VELUM OWNER'S MANUAL

Velum runs the version 2 firmware of the first Virtual Acoustic synth on an emulated board and adds a voice editor that draws every parameter. This manual shows how to play it, how to choose its voices and, above all, how to shape them in the voice editor.

Formats VST3 · AU · CLAP · LV2 (Linux)

Systems macOS 11 or later · Windows 10 and 11, Linux 64-bit (in testing)

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Original 1994: the first synthesizer sold with a physical model of winds and strings inside, two voices played with a breath controller

CONTENTS

0 About this manual

1 Velum basics

2 The panel and the editor

3 Setting up

4 Selecting voices

5 Editing a voice

6 The controllers

7 Mixing and the modifiers

8 Effects

9 The instrument in depth

10 Voice-wide settings

11 The library

12 The panel's own modes

13 Velum in your studio

A The factory voices

B Troubleshooting

CHAPTER 0

ABOUT THIS MANUAL

Velum is a physical-modelling instrument. Its sound comes from a model of a wind or bowed instrument computed while you play, as on the first Virtual Acoustic synth in 1994. Velum does not imitate that instrument: it runs its own version 2 firmware on emulated processors and DSP chips, so the voices, the controllers and the effects behave as they did on the hardware.

The manual follows the order of the original's *Getting Started* manual: the basic ideas of physical modelling, setting up, selecting voices, the controllers, mixing and the modifiers, and the effects. Where the hardware asks you to step through its display pages, Velum's voice editor does the same job on one screen, so the procedures here are done in the editor. Chapters 9 to 13 cover what the maker left to its reference volume and what Velum adds: the instrument's expert parameters, tuning, the library, your DAW and editing the hardware over MIDI.

Some topics of the original's manuals do not apply to a plugin and are left out: power and cables, the floppy disk drive, the backup battery, the breath controller jack and its calibration trimmers. Velum receives everything over MIDI from your DAW.

Conventions

WRITTEN AS	MEANS
PLAY	A key on Velum's panel.
COMPARE	A button, tab, page or label in the voice editor, as it reads on screen.
Cnt1	Text on the panel's display.
C3	A note, named as on the original: C3 is MIDI note 60, middle C.
0…127	A range of values, from 0 to 127.

The screenshots show Velum 1.0.2 with its factory voices, mostly H02 *Alto Sax* and A01 *Vintage VL*. Click any screenshot to open it at full size.

CHAPTER 1

VELUM BASICS

A conventional synthesizer starts from oscillators or samples and shapes them with filters and envelopes. Velum has none of these. It simulates what happens inside an acoustic instrument: a reed, a pair of lips, a jet of air or a bow sets a column of air or a string vibrating, the vibration travels along it, reflects at the end and comes back to the source, which reacts to it in turn. The result depends on the length of the tube or string, on its shape and losses, and on how the player blows or bows.

That is why Velum feels like an instrument rather than a sound:

- The same note played the same way never sounds exactly the same twice.
- What happens between two notes, the slur, the overblow, the squeak, is part of the sound.
- You do not only control loudness and pitch, but breath pressure, lip tension and the reed's opening, and the tone follows them as it would on a real instrument.
- It is harder to play than a sample player, and playing it well is a skill you build, as with any acoustic instrument.

The model

Each voice is built from one or two *elements*. An element is a complete instrument with three parts: the **controllers**, which play it, the **instrument**, which makes the sound, and the **modifiers**, which shape it. The two elements then share one chain of **effects**.



The instrument

The instrument is a **driver** coupled to a **resonator**. The driver is the part the player excites: a single reed, a double reed, the lips in a brass mouthpiece, a jet of air on an edge, or a bow on a string. The resonator is the tube with its air column, or the string. Its length sets the pitch; its shape, its losses and the driver set the tone. Here, as on the original, any driver can be joined to any resonator, which is how the stranger voices are made.

The instrument's internals were never meant for everyday editing: the factory voices provide the instruments, and you work with the controllers, the mixing and the modifiers. Velum still shows them, on the INSTRUMENT page described in chapter 9, with the same groups as the maker's own expert editor.

The controllers

A wind player's lungs, throat and lips, or a string player's bowing arm, are part of the sound. In Velum they are *controller parameters*, and each of them can be driven by any MIDI controller you have: a breath controller, the modulation wheel, aftertouch, velocity and so on. Every element has fourteen:

PARAMETER	WHAT IT SIMULATES
Pressure	Breath pressure on the reed or mouthpiece; on a string, the bow's speed. It changes both loudness and tone.
Embouchure	How tightly the lips hold the reed, or each other; on a string, how hard the bow presses. It changes pitch and tone.
Pitch	The length of the tube or string. Usually on the pitch-bend wheel.
Vibrato	A periodic change of pitch, embouchure or both, with its own speed and envelope.
Tonguing	Narrows the gap between reed and mouthpiece, like a saxophonist's half-tonguing.
Amplitude	Loudness alone, without changing the tone.
Scream	Pushes the whole model into chaotic oscillation: sounds only a physical model can make.
Breath Noise	The noise of the breath. Its colour is set on the BREATH NOISE page.
Growl	A periodic change of pressure: the growl of a wind player.
Throat Formant	The resonance of the player's throat and mouth; it can add roughness.
Dynamic Filter	The cutoff of the dynamic filter among the modifiers.
Harmonic Enhancer	The amount of the harmonic enhancer, another modifier.
Damping	Losses along the tube or string, from the friction of the air. It affects pitch and tone.
Absorption	The loss of high frequencies at the end of the tube or string: on a wind instrument, the bell.

The modifiers

Five stages after the instrument shape its tone. They are closer to the model than ordinary effects, and each element has its own:

HARMONIC ENHANCER → DYNAMIC FILTER → EQUALIZER → IMPULSE EXPANDER → RESONATOR

Harmonic enhancer

Modulates one of the instrument's inner signals with another, to change the harmonic structure while staying within the instrument's family.

Dynamic filter

A resonant low-pass, band-pass, high-pass or band-reject filter that can follow the keyboard and the controllers.

Equalizer

Five parametric bands, with a high-pass and a low-pass filter.

Impulse expander

Spreads the sound in time, for the metallic resonance of brass and metal-bodied woodwinds.

Resonator

Five resonating delay loops, for the woody resonance of an instrument's body.

Two elements and the effects

Velum is a solo instrument at heart, but each voice has two elements, each a complete model. They can be layered on every note, split across the keyboard, or used to play two notes at once. After the elements come three effect stages in a fixed order: modulation, feedback delay and reverb.

CHAPTER 2

THE PANEL AND THE EDITOR

Velum opens on its front panel, laid out like the original's rack version. The panel plays and selects voices and gives access to the firmware's own menus on its display. The voice editor, one click away, is where you will do most of your editing.



Velum's front panel. The numbers match the list below.

1. VOICE EDITOR opens the voice editor, once the machine has started.
2. **Output** sets Velum's output level, after the emulated converter: −24…+12 dB, +6.0 dB by default, shown under the knob. Drag up or down (with shift, ten times finer), turn the mouse wheel over it (0.5 dB a step, with shift 0.1 dB), or double-click it to go back to +6.0 dB. Your DAW can automate it as *Output*.
3. PLAY EDIT UTILITY select the firmware's three modes. The lit LED shows which one is on.
4. COPY STORE are the firmware's copy and store functions. Storing from the voice editor is easier: see Storing a voice.
5. The **display** is the hardware's, drawn by its firmware. Click it to open the patch browser. Right-click it (or control-click) for *Display colors*, a choice of eight schemes: Blue (retrofit), Grey STN, Yellow-green, Black on white, White on black, Amber, Green OLED and Red.
6. F1 … F8 are the function keys. What each one does is written on the display's bottom line, just above it.
7. DEC INC step through voices and values. They also answer the display's `Are You Sure?`: INC for yes, DEC for no.
8. The **cursor keys** move the cursor on the display.
9. EXIT leaves a page; ENTER opens the page under the cursor or confirms.
10. DUAL CORE runs part of the emulation on a second processor core, without changing the sound. Its LED is lit when it is on. See chapter 13.

> **NOTE**
>
> Velum's panel has no power switch, volume knob, headphone or breath controller jack, floppy drive, data dial or contrast control. With a mouse you press one key at a time, so the hardware's shortcut of holding INC and DEC together to jump by 16 is not available: the patch browser reaches any voice in one click.

The voice editor at a glance

Click VOICE EDITOR. The window grows to the editor's size and shows the voice that is playing. Press ESC or click < PANEL to go back. You can resize the window by its corner; the panel and the editor scale together.



The voice editor, here on **Element 1 › Harmonic Enhancer** with H02 Alto Sax playing.

The header

< PANEL; the **voice box**, which shows the voice's location and name like the display does (click it to open the patch browser); the < > buttons, which step to the previous and next voice; COMPARE, undo and redo, and STORE.

The tabs

COMMON holds what belongs to the whole voice. ELEMENT 1 and ELEMENT 2, each followed by the element's name, hold the two instruments. EFFECTS holds the three effect stages. At the right are MIDI, for editing the hardware over MIDI, and DUAL CORE.

The module chips

The pages of the chosen tab. The chosen one is gold; each tab remembers its page. The INSTRUMENT chip carries an EXPERT badge.

The page

Usually a drawing across the top, which you can often drag, and cards of parameters below it.

The footer

On the left, the last message sent to the firmware, or what just happened. On the right, how to use the page you are on.

CHAPTER 3

SETTING UP

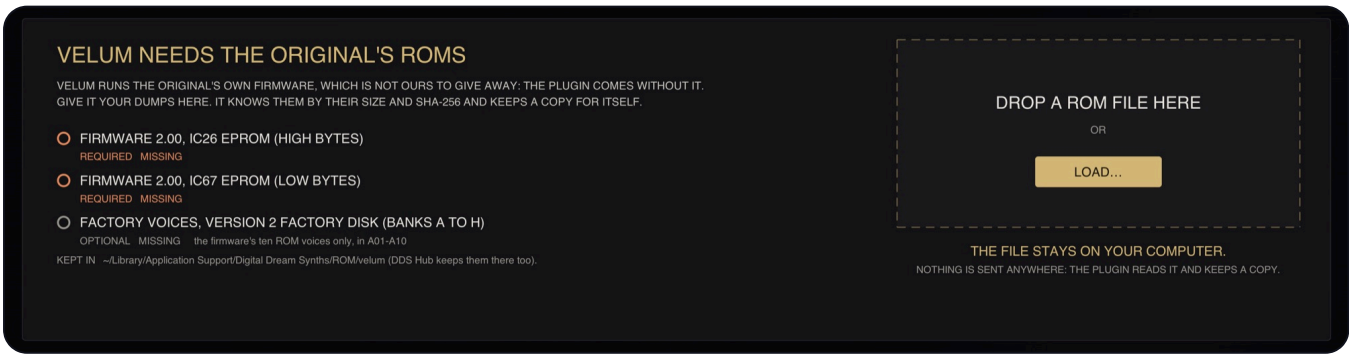
What you need

- **macOS 11 or later**, Apple Silicon or Intel: VST3, AU or CLAP. **Windows 10 or 11**, 64-bit: VST3 or CLAP. **Linux**, 64-bit x86 with glibc 2.35 or later (Ubuntu 22.04 or newer, for example): VST3, CLAP or LV2. Windows and Linux are still in testing.
- A DAW that hosts instrument plugins.
- **Your dumps of the original's version 2 firmware**: its two EPROMs, IC26 and IC67, as image files. They do not ship with Velum: you give them to Velum or to DDS Hub, and they stay on your computer. See Giving Velum its ROMs.
- Optional: the original's **Version 2 factory disk** (its `.ALL` file), for the 128 factory voices.
- For wind and bowed voices, ideally a breath controller or a wind controller. A keyboard alone plays many voices too.

Velum keeps your library, its settings and a snapshot of the started machine in its data folder, next to DDS Hub's: `~/Library/Application Support/Digital Dream Synths/velum` on macOS, `%APPDATA%\Digital Dream Synths\velum` on Windows, `~/.local/share/digital-dream-synths/velum` on Linux. Up to version 1.0.0 this was a folder of its own, `Velum`, in the same place as `Digital Dream Synths`. The first time a newer Velum starts, it moves that folder into the new place, library and settings included; if it cannot move it, it copies it and leaves the old one where it was. If the new folder already has something in it, Velum uses it and does not touch the old one. The ROM dumps live apart, in the ROM folder that DDS Hub uses too: `~/Library/Application Support/Digital Dream Synths/ROM/velum` on macOS, `%APPDATA%\Digital Dream Synths\ROM\velum` on Windows, `~/.local/share/digital-dream-synths/rom/velum` on Linux.

Giving Velum its ROMs

Velum runs the original's own firmware, which belongs to its maker and is not ours to give away, so the plugin comes without it. Until it has the two firmware dumps, Velum does not start: its ROM panel covers the front panel and lists what it needs.



The ROM panel at the first start. Each row is a dump Velum takes; a red ring is a required one still missing.

DUMP	SIZE	SHA-256	
Firmware 2.00, IC26 EPROM (high bytes)	524,288 bytes	`c96de6b67a2ca429d069361d8770cfcb813a6782828e36c2c9c94a63a91c5ba9`	Required
Firmware 2.00, IC67 EPROM (low bytes)	524,288 bytes	`012bfd27364483c345562f62e05a249e0267ddce75e6fae9f5f844939c01dbf6`	Required
Version 2 factory disk (its `.ALL` file), 128 voices	396,288 bytes	`397f75ffdd1e47ab636a4a05d1d416d6c0091f673276207b02a8c3135a6192b4`	Optional

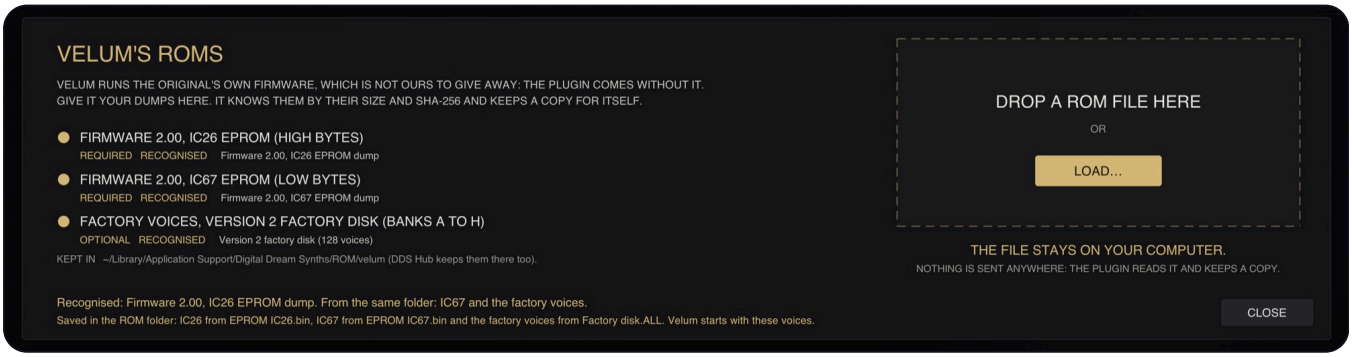
1. **Give it a dump.**
   On macOS, drag the file onto Velum's window. On any system, click LOAD… and choose it. The file can have any name: Velum knows a dump by its size and its SHA-256 checksum. If your dumps are together in one folder, choosing one of them with LOAD… is enough: Velum also looks at the other files in that folder, not in its subfolders, and takes the dumps it still lacks. It takes only dumps it recognises and leaves every other file alone.

2. **Check its row.**
   A dump Velum knows is copied into the ROM folder; its row turns gold and reads RECOGNISED, with the name of the dump. The lines at the bottom say where it was saved, or, when LOAD… found others beside it, which file filled each slot.

3. **Give it the other EPROM**
   , if it is not in yet. As soon as both are in, Velum starts, and its display counts `Starting… N%` behind the panel.

4. **Add the factory disk**
   if you have it and it is not in yet, in the same way. If Velum has already started without it, it loads the 128 voices into memory at once.

5. **Close the panel**
   with CLOSE or the Escape key.



One file chosen with Load…, the other two taken from the same folder. The message at the bottom reports the last file given and what came with it.

> **NOTE**
> The file stays on your computer: Velum reads it and keeps a copy in its ROM folder, and nothing is sent anywhere. A file it does not know is not saved: the panel shows its size and SHA-256, so you can compare them with the table above. Velum checks the dumps again each time it starts; if a saved one has changed, its row reads NO LONGER MATCHES and Velum asks for it again.

DDS Hub keeps the dumps in the same folder: a dump added on Velum's page in Hub is there for Velum, and one given to Velum shows in Hub. To look at the dumps later, or to add the factory disk, right-click the display (Control-click on a Mac trackpad) and choose ROM DUMPS….

Without the factory disk, Velum's memory holds only the firmware's ten ROM voices, in A01 to A10. Everything else in this manual works the same; the voices it names as examples are the factory ones.

The first start

Add Velum to an instrument track. Once it has its ROMs, its display counts `Starting… N%` while the emulated hardware boots, then shows the `PLAY` page with voice A01. The first start takes longer, more so with the factory disk, whose 128 voices the firmware receives as it would over MIDI: Velum then keeps a snapshot of the started machine and the next instances open quickly.

Velum is an instrument with a stereo output and no audio input. It receives MIDI on every channel, like the hardware left at its default `Receive Channel = Omni`; you can change that in Utility mode. It reports a small latency to your DAW, which compensates for it: see chapter 13.

Breath controllers and wind controllers

Velum takes breath as MIDI control change 2, *Breath Controller*. A USB or MIDI breath controller, or a wind controller, works as long as your DAW passes its messages to Velum's track. Some DAWs only do that once the breath controller is set up as a MIDI input or keyboard device in their preferences.

Many voices are made for breath: their *Pressure* is assigned to the breath controller, and they stay silent until you blow. H02 *Alto Sax* is one of them. Others, such as A01 *Vintage VL*, play from the keyboard alone. To see what a voice expects, look at its Controllers page or press `F1` on the panel for its controller view.

