

chipSynth OPMZ

Manual v1.0



PLOGUE
ART & TECHNOLOGIE

Introduction

How many FM synths does one really need?
As much as needed, apparently. *And this one really was.*

The specific quirkiness and sonic legacy of the OPM, both in the arcades and in the studio, needed to be preserved without compromise. No guesswork and no AI slop entered its sonic implementation; just long, hard (and tedious) work.

When I think about it... The first time I genuinely heard an entire score made from an FM synthesizer was probably at my local mall in the latter part of the '80s. SEGA's *Shinobi* and other great titles left an incredible, lasting impression on me that undoubtedly shaped how I perceive and enjoy video game music to this day.

The four main 80s FM chip series from Yamaha are now covered.
The chipsynth line now includes all the major series: The OPL, OPN, OPS, and now OPM.
Enjoy!

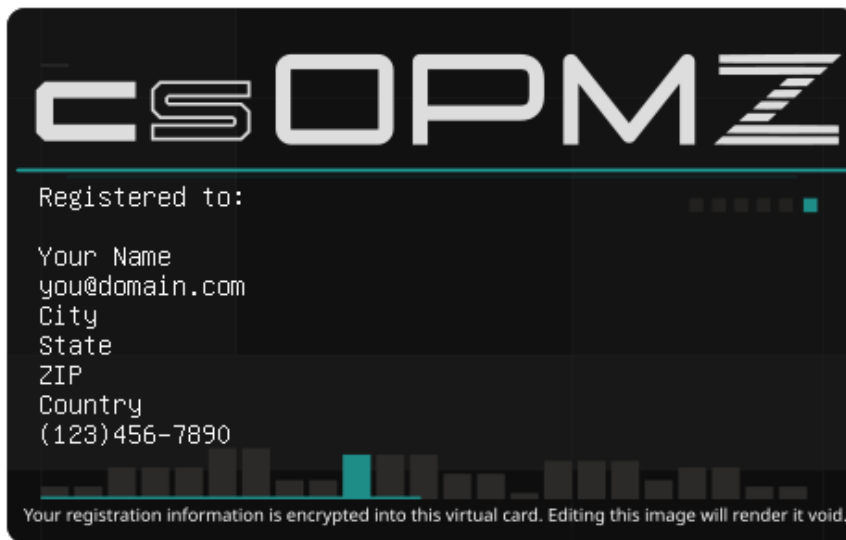
David Viens
Septembre 28th, 2026



Authorizing chipsynth OPMZ

You will need to authorize chipsynth OPMZ to make it fully functional – otherwise it will run in DEMO mode. When you order a license from our web store, you will receive a personal Activation Key card named `lic_chipsynth_OPMZ.png` as an email attachment.

The Activation Key card is a picture that looks like a typical credit card. This image contains your registration and details encoded within the Key card image. It will look like this:



You should save the `lic_chipsynth_OPMZ.png` image file to your hard drive (keep it in a safe place). For convenience, we recommend that you initially save the .png file to your desktop.

- 1) Locate the “license card” image where you saved it on your hard drive. (**`lic_chipsynth_OPMZ.png`**)
- 2) Open the chipsynth OPMZ software application, or launch your favorite host and make sure you see the chipsynth OPMZ interface.
- 3) Simply click and hold on the file, and drag-and-drop the “license image” or file icon directly onto the application's UI itself, then release the mouse button.

If you don't get any message (or are not able to drop the key image in that host), try to import the png file from the snapshot load menu or the slot load **import**. (use *.* as the file type filter in the dialog)

If all goes well, you should be presented with a message saying “Plogue Art et Technologie, Inc chipsynth OPMZ is now activated for {your name here}”.

If none of those methods work, please contact chipsynth.support@plogue.com and attach your key.

Extremely Important!!

The **lic_chipsynth_OPMZ.png** file contains your **sensitive personal information**, both encrypted inside and visible in the image itself, including your **full name and address** taken from the online shop. Carefully protect this file. DO NOT GIVE THIS FILE TO ANYONE OR DISTRIBUTE IT IN ANY WAY OR YOUR PERSONAL INFORMATION WILL BE COMPROMISED. IF THE FILE BECOMES PUBLIC THE CARD NUMBER WILL BE BLACKLISTED AND THE CARD REVOKED. WE ARE NOT RESPONSIBLE IF YOU GIVE YOUR PERSONAL DETAILS TO A THIRD PARTY. IF THE CARD IS STOLEN, CONTACT US IMMEDIATELY. Without a valid card you will also not be able to obtain critical updates to the program.

Important Note:

If you have special circumstances or require site licensing, please contact us.

Updating to the Latest Version

Be sure to check the Plogue Web sites for any possible updates that have occurred since the time your version of the software was released. Software is frequently updated and a more recent version may be available.

Getting Help

The first place to look for a solution to any problem you may be experiencing is in this manual. Please read the manual before contacting support.

Plogue chipsynth OPMZ is dynamic — evolving and growing. Please check the support area of our website at <https://www.plogue.com> for the latest up-to-date information about products, troubleshooting, FAQs, helpful hints and tutorials. Another good resource is the support forums.

Whenever you encounter problems, you should also check to make sure you have installed the latest updates. The version number of your software is displayed in the **About** dialog. Updates are released regularly to fix known problems and to improve the software.

If you can't find a solution to your problem, please email us at chipsynth.support@plogue.com. The best way to let us get you the help you need is by giving us plenty of detailed information about the problem you're having. We do ask you to read this guide thoroughly and exhaust the other avenues of support before contacting us.

The Plogue forum can be accessed at: <https://www.plogue.com/plgfrms/>
You don't have to register to browse the forum, but you will have to sign up if you want to post.

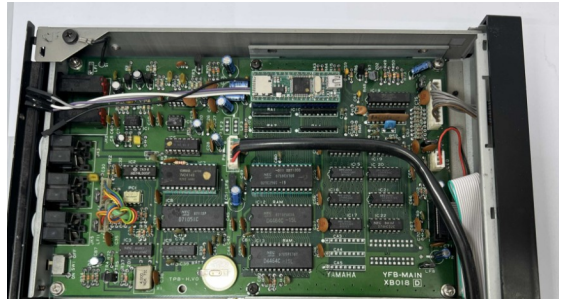
End User License Agreement: See Licence.rtf, which contains the full license agreement.

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Plogue chipsynth OPMZ

Plogue chipsynth OPMZ is a multi-layer FM synth that faithfully recreates the sound of the Yamaha™ TX81Z™ and other systems using the Yamaha OPM, OPP, OPZ and OPZ2 Chips.

Our unique system lets you do dynamic layering, real time parameter animation, effects and intuitive editing, amplifying this classic sound to new heights.



The OPM family

After the success of the Yamaha DX7 synthesizer, the company would spin off FM synthesis into multiple cost-effective chip families. The chips from the OPM family have 8 voices with 4 operators each, and are used with an external DAC (10 bits with 3 bits of companding).

