



# ELMYRA 2 v2.3

by neutral labs



## Manual

Hello, owner.

ELMYRA 2 is a digital/analog hybrid platform for microtonal sonic exploration, capable of creating anything from lush ambient soundscapes to gritty droning textures and shrieking noises, available as a Eurorack module or semi-modular desktop synth. The included set of preset cards or individual electronic components like capacitors or diodes can be used to change the sound character.

## Specifications

- Width: 42 HP
- Supply voltage (either):
  - Eurorack 10-pin header: +12V/-12V
  - USB power: +5V
- Current draw:
  - Eurorack
    - +12V: typ. 65 mA, max. 100 mA
    - -12V: unused, 0 mA
    - 5V: unused, 0 mA
  - USB
    - typ. 75 mA, max. 120 mA
- CV inputs: 0V to 3.3V usable, -12V to 12V max.
- Utility inputs: 0V to 5V usable, -12V to 12V max.
- Audio input: ideal 3V-10V, max. 15V peak-to-peak (mono)
- Audio output: 4V peak-to-peak (mono)

## Connecting ELMYRA 2 to USB power

Connect the provided USB-A-to-USB-C cable to a USB power source, such as a USB power supply or power bank. **If your Elmyra 2 has the plastic case, the device will not work with a USB-C-to-USB-C connection unless a USB-C-to-USB-A adapter is also used. Bamboo case Elmyra 2 works with any kind of USB-C cable.** If you have previously removed the module unit from its case, make sure the internal power cable is once again correctly inserted into the white XH connector on the back of the board.

## Connecting ELMYRA 2 to Eurorack power

Connect a 10-pin Eurorack power cable to the 2x5 power header on the back of the module. There is an arrow indicator next to the word STRIPE on the circuit board. Unsurprisingly, the red stripe side of the cable goes on the side that says STRIPE. The module (and your power supply) is protected in case you should ever connect it the wrong way around, but it won't turn on if you do.

## First setup

Elmyra 2 contains some controls that can cause extreme types of sound, or no sound at all. To make sure your first session will not be frustrating, follow these steps before turning on the unit or module:

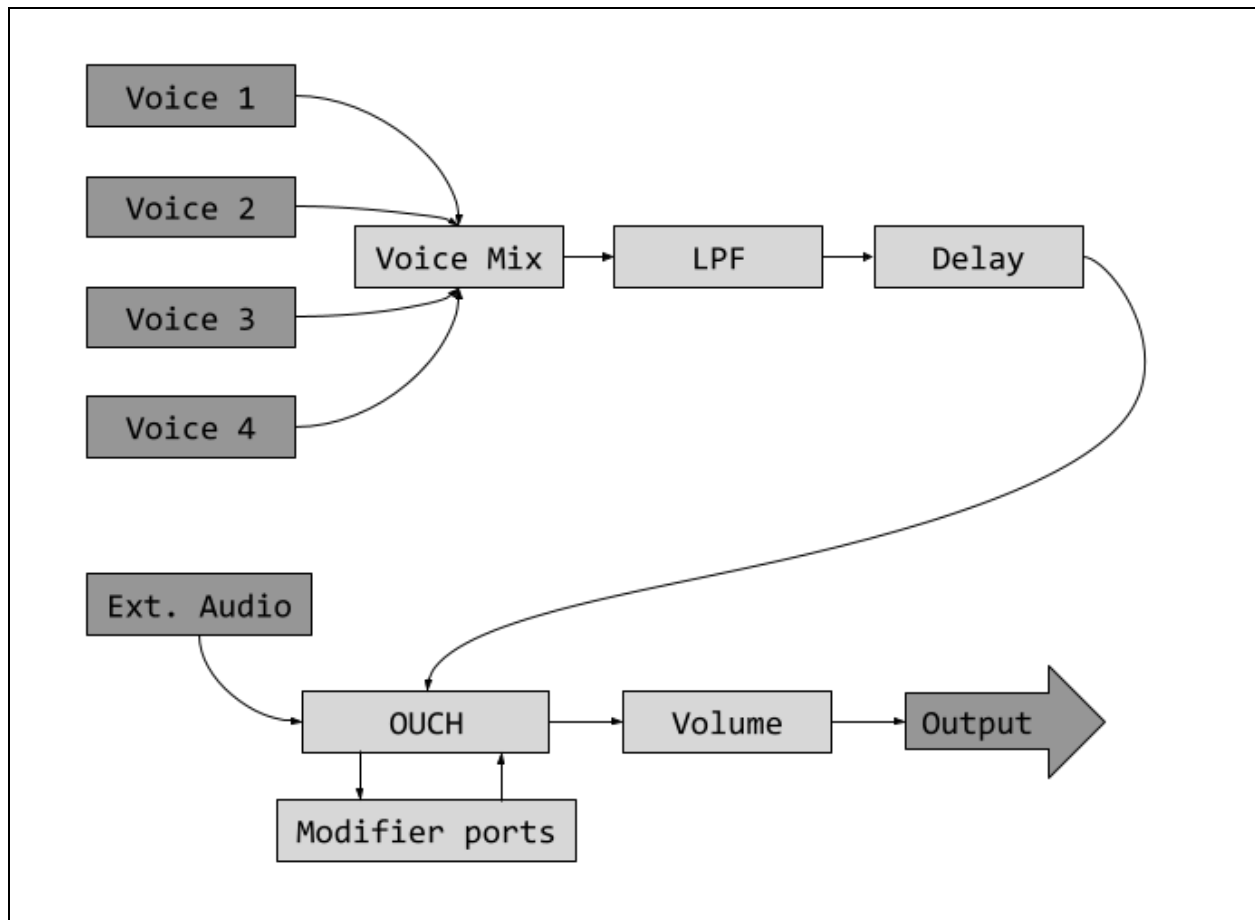
- Set **MIX**, **RESO**, **BITE** to minimum.
- Set **CUTOFF**, **CHOKE** to maximum.
- Turn up the master volume knob (top left).