No breath controller? Version 2 of the firmware can make the breath from the keyboard. In Utility mode, open `6:Breath Mode` and set `Mode` to `Velocity`, which makes each note's breath from its velocity, or to `Touch EG`, which starts from the velocity and then follows the aftertouch. The breath voices then play from a keyboard. Set it back to `BC/WX` for a breath or wind controller. The setting belongs to the whole instrument, not to a voice.

> **TIP**
> The hardware calibrated a breath controller with two trimmers on the controller itself. A modern MIDI breath controller is set up in its own software instead: make your softest playing breath send a little above 0 and your strongest reach 127.

Playing the demo

The original's demo songs are in its firmware, and Velum plays them. They are a good way to hear the instrument before you start editing.



Utility mode. **Demo** is on **F5**.

1. **Enter Utility mode.**
   Press `UTILITY`.

2. **Open the demo page.**
   Press `F5`, under `Demo`. The display reads `Push ENTER,if OK.`

3. **Confirm.**
   Press `ENTER`, then `INC` to answer yes to `Are You Sure?`

4. **Choose the first song.**
   `Top Song` starts at `01:Syndia`. Change it with `DEC` and `INC`.

5. **Run it.**
   Press `F8`, under `Run`. The songs play one after another and start over.

6. **Stop it.**
   Press `F7`, under `Stop`, then `PLAY` to return to Play mode.

Getting the factory voices back

With the factory disk, Velum starts with the 128 factory voices of version 2. If you have overwritten some of them, the library loads them back in two clicks: open the library, select FACTORY and click A under LOAD TO. This replaces all 128 voices in memory, so save the ones you want to keep as a file first.

CHAPTER 4

SELECTING VOICES

Velum's memory holds 128 voices in eight banks, A to H, of sixteen voices each: A01 to H16. The firmware adds ten *ROM voices* of its own, which you can play and edit but not overwrite. The appendix lists them all.

On the panel



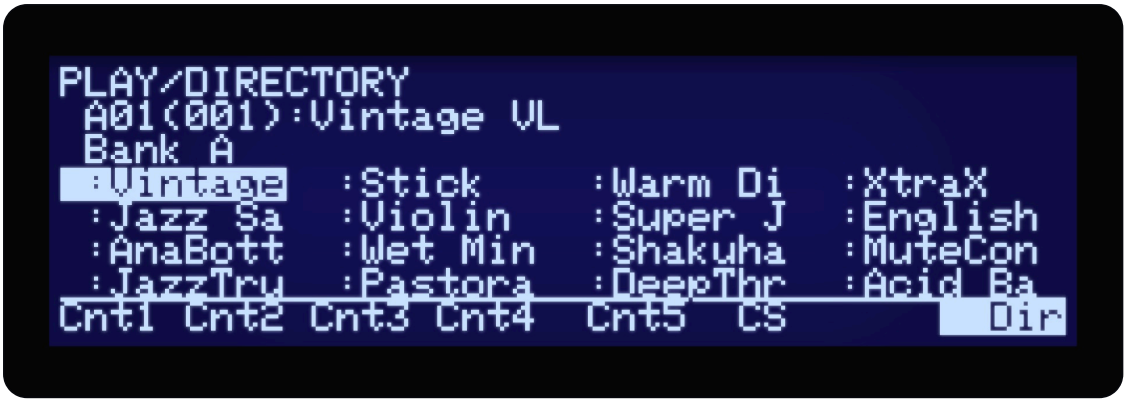
Play mode, with A01 Vintage VL.

Press PLAY. The display shows:

- the voice's location twice, as bank and number and as a number from 1 to 128: A01(001); then its name in large letters;
- its key mode and voice mode: Mono, Dual;
- the names of its elements, E1: and E2:, and its three effects;
- at the top, the breath mode, the MIDI transmit and receive channels, whether the reverb is on and whether the output is stereo;
- on the bottom line, the function keys: Cnt1 to Cnt5 and CS for the controller views, Dir for the directory.

DEC and INC step to the previous or next voice, crossing from one bank to the next.

F8 opens the **directory**, the sixteen voices of the current bank. DEC and INC still select the voice; or move the cursor to a voice, which blinks, and press ENTER to jump straight to it. EXIT or PLAY returns to the normal display.



The directory of bank A, on **F8**.

The patch browser

The quickest way to a voice is the patch browser. Click the panel's display, or the voice box at the top of the editor. The browser fills the window with every voice in sight.



	ROM	A	B	C	D	E	F	G	H
01	Jungle	Vintage VL	Brassyn	Ossyncro	SynthSplit	AnorakSyn	Funny Cat	AirSqeezer	Afterwork
02	Tenor Sax	Jazz Sax	Tenor Sub	SopranoSax	BaritonSax	Bell Miked	Old Tenor	Nat Tenor	Alto Sax
03	Syndia	AnaBottle	SaxyTrump	FlutoPhone	RoundBreth	Teped Jet	SteamLead	Sarangi	Tenor Air
04	RkGt/Pigs	JazzTrumpt	Trumpet	FlugelHorn	JazzBone	MelTrump	Horn	Cornet	Lite Tuba
05	Shakuhachi	Stick	FingerBass	Fretless	Tube Bass	Birdland	ThumBass	Square	Brite Bass
06	Haze	Violin	Cello	JetLipBow	Viol Outt	DoubleBow	Viowind	Nu Viola	Lite Cello
07	SoloViolin	Wet Mini	Soft Mini	OldMini	Mr. Mogue	Igneous	50 / 50	MoreGrunge	FunkyLead
08	Hydrophone	Pastorale	Thai Reed	Japanesque	Bagpipes	Solitude	Digeritek	Aerophone	Syraphone
09	Frenchy	Warm Dist	GuitarHero	JazzGuitar	Cruncher	IndoPluck	Sitar	Spanish	AsianPlck
10	SopranoSax	Super Jam	DynaTp&Sx	40'sSaxes	Mrs.Yang	Elec Lips	The Cool	FluBassoon	BaroqeDuet
11		Shakuhachi	C Flute	Tull Flute	Piccolo	Pan Pipes	BassFlute	Floboe	GrassHarp
12		DeepThroat	Moby	Mad Tube	No Harm AT	PlastiSax	BuzzSax	PlastcReed	CombMute
13		XtraX	MechaHorse	HydroStorm	Crystal	Black Hole	Freezing	Mu	Haze
14		EnglishHrn	Oboe	Jazz Clari	Clarinet	BassClari	Dubble	DarkBasoon	AltoRecrdr
15		MuteCone	Mute Boyz	Croma Harp	Blues Harp	Lead Bows	BowByBlow	Faerie Bow	Bowed Saw
16		Acid Bass	Wah Man	JungleBass	PowerBass	Sub Bass	Outback	Yamasteel	Waterphone

The patch browser. The **ROM** column holds the firmware's ten voices; **A** to **H** are the memory.

- **Click a voice** to select it. A memory voice is selected as the panel would; a ROM voice is loaded into the edit buffer and the memory stays as it is. The voice playing is on gold.
- **Click it again**, within half a second, to close the browser and go back to where you opened it. The × at the top right closes it too.

- **Type** to search: the letters go into the search field at once. Names that match get a gold frame, the others fade, and the count is shown. Case and spaces are ignored. ENTER selects the first match; ESC clears the search, and closes the browser if it was already empty.



Searching for “sax”: ten voices found.

The browser's LIBRARY page opens your voice files: see chapter 11.

In the editor and from your DAW

In the editor, the < and > buttons beside the voice box step through the memory, A01 to H16 and round again; while a ROM voice is loaded they step through the ROM voices.

From your DAW, MIDI program changes 1 to 128 select A01 to H16, as on the hardware. Velum offers no presets to the host: your project stores the whole machine instead, with its 128 voices and the voice you were editing (see What the project keeps).

> **CAREFUL**
> Selecting another voice, by any of these ways, throws away the changes to the voice you were editing, without asking. Store it first if you want to keep it: see Storing a voice.

CHAPTER 5

EDITING A VOICE

The voice editor edits the *edit buffer*: the voice the panel is playing right now. Every change goes to the firmware as a Parameter Change message, the same message the hardware receives from the maker's own editors, and you hear it at once. The left of the footer shows the last message sent.

The pages

TAB	PAGES
COMMON	VOICE, BREATH & PORTAMENTO, ELEMENTS, SLIDERS & EFFECT CONTROL. See chapter 10, and chapter 6 for breath and portamento.
ELEMENT 1, ELEMENT 2	CONTROLLERS and the three envelope pages (chapter 6); DRIVER & PIPE and the five modifiers (chapter 7); EXCITATION, INSTRUMENT, BREATH NOISE, THROAT FORMANT (chapter 9).
EFFECTS	MODULATION, FEEDBACK DELAY, REVERB (chapter 8).

The two element tabs have the same pages; the tab decides which element you edit.

Changing a value

Most parameters are **rows**: the name on the left, the value on the right, and a gold bar under them. The bar fills from zero when the range has negative values, and from the minimum otherwise.

- **Click** on a row and the value jumps to that point of the bar; keep the button down and **drag** sideways to adjust it. Hold **shift** for eight times finer movement.
- **Turn the mouse wheel** over a row for single steps. Rows with very wide ranges, such as depths from −127 to +127, move ten steps a notch; with shift, one.

Settings with a few named values are rows of **buttons**: click the one you want. Most pages also have a **drawing** you can drag: an envelope, a filter curve, the tap on the tube. The right of the footer always says how.

Key scaling

Many rows have a dark blue graph under them. This is the parameter's *key scaling*: an offset added to its value depending on the note you play, so that a voice can be brighter at the top, breathier at the bottom, and so on.

- The keyboard runs from left to right, MIDI notes 0 to 127, with a line at every octave; the line at C3 is brighter. The black keys are marked along the bottom.
- Up is a positive offset, down a negative one; the faint middle line is zero.

- The dots are *break points*. The offset changes in straight lines between them and stays flat beyond the first and the last.
- Point at a dot: it turns gold and shows its note and offset, for example `C3 +12`. Drag it sideways to move its note, up and down to change its offset; with shift only the offset changes. A break point cannot pass its neighbours.
- The mouse wheel changes the offset of the nearest dot by two, or by one with shift.

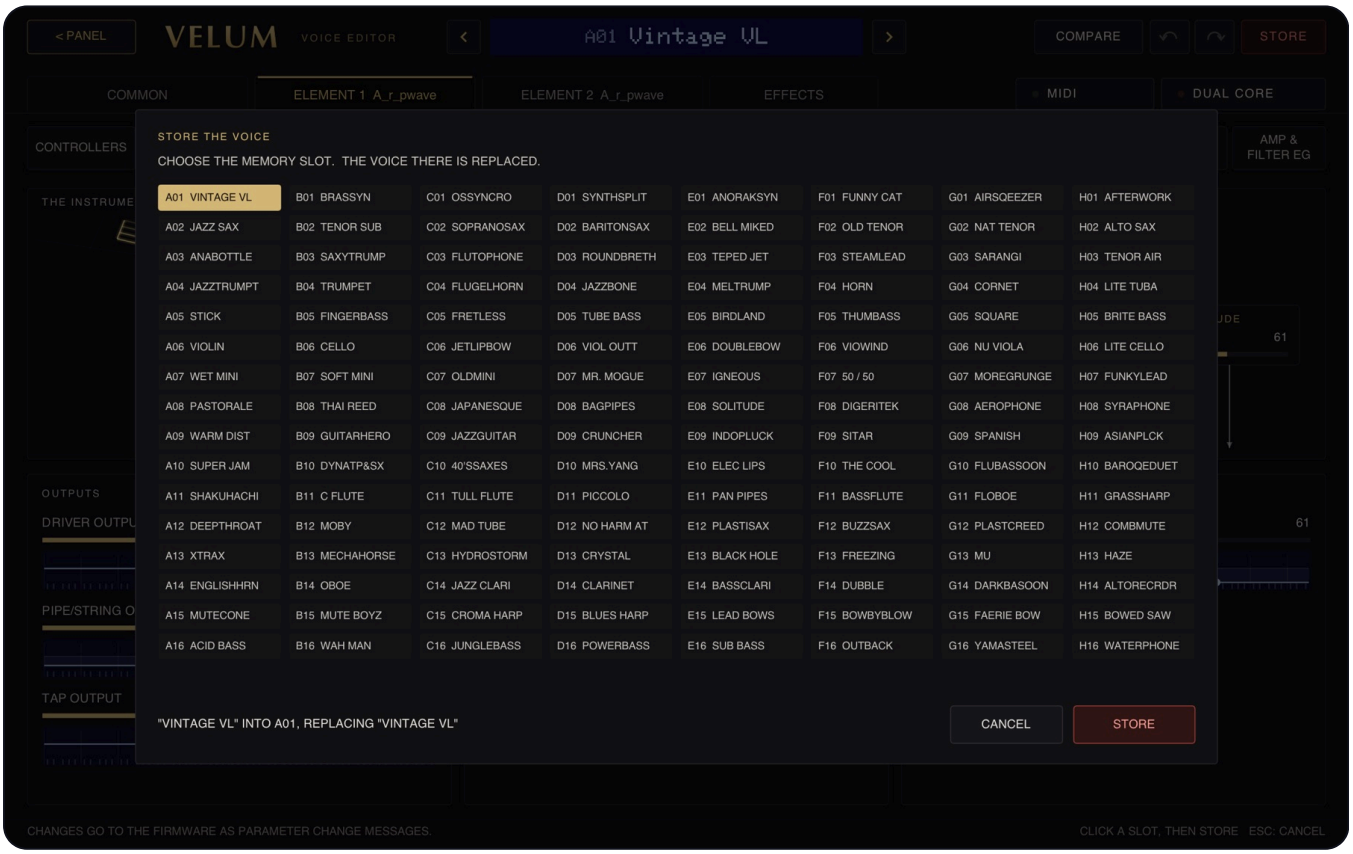
Edited, compare and undo

As soon as the voice differs from the one stored, the voice box shows an **EDITED** badge.

- **COMPARE** plays the voice as it was stored, so you can hear what you have changed. The button turns gold and the badge reads **COMPARE**. Click it again to get your edits back. While comparing you cannot edit or store, and selecting another voice ends the comparison.
- The two arrows undo and redo, as do ⌘Z and ⇧⌘Z (CTRL Z on Windows and Linux). A whole drag counts as one step, and so do wheel turns on the same row less than a second apart. The editor remembers 100 steps for the current voice; selecting another voice starts afresh.

Storing a voice

Your edits live in the edit buffer until you store them in one of the 128 memory locations.



The store window. The bottom line says which voice the new one replaces.

1. **Click STORE.**
   The store window opens on the voice's own location, which is outlined.

2. **Choose a location.**
   Click any of the 128; it turns gold. The bottom line reads, for example, "ALTO SAX" INTO A05, REPLACING "HORN".

3. **Click STORE in the window.**
   The voice is written there and selected; the footer confirms STORED INTO A05. CANCEL or ESC leaves without storing.

> **TIP**
> Storing replaces a voice for good. Before big changes, save the whole memory as a file from the library: you can always load it back.

Naming a voice

Open COMMON › VOICE. The name is ten letter boxes in the display's own font. Click a box and type, capitals and symbols included: each letter moves to the next box, ← and → move between boxes, and backspace clears the previous one. You can also turn the mouse wheel over a box, or drag up and down on it, to go through every character the original's display can show. Then store the voice to keep the name.

CHAPTER 6

THE CONTROLLERS

Chapter 1 introduced the *controller parameters*: pressure, embouchure, tonguing and the rest, the parts of the player that Velum simulates. You play them with *physical controllers*: a breath controller, the modulation wheel, aftertouch and so on. Which controller plays which parameter, and how strongly, is set per element on the CONTROLLERS page. Even if you never edit the sound itself, these assignments are worth learning, because they decide how a voice responds to your hands and breath.

There are no fixed rules for how a controller will change the sound: it depends on the role of the parameter in the model, and on the voice. As on an acoustic instrument, you learn it by playing.

Physical controllers

Any of these can drive any controller parameter. The editor calls them *sources*.

SOURCE	COMES FROM	GOOD FOR
Breath Controller	Control change 2	Pressure first of all; also tonguing, growl, throat formant, the filter.
Breath Attack	Made from control change 2	It follows how *fast* your breath changes, not how strong it is: a steady breath, soft or hard, gives nothing. Set on Common › Breath & Portamento.
Modulation Wheel	Control change 1	Vibrato, scream, anything you want to bring in by hand.
Foot Controller	Control change 4	Like the wheel, with your foot.
Porta Time	Control change 5	The portamento time, when the voice takes it from MIDI.
Main Volume	Control change 7	Level.
CS1, CS2	Control changes 16 and 17	The original's two continuous sliders. On Velum they are the DAW parameters *Continuous Slider 1* and *2*: see Sliders & Effect Control.
Sustain, Porta Switch	Control changes 64 and 65	On/off settings.
After Touch	Channel aftertouch	Throat formant, vibrato, pressure after the attack.
Pitch Bend	The pitch-bend wheel	Pitch, and embouchure for a more natural bend.
Velocity	How hard you strike the key	Pressure on plucked voices, brightness, breath noise.

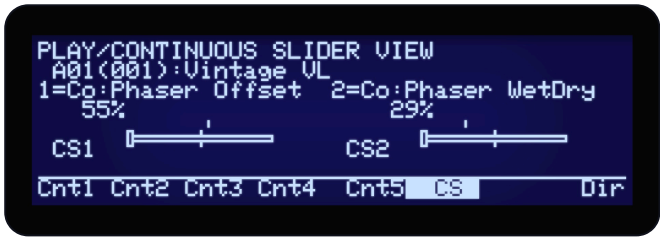
SOURCE	COMES FROM	GOOD FOR
Touch EG	Velocity, then aftertouch	Playing wind voices from a keyboard. Set on Common › Breath & Portamento.
CC *n*	Any other control change, 0…119	Whatever controller you have.

Controller views on the panel

In Play mode, the function keys under **Cnt1** to **Cnt4** show which source drives each controller parameter, one column per element. **Cnt5** shows the voice's other controls, and **CS** what the two continuous sliders move and where they are. **EXIT** returns to the normal display.