They are used in many systems:

OPM (YM2151)

- Yamaha CX5M (specialized MSX home computer)
- Sharp X68000 computer
- Numerous arcade and pinball machines from Sega, Atari, Konami, Capcom, Data East, Irem, Williams and Namco

OPP (YM2164; Adds volume ramping)

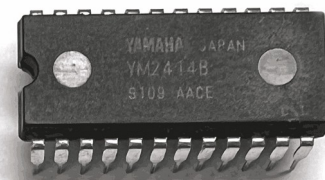
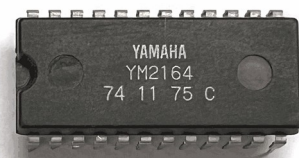
- Yamaha DX100, DX21 and DX27 synthesizers
- Yamaha FB-01 module and the compatible IBM Music Feature Card
- Korg DS-8 and 707 synthesizers

OPZ (YM2414, YM2414B; Adds numerous features including multiple waveforms)

- Yamaha TX81Z, DX11, TQ-5, YS100/YS200 synthesizers

OPZ2 (YM2424; Adds extra low range to fixed frequency mode)

- Yamaha V50 synthesizer



We capture the digital output of the real chips (sent to the DAC) to create an extensive series of tests. Then we use these to verify the emulation in chipsynth OPMZ, making sure it matches bit for bit. This procedure captures all the intricacies of the real deal, including the bit crunch and shared clocks and pipeline delays and unpredictable variations, making every note unique and living.

FM Synthesis Basics

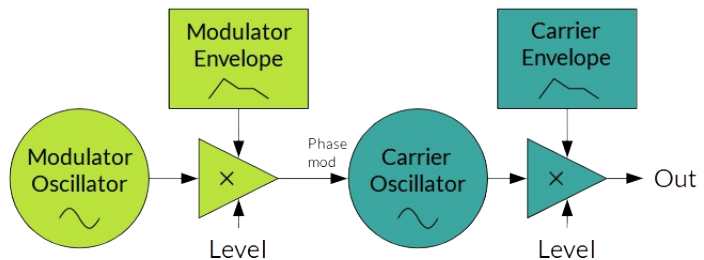
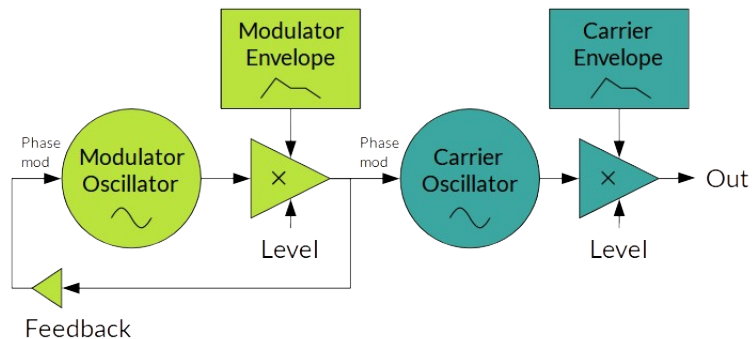
Each OPMZ voice has 4 operators:

- **Carriers** generate pure sine waves.
- **Modulators** distort the carriers to brighten the sound.

This distortion process is done by modulating the carrier wave's offset. This messes up the carrier, turning simple sine waves into bright and complex waves.

Modulator envelopes control the brightness, so that you can easily build tones that start bright and get soft.

Operator 4 has feedback, which produces bright saw waves (or, if pushed further, noise).



Algorithms select the voice structure: algorithms 1...4 are bright and have 3 **modulators**, algorithms 5....8 are softer and have more **carriers**. Up to 8 FM voices can be layered, building thick, rich sounds.

How to Build a Sound

The first step to building a sound in OPMZ is to pick an algorithm according to how bright or layered you expect the sound will be:

Bright algorithms		Soft algorithms	
1	Gritty and distorted	5	Two layers, versatile
2	Sharp, throaty	6	Layered, potential buzz
3	Balanced, buzzy	7	Soft and glassy
4	Sharp, clavi-like	8	Very soft, pure waves only

Next, to set your tone structure, you can set coarse tune, feedback, modulator levels and waves:

- Set modulator freq to 1 for saw wave, 2/4 for square wave, 3 for weird tones, 5+ for bells.
- Set feedback to 0..4 for weird, hollow tones, 5..6 for more full tones, 7 for buzzy tones or noise
- Set modulator level to 0 for pure waves, 1..60 for mellow sounds, 61..77 for bright sounds (especially with feedback at 7), 78+ more for even brighter weird tones or noise.
- Op wave: sine: basic tones, half-sines: more biting, alt/camel-sine: even grittier and distorted.

Then, setting up your envelopes and your LFO lets you control the evolution of the sound over time, and you can finish by setting the velocity response and key scaling levels for even more finesse.

How to use chipsynth OPMZ

Global Settings

Features: Enables features present on later synthesizers using the OPZ and OPZ2 chips (TX81Z, DX11, TQ-5, V50), handing of a few features specific to the V50 (low rate fixed freq, negative velocity, negative key level scaling). This also enables the pitch envelope (any setting other than DX21/100 or TZ81Z).

Presets: Loads or saves global chipsynth OPMZ presets.

Mode: Selects how OPMZ processes midi channel information either by ignoring it (normal), separating channels (multi), or using MIDI Polyphonic Extensions (MPE).

Polyphony: Sets the number of simultaneous notes (1..8). Set this to 1 for monophonic mode.

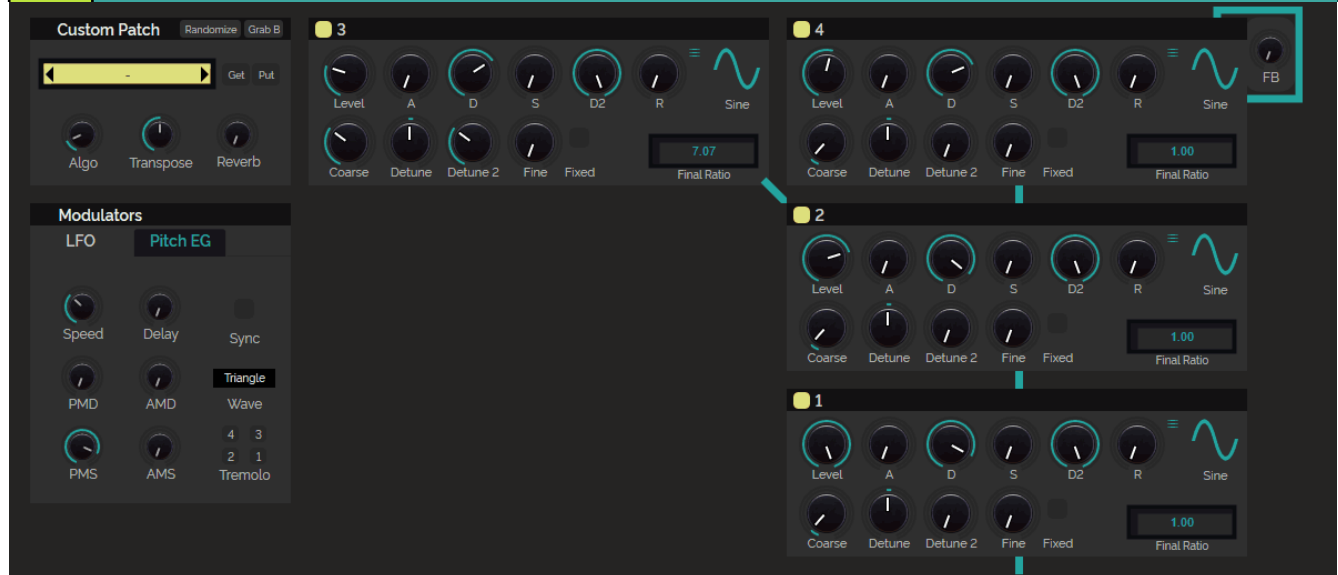
Retrig: Re-triggers the full note and envelopes on each key on. (*Polyphony must be 1*)