**Hint:** During your first session, you will notice that the mix of the 4 voices gets heavily saturated, because the OUCH circuit (described further below) loves a saturated sound in order to do its thing. If you're looking for a more subdued ambient sound (or an even dirtier one), you can adjust the saturation level (see **Advanced settings**).

## Updating the firmware

For the desktop version, unplug the USB power cable and remove the 4 screws in the corners attaching the module to the case, and unplug the internal XH power cable. For the Eurorack version, remove the module from the rack and unplug the Eurorack power cable. Set the jumper connector on the back of the module to the **UPDATE** position, connecting the middle and upper pin of the pin header. Plug a Micro-USB cable from your computer into the socket on the back of the module. Newer hardware versions have an **UPDATE** button instead, hold the button while plugging in the cable. The device will appear as a USB drive on either MacOS, Linux or Windows. Put the jumper back, or let go of the button. Copy the provided update file (suffix **.UF2**) onto this drive, which should only take 1-2 seconds. The device will reboot and the drive will temporarily disappear. **You will NOT see the file appear in the drive after copying.** Unplug the USB cable (put the jumper connector back into the **NORMAL** position), place the module back into its case or rack and enjoy the new functionality (and possibly fixed bugs)! In order to identify the installed firmware version, observe the **MODP** LED during the startup light show: For version v2.3, it displays a lime yellow colour throughout.

## Main signal flow



Elmyra 2 has 4 identical voices that are mixed together with the mix getting saturated. The level of saturation is adjustable (see **Advanced Settings**) for softer or even dirtier sounds. This mix is then sent through a resonant low-pass state variable filter (LPF) – that can be changed to various other filter types (see **Advanced Settings**), and on to a delay. (Optionally you can add a lo-fi reverb after the delay, or swap the order of filter and delay, see **Advanced Settings**). The delay output gets mixed with any external audio that might be connected, and is sent through the OUCH effect, which is an analog circuit containing a unique combination of distortion, waveshaper and low-pass filter. The specific sound of this effect can be modified using the modifier ports, which expose the circuit's feedback loop to the front panel. The final result is then adjusted in volume by the volume knob and sent to the audio output.

## Voices

Control	Function
<b>Touchpads</b>	The metal pads at the bottom of the unit react to the touch of a finger (both pads of a voice must be touched). They modulate the volume of the voice depending on the intensity of the pressure as well as the conductivity of the skin (extremely dry skin will result in a lowered volume). An orange LED beneath the pads indicates the current volume as set by the envelope. The touchpads also generate a CV signal that is available via the voice's <b>ENV</b> output.
<b>GATE</b>	This input simulates the touch of a finger on the voice's touchpads. It is not strictly a gate in the on/off sense, but rather continuous. A higher voltage will simulate a more intense pressure on the pads.
<b>ENV</b>	This sets the attack and release times for the voice's envelope. In the counterclockwise position, the attack time is short, with the release time slightly longer. Attack and release time increase as the knob is turned further clockwise. The resulting envelope affects voice activation by touch as well as activation via the <b>GATE</b> input.
<b>PG</b>	<p>A short press of this button cycles through the 4 available wavetable pages.</p> <p>A long press (&gt; 1 second) sets the voice to drone mode - where the envelope is continuously at maximum - or exits drone mode. During drone mode, the envelope is decoupled from the voice. The envelope LED will not light up continuously, but the touchpad and/or <b>GATE</b> input can now be used to generate a CV signal that is available via the voice's <b>ENV</b> output, without affecting the voice's volume. (Another way to get the voice to drone is to patch a cable between the same voice's <b>ENV</b> output and <b>GATE</b> input. This will cause the LED to light up.)</p> <p>The <b>PG</b> buttons have a number of secondary functions (in combination with other controls) which are explained in the relevant sections of this manual.</p>
<b>WAVE</b>	This sets the position in the current wavetable page used to generate the main waveform for the voice's oscillator.

<b>MOD</b>	This sets the amount of the current <b>MODP</b> voice modulation program. In the counterclockwise position, the voice will always be clean (unaffected by the modulation), unless the low-pass filter or chord <b>MODP</b> effect are selected. The <b>MODP</b> programs are described in detail in a table further below.
<b>TUNE</b>	<p>This sets the frequency of the voice, which can be changed either continuously or in quantised (chromatic) fashion, according to the current <b>CHRM</b> setting. Microtonal scales are supported, as is portamento, see <b>Advanced Settings</b>.</p> <p>The corresponding CV input follows the Eurorack 1V/octave standard. While a jack is connected to the input, the <b>TUNE</b> knob has no function.</p>