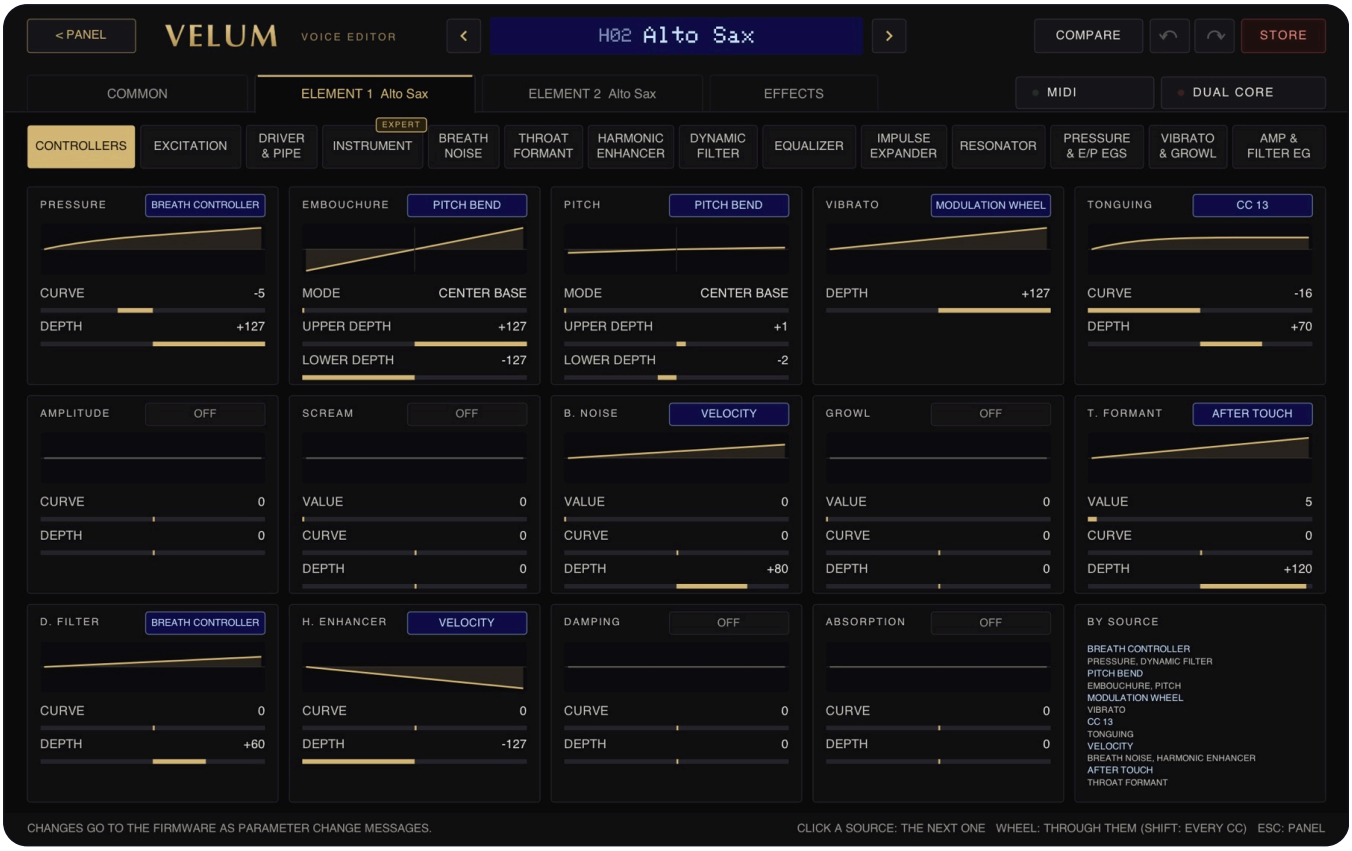


Controller view 1, on **F1**.



The continuous slider view, on **F6**.

The Controllers page



Element 1 › Controllers of H02 Alto Sax: pressure on the breath controller, embouchure and pitch on the pitch bend, vibrato on the modulation wheel, tonguing on CC 13.

Each of the fourteen cards is one controller parameter. At its top right is the **source chip**: blue when a source is assigned, plain when it reads OFF.

- **Click** the chip for the next named source, in this order: Off, Breath Controller, Modulation Wheel, Foot Controller, Main Volume, CS1, CS2, Sustain, Porta Switch, After Touch, Pitch Bend, Velocity, Breath Attack, Touch EG, Porta Time.
- **Turn the wheel** over it to go back and forth through the same list.
- **Shift-click** or **shift-wheel** to step through every number instead, for any control change.

Under the chip is a **response graph**: the source's value from 0 to 127 left to right, and its effect on the parameter, with zero across the middle. The graph is gold when a source is assigned and grey when it is off; it only shows, you change it with the rows below. The rows depend on the parameter:

PARAMETERS	ROWS
Pressure, Tonguing, Amplitude, D. Filter, H. Enhancer, Damping, Absorption	CURVE, DEPTH
Scream, B. Noise, Growl, T. Formant	VALUE, CURVE, DEPTH

PARAMETERS	ROWS
Vibrato	DEPTH
Embouchure, Pitch	MODE, UPPER DEPTH, LOWER DEPTH

Depth, −127…+127

How much of the parameter's range the source covers. At +127 the source sweeps the whole range: with Pressure on the breath controller, no breath means silence and a full breath the strongest tone. Lower depths leave part of the range in place: a smaller depth on Pressure means the voice sounds without breath, and the breath adds the rest. Negative depths turn the response upside down: more source, less parameter.

Curve, −16…+16

The shape of the response. At 0 it is a straight line. Positive curves start slowly and rise late, so the bottom of the controller's travel does little and the top does a lot; negative curves do the opposite and rise early.

Value, 0…127

For scream, breath noise, growl and throat formant: the parameter's own setting, to which the source's movement is added.

Mode, Upper depth, Lower depth

Embouchure and pitch can move both ways. In CENTER BASE mode the source's centre is the rest point: the top of its travel goes to the upper depth and the bottom to the lower depth, which suits the pitch-bend wheel. In MINIMUM BASE mode the rest point is the bottom of the travel and only the upper depth counts. Pitch's depths run from −12 to +12.

The last card, BY SOURCE, turns the page around: for every source in use it lists the parameters it drives.

An exercise with Alto Sax

Before changing anything, play H02 *Alto Sax* for a while with the controllers it uses: it needs a breath controller, because its pressure is on control change 2.

1. **Open the voice's Controllers page.**
   Select H02, click VOICE EDITOR, then ELEMENT 1 and CONTROLLERS. The BY SOURCE card shows the breath controller on pressure and the dynamic filter, the pitch bend on embouchure and pitch, the modulation wheel on vibrato, control change 13 on tonguing, the velocity on breath noise and the harmonic enhancer, the after touch on the throat formant.

2. **Put scream on the modulation wheel.**
   The SCREAM card reads OFF. Click its chip twice: Breath Controller, then Modulation Wheel. Set its DEPTH to about +100 with the wheel. The voice box now shows EDITED.

3 **Try it.**
Play and roll the modulation wheel up: the tone breaks into a scream. The vibrato comes in too, because it is still on the same wheel.

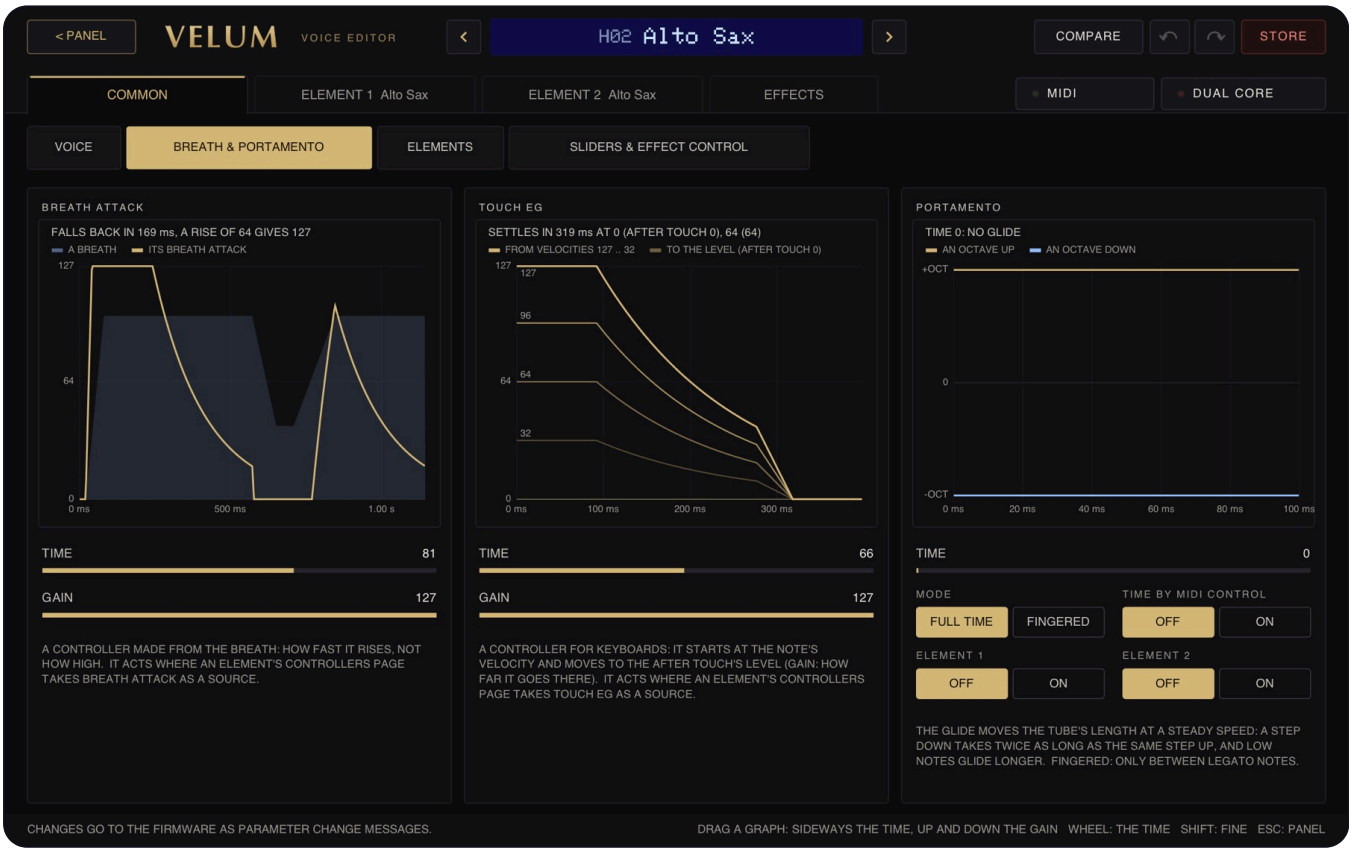
4 **Take vibrato off the wheel.**
On the VIBRATO card, turn the mouse wheel down over the chip until it reads OFF. Now the modulation wheel brings in the scream alone.

5 **Change how the breath plays.**
On the PRESSURE card, lower the DEPTH from +127 towards +60 while you play: the voice now sounds even with almost no breath, and the breath shapes the rest. Then try the CURVE: positive values make the soft end of your breath gentler and the loud end more dramatic, negative values the opposite. The graph follows every change.

6 **Keep it or not.**
COMPARE plays the voice as it was; undo steps back. To keep the result, store it before you select another voice.

Breath attack, touch EG and portamento

Two of the sources are not MIDI messages but small processors of their own, set for the whole voice on COMMON › BREATH & PORTAMENTO. The same page holds the portamento.



Common › Breath & Portamento.

Breath attack

A controller made from the breath that reacts to how fast it rises. TIME sets how quickly it falls back, GAIN how strongly it responds. The graph shows a breath in blue and its breath attack in gold. It acts wherever an element's Controllers page uses Breath Attack as a source.

Touch EG

A controller for keyboard players: it starts at the note's velocity and moves towards the aftertouch level. TIME is how long it takes, GAIN how far it goes there. The graph draws it for velocities from 127 down to 32. It acts wherever Touch EG is the source.

Portamento

The glide from one note to the next. It changes the tube's length at a steady speed, so a step down takes twice as long as the same step up, and low notes glide longer; the graph shows a glide an octave up and an octave down. TIME sets the speed. FULL TIME glides between every note, FINGERED only between legato notes. TIME BY MIDI CONTROL lets control change 5 set the time. Portamento can be switched on and off for each element.

Drag a graph sideways to change its time and up or down to change its gain; the mouse wheel changes the time.

The controller envelopes

An acoustic instrument never answers its player instantly: the reed needs a moment to start, the lips settle, the vibrato grows. Velum's envelopes shape these movements on three pages of each element. Their graphs have round handles: drag a handle sideways to change a time and up or down to change a level, with shift for finer steps. The handle you hold shows the parameters it moves.

Pressure & E/P EGs

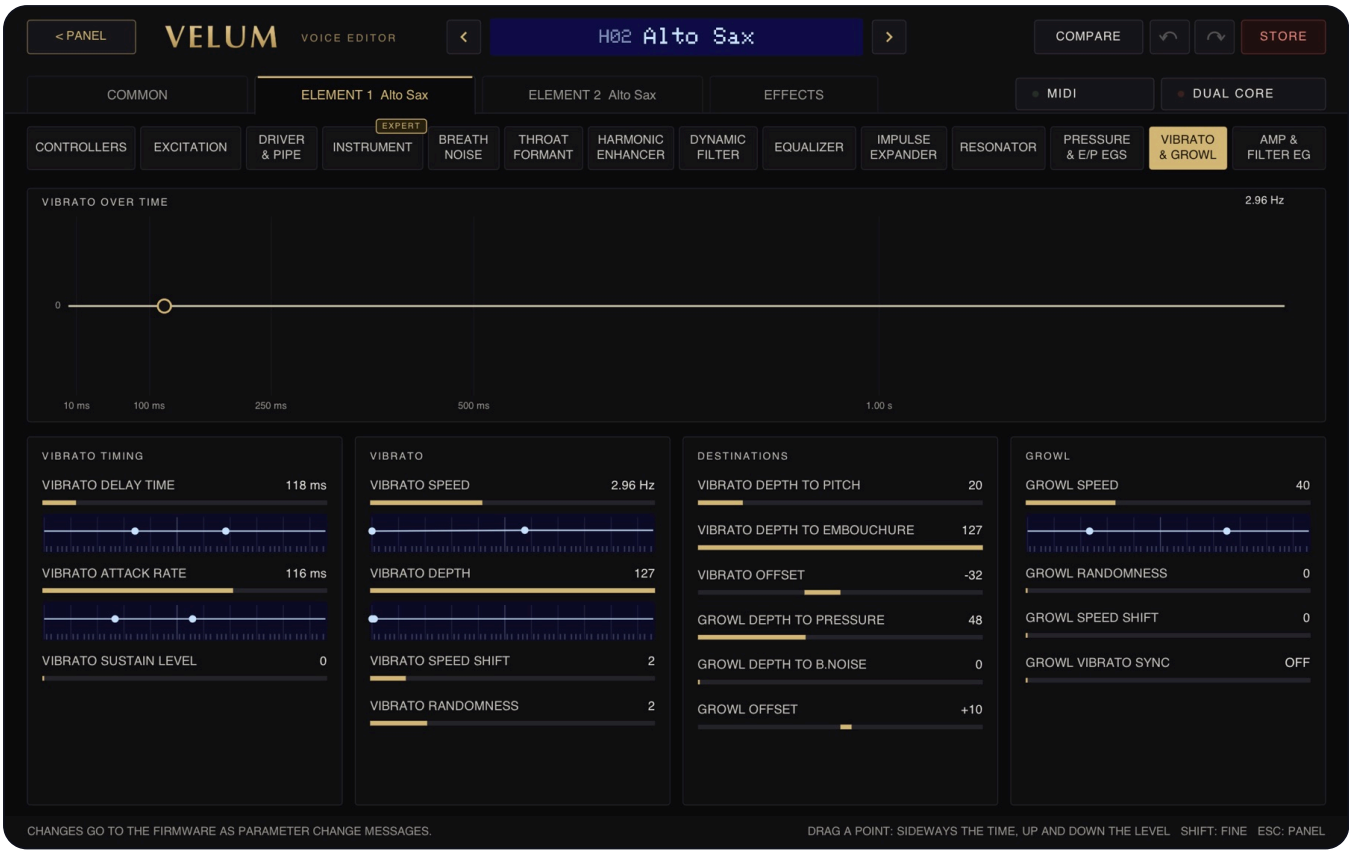


Element 1 › Pressure & E/P EGs.

The **embouchure and pitch envelope** bends the start of each note, as a player's lips settle. It starts at INITIAL LEVEL and holds there for HOLD TIME, moves to ATTACK LEVEL at the ATTACK RATE, then returns towards zero at the DECAY RATE. DEPTH TO PITCH and DEPTH TO EMBOUCHURE set how much of it reaches each, and the velocity settings let the strength of the note change its level and speed.

The **pressure EG** shapes the pressure itself. Its MODE is ADSR, AR or DISABLE; offsets speed up or slow down its attack and release, and velocity can change its level and rate.

Vibrato & Growl



Element 1 › Vibrato & Growl.

The graph draws the vibrato as it grows in each note: nothing until the DELAY TIME, then a rise at the ATTACK RATE to the SUSTAIN LEVEL. The wave is drawn at its real SPEED, shown at the top right in hertz. DEPTH, SPEED SHIFT and RANDOMNESS make it more or less regular; DEPTH TO PITCH and DEPTH TO EMBOUCHURE decide where it goes.

The **growl** is a fast wobble of the pressure. Its card sets its SPEED, its randomness and speed shift, and whether it runs in step with the vibrato. How deep it goes into the pressure and the breath noise, and its OFFSET, are on the DESTINATIONS card, below the vibrato's.

Amp & Filter EG



Element 1 › Amp & Filter EG.

The amplitude and filter envelope has two attack stages: ATTACK RATE 1 up to ATTACK LEVEL 1, then ATTACK RATE 2 up to full level. It then decays at the DECAY RATE to the SUSTAIN LEVEL, holds while the note is held, and fades at the RELEASE RATE after note off. Times are shown in milliseconds or seconds, levels in decibels. DEPTH TO AMPLITUDE and DEPTH TO FILTER set how much it moves each, and velocity can change its level and rate.

