital FM: coarse tables, stepped envelopes, no oversampling and a converter whose grit you set with GRIT.
- **Two pages.** PLAY for playing and quick shaping; EDIT for programming, with the envelope and the keyboard scaling drawn as curves you drag.
- **Accurate.** Sidebands match theory to better than 0.002, every note from C1 to C8 is within 0.0013 cent of equal temperament, and stolen voices fade without a click.
- **A finishing chain.** CHORUS, DELAY and SPACE, then VOLUME and a soft limit that never lets the output reach full scale.
- **73 original factory presets** in 11 folders, levelled to about the same loudness, from tine pianos to bells, basses, brass, pads and templates to start from nothing.

How this manual is organised. *Getting started* installs and activates the plugin. *The panel at a glance* names the parts of both pages. *How FM synthesis works* explains operators, sidebands, ratios and algorithms, and what happens inside. *The PLAY page* and *The EDIT page* go through every control; *Programming a sound* walks through building one. *Presets*, *Recipes*, *Specifications* and *Troubleshooting* close the manual.

Getting started

What you need

macOS	macOS 11 Big Sur or later. Native on Apple silicon and Intel Macs (universal).
Windows	Windows 10 or 11, 64-bit.
Plugin formats	VST3 (macOS and Windows), Audio Units (macOS), and a standalone app. Pro Tools (AAX) versions arrive once they are signed for Pro Tools.
Hosts	Any DAW that loads VST3 or Audio Units: Logic Pro, Cubase, Nuendo, Ableton Live, Studio One, Reaper, FL Studio, Bitwig and others.
Account	A VEIRA account at veiraaudio.com, and the free **VEIRA Manager** app.
Internet	Needed to install and to refresh the licence. The plugin itself never goes online.

Install with VEIRA Manager

VEIRA plugins are not downloaded from the website one by one. You install them with **VEIRA Manager**, the free VEIRA app that installs, updates and activates everything you own. Its own manual covers it in full; the short version is:

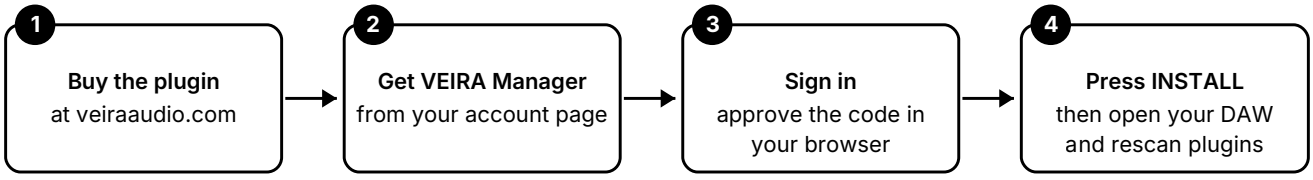


FIGURE 1 From purchase to first sound in four steps.

1. **Buy** VEIRA FM Six at **veiraaudio.com**. It's a one-time purchase: you own it for good, with free updates.
2. **Download VEIRA Manager** from your account page (or veiraaudio.com/manager) and install it.
3. **Sign in.** VEIRA Manager shows a short code and opens your browser; confirm the code there. Your password is never typed into the app.
4. Find VEIRA FM Six in the list and press INSTALL. When it says SHOW, it's installed. Open your DAW and let it rescan its plugins.

After installing, VEIRA FM Six appears in your DAW under the manufacturer **VEIRA** (in Logic Pro: Audio Units ▸ VEIRA ▸ VEIRA FM Six).

Activation and the licence

VEIRA Manager keeps a licence on your computer that the plugins check. It is refreshed every time VEIRA Manager opens and stays valid for 30 days offline, so you can work without internet as long as you open VEIRA Manager now and then.

Without a valid licence, VEIRA FM Six still loads and works, but **its sound fades out for 1.5 seconds every 30 seconds**, and a strip along the bottom of its window says why (for example, *NOT ACTIVATED ON THIS COMPUTER. SIGN IN WITH VEIRA MANAGER.*). Clicking the strip opens your account page.

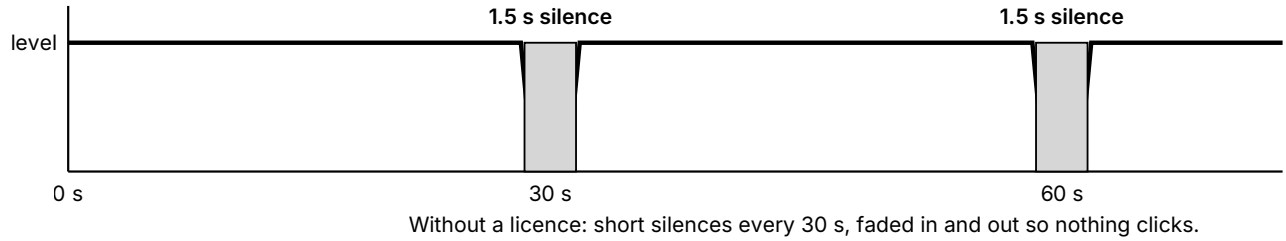


FIGURE 2 What an unlicensed copy does. With a valid licence the audio is never touched.

- **Activating while your DAW is open** takes effect within about two minutes. You don't need to reload the plugin.
- **"Not activated on this computer"**: open VEIRA Manager and sign in.
- **"Expired"**: open VEIRA Manager while online; it renews the licence at once.
- **"Not included"**: the signed-in account doesn't own VEIRA FM Six. Check that you're signed in with the account you bought it with.

Formats and where the files go

VEIRA Manager puts every format in the standard place, so you never need to copy files by hand:

Format	macOS	Windows
VST3	`~/Library/Audio/Plug-Ins/VST3` (just for me, the default) or `/Library/Audio/Plug-Ins/VST3` (all users)	`C:\Program Files\Common Files\VST3` (all users, the default) or `%LOCALAPPDATA%\Programs\Common\VST3`
Audio Units	`~/Library/Audio/Plug-Ins/Components` or `/Library/Audio/Plug-Ins/Components`	(Audio Units are macOS only)
Standalone	`~/Applications/VEIRA` or `/Applications/VEIRA`	`C:\Program Files\VEIRA` or `%LOCALAPPDATA%\Programs\VEIRA`

You choose *just for me* or *all users* in VEIRA Manager's install settings.

The standalone app runs VEIRA FM Six on its own, with your audio interface's input and output, which is handy for trying presets without a DAW.

The panel at a glance

VEIRA FM Six has two pages. Choose one with PLAY and EDIT in the header; the page is kept with your session.

Parts of the PLAY page



FIGURE 3 The PLAY page with *Init* and a chord held: 1 the header, 2 the preset's folder, name and note, 3 the algorithm, 4 OPERATOR LEVELS, 5 the read-outs, 6 SHAPE, 7 STEREO, 8 CHARACTER, 9 EFFECTS, 10 OUTPUT and 11 the keyboard.

	Part	What it does
1	Header	The VEIRA logo, the name and the version, the preset browser, SAVE, PLAY and EDIT, and the size button.
2	The preset	Its folder, its name and its note: what it's for and what to try.
3	The algorithm	How the six operators are connected, each block lighting with its operator's level.
4	OPERATOR LEVELS	A meter per operator, with its ratio or fixed frequency under it.
5	Read-outs	ALGORITHM, FEEDBACK, VOICES (sounding / allowed) and CHARACTER.
6	SHAPE	BRIGHTNESS, ATTACK, DECAY and RELEASE: macros that reshape any preset.

	Part	What it does
7	STEREO	DETUNE and WIDTH.
8	CHARACTER	MODERN or VINTAGE, and GRIT.
9	EFFECTS	CHORUS, DELAY and SPACE.
10	OUTPUT	VOLUME.
11	The keyboard	C0 to C6; it plays and shows the notes. C3 is middle C.