### Left side buttons

Control	Function
<b>SYNC</b>	This button can be pressed multiple times in order to tap in a tempo for the internal clock. This clock tempo will then be used in the sequencer (and optionally for syncing the delay time or LFOs, see <b>Advanced Settings</b> ). The LED will flash in sync with the clock while the clock tempo is set. You can unset the tempo (and stop the flashing) by pressing this button for more than 1 second. Instead of tapping in a tempo, the socket above the button can receive a continuous clock signal from an external source.
<b>MODP</b>	<p>There are 10 <b>MODP</b> programs, each of which will modify the plain oscillator output of a voice in different ways. The intensity/mode of the selected effect is determined by the voice's <b>MOD</b> knob setting (and/or its <b>MOD</b> CV input). Pressing and releasing the <b>MODP</b> button will cycle through those 10 programs. When doing this, the program is changed globally across all voices.</p> <p>If you want to change the program for a single voice only, press and hold the voice's <b>PG</b> button, press <b>MODP</b> repeatedly until the desired program is selected, and release the <b>PG</b> button. (The <b>PG</b> button will not execute its other functions of changing the wavetable page or enabling drone mode in this case.)</p>

	<p>If you changed the program for a single voice only, the <b>MODP</b> LED will blink in the color of the last selected program to remind you that the settings are now different across the voices.</p> <p>This can be repeated for other voices, so each voice can have a different <b>MODP</b> effect. Pressing and releasing <b>MODP</b> normally will align the voices again, and cause the LED to stop blinking. (It will also stop blinking in case you set all 4 voices to the same program individually.)</p> <p>Pressing any <b>PG</b> button to change the wavetable page will set the <b>MODP</b> LED color to the one of the program used for that voice. You can also press any <b>PG</b> button while holding the <b>MODP</b> button, and that voice's <b>MODP</b> setting will be indicated by the LED without changing the wavetable page.</p>
<b>CHRM</b>	<p>Pressing this button will activate/deactivate chromatic mode. The LED lights up while chromatic mode is active.</p> <p>In this mode, the <b>TUNE</b> knobs are quantised to the notes of the 12-tone equal temperament chromatic scale, based on A=440 Hz. This makes it easy to play chords and other harmonic structures, and also play in tune with other instruments. You can also set the scale to one of several microtonal scales instead, see <b>Advanced Settings</b>.</p> <p>Chromatic mode can also be activated/deactivated selectively per voice. Press and hold any <b>PG</b> button, press and release the <b>CHRM</b> button, and release the <b>PG</b> button again. (The <b>PG</b> button will not execute its other functions of changing the wavetable page or enabling drone mode in this case.) Chromatic mode will be toggled for this voice only. The LED will blink as long as chromatic mode is only activated for some of the voices. You can at any time press the <b>CHRM</b> button in order to align all voices again.</p> <p>(Hint: If you want to avoid the audible stepping of notes while adjusting the <b>TUNE</b> knob in chromatic mode, but still want the tuning to be quantised once it settles on a note, portamento can be used, see <b>Advanced Settings</b>.)</p>
<b>REC</b>	<p>Press and release the <b>REC</b> button in order to start recording a sequence of <b>TUNE</b> settings on voice 1. Or press and hold any combination of voice <b>PG</b> buttons, then press and release the <b>REC</b> button to start recording sequences on all of those voices. Each voice has its own sequence memory</p>

	<p>and the recording of sequences can be done in parallel or one after another. Stored sequences are not persistent across device restarts. The maximum number of steps per voice is 128.</p> <p>The step length is arbitrary, so you could e.g. record a looping 3 step sequence on voice 1 and a looping 7 step sequence on voice 2 (if you record them one by one).</p> <p>While the <b>REC</b> LED is lit up, press and quickly release the <b>REC</b> button to record one step (the current <b>TUNE</b> setting for the voice or voices) and advance to the next step. The LED will blink once to confirm. Repeat as desired.</p> <p>While the <b>REC</b> LED is lit up, press and hold the <b>REC</b> button for more than 1 second in order to end and store the recording. You may also press and release the <b>PLAY</b> button to end and store the recording and start playback.</p> <p>While the <b>REC</b> LED is off, you may press and hold any number of <b>PG</b> buttons and then press and hold the <b>REC</b> button for more than one second in order to delete the recorded sequence for those voices. The <b>REC</b> LED will blink once to confirm, after the <b>REC</b> button is released.</p>
<b>PLAY</b>	<p>Press the <b>PLAY</b> button in order to start looping sequence playback for all voices that have a sequence in memory. Press it again in order to stop playback.</p> <p><b>Note:</b> The sequencer records only the voice <b>TUNE</b> setting, it does not record or output gates. In general, you will want to put the sequenced voices in drone mode (by long pressing on their <b>PG</b> buttons) during playback and recording, although it can be an interesting effect to play the sequenced voices manually via the touchpads. If you want gates or rather envelopes, try synchronizing one of the LFOs to the clock (see <b>Advanced settings</b>) and use it to modulate either the main filter, the <b>GATE</b> input or the <b>MOD</b> input while on the DJ <b>MODP</b> setting.</p> <p><b>Note:</b> The sequencer will not initiate playback unless a clock speed has been tapped in via the <b>SYNC</b> button or a clock signal is connected to the corresponding input. The <b>SYNC</b> LED will flash with the internal or external clock pulse if either is the case.</p>



## LPF (low-pass filter)

The default main filter is a resonant 2-pole state variable low-pass filter. The mix of all 4 voices passes through this filter and is then sent into the delay. It is possible to switch to one of several alternative filter types: a 2-pole state variable filter in band-pass or high-pass configuration, a 4-pole ladder filter, non-resonant high-pass and low-pass filters in series or parallel, and 2 types of base-width filter, see **Advanced Settings**.

