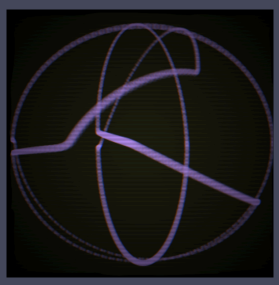
USER MANUAL

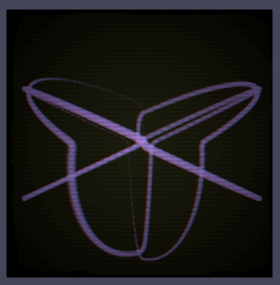
V1.2.6.3

1-INTRODUCTION

1.a What is RSO?

I wanted an instrument that would surprise me. One that responds rather than obeys. One that pushes back, breaks my habits, pulls me somewhere I wouldn't go alone. I wanted the music to come from an exchange—my intentions meeting the instrument's personality. That's what RSO is.



THE PRINCIPLE

A good conversation never happens if you already know exactly what the other person is going to say. But it doesn't happen either if you can't understand a single word. And even a good one can go stale—it needs interruptions, shifts, something to keep it from circling.

An instrument should do the same to you. Destabilize you just enough—that's where new ideas come from. But give you enough familiar ground to play with them. And something to keep the exchange from settling—to steer it, perturb it, keep it moving. Without all three, you're either adrift, running on rails, or going in circles.

THE ARCHITECTURE

This principle shapes RSO's architecture: exotic oscillators in a familiar signal path, animated by a powerful modulation system.

The Exotic. The oscillators are where RSO breaks from tradition. No standard waveforms—instead, sources designed to surprise you, with complex textures and life built in. They're stereo from the start, and that width carries through the entire signal path.

The (Almost) Familiar. From there, the signal flows through territory you know: filters, wavefolders, envelopes, low pass gates. East Coast and West Coast, living side by side. But nothing here is a straight copy. Every module has been tweaked, extended, modernized to make them more expressive.

The Movement. The modulation system is what steers. LFOs, slopes, smooth noise—patchable to any parameter. Your performance can be a modulation source too: MPE, aftertouch, velocity. RSO doesn't just receive notes, it can respond to how you play them.

But honestly? None of this matters if you're not playing. RSO is meant to be explored, not explained. So go. Make some noise. The manual will still be here when you get back.

1.b Quick Start

1. Download the installer for your system:
    - Windows: .exe
    - macOS: .pkg (Apple Silicon only)
2. Run the installer and follow the instructions.
    - The VST3 installation folder should not be changed.
    - Installing the standalone version is not recommended.
3. Open your DAW and rescan your plugins.
4. Load RSO — look for manufacturer: Iperron.
5. Make some noise.
6. (Optional) Activate your license — go to Settings → Activate License and enter your license key (or use offline activation).

1.c Demo Version

The demo is the real thing. Full access, no restrictions on what you can explore. Take your time with it, play, have some fun. See if RSO fits into your creative process, if it speaks to the way you work. Not every instrument clicks with every musician—and if RSO isn't for you, no hard feelings. Keep making great music without us. But if it does click, if it becomes part of how you create, supporting the project seems fair. This took a lot of time to build, and your support is what lets us keep going.

Choosing what to disable in a demo isn't easy—we want it to be fair to you, but also fair to us. We think the real difference between someone experimenting with an instrument and someone actually working with it comes down to one thing: saving and restoring. Continuing to build on something. So that's where we drew the line.

Two things are disabled:

1. **Preset Saving:** You can't save presets in the demo. Fair enough.
2. **DAW State Recall:** This one needs explaining.

When you load a project (or recall a saved state), your DAW asks RSO to restore its previous settings. In demo mode, RSO ignores this request and stays at its default/init state.

But here's the thing: your DAW still saves RSO's state normally. We don't block that. So if you've created something you love—a sound, a patch, a whole project—save it. That data is stored in your project file, waiting for you. Once you activate RSO with a license, it will properly restore any state saved during the demo period.

Think of it as us holding onto your work until you're ready.

One thing to be careful about:

Because of how DAW saving works, if you load a project in demo mode (and RSO ignores the restore), then save that project again, your DAW will overwrite the previously stored RSO state with the current init state. Your original settings will be gone—and no license can bring back data that's no longer there.

So: save your project once when you've made something worth keeping, and avoid re-saving after loading in demo mode. We can't undo an overwrite, but we can hold onto everything you don't overwrite.

One last tip:

If you accidentally re-saved a project and lost your RSO state, don't panic just yet. Most DAWs automatically create backup copies of your projects as you work. Check your DAW's documentation for where these backups are stored—you might be able to recover an earlier version with your original RSO data intact. It's worth a look before giving up hope.

2-INSTRUMENT OVERVIEW

2.a GUI Layout

1. **Menu Bar:** Here you can find the presets manager (with basic controls : delete, prev, next and save, clicking on the preset name will open the presets explorer), plus buttons to switch modulation overlay mode, enable MPE and to open the settings menu.

2. **Audio Row:** It contains all modules of the audio path, plus the voice manager. Audio modules are oscillators, filters, VCA/Envelope and the output. The audio flow is from left to right (yup.. very original).

3. **Modulation Selector Row:** Lets you access all modulation outputs and the button to expand/collapse the interface. The collapsed interface does not show the modulation row (aka last row).

4. **Modulation Row:** Here are all the modulation modules (Inputs, 2X Morphing LFO, PIM2 and Dual Slope).

2.b Audio Path

RSO audio path can be viewed mostly as a classic East Coast flow : Osc to Filter to VCA to Ears (except when using the West Coast Channel as a filter, replacing the filter stage by a Wavefolder to Lowpass gate).

While this audio path may seem kinda boring, it is just a framework. Its original modules and a powerful modulation system allow RSO to be a surprisingly versatile and inspiring instrument.

Crucial detail: the audio path is fully stereo. Oscillators are designed to be stereo right from the

start and consequently all subsequent modules are doubled internally (true stereo signal path, meaning twice the filters, twice the VCAs, etc... twice the fun?).

Some modules do offer specific stereo controls (XPander Filter Freq and Res Stereo Offset, West Coast Wavefolder's Mirror parameter, etc.) but most of the time parameters are fully shared between channels and the stereo nature of the signal path is hidden from the user.

(Sorry, but we had to set limits. If we exposed everything, the interface would have hundreds of knobs and look like an airplane cockpit, which is far less intuitive).

That said, we are still looking for ways to expose more of these stereo controls, but the priority remains the workflow. We want to give you power, but not if it means ruining the creative flow. (Complexity is easy, keeping it usable is the hard part).

2.b Interface Interactions

The interface of RSO is designed with a "fractal" philosophy (i.e. the same logic applies everywhere). You can interact with the instrument at three different scales : the whole Synthesizer, a specific Module, or an individual Control.

SYNTHESIZER SCALE

Right clicking the menu bar will give you access to some global commands (actions affecting the whole synth).

- **Randomize All**: Randomizes every knob, pad, dropdown and button of the interface, except the locked ones (and except the main output level because it seems kinda dangerous to do that if you wanna keep your ears almost tinnitus free).
- **Lock All**: Locks all controls of the interface (so same as randomize : knobs, pads, dropdowns and buttons). A locked control isn't really locked : you can still modify it manually, it can still be automated by your DAW or modulated by the modulation system. It will just be ignored when a new preset is loaded or by the randomize function.
- **Unlock All**: As expected it unlocks all currently locked controls. Groundbreaking stuff.

MODULE SCALE

As explained in the previous section, all modules (except the Voices Manager) have Lock/Unlock and Randomize All commands accessible by right clicking the module's name.

This is particularly useful if you want to freeze a specific part of your sound (like locking the Oscillator module) while randomizing the rest of the synthesizer to find new textures.

Note: Some modules have specific options or commands available in addition to the standard ones. For example, Oscillators have a Switch Osc submenu, Filters have a Switch Filter one, and the Dual Slope has commands to trigger its envelopes manually. These specific items will be detailed later in their respective sections.

CONTROL SCALE

Finally, you can interact directly with the Knobs, Pads, Dropdowns and Buttons.

Knobs:

- **Mouse Shortcuts:** Double clicking a knob resets it to its default value. Double clicking the Modulation Ring (the colored outer ring) will reset and remove all its modulation connections (since default = no connection).
- **Precision Dragging:** Sometimes you need surgical precision. Holding Ctrl while dragging a knob will make the movement 10x slower. Holding Alt makes it 100x slower, and Ctrl + Alt makes it 1000x slower (micro-surgery mode).
- **Context Menu:** Right clicking a knob gives you access to :
  - **Lock & Randomize:** Standard behavior (see Synthesizer Scale).
  - **Modulations:** You can remove a specific modulation source or clear them all at once.
  - **Safety Note:** RSO is smart about the Output Level. If you randomize the whole synth, the level is ignored. However, if you right click the Output Level knob specifically and hit Randomize, it will do it, but it restricts the range between Min and 0dB (ignoring the +dB zone). So it generates a random level, but safe for your ears.

Pads:

Internally, a pad is essentially two knobs wrapped in a custom interface. Because of this dual nature, the context menu offers much more granularity than a standard knob.

- **Per Axis Control:** Just like you can Lock/Unlock the entire pad or just the X or Y axis independently, you can also Randomize the X or Y axis independently.
- **Modulation Management:** The same logic applies to modulations. You can remove modulation connections for the whole pad, or target specific connections on the X or Y axis.
- **Knobs Panel:** If you right click a pad and select Knobs Panel, a small panel will pop up above the pad displaying the two internal knobs (X and Y). This allows you to have finer control over the parameters or to visualize them as standard controls.

A Pad displaying its Knobs Panel, In Modulation Edit Mode

Dropdowns & Buttons:

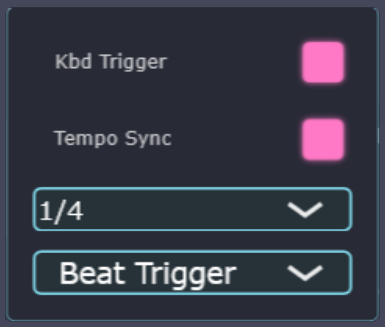
Next we have the Dropdowns and Buttons. They share a common, simple context menu offering the standard Lock/Unlock toggle and Randomize command.

Screens:

Finally, not really controls but I don't know where to put that... The 発振器さん and VPS oscillator screens default to screensaver mode. Click on them to cycle through the other modes.

2.c Sync Modes

Scattered across various modules of RSO (currently LFOs and Slopes, but who knows what the future holds?), you will encounter the Sync Button SYNC.



Clicking it opens the Sync Widget which offers multiple sync options. Since this behavior is shared across the instrument, let's explain the rules of time once and for all.

This widget controls how a module relates to the host tempo or incoming note events.

You shouldn't view it strictly as a trigger generator (that would be too simple), but rather as a manager deciding When a module starts and How Fast it runs.