Parts of the EDIT page

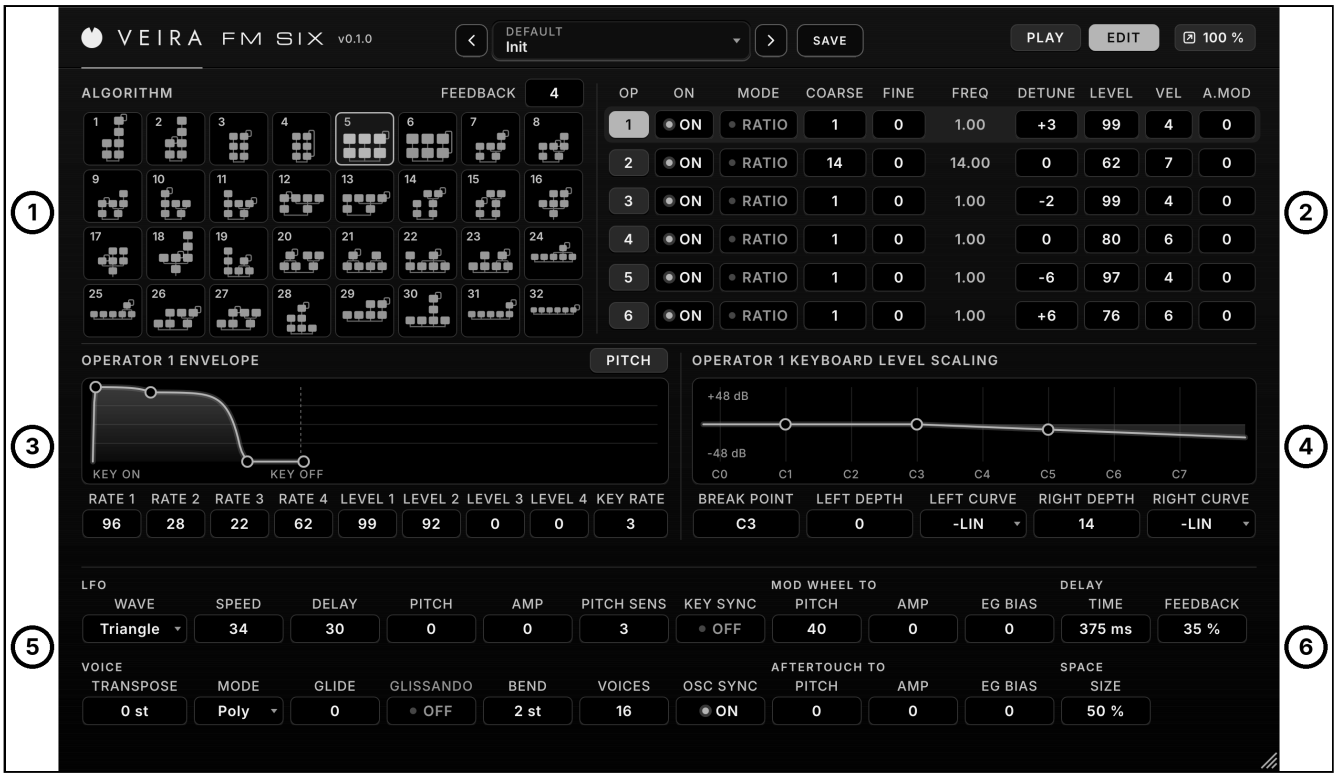


FIGURE 4 The EDIT page with *Init*, operator 1 chosen: 1 ALGORITHM and FEEDBACK, 2 the operators, 3 the chosen operator's envelope (or the pitch envelope), 4 its keyboard level scaling, 5 LFO and VOICE, and 6 MOD WHEEL TO, AFTERTOUCH TO, DELAY and SPACE.

	Part	What it does
1	ALGORITHM	The 32 algorithms as small diagrams; the chosen one is outlined. FEEDBACK 0 to 7.
2	The operators	One row per operator: ON, RATIO or FIXED, COARSE, FINE, the frequency that results, DETUNE, LEVEL, VEL and A.MOD. Click a number in OP to choose the operator.
3	Envelope	The chosen operator's envelope as a curve with four handles, and its eight values and KEY RATE. PITCH shows the pitch envelope instead.

	Part	What it does
4	Keyboard level scaling	How the chosen operator's level changes across the keyboard, as a curve with its five values.
5	LFO, VOICE	The LFO; TRANSPOSE, MODE, GLIDE, GLISSANDO, BEND, VOICES and OSC SYNC.
6	Controllers, effects	What the mod wheel and aftertouch do; the delay's TIME and FEEDBACK; the space's SIZE.



FIGURE 5 The header: 1 the VEIRA logo, the name and the version, 2 and 4 the previous and next preset, 3 the preset's folder and name (an asterisk: changed since it loaded), 5 SAVE, 6 PLAY and 7 EDIT, and 8 the size button, here at 100 %.

Using the controls

Every VEIRA plugin is played like a piece of hardware. The same few parts appear on every panel:

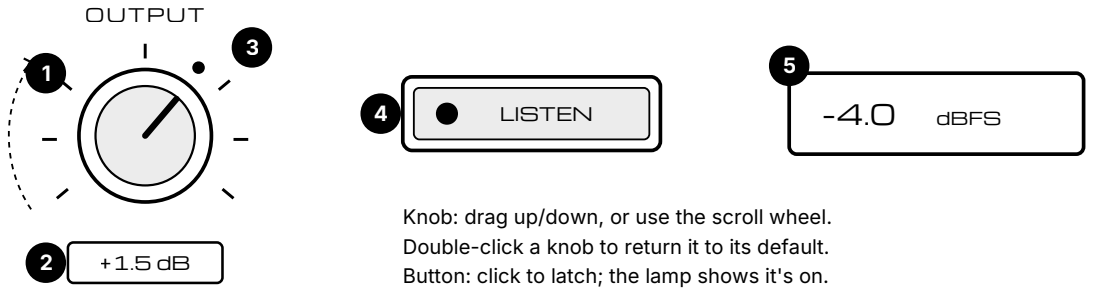


FIGURE 6 The parts you'll find on every VEIRA panel (the labels are examples).

- 1 **Knob.** Drag up to turn it clockwise, down to turn it back, or use your mouse wheel. **Double-click** returns it to its default. The engraved pointer and the small dot on the scale show where it's set.
- 2 **Value window.** The backlit window under each knob shows its exact value with its unit.
- 3 **Silkscreen label.** The control's name, as it appears in your DAW's automation list.
- 4 **Push button.** Click to switch on; the lamp lights and the cap sits lower in its bezel. Click again to switch off.
- 5 **Readout.** Live numbers update ten times a second so you can read them while the meters move. A value over 0 dBFS shows as a warning.

Tooltips: hover over any control or display for a short explanation. On displays, the tooltip depends on where you point.

Automation: every knob and button is a host parameter, so you can automate it in your DAW and control it from a MIDI controller or control surface that your DAW maps.

Units: VEIRA never shows a bare number. **dBFS** is level against digital full scale (0 dBFS is the loudest a digital signal can be); **dB** is a change in gain; **LUFS** is loudness as streaming services and broadcasters measure it; **LU** is a difference in loudness (1 LU = 1 dB).

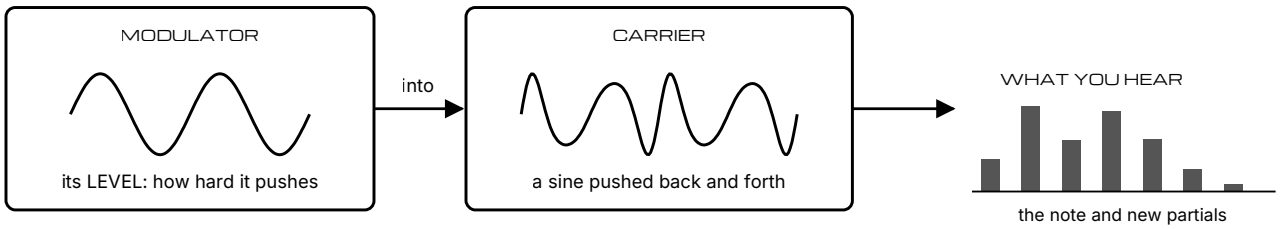
On VEIRA FM Six's panel the parts look a little different from the drawing above. The face is an 80s-inspired design of VEIRA's own: a dark anodised panel with a glowing amber display.

- **Knobs** are dark discs with a white pointer and an amber arc, their value beneath them (25 %, -5.5 dB). Drag up and down or use the wheel (Shift for finer steps); double-click for the default; right-click (Control-click on a Mac) to type a value.
- **The EDIT page's values are boxes**: drag up or down on a box, use the wheel, double-click for the default, or right-click to type. Switches (ON, RATIO / FIXED, KEY SYNC, GLISSANDO, OSC SYNC) toggle on a click, with a small lamp lit when on; choices (WAVE, MODE, the curves) open a menu.
- **Amber and blue.** In the algorithm drawings and the meters, **amber blocks are carriers** (heard) and **blue blocks are modulators**; the **red loop** is the feedback. In print, carriers are the lighter blocks along the bottom row, modulators the blocks above them; this manual's own drawings fill the carriers in black.
- **The chosen key** (PLAY or EDIT, MODERN or VINTAGE, the chosen operator) is filled in amber.
- **Tooltips** explain every control: hover over it.
- **The window size.** VEIRA FM Six opens at 100 %, 1280 × 800 points. To change it, click the size button 8 in the header and choose 75, 90, 100, 125, 150 or 200 % or *Fit to screen* (sizes that don't fit your display are left out); or drag the grip in the bottom-right corner (double-click it for 100 %); or press Cmd + = and Cmd + - (Ctrl on Windows) to step up and down and Cmd + 0 for 100 %. Your DAW saves the size with the session, and new instances open at the size you chose last.

VEIRA FM Six is an instrument: put it on an instrument (or software instrument) track. It has no audio input, and plays in stereo or mono.