Control	Function
RESO	This changes the resonance of the filter. In the counterclockwise position, there will be no resonance. In the clockwise position, the resonance is at maximum.
CUTOFF	This changes the cutoff frequency of the filter. If set to the default low-pass filter: In the counterclockwise position, the sound will be almost completely cut off. In the clockwise position, the filter is completely open.

## Delay

Control	Function
TIME	This sets the delay time, with the shortest time in the counterclockwise position and the longest time in the clockwise position (about 1.6 seconds). The delay time can be synchronised to the clock, see <b>Advanced Settings</b> .
FDBK	This sets the amount of feedback. In the counterclockwise position, there is no feedback added to the delay. Around the middle position, the feedback is at 100%, increasing even further towards the clockwise position. There is a saturator in place that keeps things (mostly) in control even while at crazy feedback levels. Still, in certain cases it's possible for the audio signal to break up due to too much feedback. This occurs gradually, and as you start noticing it, you can try changing the delay time, the waveforms or the tuning of the voices slightly in order to prevent it. If this fails, you'll want to dial back the feedback setting, and then slowly increase it again.

<b>MIX</b>	This determines the dry/wet mix of the delay effect. In the counterclockwise position, you'll hear only the dry signal and the delay has no effect. In the clockwise position, you will only hear the delay effect without the dry signal.
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## OUCH

This is a special analog circuit - a unique combination of waveshaping, distortion and filter that is able to wreak havoc on the sound, if you so desire.

With **BITE** set to minimum and **CHOKE** set to maximum, the sound will pass through unaffected.

The modifier ports that are exposed on the front panel to the right of the knobs can be used to customize the sonic qualities of this circuit by using the included preset cards (or other Neutral Labs preset cards), or individual electronic components like diodes or capacitors. This is described in its own chapter below (see **Modifier Ports**).

Control	Function
<b>CHOKE</b>	<p>This control filters the sound: The filter will be closed when turned fully counterclockwise. With <b>BITE</b> turned partially or fully up, <b>CHOKE</b> will affect the phase of the signal and create weird artifacts in the sound at certain settings.</p> <p>Turn the control fully up (clockwise) to disable it.</p> <p>The <b>BITE</b> control loves to be modulated at audio rates via an LFO (turn the BITE knob almost fully up and set the LFO close to maximum speed).</p>
<b>BITE</b>	<p>This control shapes and distorts the sound and adds harmonics in the high frequency range. Turn fully down (counterclockwise) to disable it. Turning it up beyond the middle position makes it more and more destructive, to the point where depending on the current sound's characteristics and volume, the output may break down completely. This can be counteracted by turning down the <b>CHOKE</b> control.</p>

## LF0s

Elmyra 2 has 2 separate LFOs that can be patched into any of the modulation inputs. The default waveform for LF01 is a sine wave, while the waveform of LF02 can be changed along a continuum of wavetable entries. The LFO's frequencies can be synced to the clock, you can set LF01 to complex waveforms, or enable sample&hold as well as sample&glide output, see **Advanced settings**.

Control	Function
LF01 FREQ	This adjusts the frequency of LF01 from slow (counterclockwise) to fast (clockwise).
LF02 FREQ	This adjusts the frequency of LF02 from slow (counterclockwise) to fast (clockwise).
LF02 WAV	<p>This adjusts the waveform of LF02 from a wave with a short attack and long exponential decay (counterclockwise) to some more complex waveforms, then to a rising sawtooth wave, square wave and finally to a sine wave (clockwise).</p> <p>The waveform in the counterclockwise position is ideal for modulating a low-pass filter's cutoff frequency (either the main filter or the low-pass filter <b>MODP</b> effect). Although Elmyra 2 is more suitable for experimental sounds, you can use this in combination with the sequencer while the LFO is synced to the main clock (see <b>Advanced Settings</b>) in order to generate some pretty basslines as well.</p>

## ATT Controls

This utility acts as a voltage generator, buffered multiple and attenuator.

With a signal present at the **IN** socket, and both knobs in the clockwise position, it will simply buffer the incoming signal and output the same signal at the 2 **OUT** sockets. With the knobs in any other position, the incoming signal will be attenuated as set by the knobs. Finally, with nothing patched into the **IN** socket, it will attenuate a fixed voltage of 3.3V, thus generating arbitrary voltages between 0V and 3.3V at its outputs.

Control	Function
OUT1	Sets the attenuation level for this output.
OUT2	Sets the attenuation level for this output.

## ADD Controls

This utility attenuates and then adds 2 control voltages: Patch 2 signals into the **IN** sockets, attenuate them as needed using the knobs and use the result from the **OUT** socket to modulate a destination of your choice.

Control	Function
IN1	The knob attenuates the incoming CV signal.
IN2	The knob attenuates the incoming CV signal.

## CV (control voltage) inputs

Almost all knob functions can also be controlled via CV from an external source, or from any of the modulation sources within Elmyra 2.

When connecting external modulation sources, keep in mind that the functional voltage range is between 0V and 3.3V. Lower or higher voltages will not damage the unit, they will simply be limited to the threshold and be presented as 0V or 3.3V internally.