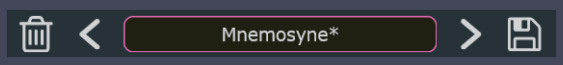
MODES

- **Kbd Trigger** (**Keyboard Trigger**)**:** The simplest one. Each incoming note will generate a trigger.
- **Tempo Sync:** Connects the module to the Host BPM. This opens up two sub-settings:
  - **Time Signature:** Defines the musical interval. We have the classic divisions (from 16 bars down to 1/64), triplets, quintuplets... and even Primes (for the nerds who want polyrhythmic madness).
  - **Beat Mode:** This is the crucial switch. It defines how the module uses that Time Signature.
    1. **Beat Trigger:** The module runs at its own speed, but it gets re-triggered every time the selected Time Signature interval passes.
    2. **Lock:** The module ignores its Hz setting and adapts its internal timing to match the exact duration of the Time Signature.

Both Keyboard Trigger and Tempo Sync can be enabled at the same time.

2.d Presets Manager

You can’t miss it, it’s right in the center of the menu bar. It features simple controls to Delete a preset, load the Next or Previous one, and Save your current patch. The central display shows the Preset name and an indicator if it has been modified (the classic "dirty" state)..



RSO's Presets Manager

Some points to consider:

- **Delete:** The delete button is only enabled for user presets. (You can't delete Factory presets, and why would you want to?)
- **Navigation:** The Next and Previous buttons use the preset list from the Presets Explorer—they respect both the current sorting order (by default alphabetical) and any active filters. So if you've filtered to show only "Bass" presets, Next/Previous will cycle through only those.

- **Save:** Saving a preset will open a native file chooser window, but be aware: RSO is only interested in the filename. It uses the OS window just to take advantage of its filename safety checks, but it will ruthlessly ignore the folder you chose and save it in RSO's designated preset folder. (It's not a bug, it's specific file management hygiene).

  - **Soft Save** (**Right Click on Save**): Right Clicking the Save icon will expose another handy

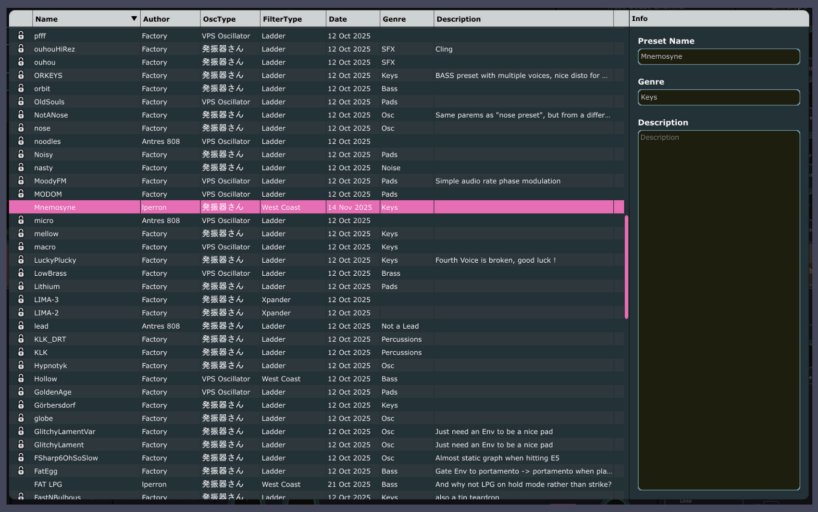
The preset explorer with its preset filter panel opened

option : Soft Save. It will save all exposed parameters of the synth to a new preset, but without touching or updating the oscillators' internal states (it essentially keeps the internal state defined in the currently loaded preset). One typical use case is when you are designing sounds using an unstable 発振器さん. Take the factory preset "Dragged" for example: its character relies on a specific, drifting state at the very start. By the time you are done tweaking the filter or the envelope (say, 2 minutes later), that internal state has drifted far away. If you save normally, you save the drifted state. Soft Save allows you to save your parameter edits while keeping the original "magic" (the initial chaos state) of the original preset intact.

PRESETS EXPLORER

Clicking the central display of the Presets Manager will open the Presets Explorer. Here you can see all your presets and various data about them:

- Factory Lock: (i.e. Read Only).
- Name, Author, Date, Genre.
- Osc Type & Filter Type
- Description.



The preset explorer, the current preset is highlighted

A Factory Locked Preset can't be deleted and you can't edit its data.

For User presets, you can edit the Name, Genre and Description in the right panel of the explorer. These data are auto-saved when modified.

Finally, you can sort the presets table according to every column (except Description, because sorting by a novel makes no sense).

PRESET FILTERS

Click the Filter button in the first column header to open the Filter Panel. This lets you quickly narrow down the preset list by:

- **Bank**: Preset folder (Factory, User, custom banks, etc.)
- **Oscillator Type**: 発振器さん, VPS
- **Filter Type**: Ladder, Xpander, WestCoast
- **Author**: Preset creator
- **Genre**: Bass, Lead, Pad, and so on

Each category shows colored capsule chips. Click chips to toggle them on/off—filled capsules are active, outlined ones are hidden. Select multiple chips across categories to combine filters (e.g., "Bass" + "Ladder" + "Factory").

For more informations about presets (tags, chips colors, and other metadata) please refer to Appendix 4 Preset Administration.

2.e Settings Menu

Clicking the Gear icon menu  (top right) opens the Settings panel. This is where you tweak the engine to fit your machine (and your tastes).

Important: Some settings (like everything in the Performance category) will need a restart of the plugin before being applied. Don't panic if nothing changes immediately.

UI QUALITY SETTINGS

- **Chaos Graph Quality:** Determines the refresh rate of the Oscillators graphs, the number of points stored/drawn, etc. 5 different quality presets are available. There is also a Manual mode that lets you set these parameters yourself (but please note: if you mess with the manual mode I do not guarantee that everything will work correctly. You are on your own).
- **Sparks and Glitter:** Enables the Glow Effect for knobs and buttons. Currently only available on Windows. (I hope to bring it to macOS soon, but currently we are not able to use Hardware Acceleration for glow on macOS so it kills the frame rate).
- **OpenGL Rendering:** Enables OpenGL rendering for Oscillators and PIM2 screens. If disabled, their rendering is simplified (no shaders... so no cool CRT effect). This setting is available because some hosts/DAWs handle OpenGL poorly, but if your system supports it, it is highly recommended to keep it enabled. It just looks better (and we work hard on it).

PERFORMANCE

- **Aggressive Oscillator Bypass:** Enables an optimization that fully skips oscillator processing if their voice is inactive (i.e., if the VCA of that voice is closed). The Trade-off: This optimization is clearly not negligible, it helps the CPU load a lot. However, it also messes with the oscillator phases (since we stop calculating them, they pause instead of running in the background). It is "mathematically not rigorous," but musically usually fine. Your choice: CPU cycles or Phase Purity?
- **Modulation Sample Rate:** The speed at which the Modulation System works. It is independent of the audio sample rate and oversampling. (Lower = less CPU, Higher = tighter modulations, but to be honest 512Hz is usually fine).
- **General Oversampling:** Sets the Oversampling factor. A value of at least 2x is recommended to keep aliases at bay, and the higher the better. Please note that RSO will not oversample above 192kHz, already plenty of sample rate headroom!

USER SETTINGS

- **Username:** Lets you set the username that will be used as the "Author" value when saving a preset. Sign your masterpieces.
- **God Mode:** If enable you will be able to edit data of factory locked presets (like genre, description, etc.).
- **Show Demo Banks:** Controls visibility of tutorial and demonstration preset banks in the browser. Demo banks contain educational presets designed to showcase RSO features. Disable this to declutter your workflow once you're familiar with the synth.

APPEARANCE

- **Theme:** Lets you choose the visual theme of RSO. It ships with a selection of factory themes but you can also create your own. (Our theming engine is explained in detail in the Appendix).

- **Screen Scale**: Lets you set a scale multiplier applied to the UI.

RSO wearing different Themes

MIDI SETTINGS

- **Classic MIDI Pitchbend:** The range of the pitchbend when MPE is disabled. The default industry standard is +–2 semitones.

- **MPE Pitchbend Range:** The range of the pitchbend when MPE is enabled. The default is +– 24 semitones, but you may want to adjust it according to your controller... and your talent!

- **MPE Slide Mode:** Determines how RSO interprets vertical finger movement (CC74) from your MPE controller. Three modes available:

  - Absolute: Direct position mapping (0-1). Your finger position = slide value. Simple and predictable.

  - Relative Bipolar: Strike point becomes center (0), then slide maps to ±1 range. Great for symmetrical vibrato/modulation from any key position.

  - Relative Unipolar: Strike point becomes zero, distance from strike point maps to 0-1. Useful when you want "amount of movement" regardless of direction.

Important: For Relative modes to work properly, your MPE controller must be set to Absolute slide mode in its own settings.

- **Dynamic Full Range (DFR):** The secret sauce for expressive playing with relative modes. When enabled, RSO automatically scales your available keybed space to give you full modulation range, no matter where you strike. (Only affects Relative modes)

  - Without DFR: Strike at the bottom? You get less upward range. Strike at the top? Less downward range. Honest, but limiting.

  - With DFR: Strike anywhere, get full ±1 (bipolar) or 0-1 (unipolar) range by intelligently scaling the available space. Strike at 25% height? We'll map that 25% below to -1 and the 75% above to +1. Every key becomes a full-range modulation controller.

3-VOICES & OSCILLATORS

RSO has 8 voices (hence it can play up to eight now at the same time). These voices are managed by the well named Voices Manager module.

RSO currently offers 2 Oscillator models.

Since the defining concept of this instrument is essentially "Weird oscillators in a fairly classic audio path (plus modulation system)", please don't expect to find here the Nth implementation of a generic Virtual Analog Oscillator. We have enough of those in the world already. Ready for some weird stuff?

You can switch between them by right clicking the name of the current Oscillator. In the context menu, just look for the Switch Osc sub-menu where all available models are listed.

3.a Voices Manager

We start our tour with this small utility module (located at the far left of the Audio Row).

It lets you enable or disable specific voices according to your needs, activate the voice randomizer, and generally monitor who is doing what.

PARAMETERS

- **Voice Toggles**: Allows you to enable a given voice, it also acts as a status indicator displaying if a voice is disabled, available or currently playing a note (aka active) (Technically, the "Playing" state just detects if the VCA of that voice is not fully closed. .. close enough).

- **Random Toggle:** This toggle enables the Random Voice mode. It means that if multiple voices are available to play an incoming note (i.e. enabled but not active), RSO will pick one of them randomly rather than always picking the first available one It may seems kinda useless but it is not, please read the note below ↧↧↧

NOTE ON VOICE STATE

When we use the 発振器さん module (see next section), each voice has a slightly different internal state. Since the oscillation logic is chaotic, subtle variations in this initial state can lead to radically different sounds.

Voice 1 might sound sharp while Voice 2 sounds broken, even with identical settings.

- The **Random Toggle** forces the synth to cycle through these different "personalities" unpredictably. (Check the "LuckyPlucky" if you need an example).

- The **Voice Toggles** allow you to "mute" a specific voice if it decides to behave too differently (or just brokenly) compared to the others. That's why this specific UI was chosen.