CHAPTER 7

MIXING AND THE MODIFIERS

There are two ways to change a voice's tone. The first is to mix the signals that come out of the instrument; the second is to shape the result with the modifiers. Start with the mix: it sets the basic sound, and the modifiers refine it.

Mixing the instrument

The instrument has three outputs, mixed on the DRIVER & PIPE page:

Driver

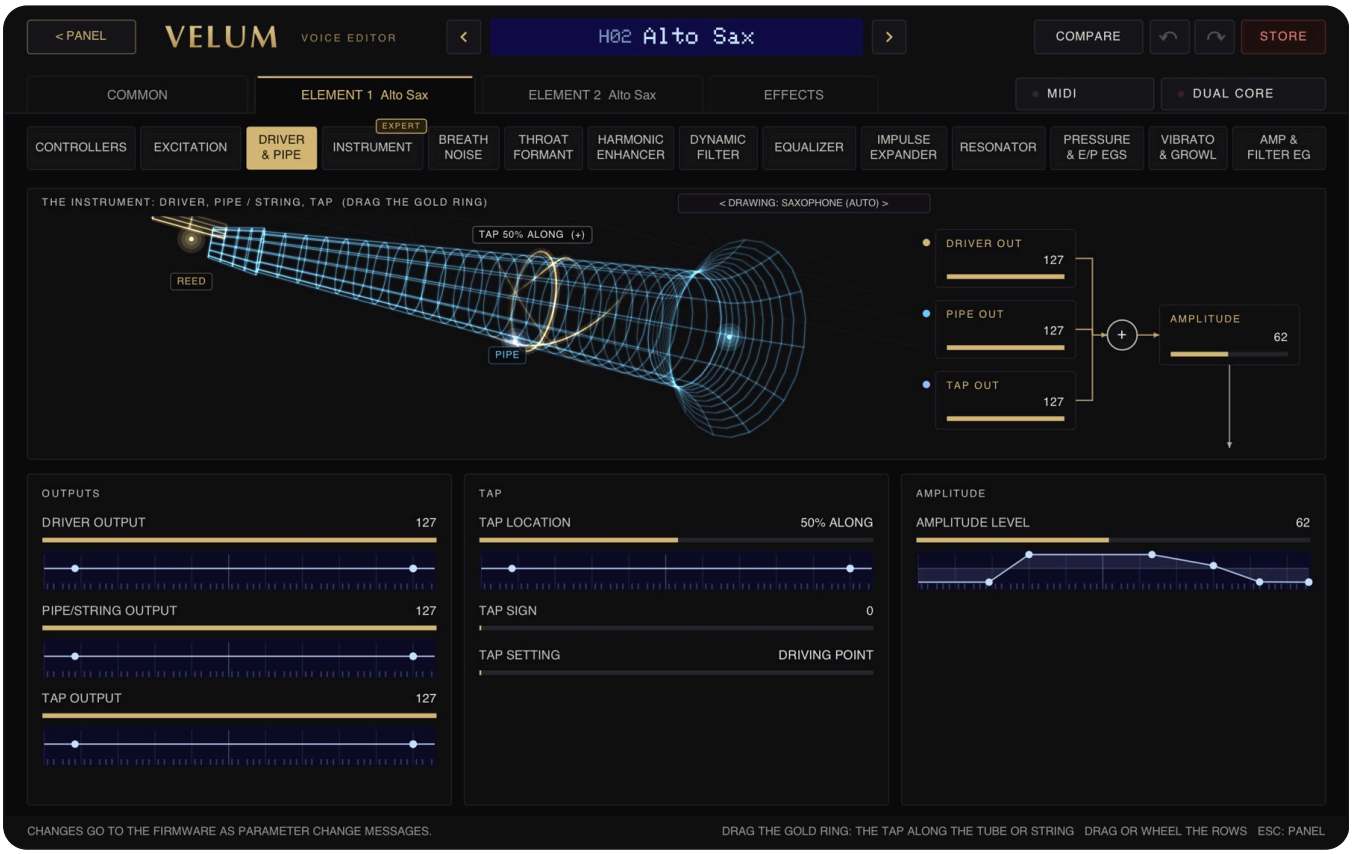
The sound of the mouthpiece or the bow on its own, without the body's resonance. Real instruments heard close up always have some; a little of it makes a voice more present.

Pipe / string

The main output, from the end of the tube or string.

Tap

The sound picked up at a point along the tube or string. On its own it sounds much like the pipe output, but its phase is different, so mixing the two changes the tone through cancellations and reinforcements.



Element 1 › Driver & Pipe of H02 Alto Sax. The gold ring is the tap.

The drawing shows the element's instrument in three dimensions: the driver in gold, the tube or string in cyan. Three glowing points are the driver, pipe and tap outputs, as bright as their levels, and a gold flow runs along the instrument as it plays. On the right, the three outputs feed the AMPLITUDE.

- DRIVER OUTPUT, PIPE/STRING OUTPUT and TAP OUTPUT, 0...127 each, and AMPLITUDE LEVEL, all with key scaling.
- TAP LOCATION is the tap's place along the instrument, in percent. **Drag the gold ring** along the instrument to move it.
- TAP SIGN inverts the tap's phase.
- TAP SETTING: at DRIVING POINT the tap sits at the driver; FIXED keeps it at the tap location; KEYTRACK moves it with the note. The (STRAIGHT) variants are the same with a straight bore.

Velum picks the drawing from the element's name: a saxophone for *Alto Sax*, a flute for an air-jet voice, a violin for a bowed one. If it guesses wrong, click < DRAWING: ... > above it to choose among Tube, Clarinet, Saxophone, Double reed, Brass, Air jet, Bowed string and Plucked string; shift-click goes backwards. Velum remembers the choice for every element of that name. The drawing changes nothing in the sound.

An exercise: remix the Pan Pipes

1. **Listen first.**
   Select E11 *Pan Pipes* and play it for a while.
2. **Open the mix.**
   In the editor, open ELEMENT 1 › DRIVER & PIPE.
3. **Change the balance.**
   Play while you move DRIVER OUTPUT, PIPE/STRING OUTPUT and TAP OUTPUT between 0 and 127, one at a time, and hear what each one brings.
4. **Move the tap.**
   Set TAP SETTING to FIXED, then drag the gold ring slowly along the pipe as you play: the tone changes with the position. Try TAP SIGN too.

Once the mix gives you the basic sound you want, move on to the modifiers.

The modifiers

The five modifiers shape the tone after the instrument, in this order: harmonic enhancer, dynamic filter, equalizer, impulse expander, resonator. They can change a sound a great deal, but its character still comes from its instrument: a trumpet voice will stay more or less a trumpet. To build a new sound, start from a voice whose instrument is close to what you want.

Harmonic Enhancer



Element 1 › Harmonic Enhancer, with a note playing: the waveform and the harmonics below show the element's output.

The harmonic enhancer has the strongest effect of all the modifiers on the harmonic structure. It takes two of the instrument's inner signals, a **carrier** and a **modulator**, modulates one with the other, and blends the result with the instrument's normal output.

On the left, INSTRUMENT SIGNALS lists the six signals. Click C to make one the carrier (gold) and M to make one the modulator (blue):

SIGNAL	WHAT IT IS
Normal	The instrument's whole output: driver, pipe or string, and tap.
Breath Noise Amp.	The moment-to-moment level of the breath noise made at the driver: a strongly distorted relative of Slit/Friction.
Flow Rate Saturation	The air flowing through the reed's opening, which cannot grow beyond a limit however hard the pressure pushes.
Beat	The reed striking the mouthpiece.
Slit/Friction	The size of the opening between reed and mouthpiece as the reed vibrates; on a string, the bow's friction.

SIGNAL	WHAT IT IS
Reed	The reed's own bending.

Each lane is a row of boxes. The carrier goes through HPF and OVERDRIVE, is modulated at the ×, then passes LEVEL; the modulator goes through its own HPF and OVERDRIVE, then PHASE and INDEX, how much it modulates. BALANCE mixes the enhanced signal with the dry output, from 0% wet (the instrument alone) to 100% wet (the enhanced signal alone).

- **Drag a box** up or down, or turn the wheel over it, to change its value. Each box draws what it does: the filter's response, the overdrive's curve, the phase on a dial.
- **Click a box** to show its key scaling in the card at the bottom right.

Two ways to start, from the maker's own advice:

- Carrier NORMAL, modulator any other signal, balance 100% wet and a fairly high index. The whole sound is modulated by one of its parts.
- Carrier any signal but Normal, balance nearer the middle and a low index. The enhancer's sound is added to the instrument's instead of replacing it, so keep enough of the dry side.

These are starting points only: the enhancer responds differently to every instrument.

The bottom row shows the element's output while you play: two periods of its **waveform** with the pitch and peak level, and its first 24 **harmonics** in decibels below the strongest, the fundamental in bright gold. The readout 8-24: X DB OF THE SOUND measures how much of the energy is in the upper harmonics. HOLD keeps the current harmonics as light blue marks, so you can compare your next change against them; CLEAR removes them.

Dynamic Filter



Element 1 › Dynamic Filter: low-pass, cutoff tracking the keys.

A resonant filter like those of classic synthesizers, with four modes: LOW-PASS, BAND-PASS, HIGH-PASS and BAND-REJECT. Controllers can move it through the *D. Filter* controller parameter.

- CUTOFF is a frequency in FIXED mode, or an offset in octaves from the note played in KEY TRACK mode, where the filter follows the keyboard.
- RESONANCE raises a peak at the cutoff, shown as its Q.
- INPUT GAIN sets the level into the filter; BALANCE mixes filtered and dry signals. At the bottom of its range you hear only the dry signal, in the middle both at full level, at the top only the filtered one.

The graph draws the filter's response, with the whole module's output as the bright line, over the live spectrum of the element. **Drag the round handle**: sideways moves the cutoff, up and down the resonance; with shift only the resonance. The mouse wheel anywhere on the graph changes the resonance.

Equalizer



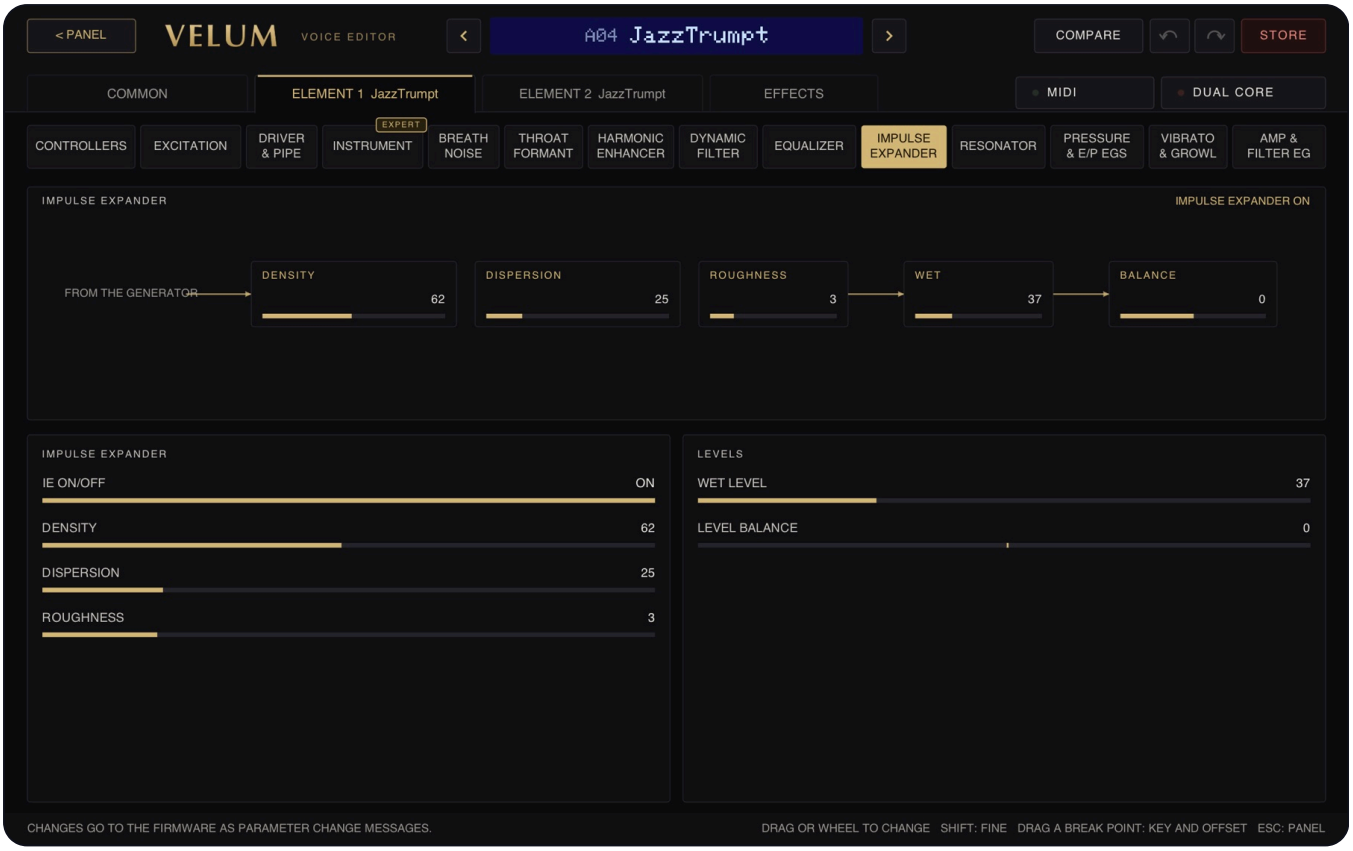
Element 1 › Equalizer, with the element's spectrum behind the curve.

Five parametric bands, each a bell with its own **FREQUENCY**, **Q** and **LEVEL**, plus a gentle **HIGH-PASS** and **LOW-PASS** filter, an **INPUT GAIN** and a **POST BOOST** of up to ±12 dB. Each band covers its own part of the spectrum, shown on its card: band 1 from 40 to 322 Hz, band 2 from 104 to 839 Hz, band 3 from 248 Hz to 2 kHz, band 4 from 646 Hz to 5.2 kHz and band 5 from 1.5 to 10 kHz. The high-pass and low-pass filters have key scaling.

- **Drag a numbered handle**: sideways for its frequency, up and down for its level; with shift only the level. The **wheel** on a handle changes its Q.
- **Drag the HPF and LPF tags** sideways to move the filters.

The bright line is the whole equalizer, drawn from the firmware's own coefficients. Behind it is the element's spectrum while you play, with small ticks at the top marking the harmonics of the note.

Impulse Expander

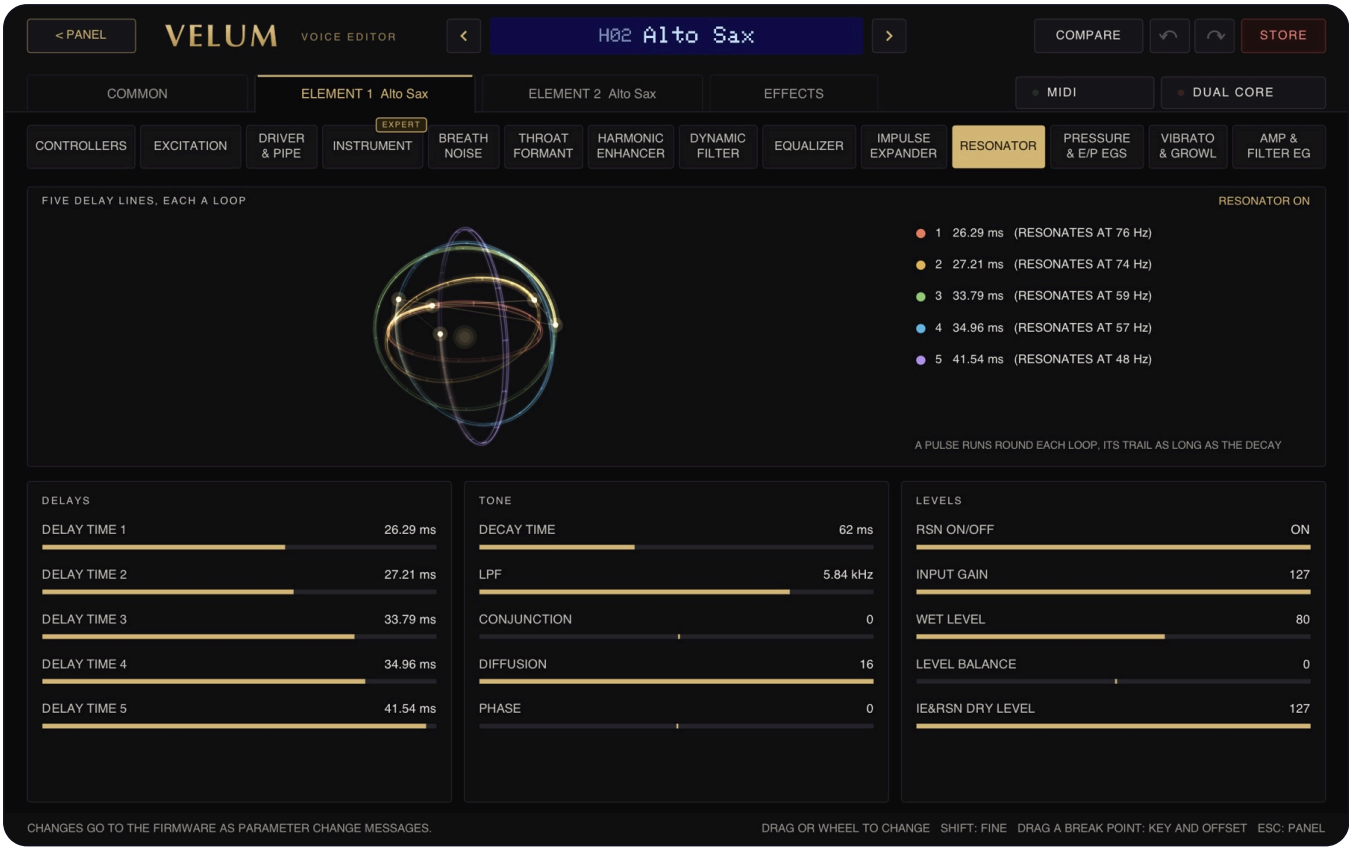


Element 1 › Impulse Expander of A04 JazzTrumpt.