The incoming CV is combined with the current knob setting in such a way that the effect of the CV is highest around the middle knob position, and gets lower towards either side. In the fully clockwise and counterclockwise positions, incoming CV has no effect. For an LFO signal with a 0V to 3.3V swing, as output by the Elmyra 2 onboard LFOs or **ENV** outputs, this means that in the middle knob position the effect of the CV signal would span almost across the whole range of the parameter modulated by the knob. Turning the knob towards either side adds a positive or negative bias to the modulated parameter while also attenuating the incoming CV the further the knob is turned.

## MODP (MOD programs)

Colour	Name	Description
red	DETUNE	Adds 2 detuned oscillators to the main oscillator, one slightly lower and one slightly higher. Both volume and frequency deviation of these oscillators are increased as the <b>MOD</b> amount increases.
green	SUBOSC	Adds 2 sub oscillators to the main oscillator, a sawtooth wave 1 octave below and a square wave 2 octaves below. The volume of those oscillators is increased as the <b>MOD</b> amount increases. This sounds especially pleasant if the main oscillator is set to higher frequencies.
mint	CHORD	<p>In chord mode, the 3 oscillators of the voice are stacked into chords. This mode uses just intonation for nice and subtle harmonic beating. Use the <b>MOD</b> control to select the type of chord (from counterclockwise to clockwise):</p> <ul style="list-style-type: none"> <li>• fifth plus octave (1-5-8)</li> <li>• major (1-3-5)</li> <li>• minor (1-b3-5)</li> <li>• diminished (1-b3-b5)</li> <li>• sus2 (1-2-5)</li> <li>• sus4 (1-4-5)</li> <li>• augmented (1-3-#5)</li> <li>• major seventh (1-3-7)</li> <li>• dominant seventh (1-3-b7)</li> <li>• minor seventh (1-b3-b7)</li> </ul>
lime	DUAL	This adds a second oscillator that goes from 1 octave below to 1 octave above the main oscillator, the frequency being adjusted with the <b>MOD</b> knob.
purple	SHAPER	A special waveshaper that shifts part of the wave up or down, similar in effect to the Neutral Labs Meg Eurorack module.
blue	SATURATOR	A saturator effect that will fatten up the wave.
cyan	BITMANGLER	Flips individual bits of each sample, resulting in digital artifacts reminiscent of circuit bending experiments.

yellow	SRR	Gradually reduces the sample rate giving the sound a chiptune-like quality. At more extreme settings, this can affect the perceived pitch of the voice.
white	NOISE	Gradually crossfading white noise into the oscillator output. At the maximum <b>MOD</b> setting, the oscillator gain is zero and the white noise gain is at maximum. This pairs well with the main filter set to band-pass at high resonance, see <b>Advanced Settings</b> .
pink	DJ	Non-resonant DJ-style filter. With the <b>MOD</b> control in the middle position, the sound will pass unaltered. Turn it to the left in order to turn down a low-pass filter, or turn it to the right in order to turn up (close) a high-pass filter. With the <b>MOD</b> control turned all the way down, the voice will generate no sound, which is useful in order to use its touchpads for CV control via the <b>ENV</b> output, without also generating any sound by the voice itself.

## Audio input

Connect a line or Eurorack audio source to the external audio input socket (the one with the horizontal arrow going towards the socket). The audio will be processed by the OUCH circuit in parallel to the internally generated sounds. A line level signal may benefit from boosting in case the effect is not as desired. It is also possible to connect the output of one of the onboard LFOs while the LFO **FREQ** is set to audio rate.

## Advanced settings

Some special settings cannot be accessed directly via dedicated front panel controls. Instead, they are set by entering a 3- or 4-digit code using the **MODP** and **PG** buttons. These settings are not persistent across power cycles (with the exception of calibration) unless you explicitly save them, see “Save state” in the table below.

To access one of these settings, press and hold the **MODP** button. While holding it, enter the numeric code using the 4 **PG** buttons, where each **PG** button’s number corresponds to the number of its voice. Then

release the **MODP** button. (The **MODP** and **PG** buttons' normal functions will not be executed if you use them in this manner.)

E.g. to enter code 331, press and hold **MODP**, press the **PG** button for voice 3 twice, then press the **PG** button for voice 1 once, then release the **MODP** button. Or if you were, say, looking for easter eggs hidden in the firmware and wanted to try out if maybe something funny happens when you enter code 1234, you'd hold **MODP**, press the **PG** buttons for voices 1, 2, 3 and 4 in this order, and release the **MODP** button.

If you enter 5 digits or more, there will be no effect. This can help in a recording or live situation if you've made a mistake while entering the code – and don't want your audio affected by the setting you mistakenly accessed, but are still holding down the **MODP** button. In this case, just press any **PG** button a couple of times and release the **MODP** button.

The default settings are marked with an asterisk (\*) in the table.