How FM synthesis works

Operators: carriers and modulators

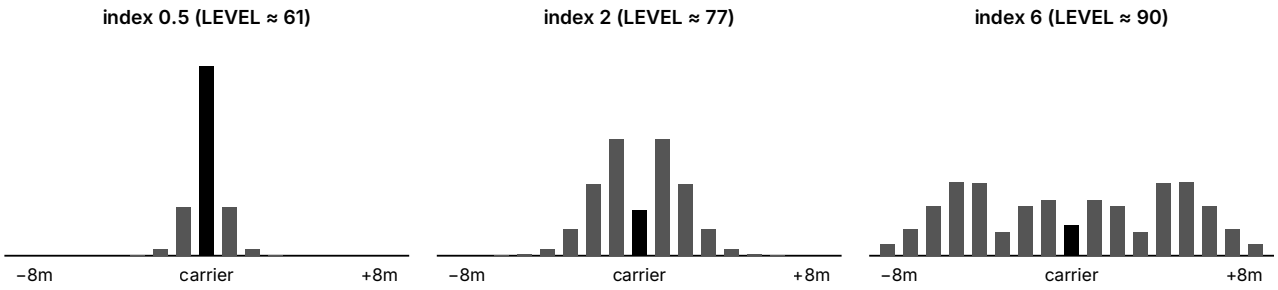


An operator is a sine wave with its own envelope. A carrier is heard; a modulator is not heard itself: it bends the phase of the operator under it, and the harder it pushes (its LEVEL), the more partials appear. Six operators, wired in one of 32 algorithms, make every sound in VEIRA FM Six.

FIGURE 7 A modulator and a carrier.

An **operator** is a sine wave with its own level and its own envelope. On its own it is the plainest sound there is. The trick of FM is to connect operators: one operator's output is added to another's **phase**, pushing it back and forth many times a cycle. The operator that does the pushing is a **modulator**; the one you hear is a **carrier**. A modulator is never heard directly, only in what it does to its carrier.

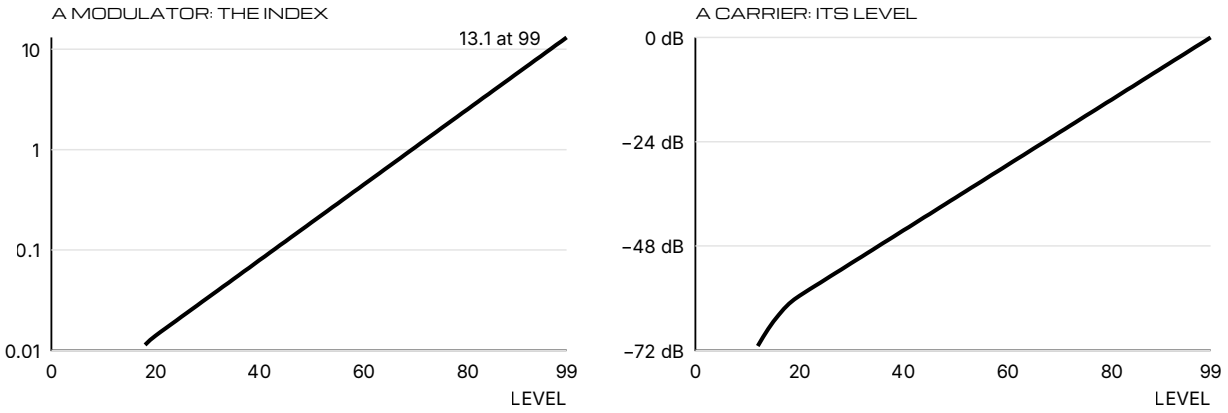
Sidebands and the index



Sidebands appear either side of the carrier, one modulator's frequency (m) apart, each as loud as a Bessel function of the index says. A low index adds a couple; a high one spreads the energy wide and the carrier itself dips. The index follows the modulator's LEVEL and its envelope, so the brightness moves as the note plays.

FIGURE 8 The sidebands of one carrier and one modulator at three indices.

Pushing a sine's phase makes new frequencies, called **sidebands**, either side of the carrier, spaced by the modulator's frequency. How many and how loud depends on the **modulation index**: how far the modulator pushes. A small index adds a soft edge; a large one spreads the sound into many partials, bright and buzzy. In VEIRA FM Six the index is the modulator's [LEVEL]: at 99 it is 13.1, and every eight steps down halves it.

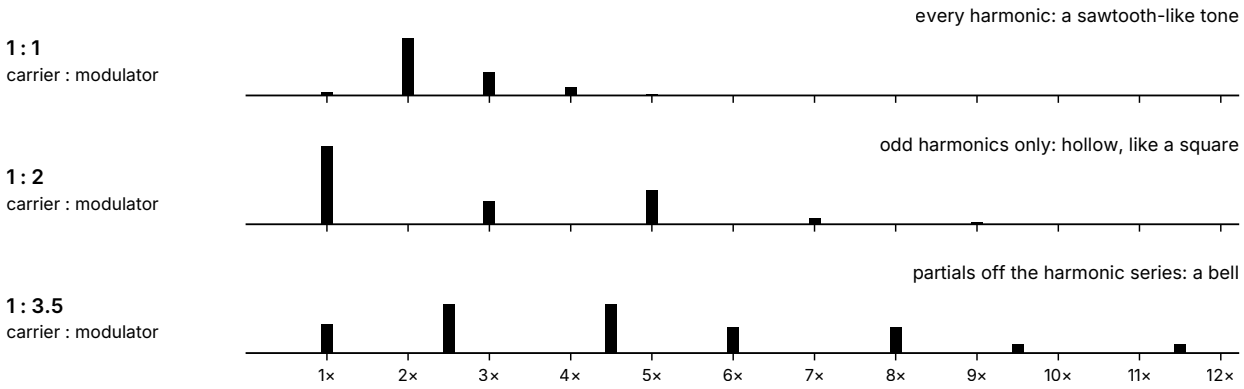


Eight LEVEL steps halve the output (0.75 dB a step), from 99 down to 20; under 20 the steps grow until 0 is silence. On a modulator that is the brightness: the index is 13.1 at 99, 6.6 at 91, 3.3 at 83. Velocity, key scaling and the envelope add in steps.

FIGURE 9 What LEVEL does to a modulator and to a carrier.

Because the modulator's level also follows its **envelope**, the index changes as the note plays. A modulator whose envelope falls quickly makes a bright strike that mellows into a rounder tone: the sound of a struck bar, a plucked string or a tine piano. A modulator that rises slowly makes a sound that opens up, like a brass swell.

Ratios



The same index (1.8) at three ratios. Whole-number ratios make harmonic tones; others make the inharmonic partials of bells, metal and glass. COARSE and FINE set each operator's ratio; FIXED holds an operator at one frequency instead.

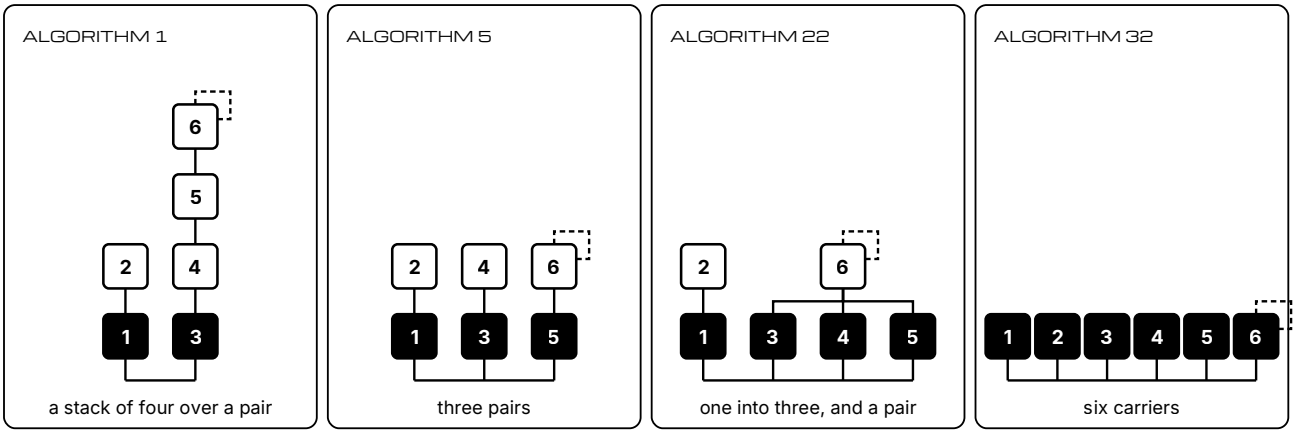
FIGURE 10 One index, three ratios.

The **ratio** between the modulator's and the carrier's frequencies decides which partials appear. Whole-number ratios (1 : 1, 1 : 2, 1 : 3) put the sidebands on the harmonic series: musical tones, a sawtooth-like buzz at 1 : 1, a hollow square-like tone at 1 : 2. Other ratios (1 : 3.5, 1 : 1.41) put them between the harmonics: the clangorous, inharmonic partials of bells, metal and glass. That is FM's great strength: a few numbers move a sound from a reed to a bell.

Feedback and algorithms

Feedback lets one operator modulate itself. A little feedback turns its sine towards a sawtooth; at 7 it is a bright, stable sawtooth-like tone, and with high ratios around it, noise. In each algorithm one loop can feed back, drawn in red on the panel.

An **algorithm** is the wiring of the six operators: which modulate which, and which are carriers. VEIRA FM Six has 32, from one long stack (each operator modulating the next, very complex) to six carriers side by side (an additive organ of six sines).