The impulse expander and the resonator imitate the body of an instrument, and sometimes the room around it. The impulse expander gives the metallic resonance of brass and metal-bodied woodwinds; it also softens hard attacks and gives depth to vibrato. It works best on voices that move, with vibrato or other cycles; on a steady tone it is hard to hear.

IE ON/OFF switches it; DENSITY, DISPERSION and ROUGHNESS shape it; WET LEVEL and LEVEL BALANCE blend it in and place it in the stereo field. The dry level it shares with the resonator is on the resonator's page.

Resonator



Element 1 › Resonator of H02 Alto Sax.

Where the impulse expander sounds metallic, the resonator sounds woody. Five delay lines, each a loop, ring at their own frequencies, like the body of a wooden instrument. A careful setting often brings a voice that is almost right to life.

- **DELAY TIME 1** to **5**, up to about 42.7 ms each. Beside the drawing, each delay is listed with the frequency it resonates at.
- **DECAY TIME**, **LPF**, **CONJUNCTION**, **DIFFUSION** and **PHASE** shape the ringing.
- **RSN ON/OFF**, **INPUT GAIN**, **WET LEVEL**, **LEVEL BALANCE** and **IE&RSN DRY LEVEL**, the dry level shared with the impulse expander.

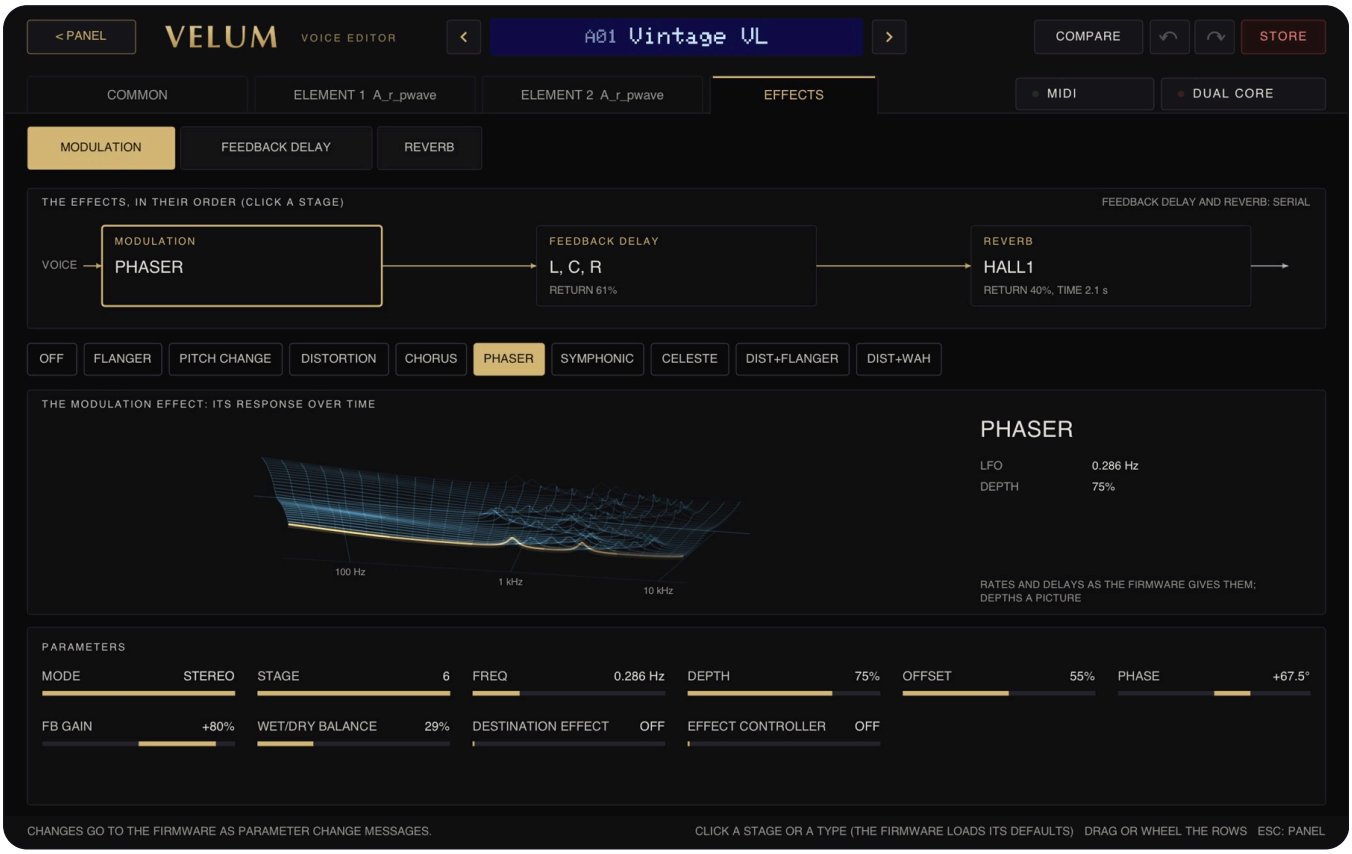
In the drawing each loop is a ring, its size following its delay. While the resonator is on, a gold pulse runs round each ring, with a trail as long as the decay.

> **NOTE**
> The waveform, harmonics and spectra on these pages show the element after the harmonic enhancer, the dynamic filter and the equalizer, before the impulse expander, the resonator and the effects. They appear while a note of that element is sounding.

CHAPTER 8

EFFECTS

The effects are the finishing touch. After the two elements come three stages in a fixed order, **modulation**, **feedback delay** and **reverb**, all working at once. Each stage plays one effect type at a time.



Effects › Modulation of A01 Vintage VL: a phaser, drawn as its response over time.

At the top of the EFFECTS tab the chain shows each stage with its type: click a stage, or its chip, to open it. Under the chain, the buttons choose the stage's type; the firmware then loads that type's default settings, as on the hardware. A picture shows what the effect does, and the PARAMETERS card holds the type's settings. A stage set to OFF is skipped.

The top right of the chain says whether the feedback delay and the reverb are *serial*, the delay feeding the reverb, or *parallel*. You set this with FBD/REVERB MODE on the feedback delay stage.

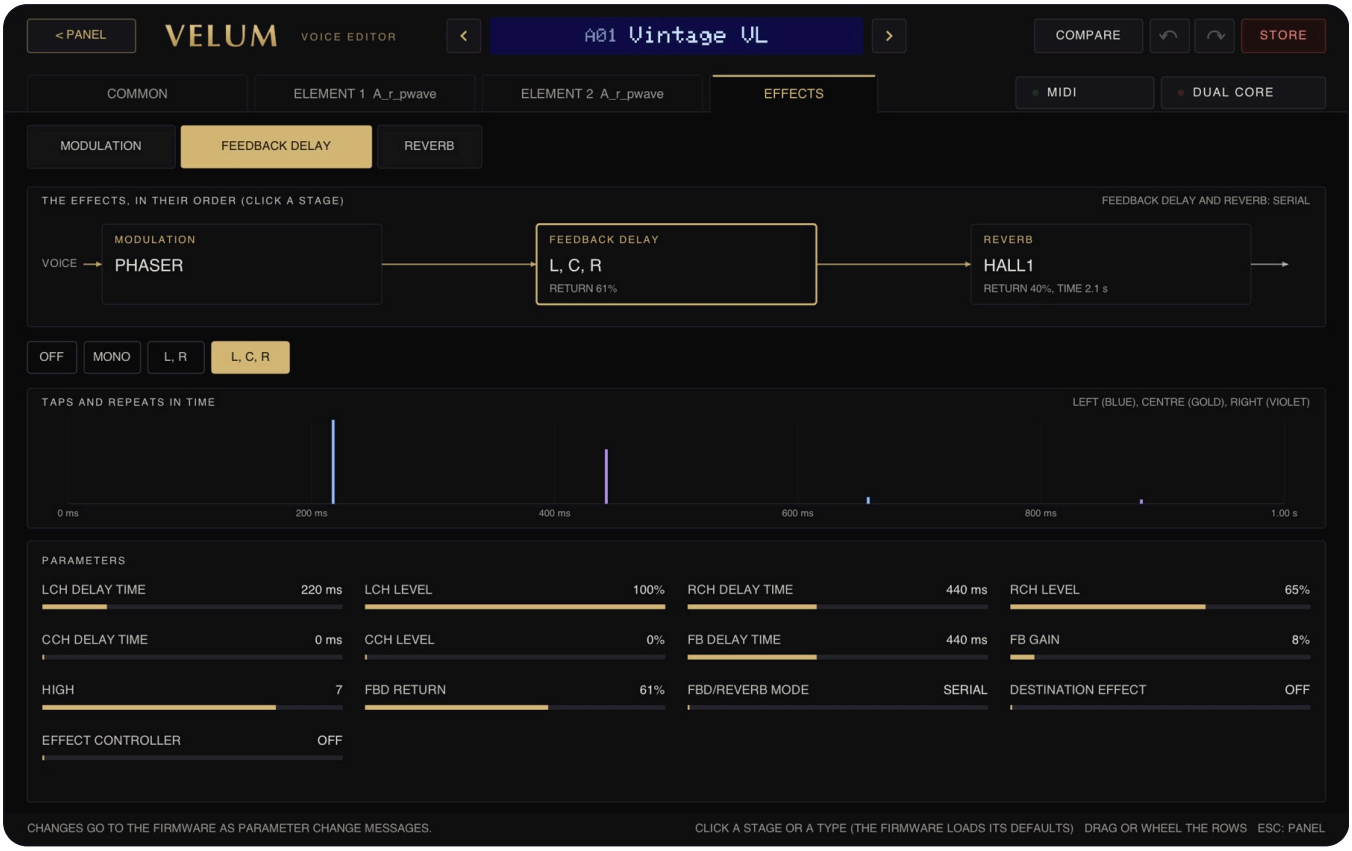
Modulation

Despite the name, only some of these types modulate; others are pitch changers and distortions. Most change the sound strongly, so they suit some voices and moments more than others.

TYPE	WHAT IT DOES	PARAMETERS
Flanger	A short delay swept by an LFO and mixed with the sound: the moving comb-filter swoosh.	Wave, Freq, Depth, Delay, Phase, FB Gain, High, Analog Feel, Wet/Dry Balance
Pitch Change	Two copies of the sound shifted by up to an octave up or down, each with fine tuning and level; in stereo mode one goes left, the other right.	Mode, Pitch 1, Fine 1, Out 1, Pitch 2, Fine 2, Out 2, Wet/Dry Balance
Distortion	Overdrive through a choice of devices (Transistor, Vintage Tube, Distortion 1 and 2, Fuzz) and speakers (Flat, Stack, Combo, Twin, Radio, Megaphone).	Overdrive, Device, Speaker, Presence, Output Level
Chorus	A gently modulated delay that thickens the sound.	Mode, Freq, Depth, Delay, FB Gain, High, Wet/Dry Balance
Phaser	Four or six swept all-pass stages.	Mode, Stage, Freq, Depth, Offset, Phase, FB Gain, Wet/Dry Balance
Symphonic	Three modulated delays for a rich ensemble.	Mode, Freq, Depth, Diffusion, Lo-Fi, Wet/Dry Balance
Celeste	A modulated delay with feedback and a lo-fi option.	Mode, Freq, Depth, Delay, FB Gain, Lo-Fi, Wet/Dry Balance
Dist+Flanger	Distortion followed by a flanger.	Overdrive, Speaker, Output Level, Freq, Depth, Delay, Phase, FB Gain, High, Flanger Balance
Dist+Wah	Distortion with a wah filter before or after it.	Overdrive, Speaker, Output Level, Mode, Wah Pre/Post, Cutoff Freq, Resonance, Sens

The picture is a waterfall of the effect's frequency response over a couple of its LFO cycles, the newest moment in front in gold. For the pitch changer it shows a test tone and its shifted copies, for the distortions the harmonics that the drive adds. The panel beside it lists the rates and delays as the firmware computes them.

Feedback delay

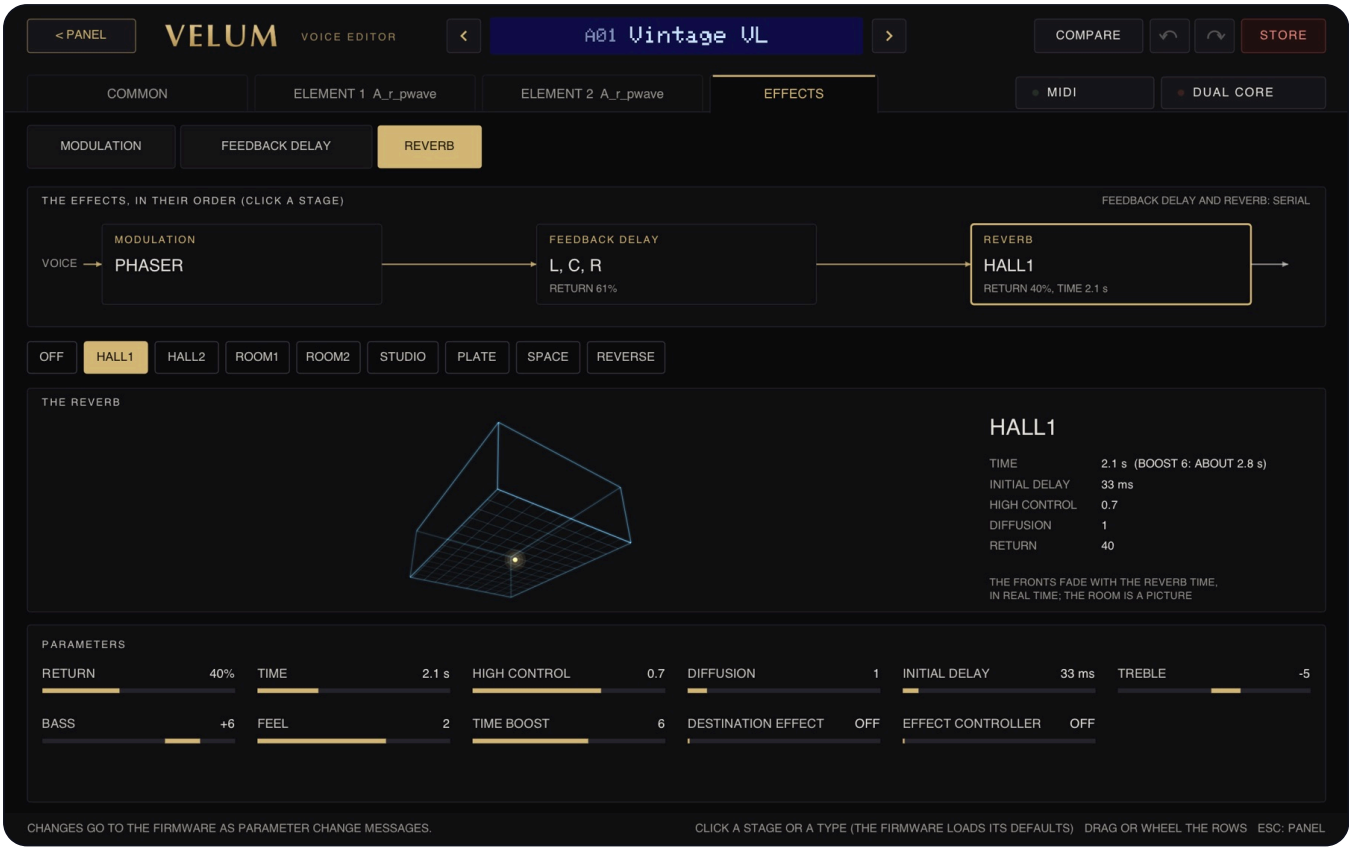


Effects › Feedback Delay: taps and repeats in time.

Distinct echoes, with control over how many come back and how they fade. **MONO** is one delay in the centre; **L, R** has a delay for each side, each with its own feedback; **L, C, R** adds a centre delay, the three sharing one feedback loop. The picture places every tap and repeat on a time line at its level: left in blue, centre in gold, right in violet.

- Delay times are in milliseconds, up to 1024 ms (512 ms per side in L, R); the wheel moves them 10 ms a notch.
- **FB DELAY TIME** and **FB GAIN** set the repeats' spacing and how fast they die away; **HIGH** the treble they keep.
- **FBD RETURN** is the level of the delay in the mix; **FBD/REVERB MODE** is **SERIAL** or **PARALLEL**.

Reverb



Effects › Reverb: the room is a picture; its fronts fade in real time with the reverb time.

The reverb gives a voice space and depth; most voices use some. The eight types:

TYPE	CHARACTER
Hall1	A concert hall.
Hall2	A hall with a fuller low end.
Room1	A small room: a light touch of space.
Room2	A larger room.
Studio	A studio's live room, with little low-frequency reverberation.
Plate	The classic studio plate.
Space	A very large, diffuse space.
Reverse	A reverb that swells instead of fading.

Every type has RETURN, its level in the mix; TIME; HIGH CONTROL, how fast the treble dies compared with the rest; DIFFUSION; INITIAL DELAY; TREBLE and BASS; FEEL, four variations of each type's character, which makes 32 reverbs in all; and TIME BOOST, which stretches the tail in small steps. With a boost the info panel shows the longer time, for example 2.1 S (BOOST 6: ABOUT 2.8 S).

The picture is a turning room shaped by the type. A gold source sends out a wavefront every couple of seconds; the fronts leave after the initial delay and fade in real time with the reverb time.

Playing the effects

One controller can move one effect while you play: EFFECT CONTROLLER chooses the source and DESTINATION EFFECT what it moves, the modulation's wet/dry balance, the feedback delay's send level or the reverb's send level. Both appear at the bottom of every stage's parameters, and with a diagram on Common › Sliders & Effect Control.