3.b 発振器さん

ヨークシャー・テリア は、小型の愛玩犬の一品種名。しばしばヨーキーと呼ばれる。

歴史 : 19世紀中ごろ、イギリスのヨークシャー地方で作出された。現代では愛玩犬として知られるが、元々は工業地帯の労働者の間で、家屋を荒らすネズミを捕まえるための間接狩猟犬として飼われていた。1862年に「ブロークン・ヘアード・スコッチ・オア・ヨークシャー・テリア」と命名されたが、長すぎたことからヨークシャー・テリアと呼ばれるようになった。1886年にイギリスのケネルクラブで公認され、比較的その歴史が短いという意味で新しい犬種である。1800年代後半にアメリカ初上陸する。かつてはオーストラリアン・テリアやオーストラリアン・シルキー・テリアと混同され、1932年にこれら3犬種の交配が禁止されるまで統一されたスタンダード種は確立されなかった。

概要 : ジャパンケネルクラブ (JKC) が公認する犬種の中ではチワワに次ぐ小型な犬種であり、成長しても2 - 3キログラム程度にしかならない個体が多い。ただし、作出にあたりマンチェスター・テリア、スカイ・テリア、絶滅種であるクライズデール・テリア（ペイズリーテリア）、マルチーズなど様々な犬種を交配改良したことや、犬種の歴史が浅く血統が不安定といった種々の要因で、しばしば7キログラム程度の大きな個体もみられる。FCIで2kg未満と3.1kg以上は認可されない。平均身長28センチメートル (cm)。尾は長いものの、多くは生後間もなく3cm程度に断尾されるため、尾の長い個体はあまり見掛けない。

性格面ではテリア種らしい勇敢さや気の強さ、独立心、賢さがあると評価される。その一方で寂しがりな面もあり、飼い主には甘える傾向も強いとされる。

幼い頃の体毛はブラック・タンだが、成長するにつれスチールブルーやゴールド、シルバーなど毛色が7回ほど変化すること、その美しい絹のような毛質から「動く(歩く)宝石」とも称される。毛質が一様なシングルコートで抜け毛は少ない。被毛が地面まで届く長さで整えるフルコートがスタンダードとされ、被毛の擦り切れを防止するために毛先を紙で包んでまとめるラッピングも多用される。ショーへの出場などを意識しない家庭犬では、手入れの容易さや汚れの付きにくさもあって、短く刈り込んだサマーカットで通年過ごさせる場合も多い。

耳は立っているものが多いが、垂れたものも居る。

JKCによる日本国内の登録件数調査では、1位になったことはないものの1970年代から3 - 6位程度を維持する、流行の影響が少ない人気犬種である。

3.c VPS Oscillator

A Vector Phaseshaping oscillator with some twists. based on the work of Jari Kleimola, Victor Lawwarini, Joseph Timoney and Vesa Välimäki (smart people).

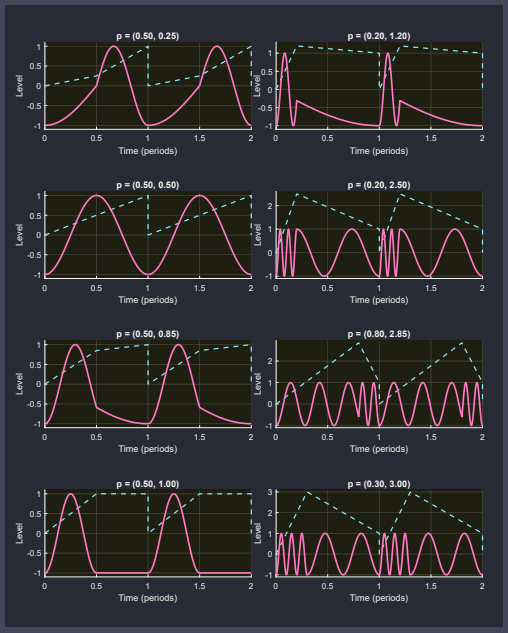
BUT WHAT IS VPS?

Think of VPS as Phase Distortion on steroids.

If you've ever used a Casio CZ synthesizer, you know Phase Distortion. It takes a carrier Sine wave and modify its phase angle with a second modulator wave to change its harmonic content or even emulate resonant filter sweeps.

Classic Phase Distortion typically relies on fixed, preset modulator curves. Vector Phaseshaping allows you to insert a variable "Knee"—a dynamic breakpoint—directly into the oscillator's internal clock. You manipulate this knee in 2D space!

The resulting waveforms can be complex, as shown on the graph, going from pure sine to some weird "formant-like" shapes. Please note that some second order discontinuities can appear and thus generating aliasing.



Oscillator's Waveform (pink) and Phase (blue) for different Vector (U, V)

An antialiasing mode is implemented and toggleable, but you can turn it off and keep the aliasing if you want. (I must confess, sometimes I like it! A bit of digital grit never hurt anyone).

TWISTIER PLEASE!

So we described the base concept of the VPS, now let's have some fun with it. Our VPS Oscillator is in fact not one but seven VPS oscillators that can be detuned (Supersaw-like) or used as sub oscillators and panned on the stereo field.

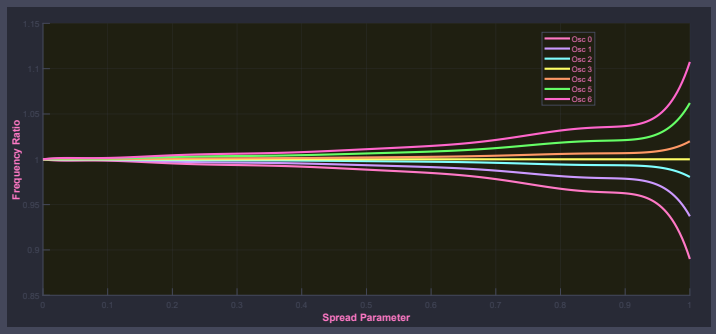
On top of that, the U and V parameters (the coordinates of the vector) are modulated by a dedicated Lissajous modulator which can go full audio-rate for some crazy Vector Phase Modulation!

The VPS Oscillator and its Lissajou Modulator

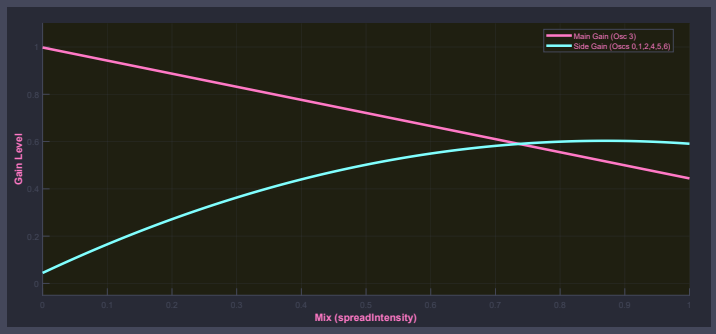
We have plenty of parameters to shape the sound of this oscillator. Let's look at the main controls:

MAIN OSCILLATOR PARAMETERS

- **Retrig Mode:** Controls the re-trigger behavior of the oscillator when a new note is played:
  - **None:** The phase is kept as it is.
  - **Reset:** The Phase is reset to 0.
  - **Rand:** The phase is Randomized. To be exact, the phases of the seven internal oscillators are randomized individually.
- **Sub Mode**: Switch between multiple sub-oscillator configurations, allowing two oscillators for each "side" to be scaled down by one or two octaves. (By side, I mean Left and Right channels, but they are only effectively on the sides if the Size parameter is not 0, otherwise they are just... in the middle)
- **Spread:** How much the oscillators are detuned (Supersaw territory, please see graph below).
- **Mix:** How much we hear the auxiliary/detuned oscillators vs the main one (see graph below).
- **Size:** How much we separate the oscillators on Left and Right channels
- **U** (**Horizontal**): Shifts the symmetry of the waveform. Moving this creates Pulse Width Modulation (PWM) style effects and "skewed" Sawtooth textures.
- **V** (**Vertical**)**:** Acts a bit like the cutoff frequency of a filter. High values of v (> 1.5) will allow the Oscillator to produce complex formant-like sounds.
- **Modulations** (**Mod U and Mod V**)**:** Controls the amount of modulation from the Lissajous Modulator applied to U and V parameters.
- **Tuning:** The frequency of the oscillator.
- **AA:** Enable or disable the Anti-Aliasing mode. (As I said before, I sometimes prefer it Off, we lose a lot of high harmonics when enabled).



VPS Spread Parameter vs Oscillator Frequency Detuning



VPS Mix Parameter vs Oscillator Gain

LISSAJOUS MODULATOR PARAMETERS

- **φ** (**Phi**)**:** The frequency of the first Modulator Oscillator. (This parameter depends on the LFO toggle status: switch from milliHertz in LFO mode to Hz in audio-rate mode).

- **ρ** (**Rho**)**:** The frequency of the second Modulator Oscillator, defined as a ratio of the frequency of the first one. (Ratios are kinda the Lissajous thing).

- **δ** (**Delta**)**:** The Phase Offset of the second Oscillator.

- **LFO** mode: If enabled, the Lissajous Modulator will work in Low Frequency mode (slow evolving textures). If disabled... be prepared for some fun stuff.

- **Tracking:** Does the modulator frequency track incoming notes? Especially important for stable audio rate modulations (~FM).

- **Retrig:** If enabled, the Modulator Oscillators are reset for each new note, starting their cycles with a phase of 0 and δ.

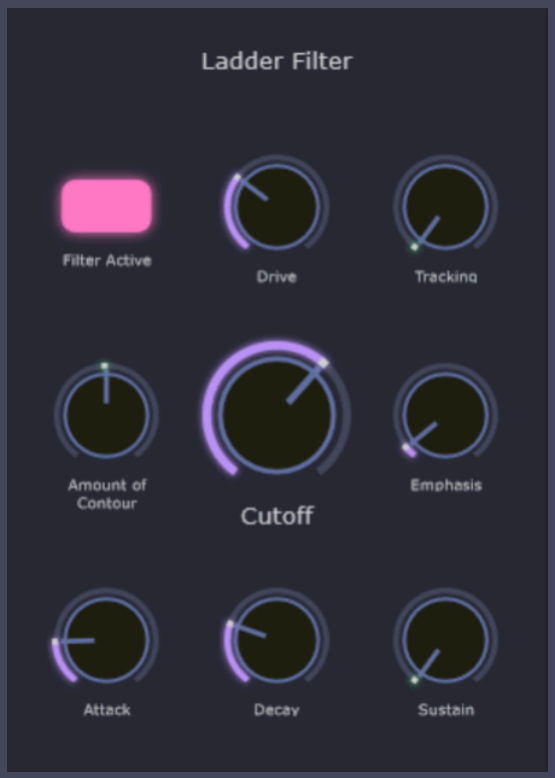
4-FILTERS

RSO currently offers 3 different filters (and... maybe more are coming? One day?).

Here we are playing it a bit more "classic" compared to our oscillators, although some of our models definitely stray far from the comfortable East-Coast subtractive world. So you'll find the expected Virtual Analog emulations, but also some "other things"... (It stays coherent with the philosophy of the instrument: weird sources, solid shapers).

You can switch between them by right clicking the name of the current filter. In the context menu, just look for the Switch Filter sub-menu where all available models are listed.

4.a Ladder Filter



A Virtual Analog implementation the classic Transistor Ladder. Do I really need to introduce this one?

It's the legendary 4-pole (24dB/oct) lowpass design that defined the sound of subtractive synthesis. Creamy, fat, and self-oscillating.

The core implementation is based on the work of Antti Huovilainen, although we have some key differences (we added a little more non-linearities here, for flavor (and, honnestly, for stability)).

Just like the original hardware, we offer a built-in Contour Envelope controlling the cutoff frequency.