Revel: Allows the velocity to change when doing legato. (*Polyphony must be 1*)

P Glide: Allows for polyphonic glide.

Volume: Sets the overall volume of chipsynth OPMZ.

Patch A / Patch B



Custom sub-patch loader: Loads a sub-patch into the current tab (Patch A or B). The opm file format is also supported.

Randomize patch: Replaces the current patch with a random one.

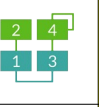
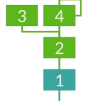
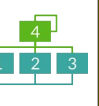
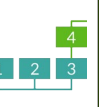
Grab A/B: Copy the patch from the other layer.

Get: Load a patch from the User1 or User2 bank.

Put: Store a patch to the User1 or User2 bank.

How to use chipsynth OPMZ

Algorithm: Selects how operators modulate each other. Each algorithm is suited to different sounds:

1		Electric guitar, bass, gritty distorted sounds. Make sure the modulator levels aren't too high.	5		Electric piano, organ, mallets, bass, brass, sounds that can be split into 2 parts (octaves, etc.).
2		Clavinet, bright FM bass and leads, guitar, complex gritty tones with formant components.	6		Brass, strings, vocal sounds, mallets, simple bright buzzy tones with maximum feedback.
3		Clavinet, bass, brass, strings, guitar, piano, buzzy tones using operator 4 with maximum feedback.	7		Organ, mallets, music box, flute, sounds with sub-bass using the pure sine wave operators.
4		Clavinet, bass, piano, guitar, synth lead, complex gritty tones.	8		Organ, anything made out of stacked pure sine waves.

Transpose: Transpose the patch up or down, in semitones (up to 2 octaves).

Reverb: Slow down the release of operators after key off after a low level.

LFO Settings

Speed: How fast the LFO changes.

Delay: This is the time it takes for the LFO to be applied and ramped to its default PMD/AMD levels after key-on.

Sync: Reset the LFO phase on key-on.

Pitch Modulation Depth (PMD): Default level of vibrato applied by the LFO.

Amplitude Modulation Depth (AMD): Default level of tremolo applied by the LFO.

Waveform: Waveform of the LFO. The available waveforms are upwards Saw, Square, Triangle and Random waves. Random LFO with the fastest speed setting is very useful to create noise.

Pitch Modulation Sensitivity (PMS): Scaling of the vibrato applied by the LFO. This affects all modulation paths – though PMD and through the SysEx modulators such as the mod wheel.

Amplitude Modulation Sensitivity (AMS): Scaling of the tremolo applied by the LFO. This affects all modulation paths – though AMD and through the SysEx modulators such as the mod wheel.

Tremolo On 1..4: Enables the LFO's volume modulation effect individually for each operator. On **carriers**, this modulates the volume; on **modulators**, this modulates the tone.

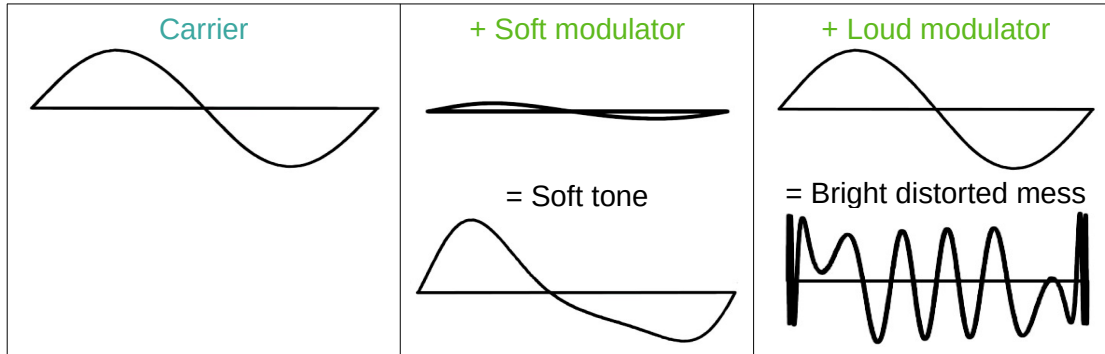
Pitch Envelope Settings

Rate 1..3: How fast the pitch envelope reaches levels 1, 2, 3.

Level 1..3: Sets the levels used by the pitch envelope. Level 1 and 2 are used for key-on, and level 3 for key-off.

Modulators and Carriers

Level: Controls the operator's volume. Increasing the volume of modulators brightens the sound by distorting the carrier more, which adds more harmonics. Every increase of 8 doubles the amplitude.



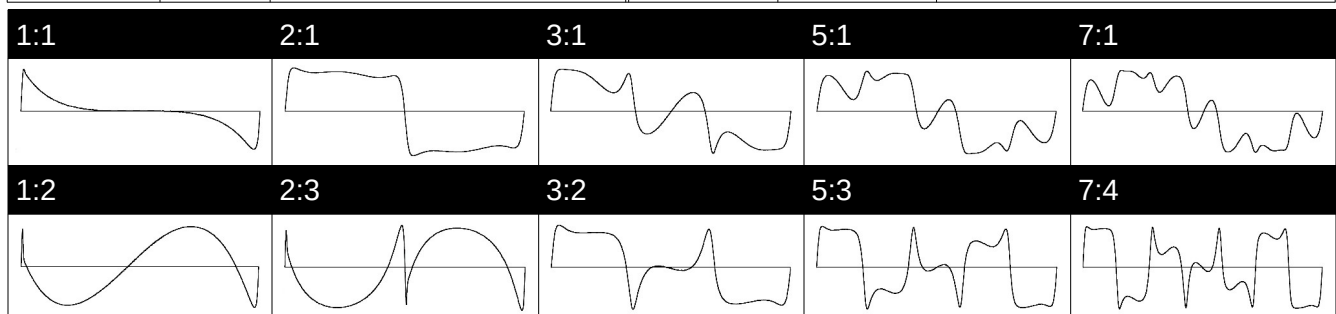
Feedback (FB) (**Operator 4** only): Controls the self-modulation level. This changes the spectrum: at 0, the spectrum varies quite a lot from harmonic to harmonic. At 7, the self-modulation fills in the volume of all harmonics, removing gaps, making the spectrum monotonic, brighter and more like a saw wave.