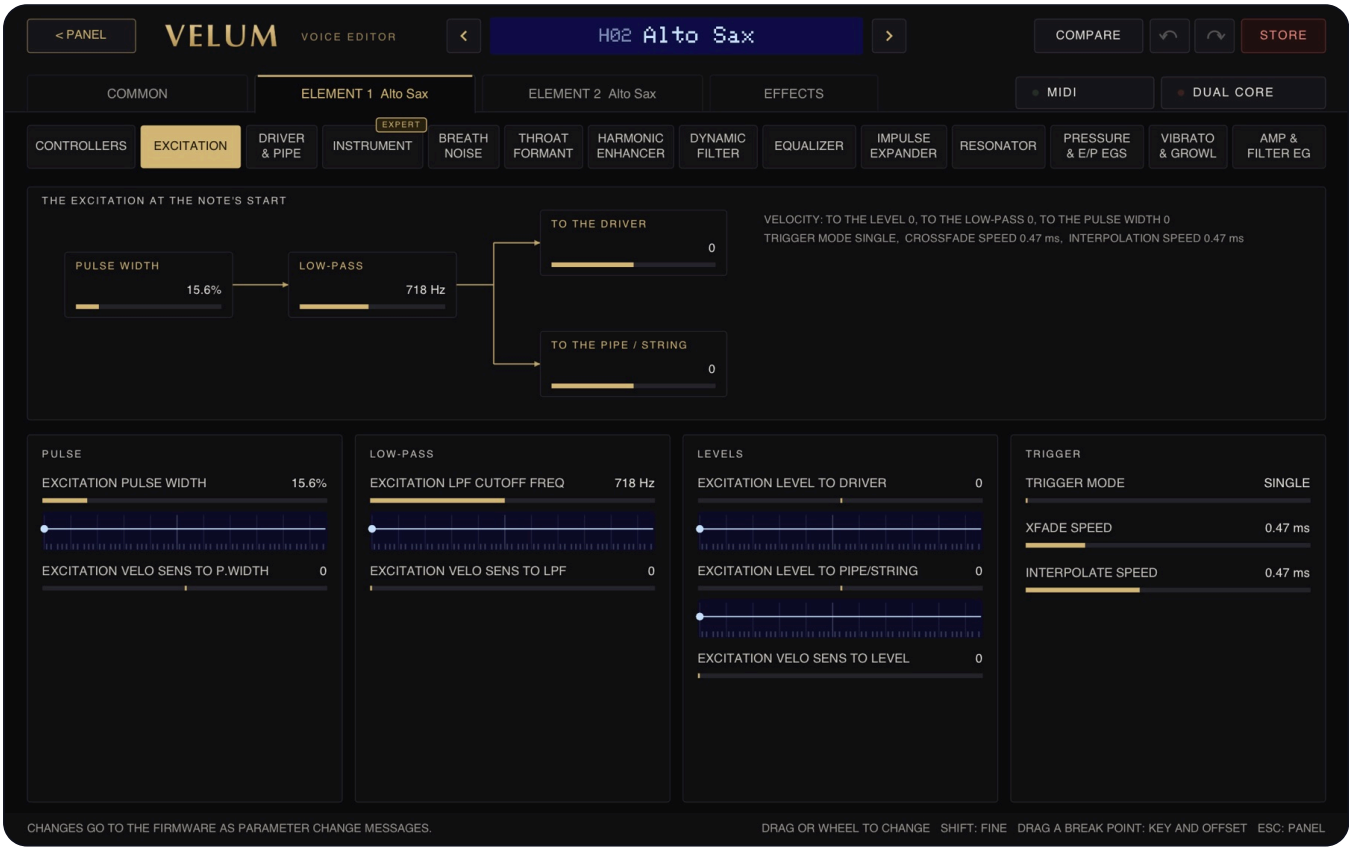
> **NOTE**
> The reverb can also be switched off for every voice at once, in Utility mode: `TG Setting` › `Reverb`. The Play display shows `Reverb on` or `off`.

CHAPTER 9

THE INSTRUMENT IN DEPTH

Four pages of each element reach inside the instrument: how a note starts, the breath noise, the player's throat, and the model itself. Small changes here can change a voice deeply, or stop it speaking at all. Change one thing at a time, listen, and keep **COMPARE** and undo at hand.

Excitation



Element 1 › Excitation.

At the start of each note the instrument receives a short pulse that helps it speak, like the tongue releasing a reed. The diagram follows it: its **PULSE WIDTH**, a **LOW-PASS** filter, then its level **TO THE DRIVER** and **TO THE PIPE / STRING**, which can be negative. The velocity settings let a harder note change the pulse's width, brightness and level.

The **TRIGGER** card sets how notes follow each other: **TRIGGER MODE** is **SINGLE** or **MULTI**, and **XFADE SPEED** and **INTERPOLATE SPEED**, from fastest to a few hundred milliseconds, set how quickly the model moves from one note to the next.

Breath Noise



Element 1 › Breath Noise: the noise's filters, drawn over the element's spectrum.

The breath noise is the air you hear around the tone. Its amount is played by the *Breath Noise* controller parameter; this page sets its colour.

- **LEVEL**, with key scaling.
- **HPF** and **LPF**, the noise's high-pass and low-pass filters, with key scaling. Drag the **HPF** and **LPF** handles along the graph to move them.
- **NOISE**, its type: Normal, Harsh 1 and 2, Lo Lips 1 and 2, Mid Lips 1 and 2, Hi Lips 1 and 2, Jet, Lo Jet, Mid Jet, Hi Jet, Steam 1 to 4, Plastic 1 and 2, Dark Woody, Metal 1 and 2, and Rain.
- **SLIT DRIVE**, **CONTROL BALANCE** and **KEY ON RESET**, how the noise follows the reed and each new note.

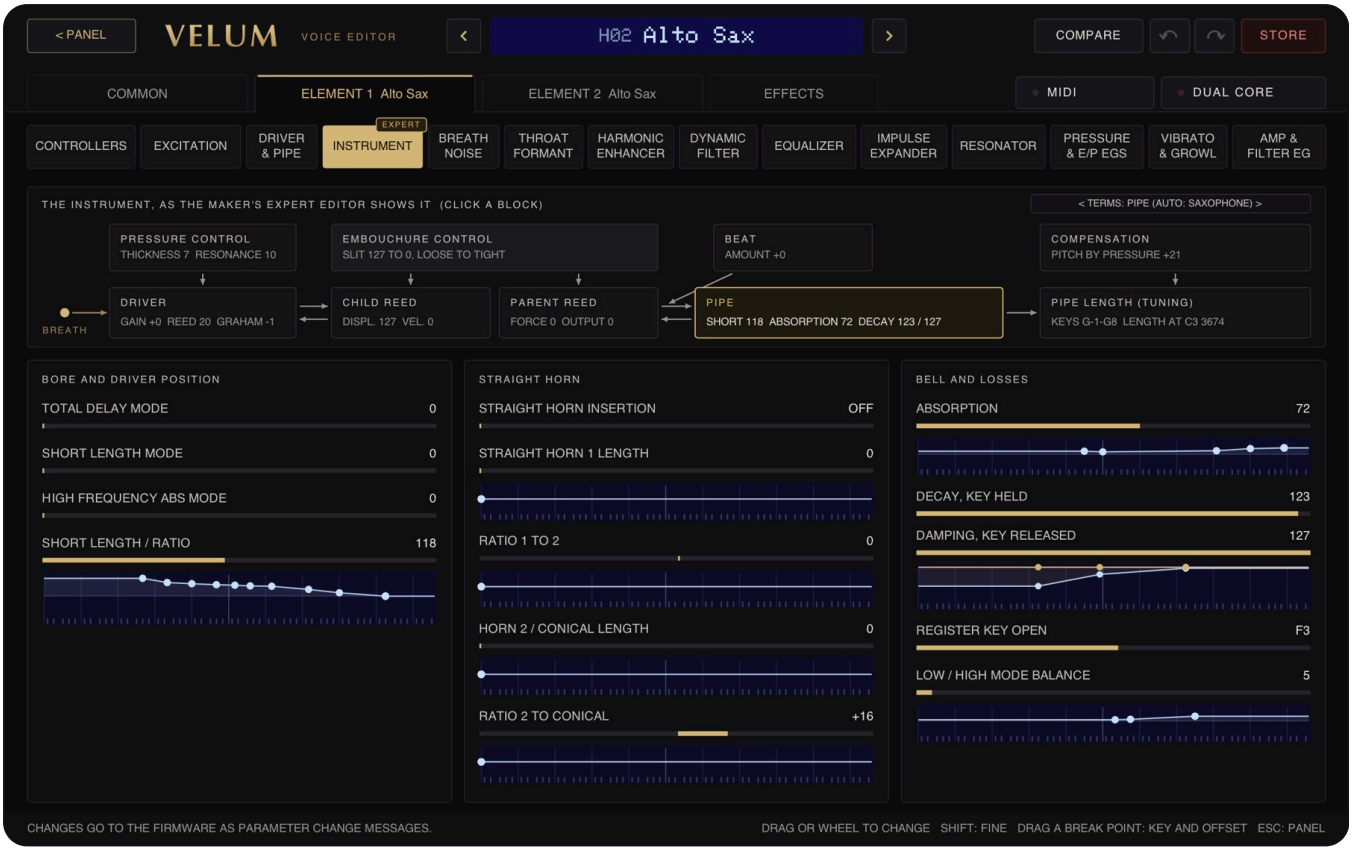
Throat Formant



Element 1 › Throat Formant.

The throat formant is the resonance of the player's throat and mouth. With PITCH TRACKING on, its PITCH is set in octaves from the note played and follows the melody; off, it stays fixed. INTENS and AMOUNT set its strength, and HPF and LPF filter it, as on the breath noise page. How much of it you hear while playing is up to the *Throat Formant* controller parameter.

The Instrument page



Element 1 › Instrument, the expert page. The **Pipe** block is selected.

This page opens the instrument itself, with the parameters and the groups of the maker's own expert editor, the program that once created the original's voices. The diagram at the top shows the model: the breath enters the DRIVER, which works with the CHILD REED and the PARENT REED; these drive the PIPE, whose length per key is the PIPE LENGTH (TUNING). Above, PRESSURE CONTROL, EMBOUCHURE CONTROL, BEAT and COMPENSATION act on them. Each block shows a summary of its settings. **Click a block** to open its cards below.

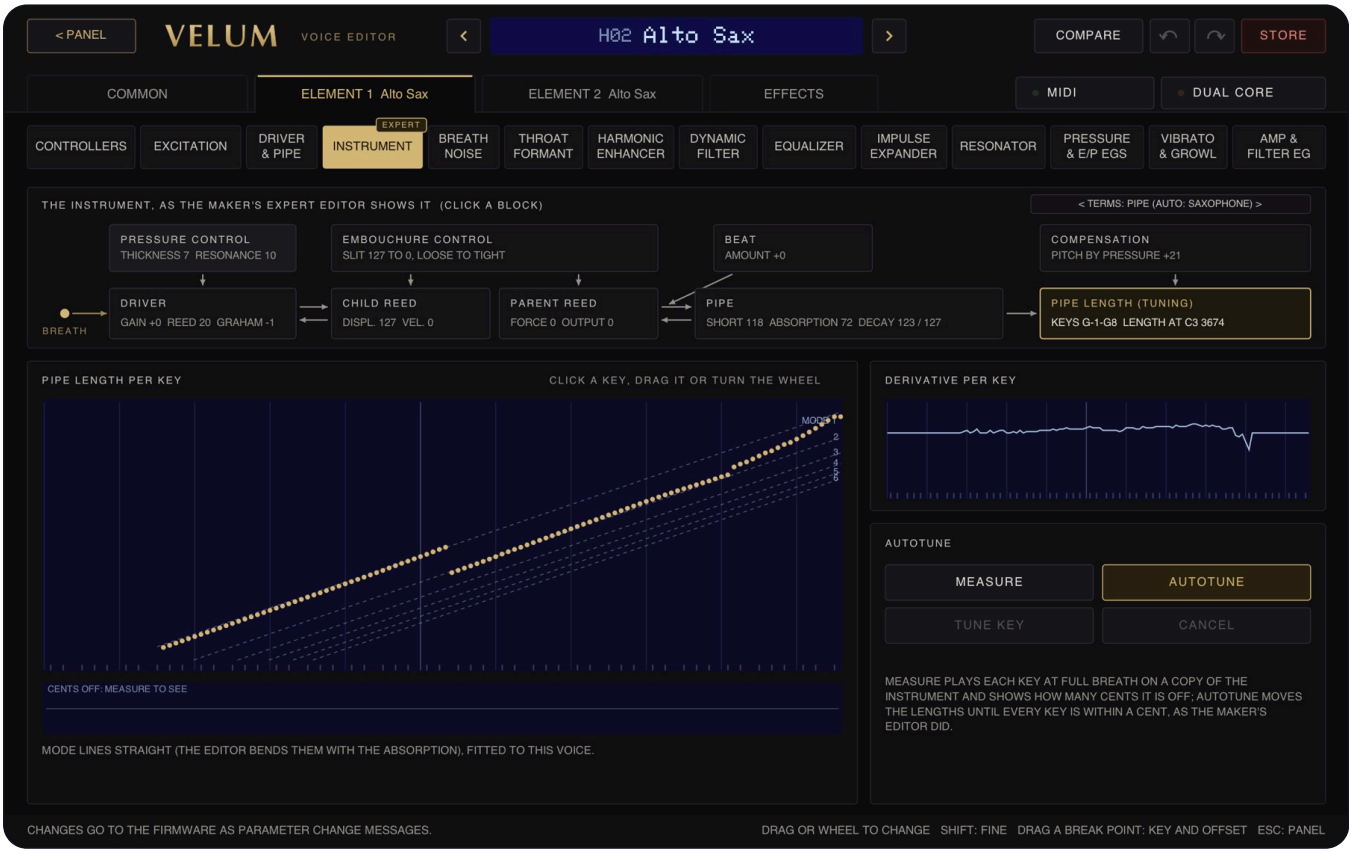
BLOCK	ITS CARDS
Pipe	BORE AND DRIVER POSITION, STRAIGHT HORN (an optional straight section and a conical one, with their lengths and ratios), BELL AND LOSSES (absorption, decay while a key is held and damping after it is released, the register key, the balance of low and high modes).
Driver	INPUT (pressure gain and level to the reed), SLIT, FLOW AND OUTPUT.
Child reed	The force on it, its displacement and velocity outputs, and its resonance.
Parent reed	The force on it and its output, its cutoff, and the lips' collision.
Pressure control	How the breath changes the reed's thickness and resonance.

BLOCK	ITS CARDS
Embouchure control	The slit's opening, the mouthpiece's narrowness, the reed's flexibility and the child reed's resonance, each between a loose and a tight embouchure.
Beat	The amount of beating and a high-frequency emphasis.
Compensation	How the pitch is corrected as the pressure changes.
Pipe length (tuning)	The tuning tool: see below.

Many settings come in pairs, one for a **loose** and one for a **tight** embouchure, drawn together over the keyboard: the loose value in blue, the tight one in gold, the band between them shaded. Drag a dot sideways to move its key and up or down to set that side's value; with shift the key stays put. The mouse wheel changes the nearest dot.

On a string instrument the same parameters mean other things: the reed's slit becomes the bow's friction, the pipe a string. The < TERMS: ... > switch at the top right chooses the words: PIPE, STRING or automatic, which follows the element's drawing. Only the labels change.

Tuning and autotune



The tuning tool of H02 Alto Sax, on the **Pipe length (tuning)** block.

A physical model does not play in tune by itself: the pitch of each note comes from the length of the tube, and the firmware keeps a table of lengths, one per key. Click the PIPE LENGTH (TUNING) block to see it.

- PIPE LENGTH PER KEY draws each key's length as a gold dot: higher means a higher pitch. The dashed lines are the instrument's modes, from the fundamental (MODE 1) to the sixth; a dot near a higher line overblows to that mode. Click a dot to select its key; drag it up or down or turn the wheel to change its length, finely with shift.
- The CENTS OFF strip under it shows, after a measurement, how far each key is from its note: gold within 1.5 cents, grey up to 5, red beyond, or when a key sounds in another mode.
- DERIVATIVE PER KEY draws the table's slope bytes, for reference.

The AUTOTUNE card does the measuring for you, the way the maker's editor did. Velum plays each key at full breath on a copy of the instrument, so you hear nothing and the voice is not touched until the end.

Measure
Plays every key and shows how many cents it is off, without changing anything.

Autotune
Changes the lengths until every key is within a cent, in up to four passes.

Tune key
Does the same for the selected key only.

Cancel
Stops a measurement or a tuning in progress.

A summary follows, for example how many keys are within 1.5 cents and how many lengths changed. A tuning is a single step of undo, so you can take it back at once.