PARAMETERS

- **Filter Active:** It is the only filter with this toggle. It allows us to completely bypass the filter stage of the synthesizer. (If you don't need a filter, turn it off. It can be nice to your CPU).
- **Drive:** Louder. (And grittier. Pushes the signal into the filter's non-linearities).
- **Tracking:** How much the cutoff frequency follows the incoming notes.
- **Amount of Contour:** Amount of the Contour envelope applied to the Cutoff. Can be positive or negative. (Be careful, the range of this knob is huge).
- **Cutoff:** The cutoff frequency of the filter. Yup.
- **Emphasis:** AKA Resonance. High Emphasis can make the filter go into full self-oscillation. (Note: As with the original circuit, cranking the Emphasis will reduce the low end. Physics is a harsh mistress).

- **Attack:** Attack time of the Contour Envelope.
- **Decay:** Decay time of the Contour Envelope. Crucial detail: Since this follows the classic Model D behavior, this knob controls both the Decay time AND the Release time.
- **Sustain:** I think you already know...

4.b XPander Filter

This filter is inspired by the legendary Oberheim Xpander. It offers the same 15 modes found in the original hardware. (Is 15 modes too many? Nah, never).

While the Ladder filter is thick and aggressive, the XPander is sophisticated, precise, and versatile.

One major twist added to this filter is its Stereo Implementation. As we mentioned before, RSO is fully stereo internally (meaning in reality there are 16 filters running—two per voice—burning your CPU for a good cause), but usually, we hide this complexity.

Here, we decided to expose it. You get specific stereo controls over Cutoff and Resonance, allowing you to create wide, immersive stereo images directly at the filter stage.

PARAMETERS

- **Drive:** LOUDER! (Pushes the input level into the filter).
- **Filter Mode:** Selects one of the 15 built-in modes.(Honnestly too many to be listed here, go click on the dropdown if you want to know).
- **Tracking:** How much the cutoff frequency follows the incoming notes.
- **Cutoff:** The center frequency of the filter.
- **Stereo Freq Offsets:** Here is the stereo magic. You have specific controls to offset the cutoff frequency for the Left and Right channels independently (relative to the main Cutoff).
- **Resonance:** The emphasis of the filter.
- **Stereo Res Offsets:** Same logic as above. You can offset the resonance amount for the Left or Right channels.

NOTE ON POLE MIXING

The original hardware was famous for offering 15 different filter modes. How did they achieve that without packing 15 different discrete circuits into the box? The answer is Pole Mixing.

The core is just a standard 4-pole Low Pass filter. However, instead of just listening to the final output, we tap the signal after each of the 4 poles (stages).

By mixing these 4 signals together with specific gains and polarities (inverting some, boosting others), we can use phase cancellation to sculpt the response.

Sum them one way? You get a High Pass. Another way? A Notch. A weird Phase Shift? Done.

This technique creates a sound that is generally cleaner, "fizzier," and more precise than the Ladder.

For the Hackers (Custom Filters):

In our case, the 15 filters are implemented using this exact pole mixing topology. But, because we are so nice and thoughtful, it is possible to expand the list of filters with your own custom pole mixing coefficients!

Just check the RSO/FilterBanks/_example_custom_filters.json file. (This file is created at first launch if the folder doesn't exist).

Have fun!

4.c West Coast Channel

Calling this module a "filter" is a bit of a stretch (technically it occupies the filter slot, so...).

It is actually a Wavefolder followed by a Low Pass Gate (LPG). This signal flow (Oscillator → Wavefolder → LPG) is the bread and butter of West Coast synthesis.

THE WAVEFOLDER: A Wavefolder takes a waveform (usually a simple one like a sine or triangle) and folds it back onto itself when it exceeds a certain threshold. This adds harmonics and creates rich, metallic, and aggressive timbres. (It's kinda the opposite of a filter).

We have implemented A Virtual Analog emulation of the legendary Buchla 259 wavefolder circuit (with some enhancements indeed).

THE LOW PASS GATE: This is a special circuit that acts as both a VCA and a Filter simultaneously. As the volume drops, the sound also gets duller (like a real drum or a plucked string).

Our implementation emulates the behavior of Vactrols (old-school components using an LED and a light sensor). Vactrols are "slow" components, they have a natural lag when opening and closing. This sluggishness gives the LPG its famous organic, woody, and percussive response. It excels at making "plucky" sounds that feel natural rather than digital.

WAVEFOLDER PARAMETERS

- **Tone Control:** The original 259 wavefolder has a fixed 1-pole low pass at its output. This tames the sound a lot (especially for high Fold values where things get harsh). We offer a Classic mode (faithful to the original, slightly muffled) and a Bright mode (where this lowpass is way more open, let the high end shine!).
- **Fold:** The Gain. The more signal we feed into the wavefolder, the more "folds" we get. This control allows us to amplify the signal to extreme values before entering the folding stage.
- **Symmetry:** Offsets the signal to get asymmetric wavefolding.
- **Mirror:** This toggle inverts the Symmetry parameter for the Right channel only. A simple trick to instantly enhance the stereo width of your patch.

LPG PARAMETERS

- **LPG Mode:** choose between VCA (amplitude only), Filter (brightness only), or Combo (the classic LPG behavior, affecting both).
- **Pole(s):** The filter part can be 1 Pole (6dB/oct) or 2 Poles (12dB/oct). A classic Buchla LPG is strictly 1-pole, but using the 2-pole mode produces darker, smoother sounds.

- **Strike Mode:** Defines how the LPG is triggered.
  - **None:** The LPG won't be auto-opened.
  - **Hold:** The LPG opens when a note is pressed and stays open until released.
  - **Strike:** The West Coast magic. The LPG is "pinged" (hit by a short trigger) when a note is pressed. It opens instantly and then immediately closes based on the natural decay of the virtual vactrol. This creates those incredibly natural, percussive plucks without needing an external envelope.
- **Control:** How much the LPG is opened.
- **Vactrol:** Allows us to switch the Vactrol model. Different vactrols have different physics (Leak frequency, Max frequency, Attack and Release times). Some are snappy, some are lazy, some are dark, etc.
- **Span:** Sets the maximum opening range of the filter. (Influences the dynamic range of the Strike and Hold modes but also the range of the Control Parameter).

5-Other Audio Modules

5.a ADSR Envelope

(Named "Envelope" because of user feedback... users... I wanted to call it "Main VCA" since that's what it is, but apparently that was confusing. So, "Envelope" it is).

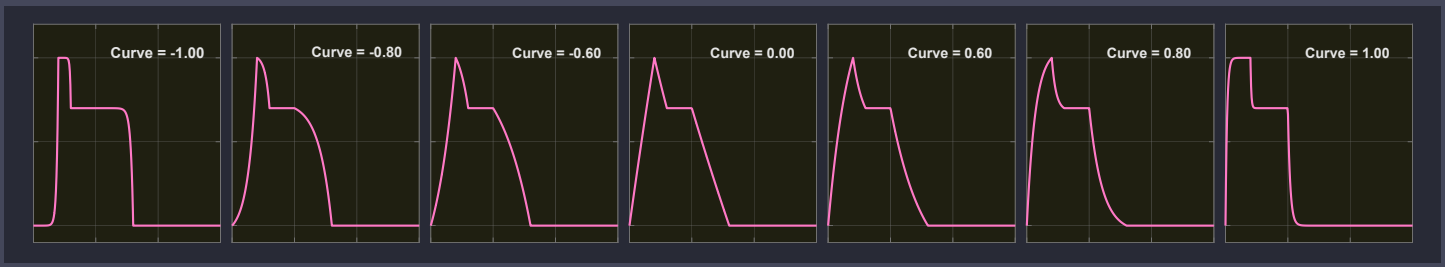
To be honest, you should still consider this module as a VCA (Voltage Controlled Amplifier) with an envelope generator permanently plugged into it.

It offers a flexible ADSR envelope with a continuous-time-constant curve control (morphing from Logarithmic to Linear to Exponential) which responds to incoming notes.

It also allows you to bias the VCA (apply an offset so it stays open) and use the velocity of the note to scale the output.

PARAMETERS

- **Env Amount:** The amount of the envelope's output added to the VCA Level. (should be non 0 if you want the ADSR to actually do something).
- **VCA Offset:** (Or VCA Bias). This sets the "floor" level of the VCA. If you turn this up, the sound never stops. Great for drones or if you just want to bypass the envelope entirely.
- **Vel Amount:** How much the velocity of the incoming note scales the output. At 0, velocity is ignored (organ style). At 1, a soft key press is quiet and a hard press is loud.
- **Env Curve:** The Envelope's Curve can be morphed continuously from Logarithmic to Linear to Exponential, see figure below ↧↧↧



Envelope Generated for different Curve value

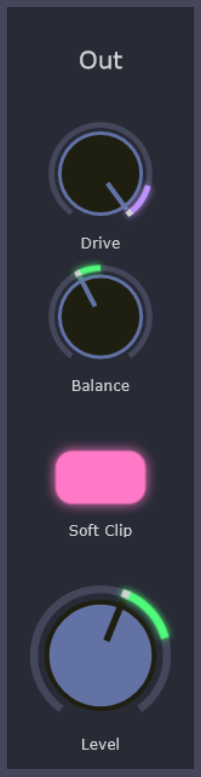
- **Attack:** Attack Time, in seconds.
- **Decay:** Decay Time, in seconds.
- **Sustain:** Sustain Level. (Currently in dB. I know, it makes the useful range kinda small and fiddly near the bottom... I might change this in a future update. Maybe. If I feel like it).
- **Release:** Release Time, in seconds.

TECHNICAL NOTES

- To keep the timing constant and avoid nasty audio clicks/discontinuities, the curve parameter is only updated at the end of the current phase. (So if you twist the knob during the Attack phase, the new curve shape will only apply once the Attack is finished or when the envelope is retriggered. It's not a bug but a real world limitation).
- If the VCA is even a little biased (VCA Offset not equal 0) some optimizations will be effectively disabled : RSO won't be able to determine if an active voice can be skipped to save some CPU cycles. (When the output Level of the VCA is 0 it is easy to say "hey it is not even necessary to run the filter (and even the VCO if the Aggressive_Oscillators_Bypass is enabled)!").

5.b Out

The Last Module in the audio path of RSO is this small utility. It offers various parameters to finalise the signal before it leaves the plugin.



PARAMETERS

- **Drive:** Controls the amount of drive applied before the clipper stage, in dB. If you want to push the clipper hard to get that fuzzy warmth, crank this knob (but please always be respectful of your ears).
- **Balance:** Since the whole audio path is Stereo (see section 2.b), we do not have a classic Pan parameter (which usually places a mono signal in the stereo field). Instead we use a Balance control, which simply attenuates the left or right channel to shift the stereo image. (Simple, effective, keeps the stereo width intact).
- **Clipping:** If enabled, applies soft clipping to the output signal. This can be used creatively (to add some warmth, distortion, or just squash the peaks like a limiter) or defensively (to avoid nasty digital hard clipping at the DAC level).
- **Level:** The final output level. Unlike the other parameters of RSO, Level is a general parameter — it is non modulatable, as it is shared by all voices (hence its special color scheme). This is the last knob in the signal chain, controlling the overall volume after the clipping stage.