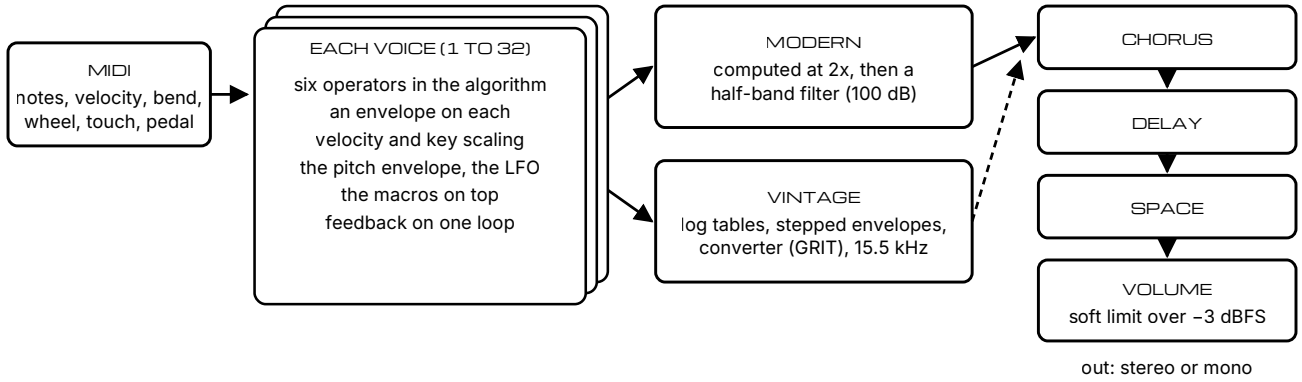


Filled: carriers (heard). Outlined: modulators. Each modulator sits over what it modulates; the dashed loop is the feedback. On the panel the carriers are amber and the modulators blue, and the feedback loop is red.

FIGURE 11 Four of the 32 algorithms, drawn the way the panel draws them.

- **Pairs** (one modulator on one carrier, as in algorithm 5) are the easiest to program: each pair is a little instrument of its own, and three pairs layer three of them.
- **Stacks** (a modulator modulating a modulator) make denser, brighter spectra, good for brass, strings and growls.
- **One modulator on several carriers** (algorithm 22) colours them all at once.
- **All carriers** (algorithm 32) is pure additive synthesis: six sines you mix, like drawbars.

What happens inside VEIRA FM Six



MODERN and VINTAGE are the same voice computed two ways; switching never shifts the timing. The latency is 31 samples at 44.1 and 48 kHz (MODERN's filter; VINTAGE is delayed to match), none at 88.2 kHz and above, and is reported.

FIGURE 12 From your keys to the output.

Each voice runs six operators in the chosen algorithm, each with its envelope, its velocity response and its keyboard scaling, under the pitch envelope and the LFO, with the PLAY page's macros acting on top. The voices are computed one of two ways, MODERN or VINTAGE (see *CHARACTER*), then pass through CHORUS, DELAY and SPACE, and VOLUME with a soft limit: exactly linear up to −3 dBFS, then bending so that the output can never reach 0 dBFS.

The latency is 31 samples at 44.1 and 48 kHz, from MODERN's filter; VINTAGE is delayed by the same amount, so switching never shifts the timing. At 88.2 kHz and above there is none. VEIRA FM Six reports it to your DAW.

The PLAY page

The display

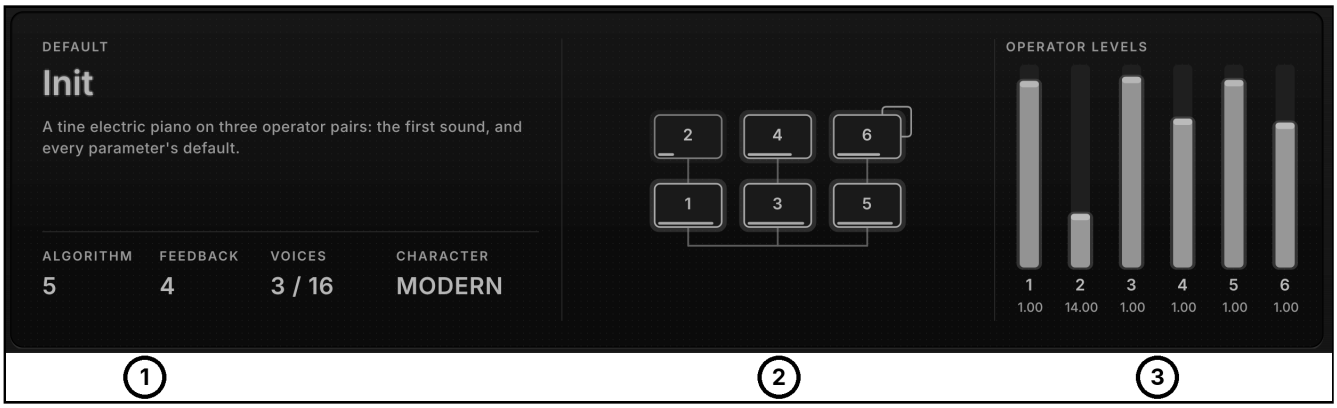


FIGURE 13 The display: 1 the preset's folder, name and note, and under them ALGORITHM, FEEDBACK, VOICES and CHARACTER; 2 the algorithm, each block lit with its operator's level; 3 OPERATOR LEVELS with each operator's ratio.

The display shows what the sound is and what it is doing.

- **The preset** is named in large amber type, with its folder above and its note below: what it is for, and what to try.
- **The read-outs** say which ALGORITHM and FEEDBACK the sound uses, how many VOICES are sounding of the number allowed (3 / 16), and the CHARACTER.
- **The algorithm** is drawn live: amber blocks along the bottom are the carriers, blue blocks above them the modulators, the red loop the feedback. Each block's bar lights with its operator's level as you play.
- OPERATOR LEVELS has a meter per operator, amber for carriers and blue for modulators, with the operator's ratio (1.00, 14.00) or fixed frequency under it. Watch the modulators' meters fall after a strike: that is the brightness dying away.

SHAPE, STEREO, CHARACTER, EFFECTS and OUTPUT

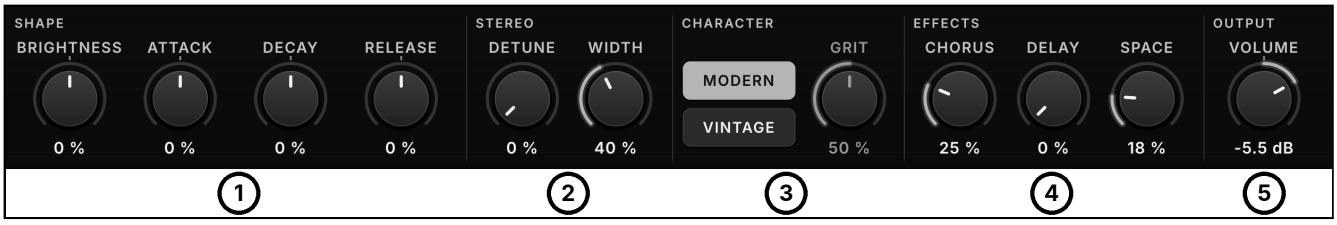


FIGURE 14 The PLAY page's controls: 1 SHAPE, 2 STEREO, 3 CHARACTER, 4 EFFECTS and 5 OUTPUT, here at their defaults.

Control	Range	Default	What it does
BRIGHTNESS	−100 to +100 %	0 %	Raises or lowers every modulator's level: brighter or mellower.

Control	Range	Default	What it does
ATTACK	−100 to +100 %	0 %	Slows (right) or speeds up (left) every operator's attack.
DECAY	−100 to +100 %	0 %	Lets the sound ring longer (right) or damps it (left).
RELEASE	−100 to +100 %	0 %	How long the sound takes to die away after the key is let go; right is longer.
DETUNE	0 to 100 %	0 %	Spreads the six operators' tuning apart: thicker, moving.
WIDTH	0 to 100 %	40 %	0 % is mono; higher places each note across the stereo field.
MODERN, VINTAGE		MODERN	The engine's character (see below).
GRIT	0 to 100 %	50 %	VINTAGE only: how much of the converter's grain you hear.
CHORUS	0 to 100 %	25 %	A stereo ensemble.
DELAY	0 to 100 %	0 %	How much echo; its time and feedback are on the EDIT page.
SPACE	0 to 100 %	18 %	How much reverb; its size is on the EDIT page.
VOLUME	−36 to +6 dB	−5.5 dB	The output level.

The macros: SHAPE and STEREO

The macros act inside the engine, on top of whatever the preset is, so you can reshape any sound without opening the EDIT page. They are ordinary parameters of their own: turning them never changes an operator's values, and setting one back to 0 % gives you the preset exactly as it was.