The level of self-modulation is also affected by the modulator level. At high values, the oscillator will self-oscillate at a very high pitch (18.6kHz), so these limits on level should be respected (except for noise):

FB	Max level before self-osc	Tone at max level	FB	Max level before self-osc	Tone at max level
7	103	Simple and buzzy	5	119	Complex with an edge
6	111	Semi-complex, edgy	0-4	No limit	Complex, more glassy

Coarse Tune (Coarse): Multiplies the oscillator frequency by 0.5, or any of 1 through 15. Multiplying both modulators and carriers by the same amount shifts the pitch (ex: doubling your frequencies from 5, 1 to 10, 2 raises the pitch by an octave). The ratio controls the sound's waveform:

Modulator	Carrier	Sound Equivalent	Modulator	Carrier	Sound Equivalent
1	1	Saw wave	1	2 or more	Band-passed saw wave
2 or 4	1	Square and triangle wave	2 or 4	3, 5, 7, 9...	Band-passed square wave
3	1	Pulse wave	3	2, 4, 5, 7...	Band-passed pulse wave
5, 7, 9+...	1	Ring modulation	5, 7, 9+...	2, 3, 4, 6...	Band-passed ring modulation



How to use chipsynth OPMZ

Detune: Detunes the oscillator pitch slightly, allowing sounds where the operators drift slowly from each other, producing a slow wobble or 'beat' effect. The effect is similar to a LFO on tone or a phaser.

Detune2: Detunes the oscillator by a large, inharmonic amount. This can be used to create metallic sounds such as bells. The available inharmonic ratios are $\sqrt{2}$, $\pi/2$ and $\sqrt{3}$. This parameter was combined into a single parameter with coarse tuning on the original Yamaha series of synths.

Fine Tune (Fine): Detunes the oscillator by a moderate, semi-harmonic amount.

Musical Frequency Ratios

Musical intervals can be achieved with the following ratios:

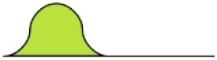
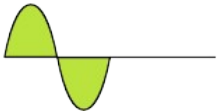
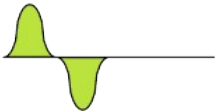
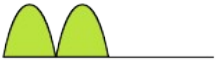
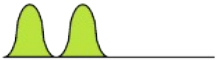
Semitones	Approx. Ratio	Semitones	Approx. Ratio
0	1.00	6	1.41
1	1.06	7	1.50
2	1.12	8	1.59
3	1.19	9	1.68
4	1.26	10	1.78
5	1.33	11	1.89

Fixed Frequency Mode (Fixed): Fixes the frequency at a static value. When this is active, the frequency controls are replaced by the **Low**, **Octave**, **Coarse** and **Fine** settings which let you set the frequency in progressively smaller units, down to 0 Hz which turns the operator into a waveshaper.

Final Ratio/Frequency

This display shows the final combined ratio obtained from multiplying the Coarse, Detune2 and Fine settings (or their fixed freq equivalents). The displayed number may be very slightly different from the physical synthesizers due to increased accuracy.

Waveform: Selects the waveform used by the operator. Waves are in order of increasing brightness.

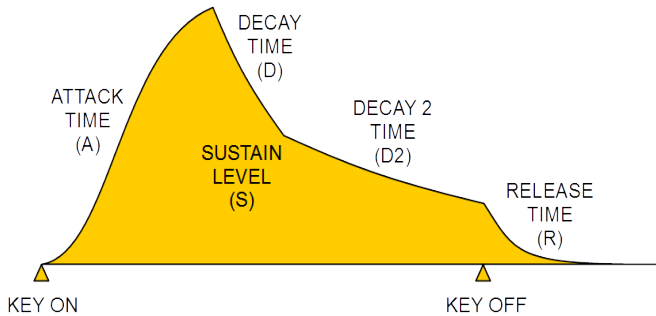
Sine	Sine 2	Half Sine	Half Sine 2
			
Alt Sine	Alt Sine 2	Camel Sine	Camel Sine 2
			

Envelope Settings

Attack Time (A): Sets how fast the envelope ramps up. Increasing this by 2 doubles the attack time. No sound will be output if you set this to maximum (31) – you get an infinitely long attack!

Decay Time (D): Sets how fast the envelope decays down to the sustain level after the attack.

Sustain Level (S): Controls the level at which the envelope switches from decay to decay 2.



Decay 2 Time (D2): Sets how fast the envelope decays down to zero after the sustain level. To produce continuous sounds, set this to 31 (maximum, infinitely long).

Release (R): Sets how fast the envelope decays down to zero whenever the key is released.

Velocity Depth (Velo): Reduces the volume on softer notes. On [modulators](#), this affects the tone.

Keyboard Scaling to Level (KSL): Reduces the volume on higher notes.

Keyboard Scaling to Rate (KSR): Speeds up the envelope on higher notes.

KS Rate	Envelope speed up	KS Rate	Envelope speed up
0	2x faster every 8 octaves	2	2x faster every 2 octaves
1	2x faster every 4 octaves	3	2x faster every octave

EG Shift: Reduces the effect of the volume envelope. This selects the maximum volume reduction between -96dB, -48dB, -24dB or -12dB. Normally this should only be used on modulators. This parameter does not exist for operator 1 (which is always a carrier).

EG Bias: How much effect the Aftertouch to EGBias and Breath control to EGBias SysEx Modulators have on the volume of this operator.