6-MODULATION SYSTEM

6.a Modulation Workflow

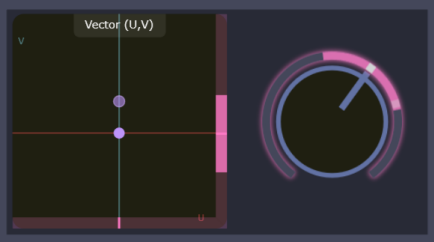
RSO comes with a powerful and flexible modulation system to animate your sounds. From subtle variations to total chaos, while also serving as an expressive performance tool, it covers the whole spectrum.

(Almost) Every parameter controlled by a knob or a pad in the interface can be a target for the modulation system (even modulators can be modulated and self modulation is possible, go wild!). A Parameter can be modulated by multiple modulation sources and these connections are bipolar (so a connection can be negative).

RSO comes packed with 5 modulators (4 unique types plus a second Morphing LFO because 2 is more than 1) offering a grand total of 19 modulation signals. All these outputs can be visualized and selected on the Modulation Selector Row.

More than just buttons, the selector row also lets you visualize the outputs of modulators with their mini-osilloscopes

HOW TO USE IT?

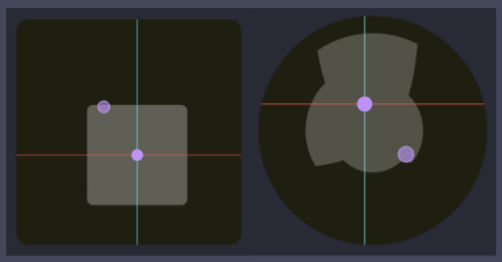


A Pad and a Knob in Modulation Edit Mode, displaying their modulation ring and bar, the effect of the currenly selected modulator on this param (solid pink)

To add a modulation connection simply select a modulation output in the selector row. The GUI will enter the "Modulation Edit mode".

Knobs: To edit or create a modulation from the selected source to a knob, simply drag its track (the outer ring) (). When modulated, a knob displays a second, semi-transparent thumb. This is the effective value (base value + current modulations) used by the engine.

Pads: Still in Modulation Edit mode, to modulate a pad simply drag the bars at its right or bottom (depending if you wanna modulate the X or Y parameter). When modulated, pads show their modulation range and their current effective value.



Pads showing their ranges and effective values

(Note for Circle Pads : The shape of the modulation range may look strange... But try to map a square control range onto a circular area without losing its full range... yeah, not so easy. So it's not "strange", it's just topology)..

Right clicking a modulation output button will open a context menu offering some useful options, like muting its connections, or deleting them (all or a specific one).

OVERLAY

The modulation overlay mode toggle allows you to switch between different overlay modes : no overlay at all, a smart overlay which only shows connections from the currently selected

modulation output, and the full overlay displaying all connections. Connections are traced in a PCB/metro style and often overlap each other. To mitigate this visibility issue a hover function has been implemented, highlighting connections either from the currently hovered selector, or connections to the hovered modulation target..

The width of a connection in the overlay depend on the strength of the connection, its color is the one of its source Modulation Output.

Notes :

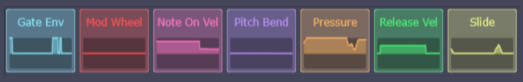
- **Control Rate vs Audio Rate:** The modulators run at a much slower rate than the audio path (and are not influenced by the oversampling factor). This was done to limit the CPU overhead without impacting the creative potential too much. It doesn't aim at doing audio-rate modulation. By default it runs at 512Hz (you can push it to 2048Hz in settings but still... not really enough for proper audio rate modulation, plus some modulators might cap out before that).

- **Audio Row Speed:** However, everything in the Audio Row runs at full speed. So if you want audio rate FM, use the VPS Lissajous Modulator on U & V parameters.

- **Efficiency:** On that same note, the main ADSR envelope and Ladder's contour also run at full speed. So when you have the choice between using them or a generic modulator, the answer is often them. (Particularly for the ADSR since when it closes, the voice is freed by the Voice Manager and processing is skipped—saving your CPU for more important things, especially if the Aggressive_Oscillators_Bypass setting is active).

- **Non Modulatable Parameter:** Currently only one knob is not modulatable: the Output Level. This parameter is general, ie. shared between all voices and because of that can't be modulated (Modulations are per voice). If you want to modulate the volume of RSO you can always modulate Out Drive which is a volume/gain control, just before the clipping stage, or just use your DAW.

6.b Input



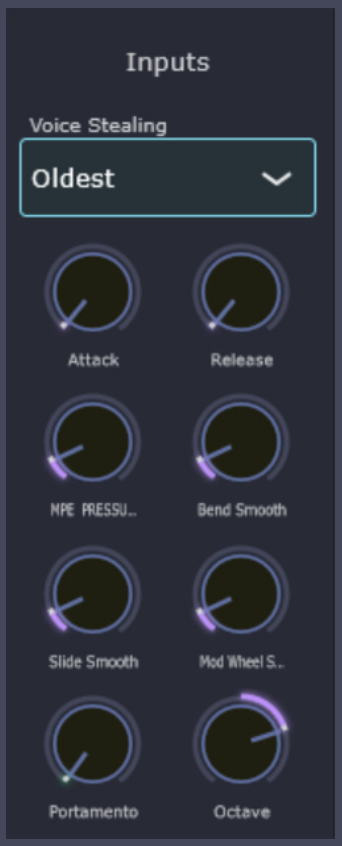
The Input Modulator is not a modulator like the others (what a good start!). While the others can be considered as generators of modulation, this one is more of a bridge between your performance (or, more realistically, the automation lanes of your DAW...) and the modulation system.

It exposes Pressure, Pitch Bend, Slide and Modulation Wheel to the system while providing some smoothing (because raw MIDI data (and/or yourself) can be quite steppy).

If MPE mode is enabled (by engaging the MPE button MPE in the top bar), Pressure, Slide and Bend become polyphonic.(Pressure can also be polyphonic without MPE if your controller sends Polyphonic Aftertouch messages) (and please if your controller isn't MPE or your DAW not in MPE mode, please **DO NOT ENABLE MPE**).

This module also offers some utility functions like a Gate Envelope (which is a simple Attack-Hold-Release envelope, held as long as the MIDI note is held), an Octave Switch, etc.

PARAMETERS



- **Voice Stealing:** When no free voices exist (see Voice Manager), this determines how RSO chooses which voice to cannibalize when a new note is received. Several algorithms are available:
  - Oldest: Steals the oldest note played.
  - Lowest: Steals the lowest note.
  - Highest: Steals the highest note.
  - Oldest Not High/Low: Steals the voice with the oldest note, skipping voices with either the Lowest or the Highest note .
  - None: No stealing at all. If no voice is available every new note will be ignored (I mean... couldn't you just play the right number of notes?)
- **Attack:** The Gate Envelope's Attack Time.
- **Release:** The Gate Envelope's Release Time.
- **Pres Smooth:** Smoothing time applied to the Pressure output.
- **Bend Smooth :** Same for the Pitch Bend Output.
- **Slide Smooth:** Same for the Slide Output.
- **Mod Smooth:** This one is totally different... just kidding... Same for the Mod Wheel Output.
- **Portamento:** The amount of portamento (Glide) applied on the Notes. If RSO is not in monophonic mode the glide will not necessarily be between the two last notes played.
- **Octave:** An Octave Shift, applied to all oscillators and keyboard tracking modules.

6.c Morphing LFO

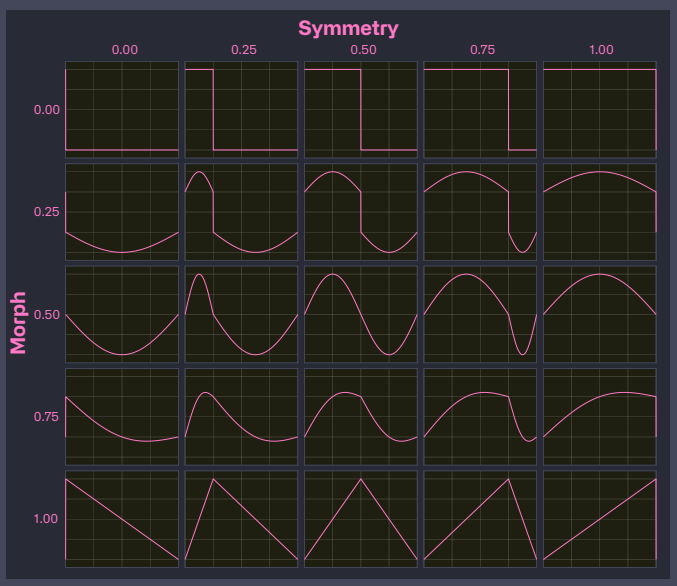
Although an LFO might seem like the "boilerplatest" modulator ever, I quite love these ones.

They can produce a wide range of waveforms, being modulatable continuously from Square to Sine to Triangle and offering even more variety via the Symmetry parameter.

But what really makes these LFOs shine is their Spice parameter which randomizes the max value of the current cycle (adds some flavor, get it?), their ability to sync to keyboard or beat, and their formidable reactions to self modulation. (Seriously, go try to self modulate the Symmetry parameter... you'll understand...).

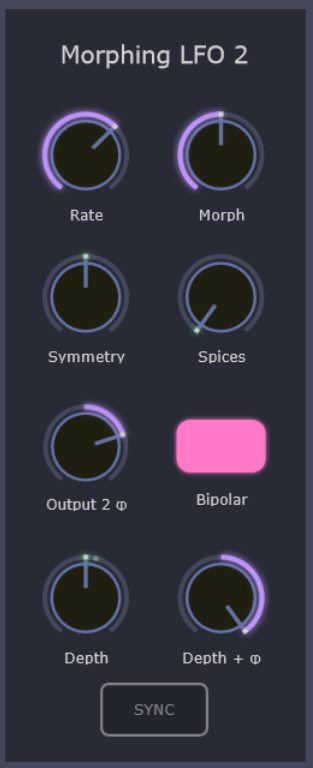
And they are so packed with features that I almost forgot to mention one of the most exciting ones : they have a second, phase shifted output. (Perfect to make modulations of a pad go full circle!).

Ah, and you have two of them!



Waveform Morping for different values of the Morph and Symmetry parameters

PARAMETERS

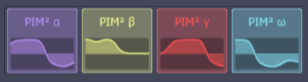


- **Rate:** The Speed at which the LFO operates. Its range is from 0.01Hz (100s per period) to 20Hz (50ms).
- **Morph:** The shape of the waveform, from Square at 0 to Sine at 1 to Triangle at 2. The morphing is done in a digital manner here (Linear Interpolation) which works well for modulation signals (in my humble opinion, and since I wrote the code, my opinion counts).
- **Symmetry:** Like Pulse Width for a square wave but extended to all waveforms. For example a triangle wave with a symmetry of 0 would be a Reverse Sawtooth, 0.5 a Triangle and 1 a Sawtooth. (Please see the graph above for more info).
- **Spices:** The amount of randomization applied to the maximum value of each cycle. It can be used to add some subtle variations to the LFO or even to make it act like a Random Number Generator.
- **Output 2 φ:** The amount by which the phase of the second output is shifted relative to the first one.
- **Bipolar:** Is the output bipolar? (i.e. between -1 and +1, or unipolar between 0 and +1).
- **Depth:** Level of the main output of the LFO. It is an attenuverter, so the signal can be inverted here (so a unipolar LFO with a negative depth would have its effective range

between 0 and -1).