- BRIGHTNESS moves every modulator's level up or down by up to 14 steps (about 10.5 dB): more or less index, so more or fewer partials. Where an algorithm has no modulators (all carriers), it acts on the operators above the lowest ratio instead.
- ATTACK shifts every operator's first rate, DECAY the second and third, and RELEASE the fourth. Turned right, the sound swells in, rings longer or fades longer; turned left, it starts harder, damps sooner or stops shorter.
- DETUNE pulls the six operators up to about 9 cents apart, each its own way, for a thicker sound that beats slowly. A little suits pianos and pads; a lot sounds out of tune on its own, so use it with taste.
- WIDTH gives each note its own place in the stereo field: at 0 % everything is in the middle; at 100 % successive notes spread across the stereo image.

CHARACTER: MODERN or VINTAGE

MODERN computes the voices cleanly: 32-bit phases into an interpolated sine, envelopes interpolated every sample, the voices computed at twice the sample rate at 44.1 and 48 kHz and brought down through a filter with 100 dB of stopband, and a guard that lowers a modulator's index only on the notes where its sidebands would fold back into the audible range. A plain sine's noise and distortion are 139 dB down; with modulators at 1, 3 and 14 times the note at full index, everything that isn't a true partial is 67 dB or more down at 48 kHz.

VINTAGE uses the era's method: a 12-bit phase into a logarithmic sine table, the level added in 0.19 dB steps, an exponential table whose low bits fall away as the level drops, envelopes that move in steps, no oversampling (so the era's aliasing is there, on purpose), and each voice through a converter that shifts its range with the level, then a gentle 15.5 kHz filter. GRIT sets that converter's resolution, from 13.5 bits at 0 % to 10 bits at 100 %: on a quiet note its grain is 64, 56 and 47 dB down at 0, 50 and 100 %. GRIT is dimmed in MODERN.

The two characters play at the same level within 0.31 dB and line up to the sample, so you can switch while you listen. High notes with bright modulators are where they differ most: VINTAGE adds the sparkle and grit of aliasing that MODERN keeps out.

EFFECTS and OUTPUT

- CHORUS: two voices a side with slowly drifting delays, for the shimmer of a chorused piano or pad.
- DELAY: a stereo echo with crossed, darkened repeats. TIME (20 to 1500 ms, default 375 ms) and FEEDBACK (0 to 90 %, default 35 %) are on the EDIT page.
- SPACE: a reverb from a small room (0.5 s) to a long hall (7 s), set by SIZE on the EDIT page (default 50 %).
- VOLUME: the output level. The defaults put the loudest single note of *Init* at velocity 127 at about −7.7 dBFS, and a four-note chord at velocity 100 at about −4.7 dBFS. Above −3 dBFS a soft limit bends the output so it never clips.

The keyboard

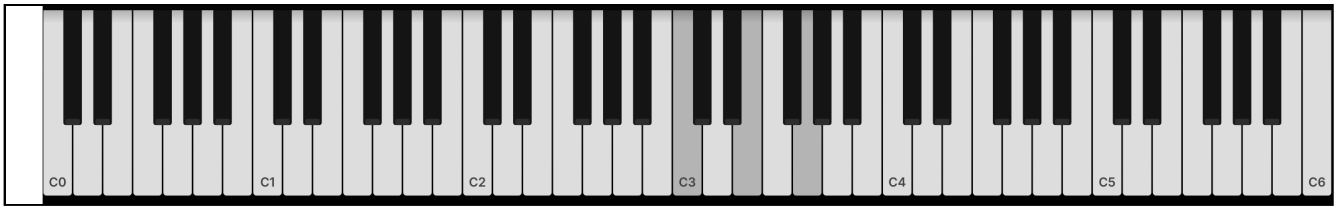


FIGURE 15 The keyboard, C0 to C6, with the notes of a C major chord lit.

The keyboard plays VEIRA FM Six with the mouse: click or drag across the keys (lower on a key plays louder). It also lights the notes your MIDI keyboard or your DAW plays. **C3 is middle C** (MIDI note 60) on this keyboard and in this manual.

The EDIT page

ALGORITHM and FEEDBACK

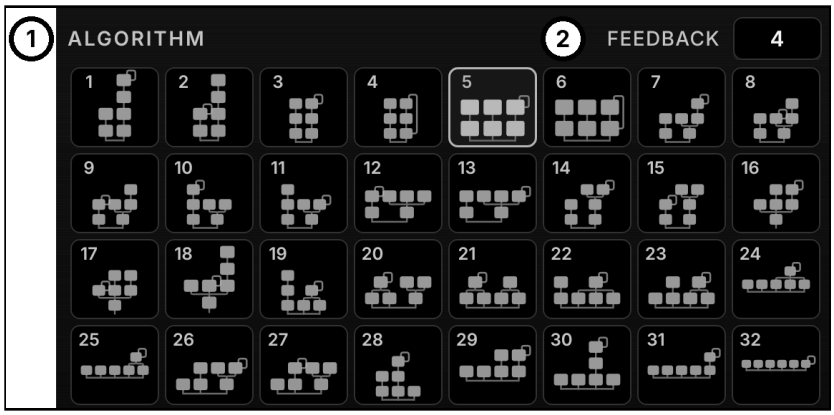


FIGURE 16 1 ALGORITHM: the 32 algorithms, the chosen one (5) outlined; 2 FEEDBACK.

Click an algorithm to choose it, or turn the mouse wheel over the grid. Each tile draws its wiring: carriers along the bottom in amber, modulators above in blue, the feedback loop in red. FEEDBACK (0 to 7, default 4) sets how much the operator on the red loop modulates itself; each step down halves it. In algorithms 4 and 6 the loop runs through two and three operators.

Changing the algorithm keeps every operator's values but changes what they do: a modulator becomes a carrier, and its LEVEL becomes a loudness instead of a brightness. When you change algorithms on a sound you like, check the LEVELs of the operators that changed role.

The operators

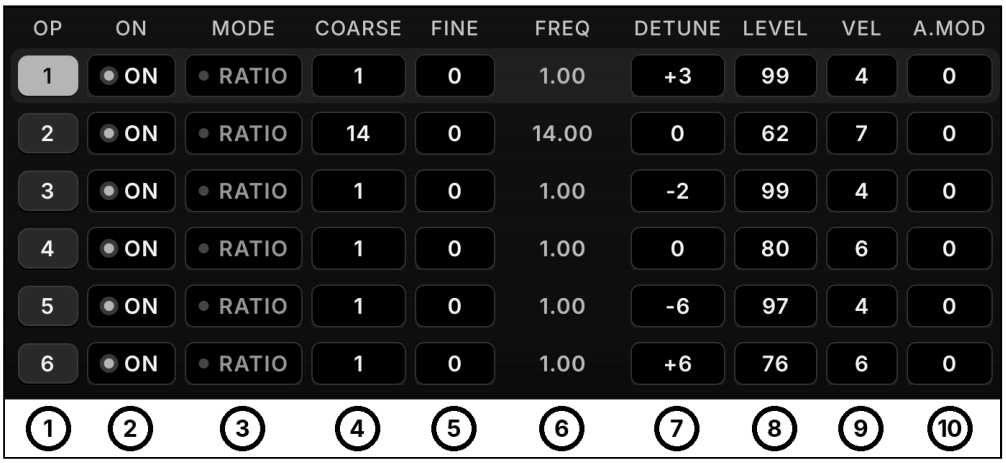


FIGURE 17 The operators: 1 OP (click to choose one; operator 1 is chosen), 2 ON, 3 RATIO or FIXED, 4 COARSE, 5 FINE, 6 FREQ, the result (amber for carriers, blue for modulators), 7 DETUNE, 8 LEVEL, 9 VEL and 10 A.MOD.

Column	Range	What it does
ON	On, Off	Switches the operator on or off.
RATIO, FIXED		RATIO: the frequency follows the key. FIXED: it stays at one frequency whatever the key.
COARSE	0 to 31	RATIO: the multiple of the note, 0.5 (shown as 0), then 1 to 31. FIXED: 1, 10, 100 or 1000 Hz (0 to 3, repeating).
FINE	0 to 99	RATIO: adds up to 99 % to the ratio (COARSE 1, FINE 50 is 1.50). FIXED: multiplies the frequency by up to 9.77.
FREQ		The ratio (14.00) or the fixed frequency that results.
DETUNE	−7 to +7	A slight detune, about ±4 cents at A 440 and wider in the bass.
LEVEL	0 to 99	The output level: a carrier's loudness, a modulator's brightness. Eight steps halve it.
VEL	0 to 7	How much velocity changes the level: 0 not at all, 7 the most.
A.MOD	0 to 3	How much the LFO's AMP and the controllers' EG BIAS change the level (up to 36 dB at 3).

Choosing an operator. Click its number under OP: it lights amber, and the envelope and keyboard scaling below now show it.

VEL makes a sound respond to how hard you play. On a modulator it is the most musical setting in FM: harder playing is brighter, as on a real instrument. At 7, velocity 50 is 14.2 dB under velocity 100.

DETUNE on two operators of the same ratio makes them beat slowly against each other: the chorus inside a tine piano or a string sound. *Init* detunes its three carriers +3, −2 and −6.