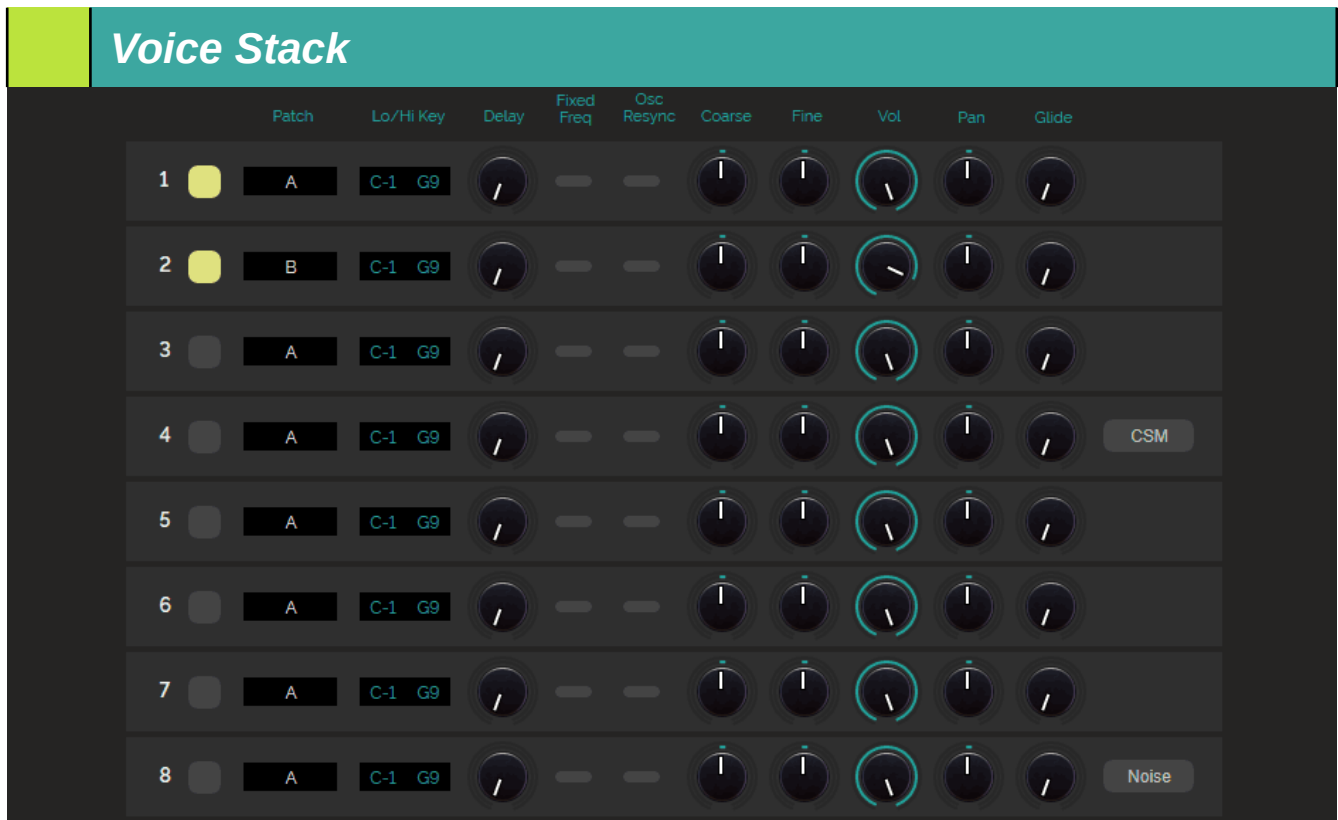
Keyboard Scaling to Level (KSL): Reduces the volume in the higher octaves. At a setting of 50, the volume is halved for every successive octave.

Assigning a Modulator to a Knob

Whenever you right-click a knob or a slider or another control, you will get a menu that will let you assign a modulator to it. This is equivalent to using the Modulation Matrix.

Equivalent Settings to Analog Synthesizers

Analog	Operator	Setting	Comments
Waveform	Modulator	Frequency Multiplier (Coarse)	Low values
Ring modulator	Modulator	Frequency Multiplier (Coarse)	High values
Filter cutoff	Modulator	Amplitude (Level)	Max this + FB = noise
Filter resonance	Modulator	Feedback (FB)	Inverted
Filter keyboard track	Modulator	Keyboard scaling to level (KSL)	
Filter env A D S R	Modulator	A D S R (attack, decay, sustain, release)	Set D2 to maximum
Filter env keytrack	Modulator	Keyboard scaling to rate (KSR)	
Filter env velocity	Modulator	Velocity	
Filter LFO	Modulator	Tremolo (AMS, AMD)	
Filter band-pass mode	Carrier	Frequency Multiplier (Coarse)	
VCA env A D S R	Carrier	A D S R (attack, decay, sustain, release)	Set D2 to maximum
VCA env key track	Carrier	Keyboard scaling to rate (KSR)	
VCA volume key track	Carrier	Keyboard scaling to level (KSL)	
VCA velocity	Carrier	Velocity	
VCA LFO	Carrier	Tremolo (AMS, AMD)	
Oscillator octave	Mod. & Car.	Frequency Multiplier (Coarse)	Multiply both by ½, 2, 4...
Oscillator LFO	Mod. & Car.	Vibrato (PMS, PMD)	
PWM	Mod. & Car.	Detune	
Distortion	Mod. & Car.	Waveform	



Channels

On/off: Turns the layer on/off.

Patch: Selects between patch A, patch B, or patches from the user bank.

Lo Key, hi Key: Limits the range of keys on which the channel plays.

Delay: Delays the key press events on this channel.

Fixed Freq: Replaces the played MIDI note by 36/48/60 (C2/C3/C4). (selectable in the settings menu)

Osc Resync: Randomize oscillator phases on key on.

Coarse Tune: Transposes the pitch (in semitones).

Fine Tune: Detunes the pitch (in cents).

Volume: Sets the overall amplitude of this layer.

Pan: Pans the sound. 3 settings are possible: center, hard left, or hard right.

Glide: Sets the pitch glide time. Setting this to 0 will turn off gliding.

Special

CSM Mode: Continuously retrigger all channels at the rate determined by the timer. In chipsynth OPMZ, the current note pitch is used. This produces vocal formants. You must set Attack to 0 (fastest) for this mode to work. D, S and D2 will have no effect. Release controls the level of resonance.

Noise: Replaces the output of operator 1 on channel 8 with noise. This changes the level scale.

Effects: Arpeggiator

The arpeggiator lets you turn any incoming MIDI data into arpeggio patterns.

On/off: Turns the effect on or off.

Preset: Loads and saves arpeggiation presets.

Mode: Selects the arpeggiation pattern:

Mode	Pattern	[] Variant
Up	From low to high	
Down	From high to low	
Up-Down	Low to high to low	Top & bottom notes repeat
Down-Up	High to low to high	Top & bottom notes repeat
Key	Same order as pressed	
Random	Random pattern	Can repeat the same note twice

Type: Switches between continuous arpeggiation (loop) and one-shot

Type	Mechanics	After last note
Loop	Cycles through currently held notes.	Repeat
Single	When you play notes together in one close block, they are arpeggiated together in a single shot.	Stop
Sustain Last		Hold last note

Duration: Sets the time between arpeggiated notes.

Range: Adding more arpeggiated notes one octave or two octaves above.

Velocity: Switches between the following velocity modes:

Mode	Velocity Output
Key	Same velocity as the original individual key press
1st	First velocity used for the group of notes
Norm	Always 100

BPM: Sets the note arpeggiation tempo. When BPM Lock is active, this follows the host tempo.

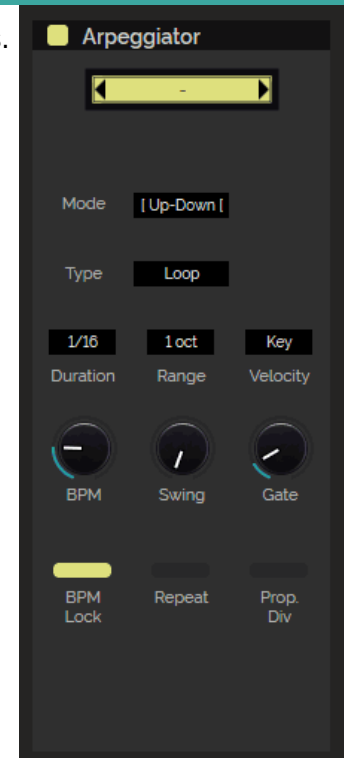
Swing: Sets the swing amount, creating slightly longer notes and slightly shorter notes.