Setting	Code	Function	Description
Filter	331	ladder LPF	<p>This changes the main filter (the one accessed by the <b>RESO</b> and <b>CUTOFF</b> controls):</p> <ul style="list-style-type: none"><li>• a 4-pole ladder low-pass filter</li><li>• a multimode 2-pole state variable filter in low-pass (LPF), band-pass (BPF) and high-pass (HPF) configurations</li><li>• a non-resonant low-pass (LP) filter (controlled by <b>CUTOFF</b>) in series or in parallel with a non-resonant high-pass (HP) filter (controlled by <b>RESO</b>)</li><li>• a base-width filter (band-pass filter with the base frequency determining the lower end of the passband, and adjustable width of the passband, <b>RESO</b> controls the base frequency, <b>CUTOFF</b> controls the width)</li><li>• a base-width notch filter (notch or band-stop filter with the base frequency determining the lower end of the stopband, and adjustable width of the stopband, <b>RESO</b> controls the base frequency, <b>CUTOFF</b> controls the width)</li></ul>
	332	state variable LPF*	
	333	state variable BPF	
	334	state variable HPF	
	3311	HP/LP series	
	3312	HP/LP parallel	
	3313	base-width	
	3314	base-width notch	

Signal routing	133	default*	This changes signal routing from the default (filter output goes into the delay) to reversed (delay into filter).
	134	reversed	
Octave	231	voice 1	Toggles the TUNE knob and CV range of the given voice between starting on a low octave (default setting) and starting one octave above. The sub-oscillator MODP effect will be unaffected, so in the high octave setting, the sub-oscillators will be 2 and 3 octaves below the main oscillator.
	232	voice 2	
	233	voice 3	
	234	voice 4	
Reverb	441	off*	Elmyra 2 shines with an external stereo reverb. Alternatively, this setting adds a crude lo-fi mono reverb behind the delay in the signal chain.
	442	on	
Mix saturation	121	none	This changes the level at which the mix of the 4 voices is saturated. If you're temporarily inclined to make some soothing ambient, you may want to lower this setting. Just be advised that the overall output volume will be lowered and the BITE control will not have the same effect. (It may break up the sound instead, so best leave BITE in the counterclockwise position while the saturation is lowered.)
	122	soft	
	123	hard*	
	124	dirty	
Microtonal tuning	111	7-EDO	This changes the scale used while the <b>CHRM</b> setting is active. 12-EDO is the default (this is the common western 12-tone equal temperament scale). When using another scale, the range of the TUNE knobs is scaled accordingly (only while the <b>CHRM</b> setting is active) so that the knob travel distance between two neighbouring scale tones remains the same. All tunings start on A0 (27.5 Hz).
	112	9-EDO	
	113	15-EDO	
	114	17-EDO	
	1111	12-EDO*	
Delay sync	131	unsync*	When synced, the delay time will be synchronised to the clock (if a clock tempo has been set and the <b>SYNC</b> LED is flashing). In this case, the <b>TIME</b> knob adjusts the delay time from 1/2 (counterclockwise), 1/1 (10 o'clock position), 3/2 (2 o'clock position) to 2/1 (clockwise) of the clock period. If the resulting delay time would be longer than the delay buffer size of about
	132	synced	



			1.6 seconds, it will instead be limited to that time.
LFO sync	141	LF01 free*	When synced (and if a clock tempo has been set, meaning the <b>SYNC</b> LED is flashing), the LFO cycle will restart with the clock cycle and the period will correspond to the clock period (if the LFO <b>FREQ</b> knob is clockwise from the middle position) or half the clock period (if the LFO <b>FREQ</b> knob is counterclockwise from the middle position).
	142	LF01 sync	
	143	LF02 free*	
	144	LF02 sync	
LFO advanced functions	241	reset LF01*	Codes 241 and 242 reset the LFOs to their default functions. Code 243 copies the current LF02 waveform to LF01. Code 244 cycles LF02 through 4 additional wavetables.
	242	reset LF02*	
	243	copy LFO	
	244	cycle LF02 wavetables	
	2411	LF01 S&H	Both LFOs can be set to sample&hold (S&H - stepped random) as well as sample&glide (S&G - smooth random). In those modes, the <b>FREQ</b> controls set the stepping rate. In synced LFO mode, the steps will be synced to the clock tempo in the same way as the LFO wave. For LF02, the <b>WAVE</b> control sets the range of random values, with a constant value (of half the maximum voltage) at the output in the counterclockwise position, and the full range of random values at the clockwise position.
	2412	LF01 S&G	
	2413	LF02 S&H	
	2414	LF02 S&G	
Portamento	221	none*	This sets the portamento slew rate to none (default), fast, medium or slow. The setting will be used for the <b>TUNE</b> knobs both in normal and chromatic modes, for the <b>TUNE CV</b> inputs as well as for the sequencer.
	222	fast	
	223	medium	
	224	slow	
Calibrate 1V/octave	211	calibrate	This is used to calibrate the 1V/octave <b>TUNE</b> inputs. See chapter <b>1V/octave calibration</b> below.
	212	store	
	213	5V default	
	214	12V default	
Save state	443	default	Code 444 saves the current config state including all sequencer data. The state will
	444	save	

			be recalled automatically at startup. Code 443 resets to the default state, without saving that state.
Volume control	411	default	Use code 412 to temporarily change the function of the 4 <b>WAV</b> knobs to volume control per voice. Code 411 reverts to the original <b>WAV</b> knob function, with the volume setting being retained.
	412	volume control	
MODP chaining	421	off*	<p>Use this to route the output of one voice through another voice's <b>MODP</b> effect.</p> <p>Code 422 routes voice 3 through voice 4 (oscillator 4 is disabled).</p> <p>Code 423 routes voice 1 through voice 2 and voice 3 through voice 4 (oscillators 2 and 4 are disabled).</p> <p>Code 424 routes voice 2 through voice 3 and then through voice 4 (oscillators 3 and 4 disabled).</p> <p>The <b>DETUNE</b>, <b>SUBOSC</b>, <b>CHORD</b> and <b>DUAL MODP</b> effects obviously won't work unless they're first in the chain.</p>
	422	3→4	
	423	1→2,3→4	
	424	2→3→4	
Sequencer random order	3111	off*	<p>Using codes 311 to 314, the sequencer steps of the respective voice will be played in random order instead of the recorded order.</p> <p>Use code 3111 to revert to normal play behaviour.</p>
	311	voice 1	
	312	voice 2	
	313	voice 3	
	314	voice 4	
Delay color	321	very dark	This changes the cutoff frequency of the low-pass filter in the delay's feedback loop, giving the delay a darker or brighter sound as desired.
	322	dark	
	323*	default	
	324	bright	