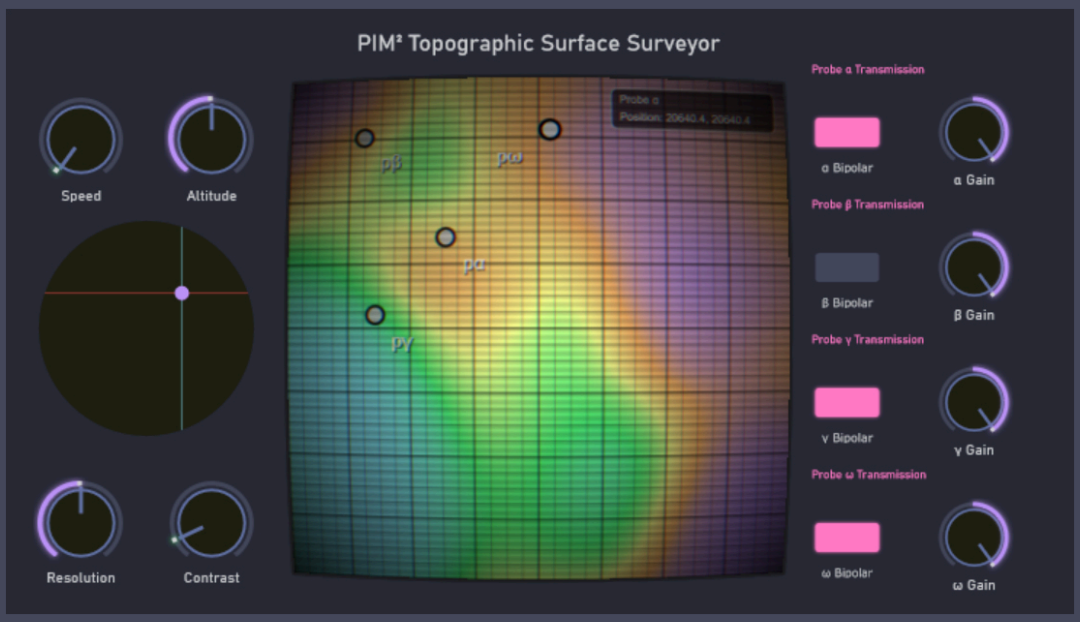
- **Depth + φ:** Depth of the phase shifted output. Same logic as above, just for the other output.
- **Sync:** The LFO can be re-triggered either by the keyboard or by the tempo (refer to section 2.c about Sync for the full story).
    - **Triggering:** Once a Sync trigger is received (from Keyboard or Beat Trigger), the LFO is reset immediately (restarted from a phase of 0).
    - **Sync Mode:** If the Beat Mode is set to Lock, the LFO will automatically adjust its rate to perfectly match the Time Signature.

6.d PIM²



The **Perlin Intuitive Multi Modulator** (PIM2) generates 4 synchronized modulation outputs by sampling a Perlin noise texture at different relative positions while moving through the noise space.

Perlin noise is very interesting in musical applications because it generates smooth noise, with control over scale, speed and direction (and with some steps added, more control over the "flavour" of the noise is possible).



Having 4 outputs, represented by the 4 pins on the topographic screen, allows us to create connected, relative, delayed movements modulating different parameters of the synthesizer (the most basic use case would be for the Xpander filter's 4 stereo parameters, but I am confident you will be creative with that).

If you are not interested in the spatial connection between the outputs you can also just use it as 4 smooth noise generators, with a pretty screen (which is already not too bad).

PARAMETERS

- **Speed:** As expected, controls the speed at which the noise moves.
- **Altitude:** The scale of the noise. High altitude will result in more variations on the noise texture.
- **Direction:** Honestly, I find the parameters of this module quite intuitive. Since direction is controlled with the Pad/Joystick it is more of a 2D speed than just a direction, so the real speed is actually Direction X Speed.
- **Resolution:** The level of detail of our noise. Technically it is an octave parameter for our generator : we generate multiple noise values at different scales and mix them together. This parameter is the number of values generated (limited to between 1 and 3, because after that it becomes quite CPU costly without real improvement for our musical application,

diminishing returns...).

- **Contrast:** Just like for a screen, high contrast will move values toward the extremes (-1, +1) while a low contrast will move them toward 0. A value of 1 is the direct output of the generator, with its constant probability distribution.

- **Pins Positions:** ...The... position of... the pins... on the noise texture. Still pretty intuitive. Setting the positions of the pins allows us to create some spatial (and/or temporal) relationships between our four outputs.

(the last two parameters are duplicated for each output, so Bipolar α and Gain α are the gain and bipolarity of the Output α, sampled at the Pin α position)

- **Bipolar:** Is the output bipolar? (i.e. between -1 and +1, or unipolar between 0 and +1).

- **Gain:** A simple multiplier applied to the output. Negative gains are possible (e.g. a -1 gain on an unipolar value will result in an effective range of -1 to 0). (Same as for the Morphing LFO's Depth and Bipolar parameters)

Notes: Changing the altitude will cause discontinuities in the outputs of PIM2 (which is not always a problem, some extreme modulations can be achieved this way).

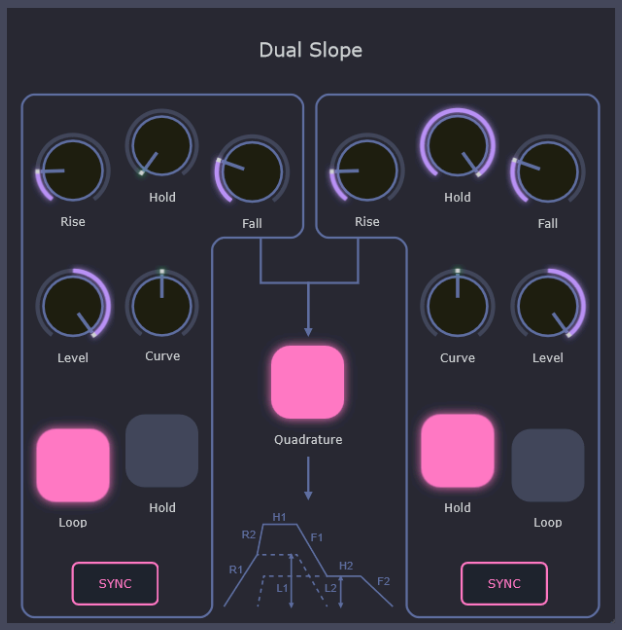
(And for the Perlin fanatics : yup the density probability of the noise is linearized here, Perlin noise has the nasty habit to like centered values a little too much).

If two pins overlap on the screen and you want to move the one below without touching the other, clicking in the Probe X Transmission area of the X pin (X being the greek letter of the pin) will bring it up on top of all the other pins.

(For the area : imagine a rectangle encapsulating the title "Probe X Transmission", the Bipolar button and the Gain knob. Or just imagine PIM2 is smart and will bring to front the pin you are most likely interested in, you just need a way to tell PIM2 "This is this pin", so click in the area reserved for the output of this pin).

6.e Dual Slope

A Dual Slope (or ramp, or function...) generator. Although it might seem like an obscure module even for seasoned synth heads (mainly because for the vast majority of people, synth = East Coast/Moog style subtractive synthesis), it is actually a core component of the West Coast synthesis flow.



It is inspired by classic slope generators found in Buchla or Serge synthesizers and their modern counterparts like Make Noise's Maths or Frap Tools's Falistri.

But rather than using simple AR envelopes, a Hold stage (fixed time or while the note is held) has been added. (I think it's more flexible this way, sometimes you just want to sustain...).

Even if an A(H)R envelope might seem a bit limited for someone used to the comfort of a standard ADSR (or even more complex multi-segment envelopes), don't be fooled. The true power of this module lies in the interactions between the two Slopes. With the various combinations of Loop and Hold modes plus the Quadrature mode, it becomes an extremely powerful and versatile modulation source.

It follows very simple rules but allows for complex behaviors. You can definitely use it as two independent and identical slope generators (it works, it's immediate, sometimes you just need that.. and it's fine), but you would miss the really fun part.

PARAMETERS

- **Rise:** Rise Time (in seconds), time from the value to rise from 0 to its maximum.
- **Hold:** Only used when the Hold toggle is set to On (fixed hold time), still in seconds. The time the max value is held before starting to fall.
- **Fall**: Fall time (still in seconds, consistently), time it takes for the value to return to 0.
- **Level:** The max value of the envelope
- **Hold Toggle:** Defines the behavior of the hold stage. If set to On, the hold stage is time based and will follow the value of the Hold knob. If set to Off and keyboard trigger is active, it will act as a sustain (gate driven : as long as your finger is on the key, it holds).
- **Loop Toggle:** If set to On the envelope will retrigger itself when it ends, effectively acting as an LFO.
- **Curve :** Controls the slope shape. It behaves exactly the same as for the envelope in the audio path (logarithmic, linear, exponential...). I'm not going to draw the graph again here, just scroll up/back to the Envelope section, memory is a muscle!
- **Sync:** Each Slope can be triggered either by the keyboard or by the tempo (refer to section

2.c for the full lecture on Sync Modes).

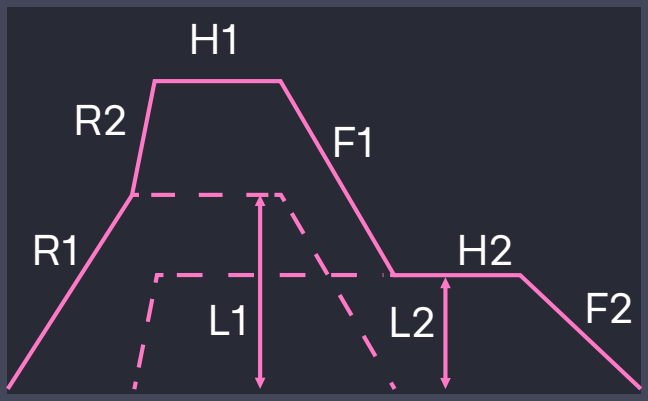
- **Triggering:** When a Sync Trigger is received (either from Keyboard or Beat Trigger), the Slope is simply fired/restarted.
- **Sync Mode:** If the Beat Mode is set to Lock, the Slope becomes smart. It will mathematically scale its Rise, Hold, and Fall times so the total duration fits the selected Time Signature perfectly, all while preserving the relative proportions between the stages. (So if you have a short attack and long fall, it stays that way, but stretched or squashed to fit exactly into the bar.).

Quadrature Mode :

One last control is present on the interface, the Quadrature Toggle which enables the Quadrature Mode.

This mode enables a complex linked interaction between the two slopes. It creates a chained, sequential envelope behavior where one envelope "leads" into the next. You get :

- More complex, evolving modulation patterns
- Envelopes that smoothly transition from one to the other
- Useful for creating sweeping or cascading effects
- Using the Sum output it generates an weird A_1 A_2 H D L R envelope... honestly, by messing with Hold and Loop modes, plus levels and timings, even I don't know all the possibilities! (Happy accidents ahead).



Quadrature Mode Sum Output

Notes:

Right Clicking the name of the module lets you access some manual trigger options. You can trigger each channel individually or both at the same time. This allows you to use the Slopes as free-running LFOs, bypassing the need to enable Sync modes.