Gate: Shortens the notes, inserting more space in between.

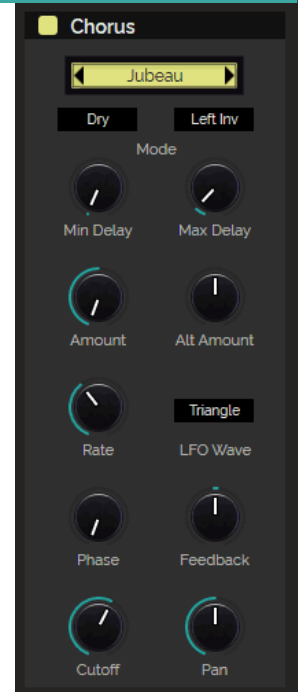
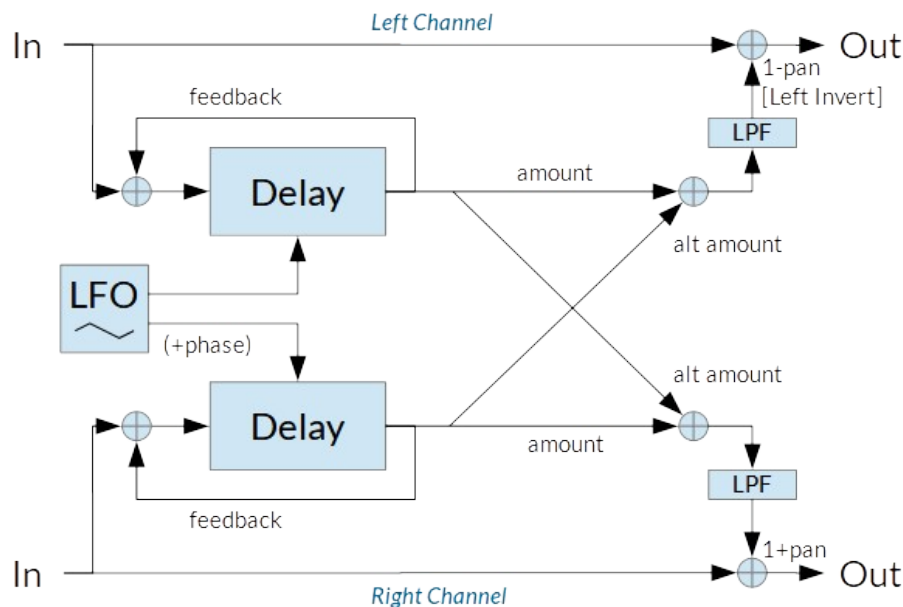
BPM Lock: Automatically forces the BPM to follow host BPM.

One Note Repeat: Applies arpeggiation even when only one single note is played.

Proportional Division: Accelerates the repeat rate as more notes are added, keeping the total length.



Effects: Chorus



This chorus is based on the famous Dimension D, and will let you capture the classic rich and wide sound that will put your FM sounds in the best light!

On/off: Turns the effect on or off.

Preset: Loads and saves chorus presets.

Mode (Filter): Toggles the output filter.

Mode (Inversion): Toggles the phase inversion of the left channel. Use this on a mono chorus to simulate the simpler single-delay chorus found on the DX21 and on some well known Roland synths.

Min Delay: Controls the delay time when the LFO is at its minimum level.

Max Delay: Controls the delay time when the LFO is at its maximum level.

Amount: Mixes in the chorused sound at the specified level.

Alternate Amount: Mixes in the chorused sound with channels swapped. Setting this the same as "Amount" will make the effect mono, setting this to the inverse will give the maximum stereo field.

Rate: Sets the LFO modulation rate between minimum and maximum delay length.

LFO Wave: Switches the LFO waveform between triangle wave (default) and sine wave.

Phase: Offsets the phase offset of the LFO on the second channel.

Feedback: Recirculates the chorused sound back into the effect.

Cutoff: Sets the cutoff of the output filter.

Pan: Pans the output of the chorus.

Effects: Ambience Reverb

Ambience is a very smooth and flexible stereo reverb effect created by Magnus Jonsson, known mostly for its Ambience VST/AU version.

It has the very nice characteristic of having an adaptable EQ section and allowing the decay time to be shaped to different values in the low/mid/high frequency ranges.

On/off: Turns the effect on or off.

Send: Controls the input level of reverb.

Preset: Lets you load and save reverb presets.

Decay: Sets the reverb decay time.

Diffusion: Sets the smoothness of the decay tail.

Size: Sets the time between the echos (to simulate a small or a large room).

Pre-delay: Delays the reverb tail by some time, adding separation from the original sound.

Width: Controls the amount of stereo separation (how different the reverb is on the left vs right side).

Quality: Increases the complexity of the reverb tail, at the cost of requiring more CPU to process.

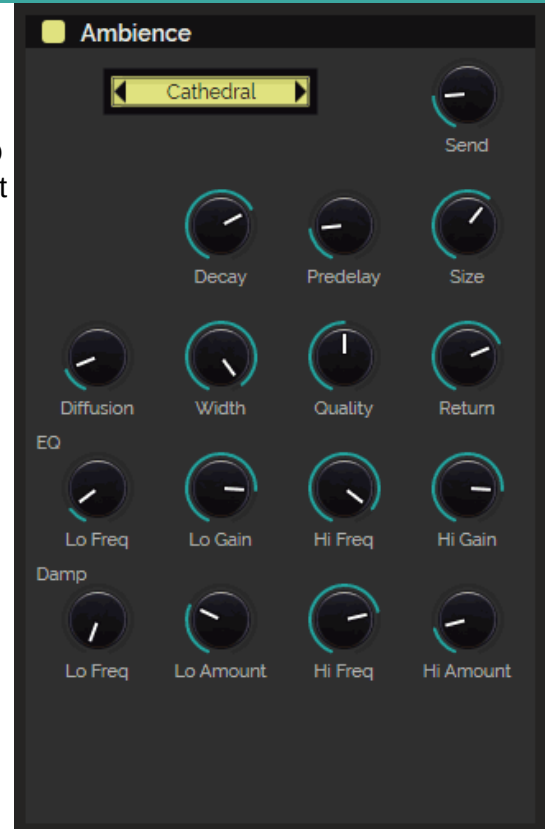
Return: Controls the output volume of reverb.

Equalizer Lo/Hi Freq: Sets the frequency under which the low/high gain is applied.