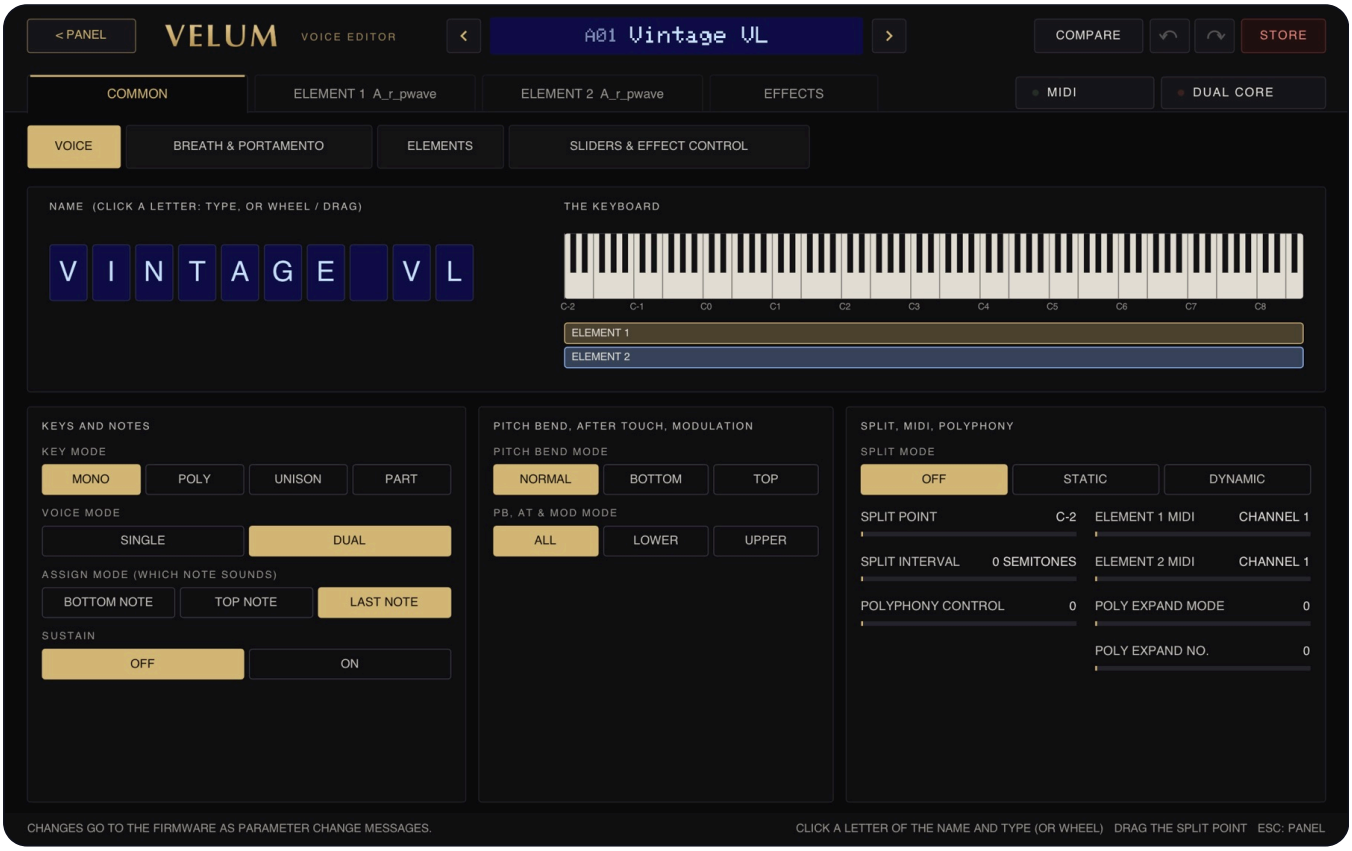
> **NOTE**
> The graph's keys are the notes that sound. If the element has a NOTE SHIFT, a key you play uses the entry that many notes away.

CHAPTER 10

VOICE-WIDE SETTINGS

The COMMON tab holds what belongs to the whole voice: how it is played from the keyboard, how its two elements are placed and tuned, and what the sliders and the effect controller move. Its BREATH & PORTAMENTO page is described with the controllers, in chapter 6.

Voice



Common › Voice of A01 Vintage VL, a dual voice.

At the top are the voice's **name** (see Naming a voice) and a **keyboard** that shows where each element plays. When the voice is split, a gold handle marks the split point: drag it along the keyboard.

Key mode

MONO plays one note at a time, the natural mode for a wind instrument. POLY and UNISON let two notes sound at once, one per element. PART gives each element its own MIDI channel, set under ELEMENT 1 MIDI and ELEMENT 2 MIDI, so a sequencer can play them as two parts.

Voice mode

SINGLE uses element 1 only; DUAL uses both.

Assign mode

Which note sounds when you hold more keys than the voice can play: the BOTTOM NOTE, the TOP NOTE or the LAST NOTE.

Sustain

Whether the sustain pedal holds notes.

Pitch bend mode, PB, AT & Mod mode

With two notes sounding, whether the pitch bend reaches both (NORMAL) or only the lower or upper one, and likewise which notes the aftertouch and the modulation wheel reach.

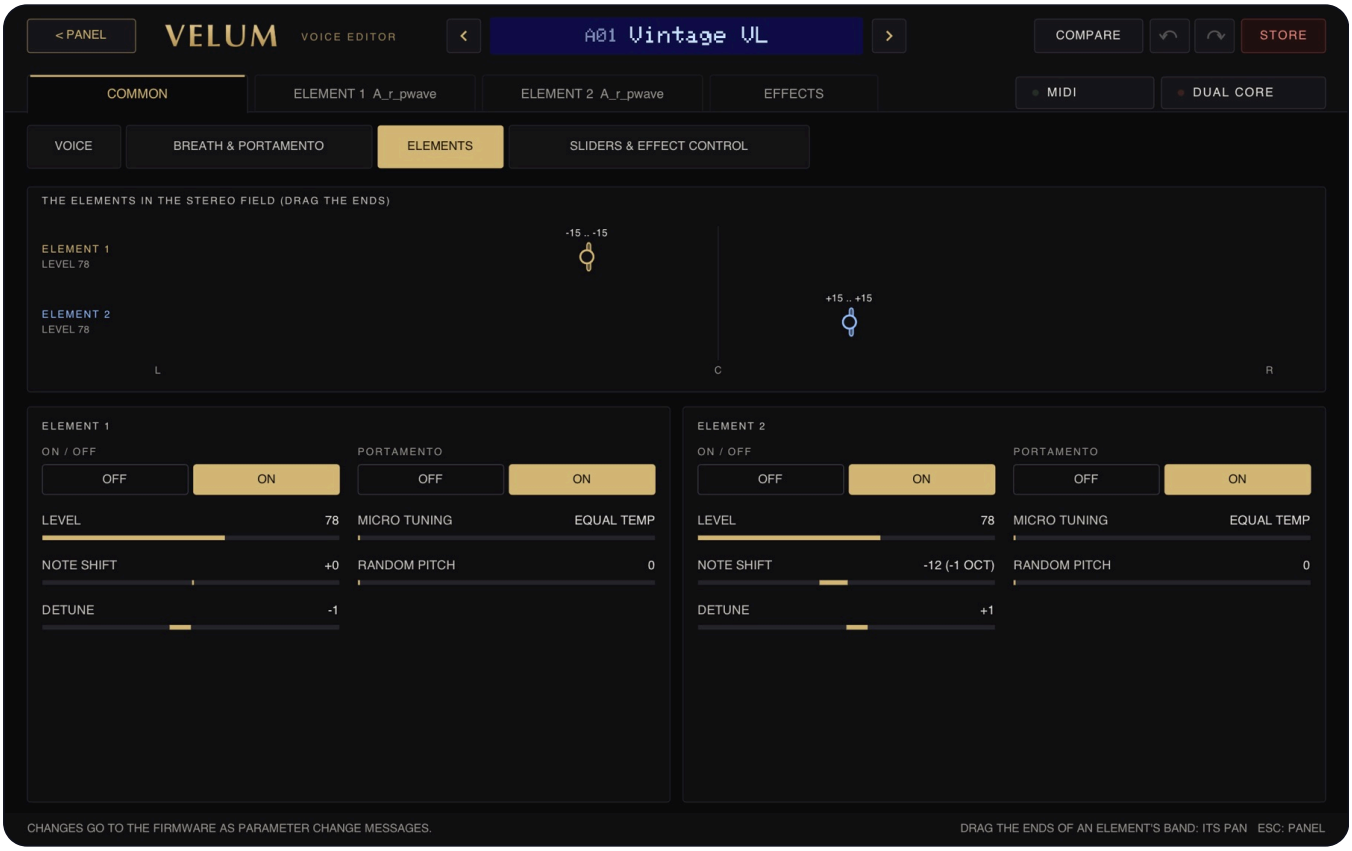
Split mode, split point, split interval

Split the keyboard between the elements, STATIC or DYNAMIC, at a key and with an interval in semitones.

Polyphony control, poly expand mode and number

The control change that switches between one and two notes, and the hardware's settings for sharing notes among several units over MIDI.

Elements



`Common › Elements: each element is a band in the stereo field.`

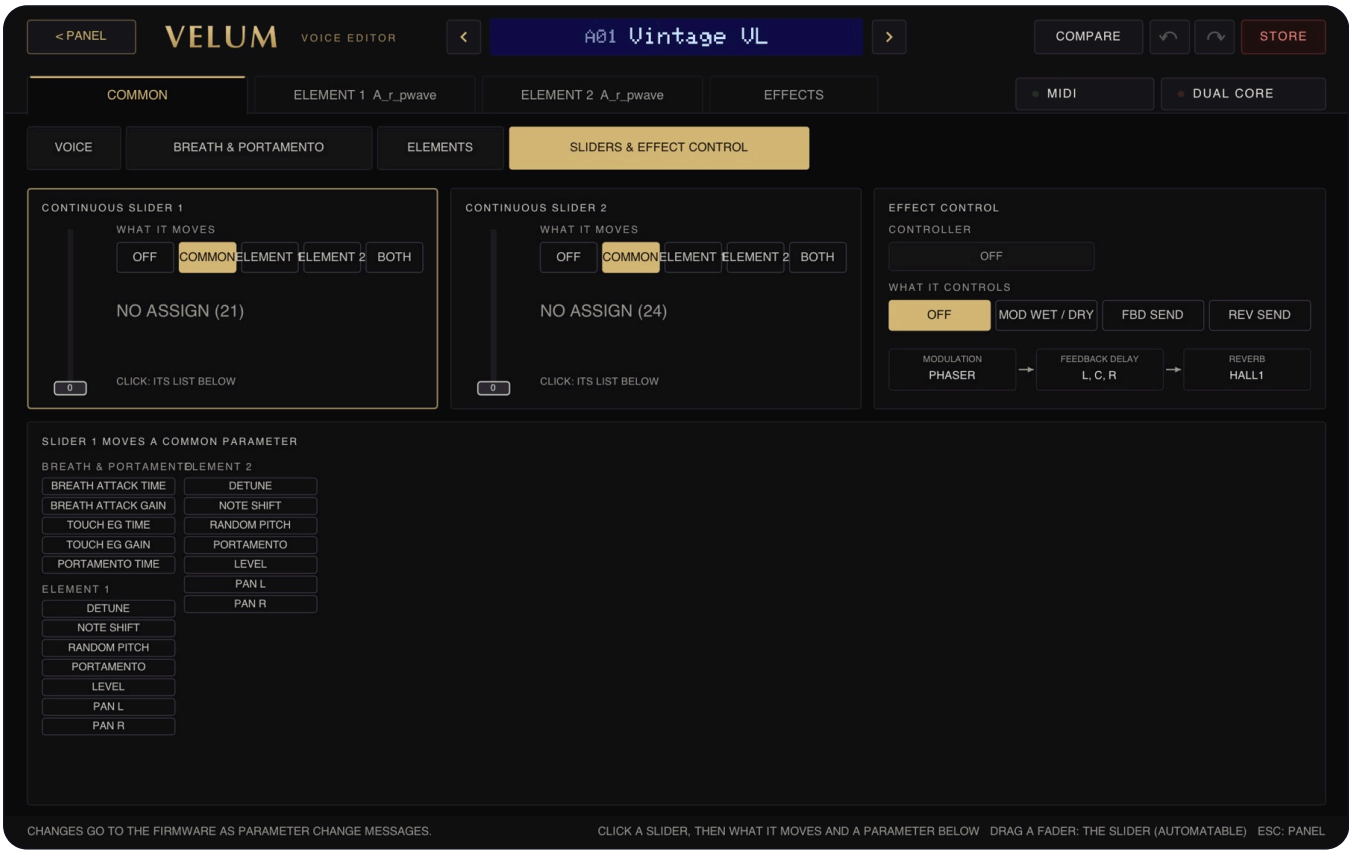
The drawing at the top places each element in the stereo field as a band from its left to its right pan position, brighter the louder it is. **Drag either end** of a band to move it.

Each element's card sets whether it is ON, whether it takes the PORTAMENTO, its LEVEL, its NOTE SHIFT in semitones, a fine DETUNE, its MICRO TUNING, and a RANDOM PITCH that makes every note slightly different. Micro tuning offers 87 tables: equal temperament; just intonation, mean-tone and Pythagorean tunings in

every key; Werckmeister, Kirnberger and Vallotti & Young; quarter- and eighth-tone scales; historic Arabic and Persian tunings, bagpipes, gamelan, Indian and Japanese scales; and a user table.

> **TIP**
>
> Two elements a few cents apart, panned slightly left and right, are a quick way to a fuller sound, as in A01 *Vintage VL*.

Sliders & Effect Control



Common › Sliders & Effect Control.

The original has two continuous sliders, CS1 and CS2, that each voice can assign to one parameter for hands-on control. On Velum they are DAW parameters, *Continuous Slider 1* and *2*, so you can draw them as automation or map them to a controller.

- The **fader** at the left of each card moves the slider, as your DAW would; it is recorded as automation. The mouse wheel moves it too.
- WHAT IT MOVES chooses the kind of parameter: OFF, COMMON, ELEMENT 1, ELEMENT 2 or BOTH, which moves the same parameter of both elements; the last two are for dual voices. Then pick the parameter in the list below: breath attack, touch EG and portamento times and gains, each element's detune, note shift, level and pan, or, for element parameters, more than a hundred settings from the controller depths to the envelopes.

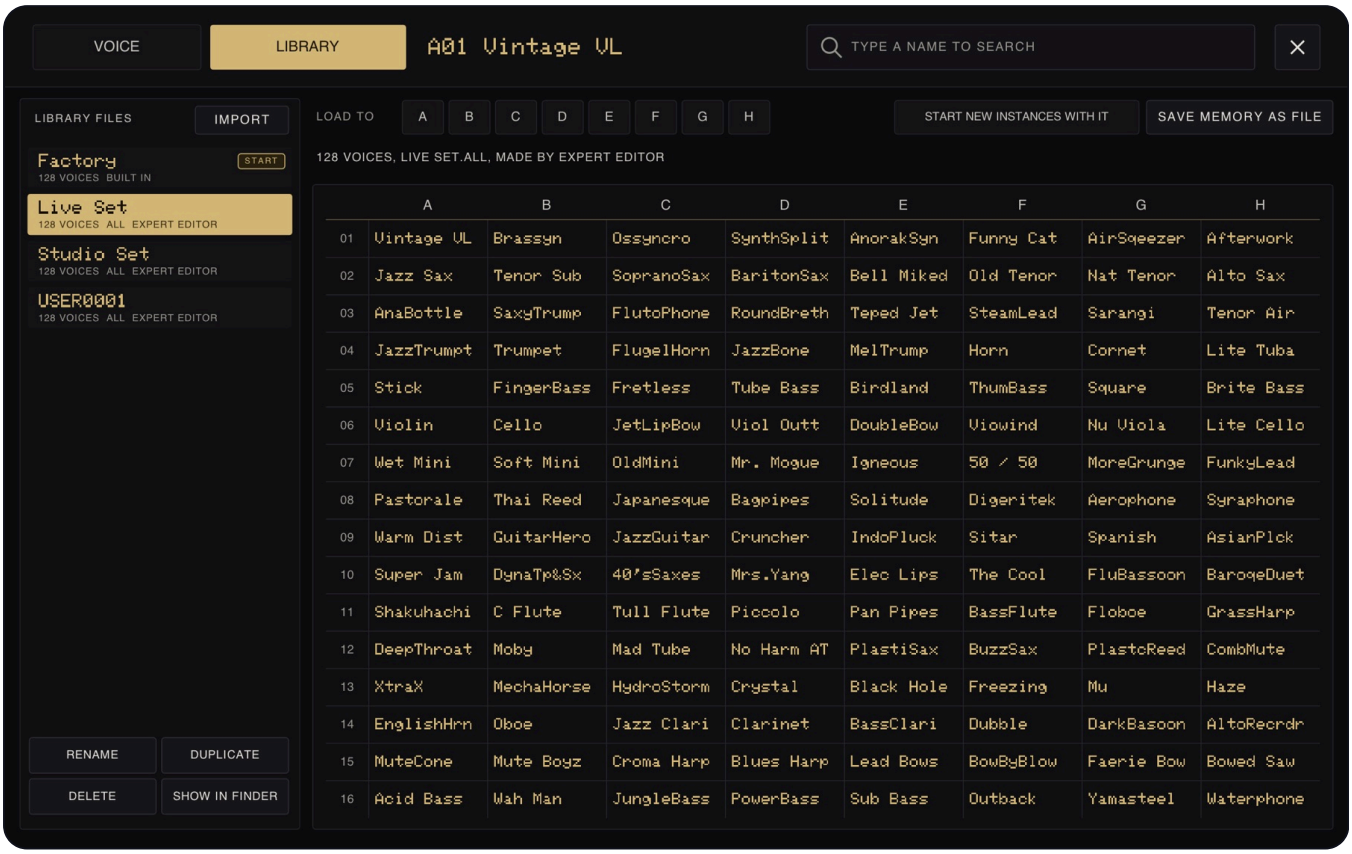
- A gold marker on the fader shows where the parameter's current value lies. The slider takes the parameter over when it reaches the marker, so nothing jumps.

The EFFECT CONTROL card sets the controller that plays one of the effects, and what it moves: the modulation's wet/dry balance, the feedback delay's send level or the reverb's send level. The three effect boxes below show which stage it reaches, or NOT IN USE if that stage is off.

CHAPTER 11

THE LIBRARY

Velum's memory holds 128 voices; its library holds as many voice files as you like. Open the patch browser, by clicking the display or the editor's voice box, and choose LIBRARY.



The library, with a file selected.

The files

The column on the left lists FACTORY, the voices of the factory disk you gave Velum, then the voice files in the `library` folder inside Velum's data folder; a file you copy there appears too. Each shows its number of voices, its type and the editor or instrument that made it. Click a file to see its voices on the right. The mouse wheel scrolls a long list.

IMPORT brings in the original's voice files: `.ALL` files from the hardware or its rack version, single banks and voices (`.1BK` , `.1VC`), and expert editor `.AVC` files. Files from the first firmware are converted by the emulated firmware itself, as version 2 would load them from disk; the file as imported is kept in the library's `Deleted` folder.

Playing and loading voices

- **Click a voice** to hear it: it goes into the edit buffer, and the memory is not touched. The editor's voice box reads LIBRARY. To keep it, store it in a memory location.