7-TIPS & TRICKS

MORPHING LFO (RANDOM) SAMPLE & HOLD

You can turn the Morphing LFO into a (random) Sample & Hold. Set the rate to minimum and shape to pure square—this keeps the value locked as long as possible. Max out Spice so that value is random. Enable keyboard retrig so a new random value is sampled on each incoming note. There you go!

(See Preset: BucketHead LFO2 (shape and symmetry are not as we described here but the core concept is the same))

LEGATO PORTAMENTO

Want portamento only on legato? Modulate the portamento time with the Gate Env (attack and release both at minimum). Now the portamento time is controlled by the modulation amount. Set the synth to mono, and you get portamento only when notes connect. Staccato stays clean. (If you're already using the Gate Env for something else, you can achieve the same result with one of the Slopes in sustain mode, or even with a morphing LFO using a similar config as the previous tip.)

(See preset: FatEg)

STEREO FILTER SWEEP

Want the filter to smoothly pan from left to right? Set one Morphing LFO output's +φ to +180°—now both outputs are in opposite phase. Modulate the Xpander's L Freq Offset with the first output and R Freq Offset with the second, same amount. The filter frequency now sweeps from one side to the other.

"But wait—couldn't I just use the first output and invert the modulation on R?" Yes, you could. But this way you get control over the delay between left and right. Try modulating the +φ with a slow PIM[2]. You're welcome.

GLITCHY MORPHING LFO

This one's a bug. A bug I loved too much to fix. If you self-modulate the LFO's symmetry with a negative amount (at least -0.5 to be safe, but the threshold depends on the Shape), the output goes haywire—jumping between high and low values almost every sample, in a more or less regular pattern. Add some small modulations, play with Spices and Shape, and you've got one of the wildest LFOs you'll ever see.

What's happening here?!?

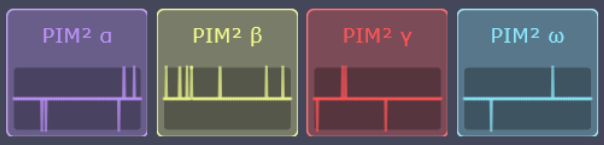
(See: preset SubNastyy)

SHARK FIN MODULATOR

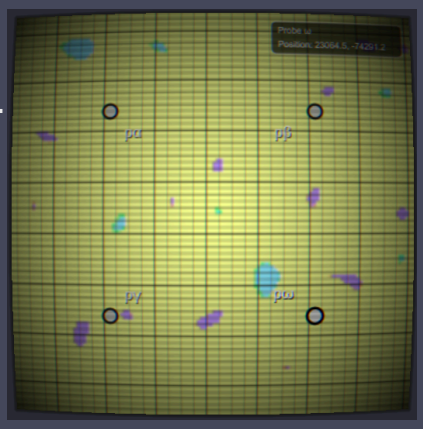
Not really a new trick—just the non-buggy version of the previous one. LFO in triangle mode (Shape to max), self-modulate the Symmetry with a reasonable amount, and the waveform turns into a shark fin. You can experiment with other Shapes, self-modulating the Symmetry is always a fantastic source of happy accidents!

DIRAC'S TOPOGRAPHY

Looking at PIM² , set Altitude high (let's say max) and Contrast to 0. PIM² now outputs Diracs—extremely short impulses, basically instant spikes of positive or negative value. Play with Speed, Altitude, and Resolution (lower resolution = more spikes) to adjust the density of events. I am sure you'll find a use for such a modulation signal!



PIM² now generating Diracs!



And the output on the screen is quite nice too

REGENERATION SLOPE

For this trick, switch your oscillator to 発振器さん.

First, open your Filter fully and set your main Envelope's VCA Offset to the max. We need the signal path wide open to hear what we are about to do.

Set the ダウンサンプル parameter (top right of the module) to its minimum value. Since this acts as a decimator, the sound should almost disappear, leaving just some glitchy artifacts.

Now, configure a Slope to act as an envelope (Attack/Decay timings to taste, or even both Slopes in Quadrature mode if you feel fancy) with Keyboard Retrig enabled. Modulate the ダウンサンプル knob with this Slope (start with full range modulation, then reduce until it sounds right).

The Result: The Slope will open up the sampling rate, acting like a pseudo-VCA that controls both dynamics and harmonics simultaneously, with a zest of glitchiness.

(See preset: Atomium)

JUMPING BASS

This one's a bit involved—grab your favorite hot beverage (tea, obviously) and buckle up.

Start with a bass preset you like. Set the Envelope Amount to 0 and its VCA Offset to 0. We're going to replace the envelope with something more rhythmic.

Step 1: The tempo.

Set both LFOs and one Slope to Beat Trigger mode (Tempo Sync), all at the same Time Division (pick something fairly fast). You'll need your DAW sending tempo to RSO—hit play!

Step 2: The rhythm.

The Slope will be our envelope. Set its Hold mode to Hold, modulate VCA Offset with the Slope, and tweak until it sounds good.

Step 3: The random jumps.

Now we have a bass that plays in time, but always the same note. Let's fix that.

Set LFO2 to: Rate minimum, Shape to square (far left), Unipolar, Symmetry at center, no Spice, Output 2 +φ to 0. (See Sample & Hold tip—we use the same logic here.)

We want an output that's randomly 0 or 1, in sync with tempo. To get there, we modulate LFO2's φ with LFO1. Why? A square wave outputs 0 or 1 depending on where it starts in its cycle—before 90° it's 1, past 90° it's 0. Randomizing φ randomizes which one we get.

Set LFO1 to the same settings as LFO2, but with max Spice and Symmetry at 0. Now modulate LFO2's φ with LFO1's first output—the modulation amount controls how often the bass jumps (tweaking LFO2's Symmetry can be used to adjust jumps' frequency).

Step 4: The payoff.

Modulate the Input module's Octave Switch with LFO2 output 2 (MLFO2+φ).

Voilà—jumping bass. Easy peasy!

(See preset: jumpingBass)

GATED MODULATION

Want a modulation signal that's only active while a note is held? Every modulator (except Input) has a Level knob on each of its outputs (except compound outputs of Dual Slope). Set it to 0, then modulate it with either the Gate from the Input module, or one of the Slopes (with Keyboard Retrig enabled).

The modulator now only "exists" when a key is down. This is particularly useful for MPE modulations like Slide — its value sticks wherever it was at the end of the last note, which can cause an quick and sometimes quite annoying jump at the start of the next one. Gating the modulation signal ensures it only comes through while you're actually playing.

You can adjust the Attack and Release of the Gate envelope (or the rise/fall times of the Slope) to make the gating as smooth as you need.

8-Notes

ABOUT 発振器さん

Some parameters: 発振器さん is deliberately opaque with its Japanese (and nonsensical) labels and manual pages. The math behind it has no musical intuition—there's no 'brightness' knob or 'harmonics' slider that makes sense to name. So rather than fake clarity, the interface is designed as an invitation to explore. That said, here are a few parameters worth knowing:

- The First Dropdown is the **Retrig Behavior** — how the oscillator reacts when a new note is received. Since 発振器さん is a chaotic system, its internal state at the moment of a new note has a huge influence on what comes next. The options:
  - **None**: Leave the internal state as is.
  - **Reset**: Reset the internal state to zero.
  - **Rand**: Randomize the internal state.
- The Second Dropdown is the Buckets **Configuration**. 発振器さん has four internal outputs—the Buckets control how they're mixed down to stereo. (If you set the screen to oscilloscope mode, you'll see these four outputs and their names. Each dropdown option shows which outputs go left and which go right.)

Fair warning: 発振器さん is chaotic by nature, and floating-point math has limits. In rare cases—usually at the edge of stability—the output can vary depending on sample rate. It's a known issue with no real solution. It's annoying, it's unavoidable, and it's part of the deal.

For the curious: 発振器さん is a **Quaternion-Phase Oscillator**. If you want to know what that means, see Miller Puckette's paper in the References.

APPENDIX

A.1 References

RSO wasn't built in a vacuum. These papers and resources shaped it behind the scenes.

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Wiltshire, T. (2020, May 24). *Multimode Filters, Part 2: Pole-mixing filters*. Electricdruid. Retrieved November 30, 2025, from https://electricdruid.net/multimode-filters-part-2-pole-mixing-filters/

A.2 Theming System Reference

IMPORTANT NOTE

This appendix is just a crash course to get you started.

A complete, detailed technical reference named Theme.md is located directly in the Themes folder (see next section). It contains every single Color ID, Float ID, XML tag, and inheritance rule known to man (or at least known to RSO).

If you really want to dive deep, open that file with a text editor.

So, you don't like RSO Style? Or you want a high-contrast industrial look?

The RSO theming engine is a fully data-driven, XML-based beast. It allows complete customization of the plugin's appearance, supporting color variables, module-specific overrides, and even multiple inheritance (because why reinvent the wheel when you can just inherit from the Pro theme and change three colors?).

FILE LOCATIONS

To create a theme, you need to place an .xml file in the shared public documents folder of your OS:

- Windows: `C:\Users\Public\Documents\Iperron\RSO\Themes\`
- macOS: `/Users/Shared/Iperron/RSO/Themes/`

(You will find the Theme.md file right there).

THE BASICS

A theme file is a standard XML document. The root element is <Theme>.

You don't need to define every single color. You can (and should) use the inheritsFrom attribute to base your theme on an existing one.

Minimal Example:

```
<>Xml


<Theme name="MyBlueTheme" inheritsFrom="Pro">
  <defaultModule>
    <Colors>
      <!— Just override the slider color to Blue —>
      <Slider_trackColourId value="#0088FF"/>
    </Colors>
  </defaultModule>
</Theme>
```

INHERITANCE

You can inherit from built-in themes or even from your own custom themes.

We also support Multiple Inheritance. Themes are merged from right to left.

inheritsFrom="Pro, MyFlatMixin, MyGreenColors"

- Start with Pro.
- Apply MyFlatMixin on top.
- Apply MyGreenColors on top of that.
- Finally apply your local overrides.

This allows you to create "Mixins"—small themes that only change specific aspects (like a "No Gradients" theme or a "Big Knobs" theme) and combine them.

DEFINING COLORS

Colors can be defined in two formats:

- #RRGGBB: Standard Hex (e.g., #FF0000 for Red).
- #AARRGGBB: Hex with Alpha (transparency) at the start (e.g., #80FF0000 for 50% transparent Red).

Color Variables:

To stay sane, define your palette first in <ColorDefinitions> and reference them later using the @ symbol. You can even add transparency on the fly!

```
<>Xml
<ColorDefinitions>
  <def name="myAccent" value="#FF6B35"/>
</ColorDefinitions>
<defaultModule>
  <Colors>
    <Slider_trackColourId value="@myAccent"/>
    <!— Use accent but make it 50% transparent —>
    <graphBackground value="@myAccent, 0.5"/>
  </Colors>
</defaultModule>
```

SCOPE & OVERRIDES

You can define settings globally in <defaultModule>, or target specific modules to create rainbow-colored synths (please do and send it to me).

Supported sections: <defaultModule>, <VPS>, <Ladder>, <PIM2>, <LFO>, <Settings>, <MenuBar>, etc.

KEY PARAMETERS REFERENCE

Here are the most common IDs you might want to tweak. (For a full list, open theme.md and look around).