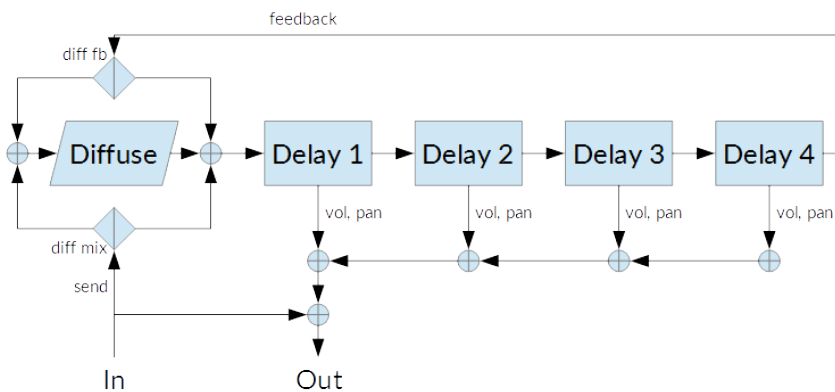
Equalizer Lo/Hi Gain: Applies a gain on low/high frequencies.

Damping Lo/Hi Freq: Sets the frequency under which low/high damping is applied.

Damping Lo/Hi Amt: Change the decay time under/above the low/high damping frequency.



Effects: Stereo Delay



The stereo delay is custom made for chipsynth and creates a repeating pattern of four delays. Along with extensive modulation and diffusion capacities, this allows for huge endless spatial sounds.

On/off: Turns the effect on or off.

Send: Controls the input level of the delay effect.

Preset: Loads and saves delay presets.

Delay: Sets the time between repeats (in milliseconds).

Beat Delay: Sets the time between repeats (in beats). This is added to the delay (see above).

Diffusion Mix: Sets the mix balance between crisp reflections and diffuse reflections.

Tap X-Mix: Short-circuits the normal order of reflections.

Feedback: Re-injects the signal back into the delay after the 4th reflection.

Modulation Rate: Sets how fast the delay time is modulated.

Modulation Level: Controls the level of delay modulation.

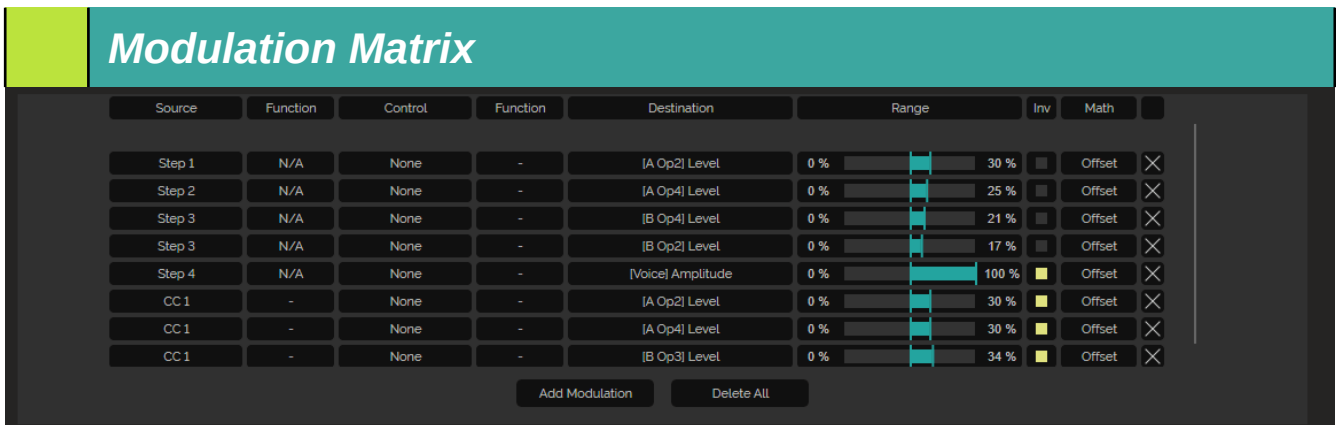
Diffusion Length: Spreads the diffuse reflections by a controllable amount.

Diffusion Feedback: Balances how much of the feedback gets diffused each time the signal loops around.

Tap 1..4 Volume: Sets the amplitude of each reflection.

Tap 1..4 Pan: Sets the panning of each reflection.

How to use chipsynth OPMZ



Plogue chipsynth OPMZ has a Modulation Matrix. This is a powerful tool to modulate parameters with step sequencers and links to MIDI Ccs and other controllers. Modulations can also be added by right clicking parameter knobs and sliders.

Source: Sets which step sequencer or MIDI value modulates the parameter.

Function (source): Changes the source value with a function.

Control: Adds a second modulation source to scale the amount of modulation (often the Mod wheel).

Function (control): Changes the control value with a function.

Destination: Selects which parameter gets modulated. The list of available modulation destinations depend on the modulator.

Range: Range of modulated values. Normally this is used to control the modulation level.

Invert: Invert modulation values.

Math: Operation used to combine value sources. Note: MULTIPLE MODULATION TYPES CANNOT BE USED ON A SINGLE DESTINATION. They must all be 'Offset' or all be 'Scale'.

Math	Effect
Offset	All sources are added together.
Replace	The "base" value is ignored and is replaced. (SINGLE MODULATOR ONLY)
Scale	All sources are multiplied together.

Sysex Modulators



MW/Aft/FC/BC to Pitch LFO (Pitch): LFO vibrato effect. Scaled by PMS but not by PMD.

MW/Aft/FC/BC to Amplitude LFO (Amp): LFO tremolo effect. Scaled by AMS but not by AMD.

Aft/BC to Pitch Bias: Pitch bending effect from MIDI aftertouch or breath CC.

Aft/BC to EG Bias (EGBias): Operator volume changing effect. Scaled by operator EG Bias settings.

FC to Volume (Vol): Voice volume changing effect from MIDI foot controller CC. OPMZ also responds to MIDI volume CC7.

Step Sequencers

The step sequencers let you add complex custom modulation envelopes to any parameter you want, including layer settings and individual FM patches.

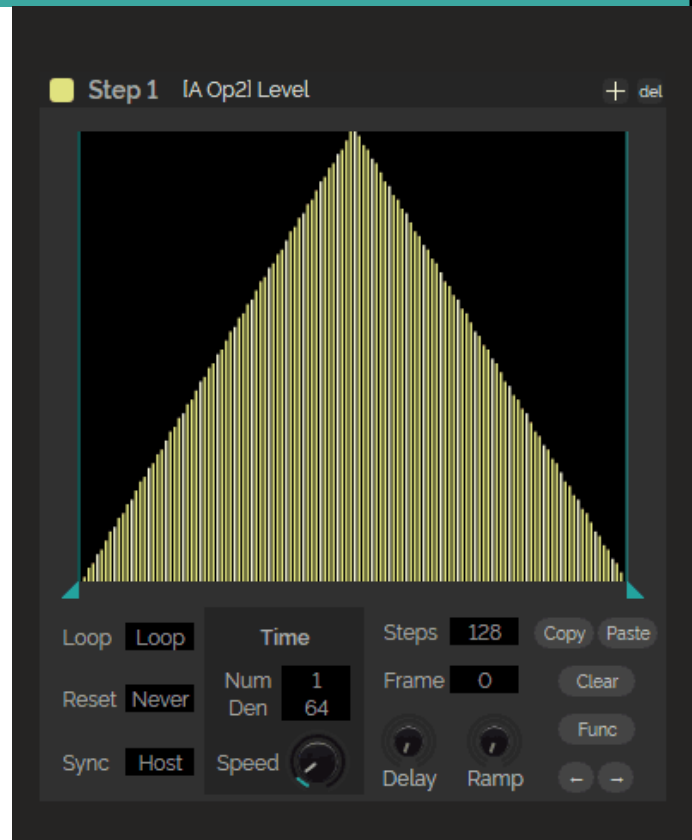
This makes it possible to create evolving/rhythmic sounds, pitch envelopes and so forth. You can even do 'audio rate' modulation with key-tracked frequencies.