## 1V/octave calibration

The 4 **TUNE** input sockets adhere to the 1V/octave CV standard, meaning they are compatible with Eurorack and other gear using this standard. In order for the tuning to be precise, the device may need calibration. There are 2 default settings that can be used, which should be sufficient for most situations. Depending on your (USB or Eurorack) power supply, additional custom calibration may be desirable.

**This is not needed if you're only going to use the TUNE knobs. Calibration affects the TUNE CV inputs only. It also does not alter the scales used in chromatic mode.**

In order to recall the default setting for the desktop version, enter code 213 as outlined under **Advanced settings** above. In order to recall the default setting for the Eurorack version, enter code 214. In both cases, these default calibration settings will be stored and then recalled automatically whenever the device is powered on.

If the tuning is still off, this means your power supply deviates from the standard 5V for desktop or +/-12V for Eurorack, thus affecting the voltage readings slightly. In this case you may want to manually calibrate. Power cycle the device and then enter code 211 to go into calibration mode. In this mode, the **RESO** and **CUTOFF** controls do not control the filter, but the calibration settings. (The actual cutoff will be at maximum and the actual resonance at minimum, so make sure not to have the high-pass or band-pass filters selected.)

Calibration will only have to be done once for a given power supply. You only need to calibrate using any of the 4 voices, as the calibration settings are the same for all of them. Simply pick one voice and turn its **MOD** and **WAV** controls to minimum.

Now plug in a jack into the voice's **TUNE** CV input (with the other end of the cable being connected to a sequencer or keyboard), set the voice to drone by holding the **PG** button for more than a second and then releasing. Use a tuner module or tuner app on your smartphone to inspect the tuning.

The **RESO** control sets the linear correction and the **CUTOFF** control sets the exponential correction. As a good starting point for your own calibration routine, for the desktop unit, set the **RESO** control between the 12 and 1 o'clock position and the **CUTOFF** control to the 9 o'clock position. For the Eurorack module, set the **RESO** control to the 11 o'clock position and the **CUTOFF** control to the 2 o'clock position. Now follow these steps:

- Send a low note from the keyboard or sequencer, corresponding to 0V or slightly above.
- If the note being played is too high, slowly turn down the linear correction. If it is too low, slowly turn up the linear correction.
- Send a note one semitone higher and repeat the previous step, using only linear correction for now. Go back and forth between the notes until both are in tune.
- Send a note about an octave higher.
- If this note plays too low, turn up the exponential correction, if it is too high, do the opposite. Go up a few times in single semitones and repeat.
- Go back to the first step and repeat these steps until you are satisfied with the result, with ever smaller adjustments. If you are unable to achieve a good result, you may have turned linear correction too far from the middle position, or exponential correction too far clockwise. Reset and start over.
- Once everything is looking well for a single octave (also test the notes in between), now go two octaves higher and do small adjustments if necessary.

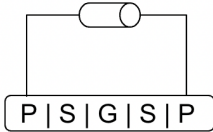
When you're done, enter code 212 in order to store the calibration settings. The device will leave calibration mode and the **RESO** and **CUTOFF** controls will revert to their default functions. The calibration settings will now be recalled automatically whenever the device is powered on.

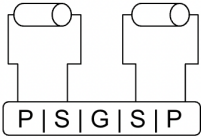
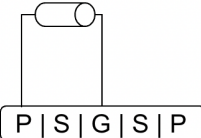
## Modifier ports

The ports at the top right of the unit labeled P|S|G|S|P support the plugging in of preset cards (bundled or available from Neutral Labs), as well as individual passive components like resistors, capacitors or diodes. LEDs and LDRs (light-dependent resistors) can be used as well. Any combination of components and/or cards will change the OUCH circuit behavior in its own unique way. The effect on the sound will be noticeable when using the **BITE** and **CHOKE** controls simultaneously. **You may not hear any change in sound when using none or only one of those controls.**

There are 2 rows of ports which work exactly the same, and they can be used at the same time. E.g. it is possible to connect two cards to both rows of ports simultaneously, or one card and a number of components on the other row of ports. When using cards, their orientation matters: You can plug them in either way and the effect on the sound may be different depending on the orientation.