The envelope

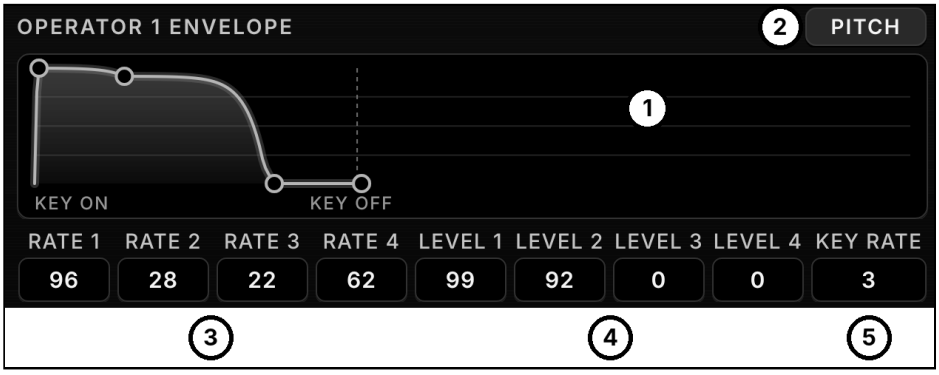
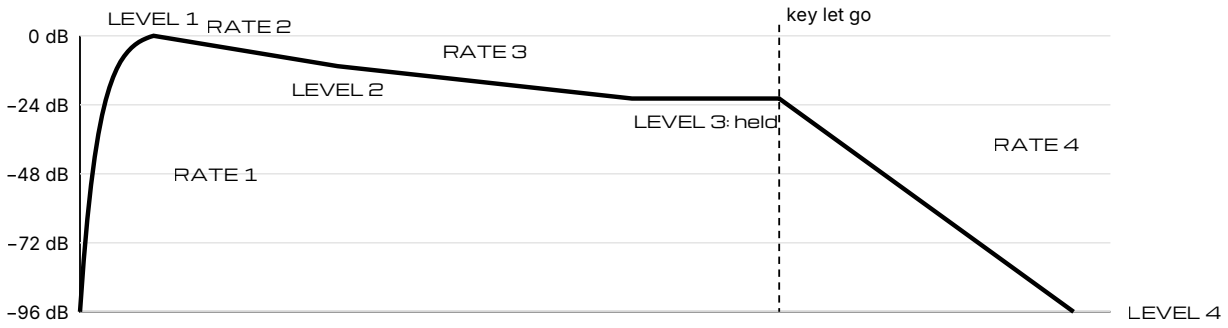


FIGURE 18 Operator 1's envelope: 1 the curve with its four handles and the key's release (dashed), 2 PITCH to show the pitch envelope instead, 3 RATE 1 to RATE 4, 4 LEVEL 1 to LEVEL 4 and 5 KEY RATE.



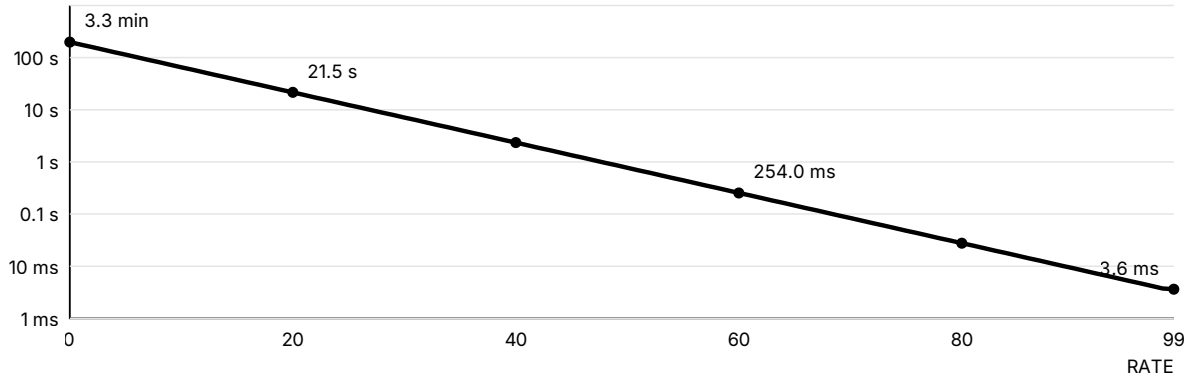
Each operator's level moves in four segments, each at its RATE to its LEVEL. A falling segment is a straight line in dB; a rising one is a fast swell. On a modulator the envelope is the brightness moving: a bright strike that mellows.

FIGURE 19 Four rates, four levels.

Each operator's level follows a four-segment envelope:

1. When a key is pressed, the level moves at RATE 1 to LEVEL 1 (the attack),
2. then at RATE 2 to LEVEL 2 (a first decay),
3. then at RATE 3 to LEVEL 3, where it stays while the key is held,
4. and when the key is let go, at RATE 4 to LEVEL 4 (the release; usually 0).

All eight are 0 to 99; a higher rate is faster. A falling segment is a straight line in decibels, an exponential decay, the way a struck or plucked note dies; a rising segment is a fast swell. **Drag the handles** on the curve: up and down for a level, left and right for a rate (right is slower). The time axis is compressed so that fast and slow segments both show.



How long a falling segment takes to fall the whole 96 dB at each RATE: its speed doubles every six or so steps. A real decay falls much less than 96 dB, so it is shorter. KEY RATE speeds every rate up towards the top of the keyboard.

FIGURE 20 How long a falling segment takes at each RATE.

KEY RATE (0 to 7) speeds every rate up towards the top of the keyboard, as on plucked and struck instruments, whose high notes die sooner: at 7 an A4 decays 11.3 times faster than an A0.

The pitch envelope. Click PITCH to show it in the same place: four rates and four levels that move the pitch of the whole voice. Level 50 is the note itself; 0 and 99 are four octaves down and up, with fine steps near 50. It makes the scoop of a brass note, the drop of a synth tom or a laser's fall. Click PITCH again for the operator's envelope.

Keyboard level scaling

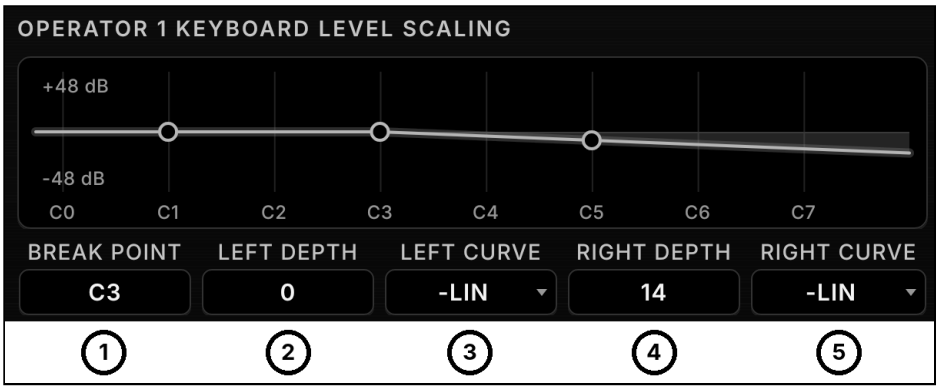
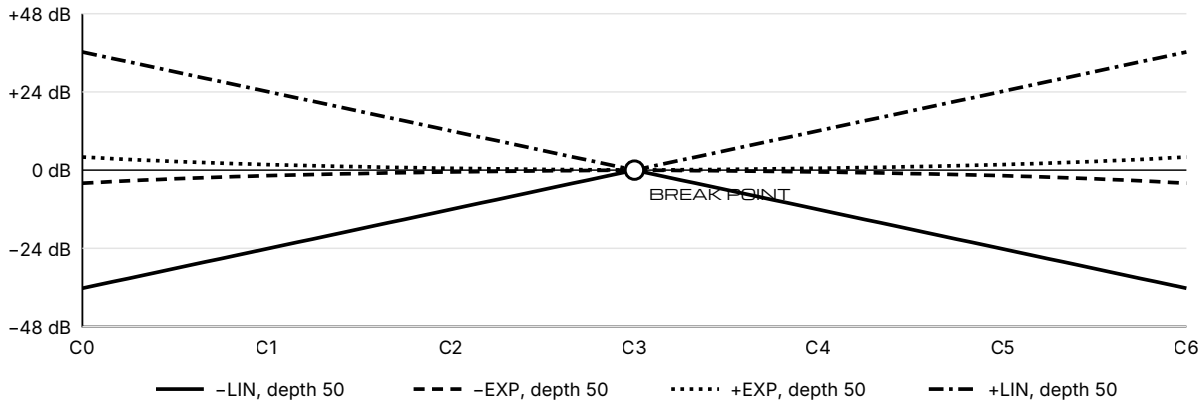


FIGURE 21 Operator 1's keyboard level scaling: 1 BREAK POINT (the blue handle), 2 LEFT DEPTH, 3 LEFT CURVE, 4 RIGHT DEPTH and 5 RIGHT CURVE (the amber handles).



Each side of the BREAK POINT has its own depth and curve: −LIN and −EXP turn the operator down away from it, +LIN and +EXP turn it up. LIN is a straight line (72 dB over three octaves at depth 99); EXP stays near the break point, then bends away.

FIGURE 22 The four curves either side of the break point.