- LOAD TO A … H copies the file's voices into memory, starting at that bank: a 16-voice bank fills one bank, a full 128-voice file loaded to A replaces the whole memory.
- START NEW INSTANCES WITH IT makes new copies of Velum start with this file's voices instead of the factory set. A START badge marks it. Projects you have saved keep their own voices.
- SAVE MEMORY AS FILE writes the 128 voices in memory to a new file, `USER0001.ALL` and so on, in the library folder. The name and format are the ones the hardware reads from floppy disk.

Managing files

Rename

Type the new name and press ENTER; ESC cancels.

Duplicate

Copies the file; duplicating Factory gives you a file of the factory voices you can edit.

Delete

Click twice: the first click asks, the second moves the file to the `Deleted` folder, from where you can still take it back.

Show in Finder

Shows the chosen file in its folder; for Factory, your dump of the factory disk (Show in Explorer on Windows; on Linux it opens the folder in your file manager).

The search works here too: type a name and each file shows how many voices match.

CHAPTER 12

THE PANEL'S OWN MODES

Because Velum runs the original's firmware, every menu of the hardware is on its panel. Their voice editing is all in the voice editor, but a few instrument-wide settings live only here, in Utility mode. Move the cursor to a menu item and press ENTER to open it; move to a value and change it with DEC and INC; EXIT goes back.

Utility mode



Utility mode opens on its System menu.

SYSTEM PAGE	SETTINGS
1: KBD Setting	Keyboard Transpose, Octave SW Hold.
2: TG Setting	Master Tuning; Reverb on or off for every voice; Output, Stereo or Mono; WX Lip, for the maker's own wind controllers.
3: MIDI Setting	Transmit Channel; Receive Channel (Omni by default, or 1 to 16); Local on/off; Device Number, for system exclusive messages (All by default).
4: Assignable Ctrl	The control change numbers of the hardware's own controller inputs (breath, second modulation wheel, foot controllers and foot switches).
5: Curve	The response curves of velocity, aftertouch and the breath controller, on the function keys Velo, Aftr and Brth.
6: Breath Mode	Where the breath comes from. BC/WX takes it from a breath or wind controller; Velocity makes it from each note's velocity; Touch EG from the velocity and then the aftertouch, with its own offsets, gains and time. The mode shows on the Play display.
7: Miscellaneous	Display, Confirm (the “Are You Sure?” prompts), Memory Protect, Greeting Message.

The function keys open the other Utility pages:

`Sys` **(F1)**
The System menu above.

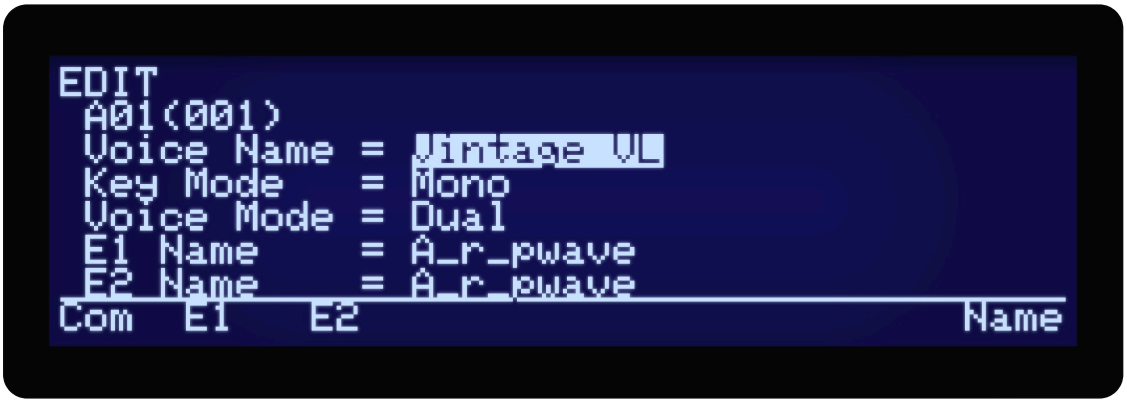
`Bulk` **(F2)**
MIDI bulk dumps of the system, all voices or the current voice. Velum has no MIDI output to your DAW, so they go nowhere: use the library to save voices.

`Disk` **(F3)**
The hardware's floppy disk functions. Velum has no disk drive for you to use: the library reads and writes the same files.

`Recl` **(F4)**
Edit Recall: brings a voice you were editing back into the edit buffer, if you selected another voice before storing it.

`Demo` **(F5)**
The demo songs: see Playing the demo.

Edit mode on the panel



Edit mode: the firmware's own edit pages.

`EDIT` opens the firmware's own edit pages, with `Com`, `E1` and `E2` on the function keys, exactly as on the hardware. They edit the same edit buffer as the voice editor, so a change made on one shows up on the other. Everything they reach is also in the voice editor. `COPY` and `STORE` work the same way.

CHAPTER 13

VELUM IN YOUR STUDIO

Dual core and latency

The original is a demanding machine to emulate, though Velum has become much lighter: since version 1.0.2 it turns the emulated DSP chips' programs into your computer's own machine code, and when the emulated processors only wait it skips straight to where the waiting would leave them. Both keep the sound the same, sample for sample. On an Apple M4, two held notes take about 5% of one core. If your DAW does not let plug-ins create executable code, the chips' programs run as before: the same sound, with more processor time. With DUAL CORE on, the default, Velum runs the modifiers' and the effects' DSP chips on a second processor core while the first one makes the next samples. The sound stays the same bit for bit, and you can switch it while playing, on the panel or with DUAL CORE in the editor. Turn it off if your DAW already keeps every core busy. The setting is remembered for new instances.

Velum runs the emulated hardware at its own 48 kHz and converts to your project's sample rate. It reports its small delay to the DAW, which compensates for it: 64 samples at 48 kHz, 74 at 44.1 kHz, 162 at 96 kHz.

Automation

Velum offers 33 parameters to your DAW:

- **Output**, the level after the emulated converter, −24…+12 dB.
- **Continuous Slider 1** and **2**, the original's sliders: see Sliders & Effect Control.
- **Thirty voice parameters**: Element 1 Level and Element 2 Level, Portamento Time, Feedback Delay Return, Reverb Return and Reverb Time; and, for each element (E1, E2), Amplitude Level, Tap Location, Excitation Low-pass, Excitation Pulse Width, Breath Noise Level, Throat Formant Amount, Harmonic Enhancer Balance, Filter Cutoff, Filter Resonance, Vibrato Speed, Attack Rate and Release Rate.

The voice parameters follow the voice: when you select another voice or edit one, the DAW sees the new values, and when the DAW moves them the change goes to the firmware like any edit. In the voice editor, their controls tell the DAW when you touch them, so the DAW shows the move and, when it is recording automation, records it. Selecting a voice, COMPARE and UNDO update the DAW's values without recording them. If the DAW's automation and a voice change arrive together, the automation's value wins.

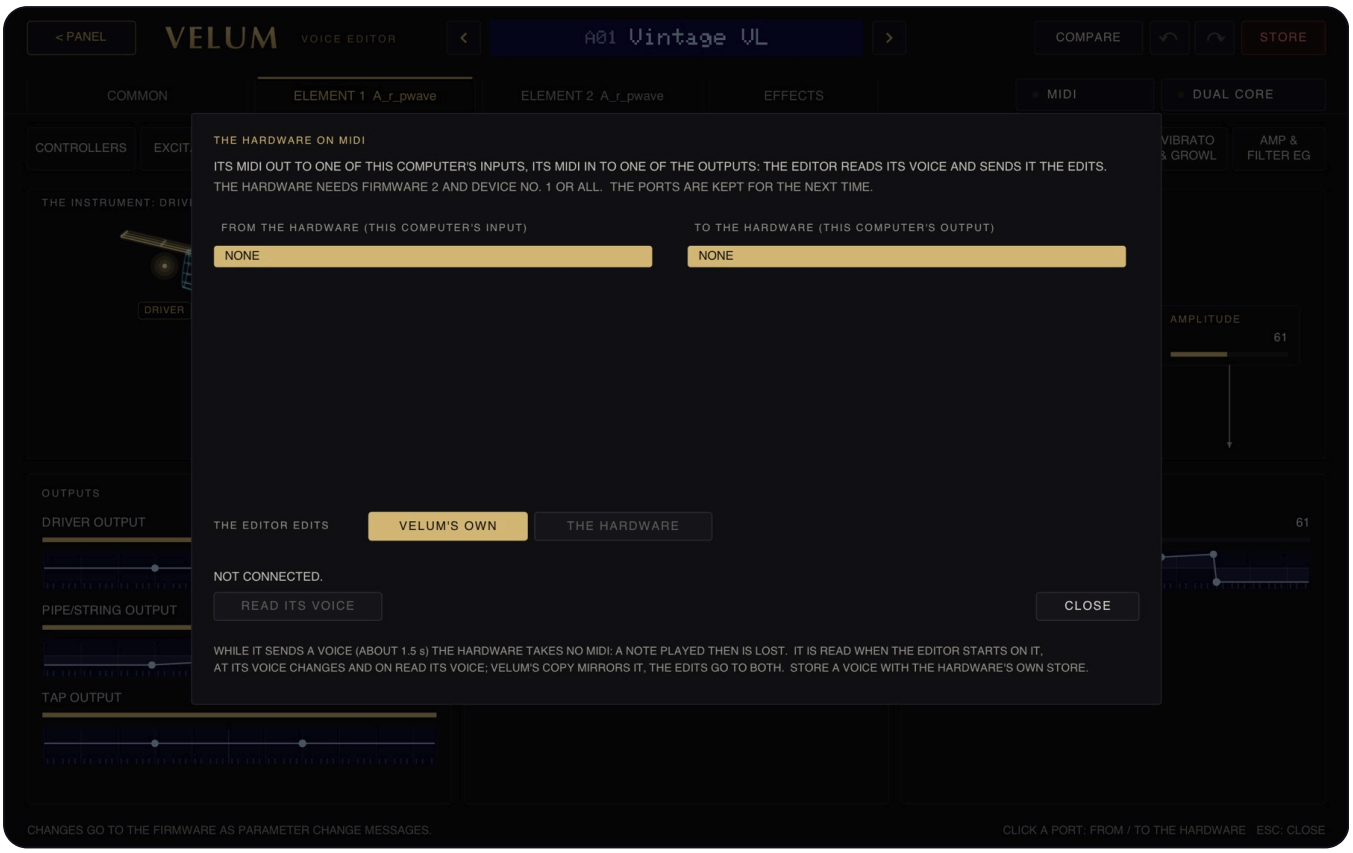
What the project keeps

When you save your project, Velum saves the whole emulated machine with it: the 128 voices in memory, the voice you were editing, its system settings and which voice was playing. Reopening the project brings all of it back, whatever the library's start file says.

Some settings belong to Velum rather than to a project, and live in its data folder: the display colours, dual core and the MIDI ports for the hardware (`ui.settings`), the library's start file (`library.settings`) and the drawings chosen on the Driver & Pipe page (`families.settings`).

Editing the hardware

If you own the original, Velum's editor can edit it too. This works on macOS for now.



The **MIDI** window. Your computer's MIDI ports are listed under the two headings.

1. **Connect it.**
   The hardware's MIDI OUT goes to one of your computer's MIDI inputs, its MIDI IN to one of the outputs. It needs firmware version 2 and its Device Number set to 1 or All.

2. **Choose the ports.**
   In the editor, click MIDI at the right of the tabs. Click the input under FROM THE HARDWARE and the output under TO THE HARDWARE. When both are open, the button's light turns green. READ ITS VOICE checks the connection: Velum asks the hardware for its voice and reports the answer.

3. **Switch the editor to it.**
   Under THE EDITOR EDITS, click THE HARDWARE. Velum reads the hardware's voice and plays a copy of it; the MIDI button turns gold and reads HARDWARE.

4. **Edit.**
   Every change goes to both the hardware and Velum's copy. Edits made on the hardware's own panel, and voices you select there, come back into the editor. < and > select voices on the hardware.

5. **Store on the hardware.**
   The editor does not write the hardware's memory: use its own STORE. COMPARE and EDITED refer to the voice as it was when you selected it.

6 **Come back.**

Click VELUM'S OWN: the editor edits Velum again, and Velum's own voice returns. The ports are remembered for next time.

> **NOTE**
>
> While the hardware sends a voice, about a second and a half, it ignores MIDI: a note played then is lost. Velum waits for the dump before sending edits.

APPENDIX A

THE FACTORY VOICES

The 128 voices of the version 2 factory disk, which Velum starts with once you have given it the disk, and the ten ROM voices of its firmware.

BANK A

A01 Vintage VL
A02 Jazz Sax
A03 AnaBottle
A04 JazzTrumpt
A05 Stick
A06 Violin
A07 Wet Mini
A08 Pastorale
A09 Warm Dist
A10 Super Jam
A11 Shakuhachi
A12 DeepThroat
A13 XtraX
A14 EnglishHrn
A15 MuteCone
A16 Acid Bass

BANK B

B01 Brassyn
B02 Tenor Sub
B03 SaxyTrump
B04 Trumpet
B05 FingerBass
B06 Cello
B07 Soft Mini
B08 Thai Reed
B09 GuitarHero
B10 DynaTp&Sx
B11 C Flute
B12 Moby
B13 MechaHorse
B14 Oboe
B15 Mute Boyz
B16 Wah Man

BANK C

C01 Ossyncro
C02 SopranoSax
C03 FlutoPhone
C04 FlugelHorn
C05 Fretless
C06 JetLipBow
C07 OldMini
C08 Japanesque
C09 JazzGuitar
C10 40'sSaxes
C11 Tull Flute
C12 Mad Tube
C13 HydroStorm
C14 Jazz Clari
C15 Croma Harp
C16 JungleBass

BANK D

D01 SynthSplit
D02 BaritonSax
D03 RoundBreth
D04 JazzBone
D05 Tube Bass
D06 Viol Outt
D07 Mr. Mogue
D08 Bagpipes
D09 Cruncher
D10 Mrs.Yang
D11 Piccolo
D12 No Harm AT
D13 Crystal
D14 Clarinet
D15 Blues Harp
D16 PowerBass

BANK E

E01 AnorakSyn
E02 Bell Miked
E03 Teped Jet
E04 MelTrump
E05 Birdland
E06 DoubleBow
E07 Igneous
E08 Solitude
E09 IndoPluck
E10 Elec Lips
E11 Pan Pipes
E12 PlastiSax
E13 Black Hole
E14 BassClari
E15 Lead Bows
E16 Sub Bass

BANK F

F01 Funny Cat
F02 Old Tenor
F03 SteamLead
F04 Horn
F05 ThumBass
F06 Viowind
F07 50 / 50
F08 Digeritek
F09 Sitar
F10 The Cool
F11 BassFlute
F12 BuzzSax
F13 Freezing
F14 Dubble
F15 BowByBlow
F16 Outback

BANK G

G01 AirSqeezer
G02 Nat Tenor
G03 Sarangi
G04 Cornet
G05 Square
G06 Nu Viola
G07 MoreGrunge
G08 Aerophone
G09 Spanish
G10 FluBassoon
G11 Floboe
G12 PlastcReed
G13 Mu
G14 DarkBasoon
G15 Faerie Bow
G16 Yamasteel

BANK H

H01 Afterwork
H02 Alto Sax
H03 Tenor Air
H04 Lite Tuba
H05 Brite Bass
H06 Lite Cello
H07 FunkyLead
H08 Syraphone
H09 AsianPlck
H10 BaroqeDuet
H11 GrassHarp
H12 CombMute
H13 Haze
H14 AltoRecrdr
H15 Bowed Saw
H16 Waterphone

ROM VOICES

01 Jungle
02 Tenor Sax
03 Syndia
04 RkGt/Pigs
05 Shakuhachi
06 Haze
07 SoloViolin
08 Hydrophone
09 Frenchy
10 SopranoSax

APPENDIX B

TROUBLESHOOTING

No sound

- Many voices wait for breath. If the voice's *Pressure* is on the breath controller, it is silent until control change 2 arrives: blow, choose a voice made for the keyboard such as A01 *Vintage VL*, or set the breath mode to Velocity or Touch EG. See Breath controllers.
- Check that your DAW sends MIDI to Velum's track and that the track is armed or selected.
- Check the **Output** knob, and on COMMON › ELEMENTS that the elements are on.
- If the ROM panel covers the front panel, Velum is still missing a firmware dump: see Giving Velum its ROMs.

Velum does not recognise my dump

The ROM panel shows the file's size and SHA-256. Velum takes only the exact files listed in Giving Velum its ROMs: the same firmware read in another byte order, or the two EPROMs merged into one file, has a different checksum.

Only one note sounds

Velum is a solo instrument: in MONO key mode it plays one note at a time, and at most two in the other modes. See Key mode.

The breath controller does nothing

Make sure the DAW passes control change 2 to Velum, then check on the voice's Controllers page which parameters the breath controller drives.

The editor does not let me change anything

COMPARE is on: click it to go back to your edits. While the hardware's voice is being read, edits also wait.

My edits are gone

Selecting another voice discards the edit buffer. Try Edit Recall (UTILITY , F4), and store voices you want to keep.

Clicks or dropouts

Keep DUAL CORE on, or raise your DAW's buffer size.

Studio One lists Velum but does not load it (Windows)

Velum has changed folder, for example when DDS Hub moved it to the folder for all users, and Studio One still remembers the old one. In Studio One's Plug-In Manager, choose REMOVE PLUG-IN SETTINGS, confirm and restart Studio One; updating the plug-in list is not enough. Studio One then scans all your plugins again, which takes a few minutes; your favourites and folders stay. If another plugin stalls the scan, SKIP leaves that plugin out until the next full scan.

The MIDI window lists no ports

Editing the hardware works on macOS only for now.

Velum is made by Digital Dream Synths. The instrument that inspired this plugin is not named in this manual: its name is a trademark of its owner. Digital Dream Synths is not affiliated with, endorsed or sponsored by any instrument maker.

This manual follows the order of the Getting Started manual of the original's rack version, but it is written for Velum, from Velum's own behaviour. Like the plugins, it was written with the help of AI. Velum 1.0.2, October 2026.