**Caution:** As shown by the warning icon to the top left of the ports, **do not use normal (unipolar) electrolytic capacitors** unless you know exactly what you're doing! Reverse voltage may make them leak or even explode violently. Large value bipolar ceramic capacitors are easily available and should be used instead. The use of active components like transistors could result in unexpected behavior and might damage the unit, so avoid them as well. Rule of thumb for the novice user: **Plugging in any kind and combination of diodes, resistors and ceramic capacitors is always safe.**

Connection type	Function
<p>Parallel (P)</p> 	<p>Connecting a component between the left and right P ports puts this component in parallel to the circuits's main feedback loop. Doing the same on the other row of ports will put both of these components in parallel.</p> <p><b>Accidentally shorting these ports will not harm your component or the unit.</b></p>

<p>Serial (S)</p>  <p>The diagram shows a horizontal row of five ports labeled P, S, G, S, P from left to right. Two components, represented by rectangles with a circle in the middle, are connected in series. The first component connects the first P port to the first S port. The second component connects the second S port to the second P port. The two S ports are interconnected, forming a continuous path for the series connection.</p>	<p>This is used for putting two components in series, the combination of which will then be in parallel to the feedback circuit. Put the first of the two components from P to S and the other from the other S to the other P. Both of the S ports on either row are interconnected, so a series connection will be made between the components. E.g. put a resistor between P and S on the left side, and an LED between S and P on the right side.</p>
<p>Ground (G)</p>  <p>The diagram shows a horizontal row of five ports labeled P, S, G, S, P from left to right. A single component is connected between the first P port and the first G port. The component is represented by a rectangle with a circle in the middle, with lines connecting it to the P and G ports.</p>	<p>This is for components that should go from the feedback circuit to ground. In this case, components should be placed in such a way that one of their legs connects to either P port and the other connects to a G port.</p> <p>In case two components should go to ground in series, connect the first one between a P and an S port and the second one between the other S port on the same row and a G port. In case two components should go to ground in parallel, connect either of them to one of the P ports and both of their other legs to a G port.</p> <p><b>Accidentally shorting from P or S to ground will not harm your component or the unit.</b></p>

## Troubleshooting

Problem	Possible Solution
The unit doesn't turn on.	<p>For the Eurorack version, make sure the power cable is properly connected and in the correct orientation.</p> <p>For the desktop version, make sure you're using a USB-A-to-USB-C cable. USB-C-to-USB-C cables will not work. A USB-C-to-USB-A adapter is fine. If you're using the original cable, make sure to fully insert it on the USB-A side. It's a reversible connector that may need a little more force than standard ones.</p> <p>Check the internal power connection that goes from the USB-C socket on the back to the XH connector on the board.</p>
There is no sound.	<p>Make sure the audio output jack is in the audio output socket (the top one with the vertical arrow going <i>away</i> from the socket).</p> <p>Make sure the jumper connector on the back is not in the <b>UPDATE</b> position.</p> <p>Turn down the <b>BITE</b> and delay <b>MIX</b> controls and turn up the master volume as well as the <b>CHOKE</b> and <b>CUTOFF</b> controls. If the current <b>MODP</b> effect is DJ, turn up the <b>MOD</b> control(s) as well.</p>
There is static noise or hissing.	<p>If you're using a USB power supply with the desktop version, check if the noise persists while powering the unit from a battery such as a laptop, smartphone (via USB-C-to-USB-A adapter) or USB battery pack. If it doesn't, you're dealing with an extremely noisy power supply. Elmyra 2 goes to great lengths to filter all but the most extreme types of power supply noise, and works well with most supplies, but unfortunately some supplies are just crazy in this regard, which is why you will have to get another.</p>
The <b>MODP</b> LED colors are off.	<p>This can happen with the desktop version if your USB power supply provides less than 5V. The unit will work fine on a lower supply voltage, but the LED colors may look a little different. If that bothers you, you may want to get a different power supply.</p>

<p>The touchpads do not react to touch.</p>	<p>If you have very dry skin, you may have to press on the pads somewhat harder. If this does not work, you may want to check the brass nuts (on the back of the Eurorack module, or accessible after removing the front panel screws for the desktop version). Make sure they make a tight connection against the circuit board. Also make sure the touchpads themselves are tightly screwed in from the top side.</p>
<p>There is a crackling sound.</p>	<p>Make sure that the device is not overdriving your amplifier, mixer or active speakers. The output level is pretty hot for a line-level device, so you may need to turn down the master volume and turn up the volume of the device next in chain. This is less of a concern for Eurorack modules, as the Eurorack standard uses higher voltage signals.</p> <p>Due to the mix saturation, there is always some dirt in the sound in the default setting. You can adjust the saturation amount in order to make softer (or dirtier) sounds, see <b>Advanced Settings</b>. If there is extreme crackling while the <b>BITE</b> control is turned up, this is expected behaviour. ;)</p>
<p>The preset cards have no effect.</p>	<p>Preset cards and components used in the slots on the front panel exhibit an effect in combination with the <b>BITE</b> and <b>CHOKE</b> controls, and the effect they impose on the sound is dependent on the source audio. Play different types of sound and/or set <b>BITE</b> to maximum and <b>CHOKE</b> to middle position and you should hear noticeable changes in sound by swapping preset cards.</p>
<p>The <b>BITE</b> control causes the sound from the external input to break up.</p>	<p>This can happen with an external audio source that is too low in volume. Try boosting the signal with a preamp or similar. Alternatively, you can dial back <b>BITE</b>, turn down <b>CHOKE</b> and slowly turn up <b>BITE</b> again to get a different character that may not break up the sound. You can also try some of the preset cards.</p>
<p>The oscillators are aliasing, the filter packs some dirt and the delay feedback and OUCH circuit utterly destroy the sound!</p>	<p>Yes.</p>