Real instruments change across their range: high piano notes are thinner, low notes of a bell rounder. Keyboard level scaling turns an operator's level up or down away from a key you choose. BREAK POINT (A-1 to C8) is that key; LEFT DEPTH and RIGHT DEPTH (0 to 99) say how much the level changes below and above it, and LEFT CURVE and RIGHT CURVE how: -LIN and -EXP turn it down, +LIN and +EXP turn it up; LIN is a straight line in decibels (72 dB over three octaves at depth 99), EXP stays close near the break point and then bends away.

Drag on the curve: the blue handle moves the break point, and the amber handles move each side's depth, up or down through zero, which changes the curve's sign. Scaling a modulator down towards the top keeps high notes from getting harsh; scaling a carrier balances the level across the keyboard.

LFO, VOICE and the controllers



FIGURE 23 1 LFO, 2 VOICE, 3 MOD WHEEL TO, 4 AFTERTOUCH TO, 5 DELAY and 6 SPACE.

Control	Range	Default	What it does
WAVE	Triangle, Saw Down, Saw Up, Square, Sine, S & H	Triangle	The LFO's wave; S & H is a new random value each cycle.
SPEED	0 to 99	34	About 0.06 Hz at 0, 6 Hz at 35, 47 Hz at 99.
DELAY (LFO)	0 to 99	30	How long after a key the vibrato and tremolo begin, then fade in.
PITCH (LFO)	0 to 99	0	Vibrato: how much the LFO moves the pitch (times PITCH SENS).
AMP (LFO)	0 to 99	0	Tremolo and wah: how much it moves the level of operators whose A.MOD is above 0.
PITCH SENS	0 to 7	3	How far the pitch can move: 7 is seven semitones each way.
KEY SYNC	On, Off	Off	On: the LFO restarts at each key.
TRANSPOSE	−24 to +24 st	0 st	Transposes the keyboard.
MODE	Poly, Mono	Poly	Mono: one voice; overlapping notes glide with no new attack.
GLIDE	0 to 99	0	Portamento, from at once to about two seconds an octave.
GLISSANDO	On, Off	Off	The glide moves in semitone steps.
BEND	0 to 12 st	2 st	The pitch bend's range.
VOICES	1 to 32	16	How many notes can sound at once in Poly.
OSC SYNC	On, Off	On	On: every operator starts its wave at each key, so every attack is the same.
MOD WHEEL TO	PITCH, AMP, EG BIAS, 0 to 99	40, 0, 0	What the mod wheel adds: vibrato, tremolo, or level (EG bias).
AFTERTOUCH TO	PITCH, AMP, EG BIAS, 0 to 99	0, 0, 0	What pressing into the keys adds.
TIME (DELAY)	20 to 1500 ms	375 ms	The echo's time.

Control	Range	Default	What it does
FEEDBACK (DELAY)	0 to 90 %	35 %	How much of each echo feeds the next.
SIZE (SPACE)	0 to 100 %	50 %	A small room (0.5 s) to a long hall (7 s).

- **Vibrato** comes from the LFO's PITCH (always on) or the mod wheel's and aftertouch's PITCH (when you move them), each scaled by PITCH SENS. *Init* puts 40 on the mod wheel, so pushing it adds vibrato.
- **Tremolo and wah** come from AMP, but only on the operators whose A.MOD is above 0: on a carrier it is tremolo, on a modulator a wah-like movement of the brightness.
- **EG bias** lets the wheel or aftertouch open the level of the A.MOD operators: with the wheel down they are quieter (or, on a modulator, darker), and pushing it brings them in. Use it for a sound that brightens as you press.
- MODE **Mono** plays one line: a note played while another is held changes pitch without a new attack, gliding at GLIDE's speed, and letting go returns to the note still held. Great for basses and leads.
- OSC SYNC On (the default) gives every note the same attack. Within a chord each note's carriers still start at their own phase, so a struck chord doesn't pile up into one tall peak: 4.1 dB lower for a four-note chord. Off, the operators run free, and attacks vary a little, like an analog synthesizer's.
- **Voices** that run out are stolen oldest first, each faded over 4 ms, so stealing never clicks.

MIDI

MIDI	What it does
Notes and velocity	Play; velocity changes the level of each operator by its VEL.
Pitch bend	Up to ±12 semitones (BEND).
Channel aftertouch	AFTERTOUCH TO: PITCH, AMP and EG BIAS.
CC 1 (mod wheel)	MOD WHEEL TO: PITCH, AMP and EG BIAS.
CC 64 (sustain)	Holds the notes.
CC 120, CC 123	All sound off, all notes off.

All 177 parameters can be automated from your DAW. VEIRA FM Six does not import banks from other instruments: its presets are its own, and your presets are saved as VEIRA preset files (.veirapreset).

Programming a sound

The EDIT page looks dense, but a sound is built from a few decisions. Here is the path from nothing to a bell-like electric piano, using the *Templates* folder.

1. **Load *Templates* ▸ *Two Operator Start*.** It is one modulator (operator 2) on one carrier (operator 1), both at a ratio of 1.
2. **Move operator 2's LEVEL.** Choose it under OP and drag its LEVEL down to 0: you hear a plain sine. Bring it back up: around 60 the sine gains an edge, around 80 it buzzes, near 99 it is harsh. This is the index.
3. **Give operator 2 an envelope that falls.** With operator 2 chosen, drag the envelope's second handle down and to the left: the brightness now strikes and dies away, while the carrier keeps ringing. That's the essence of every struck FM sound.
4. **Try ratios.** Set operator 2's COARSE to 2, 3, then 14: the tone turns hollow, nasal, then metallic, a tine's ping. Set FINE to make it inharmonic for a bell.
5. **Add velocity.** Give operator 2 a VEL of 4 to 7: playing harder is brighter.
6. **Layer.** Choose algorithm 5 (three pairs) and build a second pair on operators 3 and 4 for the body, slightly detuned against the first. *Init* is exactly this: a 14 : 1 ping on operators 1 and 2 and two warm pairs.
7. **Finish on the PLAY page** with CHORUS, SPACE and the macros, then SAVE.

Templates ▸ *Six Sines Start* builds sounds additively (algorithm 32, six carriers at ratios 1 to 6: set each LEVEL like a drawbar), and *Stack Start* is the deep end: four operators in a chain with feedback.

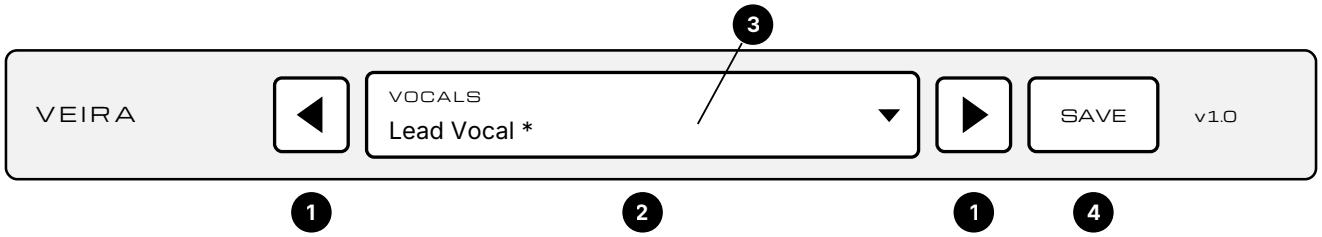
> **Tip:** When a sound is too bright, lower the LEVEL of a **modulator**, not the carrier; when it is too quiet, raise the carrier. On the PLAY page, BRIGHTNESS does the first for every modulator at once.

Presets

VEIRA FM Six comes with **73 factory presets** in 11 folders. Each one is a starting point made for a real job. Load one close to what you need, then adjust the first control its note mentions.

The preset browser

The preset browser sits in the header, at the top of the window.



The header: logo and plugin name, then the preset browser, then the version.

FIGURE 24 The preset browser.

- 1 ◀ ▶ step to the previous or next preset, through every folder in order.
- 2 **The display** shows the folder (small, above) and the preset's name. Click it to open the preset menu. Hover over it to read the preset's note: what it's for and what to adjust first.
- 3 **An asterisk (*)** after the name means you've changed something since the preset loaded.
- 4 SAVE stores your current settings as a user preset.

The preset menu

Clicking the display opens a menu with:

- one submenu per **factory folder**, in the order shown below;
- **User Presets**, with your own presets in their folders;
- **Save...**, **Delete** (only for user presets: factory presets can't be deleted), **Rescan** (re-reads the user folder, if you copied presets in by hand) and **Show User Preset Folder** (opens it in Finder or Explorer).

Saving your own presets

1. Set VEIRA FM Six the way you like it.
2. Press SAVE. A dialog opens inside the plugin window.
3. Type a name, choose a folder or type a new folder name, and confirm.

Each user preset is one small .veirapreset file:

	Folder
macOS	~/Library/Audio/Presets/VEIRA/VEIRA FM Six/<Folder>/
Windows	%APPDATA%\VEIRA\VEIRA FM Six\Presets\<Folder>\

Copy these files to move your presets to another computer, or to back them up. Presets keep loading in future versions: any control added later simply starts at its default.