Common Colors:

- **ResizableWindow_backgroundColourId:** The main background.
- **Slider_trackColourId:** The active part of the knob ring / slider.
- **Slider_backgroundColourId:** The empty part of the knob ring.
- **TextButton_buttonOnColourId:** Active state of buttons.
- **padXColour / padYColour:** The crosshair colors for XY pads.

Floats (Sizes):

Defined in `<FloatValues>`.

- **knobRelativeDiameterId:** Knob size (0.0 to 1.0).
- **knobRelativeBorderSizeId:** Thickness of the knob border.
- **knobRelativeTrackThicknessId:** Thickness of the colored ring.

Gradients:

- Defined in `<BackgroundGradient>`.
- **gradientEnable:** "true" or "false".
- **color1** / **color2:** Start and end colors.
- **isRadial:** "true" for circle gradients, "false" for linear.

Other:

- **lockStyle:** 0 for Skeuomorphic (realistic), 1 for Flat (modern).

Non-Modulatable Slider Colors:

Global parameters (like the output Level knob) use distinct colors to visually separate them from per-voice modulatable knobs. You can define these colors explicitly or leave them out — the engine will automatically invert your regular slider fill/outline colors to create contrast. See Theme.md for details.

These colors are:

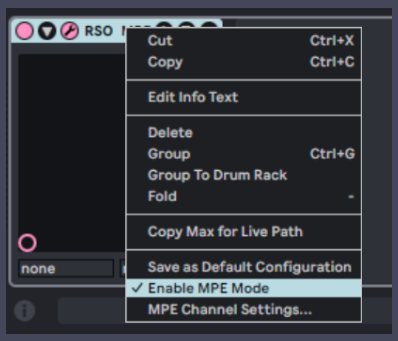
- **nonModulatableThumbColourId**
- **nonModulatableRotarySliderFillColourId**
- **nonModulatableRotarySliderOutlineColourId**

A.3 MPE DAW Configuration

First of all please ensure that RSO's MPE Pitch Bend Range setting matches your controller's configuration.

Now let's continue with some DAW-Specific Configurations:

ABLETON LIVE



1. Locate the RSO plugin in the device view (bottom panel)
2. Right-click on RSO title barr
3. Select "Enable MPE Mode"

Done! Ableton will automatically route MPE data correctly.

REAPER

No configuration needed! Reaper passes MIDI data transparently to plugins.

STUDIO ONE

1. Open RSO GUI
2. Click the down arrow in the instrument GUI header (top bar showing the plugin name) to open the plugin menu
3. Select "Enable MPE"

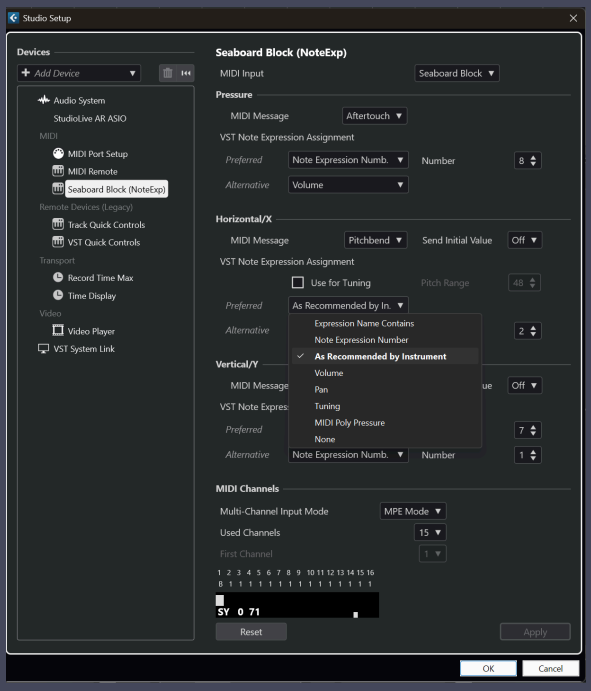
Studio One will now route MPE data correctly to RSO.

BITWIG STUDIO

1. Select RSO
2. In the Inspector panel (right side)
3. Click the MPE button

Bitwig will automatically handle MPE routing

CUBASE



Let's start with the Studio Setup Configuration:

1. Go to Studio → Studio Setup
2. In the left panel, find your MPE controller under MIDI Port Setup and select it
3. In the Horizontal/X parameter section:
   - Uncheck "Use for Tuning"
   - Set Preferred dropdown to "As Recommended by Instrument"
4. Click OK

Then the Track Inspector Settings:

1. In the Inspector panel (left side), locate the Routing section
   - Input Routing:
   - Set MIDI Input to your MPE controller (e.g., "Seaboard RISE")
2. Set Channel to "Any"
   - Output Routing:
   - Set Channel to "Any"

In **THEORY** Cubase should now route correctly MPE Data to RSO (No trauma here...)

For other DAWs please consult their manuals but usually you should search for an "Enable MPE" button, and set midi inputs to all or any channel.

Please note that some DAWs still dont support MPE in 2026 (FL?...)

A.4 Preset Administration

RSO's preset system uses plain-text XML files that you can edit directly or manage with provided scripts. This appendix explains the metadata system and tools for organizing your preset library.

OVERVIEW

RSO uses two types of metadata files:

- `.bankinfo.bowl` - Metadata for preset banks (folders)
- `.metadata.miso` - Global color definitions for authors and genres

Both are plain-text XML files and you can edit them manually or use the provided Python scripts.

BANK METADATA (.bankinfo.bowl)

Each preset bank (folder) can contain a .bankinfo.bowl file that defines:

- **Display name** - How the bank appears in the browser (instead of the folder name)
- **Tags** - Category markers like "demo", "dev", "beta", "tutorial"
- **Description, Authors, Version constraints** - Additional information (currently parsed but not shown in GUI)

This file should be placed in the root of a bank folder:

```
Presets/
        MyBank/
                .bankinfo.bowl          <— Bank metadata file
                preset1.noodle
                preset2.noodle
                ...
        SomeOtherBank/
        ...
```

.bankinfo.bowl File Format:

```
<?xml version="1.0" encoding="UTF-8"?>
<BankInfo version="1.0">
    <DisplayName>Tutorial: Basic Synthesis</DisplayName>
    <Description>Educational presets for learning synthesis</Description>
    <Authors>
        <Author>Iperron</Author>
    </Authors>
    <Tags>
        <Tag>demo</Tag>
        <Tag>tutorial</Tag>
    </Tags>
    <Order>0</Order>
    <Metadata>
        <MinPluginVersion>1.2.0.0</MinPluginVersion>
        <CreatedDate>2025-12-22</CreatedDate>
        <Color>#4A90E2</Color>
    </Metadata>
</BankInfo>
```

.bankinfo.bowl Element Reference:

Element	Required	Currently Used	Description
DisplayName	No	Yes	Name shown in preset browser (default: folder name)
Description	No	No	Long-form description (parsed, not displayed yet)
Authors	No	No	List of <Author> elements (parsed, not displayed yet)
Tags	No	Yes	Category tags for filtering (see below)
Order	No	No	Sort priority, lower = earlier (default: 999) - not currently used
Metadata	No	No	Extended fields (version constraints, dates, colors)

Note: RSO currently displays only DisplayName and uses Tags for filtering. Other fields are parsed and stored for future features.

Tag Reference:

Tag	Meaning	Defautt Visibility	Notes
demo	Educational/tutorial presets	Hidden	Controlled by Settings → Show Demo Banks
tutorial	Tutorial presets	Hidden	Same as demo
dev	Development/testing	Hidden	Edit conf.etti to enable Show_Dev_Banks
beta	Experimental features	Hidden	Edit conf.etti to enable Show_Beta_Banks

Custom tags are allowed but won't affect filtering until implemented.

Dev and beta bank visibility can be enabled by manually editing your conf.etti configuration file and setting Show_Dev_Banks or Show_Beta_Banks to 1

If the file is missing or malformed the folder name will be used as bank name and no tag will applied. .bankInfo.noodles files are optional.

GLOBAL METADATA (.metadata.miso)

.metadata.miso files define color mappings for authors and genres. These colors are used for the filter capsules/chips in the Preset Browser's filter panel.

.metadata.miso files can be placed in either the Root Presets folder (global) or in any bank subfolder (Bank-specific overrides).

```
Presets/
        .metadata.miso        ← Global defaults
        Factory/
                .metadata.miso        ← Factory-specific
        MyCustomBank/
                .metadata.miso        ← Bank-specific colors
```

.metadata.miso File Format:

```
<?xml version="1.0" ?>
<Metadata version="1.0">
	<Authors>
		<Author name="Iperron" color="#D97757"/>
		<Author name="Jane" color="#5599FF"/>
	</Authors>
	<Genres>
		<Genre name="Bass" color="#FF0000"/>
		<Genre name="Lead" color="#00FF00"/>
		<Genre name="Pad" color="#0000FF"/>
	</Genres>
</Metadata>
```

Colors must be hex format: #RRGGBB (e.g., #FF5500).

PYTHON SCRIPTS

RSO includes Python scripts in the Presets/ folder for easy management. They are:

- AuthoriZe.py - Bulk set author names and lock status on presets
- serve_noodles.py - Create and configure bank metadata
- add_metadata.py - Add colors for authors and genres in the filter UI

.AuthoriZe.py:

Sets the Author ad Protected attributes of all .noodle files in a folder.

Its options are:

- -a, —author - Author name to set on all presets (default: "Factory")
- -p, —protected - Lock presets (prevents deletion and metadata editing in GUI) (default: false)
  - Accepts: true/false, yes/no, 1/0, t/f, y/n
- -f, —folder - Folder containing .noodle files to process (default: "./User/")

A typical use case of this script would be to set autorship on presets you have created and to lock them : python AuthoriZe.py -a "Carlos Prune" -p true -f ./User/

Achtung!

This modifies preset files in-place, make backups.

add_metadata.py:

Creates and edits .bankinfo.bowl files from the command line. This is the recommended way to create and manage bank metadata.

Its options are:

- —folder (required) - Path to bank folder
- —displayName - Display name for the bank
- —description - Long-form description
- —tag - Add tag (can use multiple times)
- —author - Add author (can use multiple times)
- —order - Sort priority (integer)
- —color - Hex color for theming
- —minVersion / —maxVersion - Version constraints
- —show - Display current bank info without editing

If the folder already contains a .bankinfo.bowl it will be updated, else the file will be created.

To create or update metadata of a bank, typical use would be something like :

```
python serve_noodles.py —folder ./MyBank —displayName "My Awesome Sounds" \
—author "Carlos Prune"  —order 10  —color "#FF5500" —tag demo —tag tutorial
```

or to simply view metadata of a bank:

python serve_noodles.py —folder ./MyBank —show

add_metadata.py:

Adds or updates author/genre colors in .metadata.miso files. This is the recommended way to manage author and genre colors.

Its options are:

- -a, —author - Author name to add/update
- -g, —genre - Genre name to add/update
- -c, —color - Hex color (required, format: #RRGGBB)
- -p, —path - Path to folder (default: current directory)

Some typical use cases would be:

Add author with color in current directory (if directory = presets then global)

```
python add_metadata.py -a "Carlos Prune" -c "#D97757"
```

Or to set color for a genre in a specific folder:

```
python add_metadata.py -g "Bass" -c "#FF0000" -p ./MyBank
```