Presets in your DAW

The factory presets also appear in your DAW's own preset or program menu, named *Folder: Name* (for example *Vocals: Lead Vocal*). Whatever preset is selected is saved with your session and comes back when you reopen it, including the asterisk if you'd changed it.

The **Default ▸ Init** preset equals a fresh instance of the plugin: every control at its default.

The factory folders

Folder	Presets
Default	Init
Keys	Soft Tines, Bright Tines, Ballad Keys, Punch Keys, Reed Bark, Glass Keys, Funk Keys, Hard Keys, Harpsi Keys, Toy Keys
Bells & Mallets	Tubular Chime, Glass Bell, Tower Bell, Vibes, Marimba, Kalimba, Music Box, Crystal Chime, Steel Pan
Bass	Solid Bass, Slap Bass, Rubber Bass, Sub Sine, Pick Bass, Fretless Glide, Sequencer Bass, Detuned Bass, Club Bass
Brass & Stabs	Brass Stab, Soft Horns, Synth Brass, Fanfare, Pop Stab, Big Hit, Mellow Section
Pads & Strings	Glass Pad, Warm Strings, Voice Pad, Slow Sweep, Ice Pad, Dark Pad, Fifth Pad, Shimmer Strings, Hollow Pad
Plucks & Guitars	Nylon Pluck, Steel Strings, Harp, Silk Pluck, Synth Pluck, Muted Guitar, Glass Pluck
Organs	Drawbar Organ, Percussive Organ, Pipe Organ, Rock Organ, Soft Organ, Squeeze Box
Leads	Saw Lead, Square Lead, Whistle Lead, Reed Lead, Soft Flute
Effects	Laser Fall, Alarm, Space Wind, Robot Talk, Sub Drop, Metal Clang
Templates	Sine Start, Two Operator Start, Six Sines Start, Stack Start

Every preset was designed for VEIRA FM Six; none is taken from another instrument's sounds. *Sequencer Bass* plays in VINTAGE; the rest in MODERN, so switching CHARACTER on any of them is a quick way to hear the difference.

> **Levels:** every preset was measured through the plugin on the same phrase (a four-note chord, then a seven-note line; the basses play a bass line, the bells an octave higher) and its VOLUME set so it plays at −18 LUFS, or as loud as peaks under −6 dBFS allow, also on a fast line at velocity 120. So the soft limit is never reached, and the bank reads −23.7 to −17.8 LUFS, every preset within 3.9 LU of the median: struck and plucked sounds sit a little lower, since they fade between notes. *Init* keeps the defaults. Your own playing sets the real level. Hover a preset's name to read its note.

Recipes

A tine piano for a ballad

1. Load *Keys* ▸ *Soft Tines* or *Ballad Keys*.
2. Play softly for a round tone and harder for the bark: the modulators follow velocity.
3. On the [PLAY] page, raise [CHORUS] for movement and [DECAY] a little to let it ring; lower [BRIGHTNESS] if it competes with a voice.

A punchy FM bass

1. Load *Bass* ▸ *Solid Bass*, or *Slap Bass* for a harder snap.
2. Set [SPACE] to 0 % and [WIDTH] to 0 % so the bass stays centred and dry.
3. For a line that slides, load *Fretless Glide*, or set [MODE] to Mono and [GLIDE] around 30 on the [EDIT] page.

Bells that sit in a mix

1. Load *Bells & Mallets* ▸ *Glass Bell* or *Tubular Chime* and play an octave higher than you'd think.
2. Shorten them with [DECAY] (left) under a busy part, or lengthen them with [DECAY] and [SPACE] for an intro.
3. If the bell is too clangorous, lower [BRIGHTNESS]; for a different bell, change the modulators' [FINE] on the [EDIT] page.

Brass stabs

1. Load *Brass & Stabs* ▸ *Brass Stab* or *Synth Brass*.
2. Play short chords with strong velocities; the tone swells open just after each attack.
3. Raise [ATTACK] a little for a softer swell, or try *Pop Stab* for a scoop into each note.

The 80s grain

1. Load any preset and switch [CHARACTER] to [VINTAGE].
2. Raise [GRIT] for more of the converter's grain, and play high: bright sounds gain the sparkle of aliasing.
3. Compare with [MODERN] at the same level: the two line up to the sample and within 0.31 dB.

An organ from six sines

1. Load *Organs* ▸ *Drawbar Organ*, or *Templates* ▸ *Six Sines Start* to begin bare.
2. On the [EDIT] page, algorithm 32 makes all six operators carriers: set their [COARSE] to the drawbars you want (0 is the sub-octave, 1 the unison, 2 the octave, 3 the twelfth) and use each [LEVEL] as a drawbar.
3. Back on the [PLAY] page, raise [CHORUS] for a gentle movement, or push the mod wheel for vibrato.

Specifications

Type	Six-operator FM synthesizer: MIDI input, no audio input, stereo or mono output
Engine	Six sine operators, 32 algorithms, one feedback loop (0 to 7); index 13.1 at LEVEL 99, halving every 8 steps
Operators	ON; RATIO (0.5, 1 to 31, FINE 0 to 99) or FIXED (1, 10, 100, 1000 Hz × up to 9.77); DETUNE ±7; LEVEL 0 to 99; VEL 0 to 7; A.MOD 0 to 3; four rates and four levels; KEY RATE 0 to 7; keyboard level scaling (BREAK POINT A-1 to C8, two depths 0 to 99, curves −LIN, −EXP, +EXP, +LIN)
Modulation	Pitch envelope (±4 octaves); LFO (six waves, 0.06 to 47 Hz, delay, key sync); mod wheel and aftertouch to pitch, amplitude and EG bias
Voice	1 to 32 voices (16), Poly or Mono, portamento and glissando, bend 0 to 12 semitones, transpose ±24 semitones, OSC SYNC
Character	MODERN (2x at 44.1 and 48 kHz, aliasing guarded) or VINTAGE (log tables, stepped envelopes, no oversampling, converter 13.5 to 10 bits with GRIT, 15.5 kHz filter)
Macros	BRIGHTNESS, ATTACK, DECAY, RELEASE (±100 %); DETUNE, WIDTH (0 to 100 %)
Effects	CHORUS; DELAY (20 to 1500 ms, feedback to 90 %); SPACE (0.5 to 7 s); VOLUME −36 to +6 dB (−5.5 dB) with a soft limit over −3 dBFS
Tuning	C1 to C8 within 0.0013 cent of equal temperament at 44.1, 48 and 96 kHz; A4 = 440 Hz
MIDI	Notes, velocity, pitch bend, channel aftertouch, CC 1, CC 64, CC 120, CC 123 (C3 = middle C)
Latency	31 samples at 44.1 and 48 kHz, none at 88.2 kHz and above; reported
Parameters	177, all automatable
Presets	73 factory presets in 11 folders, plus your own
Window	1280 × 800 points at 100 %; 75 to 200 % or Fit to screen, from the size button, the corner grip or Cmd/Ctrl + = - 0; opens at 100 %, saved with the session and remembered for new instances
Formats	VST3, Audio Units (instrument), standalone; AAX once signed
Plugin ID	Manufacturer Veir, plugin Vfms

Troubleshooting and questions

The sound drops out for a moment every 30 seconds. The plugin isn't activated on this computer. Open VEIRA Manager and sign in; the strip at the bottom of the plugin's window says exactly what's wrong. See *Getting started ▸ Activation and the licence*.

I can't find it in my DAW's effects. It is an instrument: look for it where your DAW lists software instruments, under the manufacturer **VEIRA**. Make sure VEIRA Manager shows SHOW (installed) for it, then rescan plugins.

I turned a LEVEL up and the sound got brighter, not louder. That operator is a modulator in this algorithm: its level is the brightness. Raise a carrier's level for loudness (carriers are the amber blocks along the bottom of the algorithm drawing).

High notes sound harsh or noisy. The modulators are too bright up there. Lower BRIGHTNESS, give the modulators keyboard level scaling that falls to the right (-LIN or -EXP), or reduce FEEDBACK. In VINTAGE, some harshness at the top is the era's aliasing; switch to MODERN for a clean sound.

Notes cut each other off. MODE is Mono, or VOICES is low. Set MODE to Poly and raise VOICES (up to 32).

The sound is louder than the preset I came from. Changing the algorithm, a carrier's level or VOLUME changes the level. The output never clips (a soft limit bends it above −3 dBFS), but lower VOLUME if your track's meter runs hot.

Can I load sounds from other FM instruments? No. VEIRA FM Six uses the familiar 0 to 99 values, so you can program a sound you know by ear, but it does not import other instruments' banks. Its 73 presets are its own.

Why does it report latency? At 44.1 and 48 kHz, MODERN computes the voices at twice the rate and filters them back down, which takes 31 samples; your DAW compensates. At 88.2 kHz and above there is none.

Contact: support@veiraaudio.com. Mention your computer (Mac or Windows and its version), your DAW and version, and what you see.



VEIRA FM Six · User Manual · Version 0.1.0

Support: **support@veiraaudio.com** · Web: **veiraaudio.com**

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