By changing the loop mode, both envelopes and LFOs can be created. The envelope is tempo-synced by default, but this can also be changed.

Sequences

Display: Draw the shape of your modulator here!

Loop Points: Sets the start and end points of the loop. (You must be in 'Gate' or 'Loop' mode.)



How to use chipsynth OPMZ

Loop Mode: Switches the sequence between one shot, loop with intro and note-off, or loop only.

Loop Mode	Typical use	Effect	Note Off
One Shot	Envelope	No loop points. Plays the full sequence, then stops.	Ignored
Note Gate	Sustained envelope + LFO	Starts at beginning and loops between loop start and end. Jumps to points after loop end on note off.	Jump to after loop
Loop Always	LFO	Starts at beginning and loops forever from loop start to loop end.	Ignored

Reset Position: Selects the key sync type.

Reset Position	Type	Synchronization
Each Note	Polyphonic	Resets on every note
First Note	Monophonic	Resets on the first note of a group
Last Note		Resets on every note
Bar Pos		Tick advances are synchronized with music when playing or recording.

Sync BPM Source: Selects the clock source used for the step rate.

Sync Source	Step rate
Host BPM	Follows song BPM.
Internal BPM	Always 125 BPM. Setting the time division to 1:96 gives 50 steps per second.
Note Period	Step duration is scaled to note. 1:128 gives 1 step per period.

Time Division: Sets the step rate as a musical duration. Ex: Setting this to 1:16 makes each step last a sixteenth note.

Speed Scale: Multiplies the step rate.

Steps: Sets the number of sequence steps.

Frame: Selects which one of the sub-sequences is used. This can be modulated.

Delay: Delay the application of the step seq.

Ramp: Ramp up the application of the step seq.

Settings

Playing

MIDI Input: Selects which MIDI channel chipsynth OPMZ will receive notes on, either all MIDI channels (OMNI, default), or to only receive notes on a single user selectable channel.

Pitch Bend Range: Sets the range of pitch bend wheel (in semitones).

Velocity Sensitivity: Controls the global level of the velocity effect on note volumes.

SysEx Perf Global: Uses settings from Sysex patch data to replace parameters outside of patches such as polyphony, bend range and glide rate.

Emulation

DAC Quality: Selects how precise the output and the calculations are.

Click Reduce Delay: Reduces key-on clicks (especially in monophonic) but adds a very small delay.

Quench Post Release: Forcibly shut off the channel after key-off when the envelope reaches its end on carriers. This is used with the EG Shift settings to make sure no remaining tones are left after notes are played.

Tuning

Scala File: Lets you to load a custom micro-tonal tuning file.

Scala Center: Selects the root note from which the Scala tuning is applied.

MTS-ESP: Enables the MTS-ESP system to set the microtonal scale for chipsynth OPMZ.

Tuning (cents): Detunes the whole of chipsynth OPMZ to other frequencies than A 440Hz.

Fixed Pitch Root: Selects between MIDI note 36/48/60 (C2/C3/C4) for channels in fixed pitch mode.

Interface

UI Zoom: Select the size of the user interface.

Show Keyboard: Displays the mouse-clickable keyboard under the interface.

Current Host Settings

This section is used to show internal engine statistics.

Info

Chipsynth OPMZ and Fermata version check: Checks if there is an updated version of either chipsynth OPMZ, or the Fermata engine.

Show License: Shows the key file in use (when not running in demo mode). The key file can be registered by dragging it over the chipsynth OPMZ interface.

Sysex Patch Manager

This tab lets you import sysex patch banks, and move them to and from the following supported synthesizers:

- Yamaha DX100
- Yamaha DX27
- Yamaha DX21
- Yamaha TX81Z
- Yamaha DX11
- Yamaha V50
- Yamaha TQ-5
- Loading sysex patch bank files only: Yamaha FB-01, Korg DS8 and 707

Load Selected List Entry In: Selects which patch gets loaded into when selecting patches from the bank (A, B, both, none).

File Browser: Shows the patch bank files in the selected folders.

File Bank: Lists the patches in the selected patch bank file.

User 1 Bank: Lists the patches in the user bank 1.

User 2 Bank: Lists the patches in the user bank 2.

Hardware Bank: Lists the patches mirrored from the hardware.

Hardware Librarian

MIDI Input: Midi in used to receive from hardware.

MIDI Output: Midi out used to send to hardware.

Local HW Mirror Layer: Selects between patch A or B or none mirroring the hardware.

Layer to Hardware: Export patch A/B to the hardware's current patch.

Hardware to Layer: Import the hardware's current patch into A/B.

OPMZ to Hardware: Forward incoming MIDI to the external MIDI port.

Hardware to OPMZ: Apply incoming MIDI into OPMZ (separate from the usual MIDI input path).

Hardware Bank Get: Request the hardware to send in a patch bank.

Hardware Bank Push: Send the hardware mirror patch bank to hardware.

Hardware Detect: Detect current synth.

VGM Playback

VGM files contain raw register data snooped from vintage games which are meant to be directly interpreted by their target sound chip(s). Think of it as a very crude version of MIDI which also contains patch data and parameter automation.

Early on in the chipsynth series design, it was decided that every member of the chipsynth family should be able to play its dedicated music formats. This is mostly used as a regression test bed of our emulator cores – but also because we love those soundtracks so much and we felt they could inspire you as well!

Visualization: Lets you see the M3U or the Registers (more features in the future)

Clock Config(*): Controls the clock rate of the sound chip.

Detune(*): Changes the clock rate of ALL the emulator cores by musical intervals!

Warning: 'Detune' and 'Clock Config' ALSO influence the ENTIRE plugin's rendering rate! Set it back to the default of 'NTSC (3.58 MHz)' to return to normal operation!

Speed: Change the VGM data playback rate (this cannot easily be tweaked to specific BPM values since the VGM stream doesn't contain the source BPM information).

Mute: Mutes any channel. Great for studying VGMS!

Solo: Mutes all the other channels (the ones without the solo setting).

Copy: Copies the FM settings from this channel to patch A.

Note: Only VGM streams which contain OPM data will be properly played. Other streams types will be ignored.

Using OPMZ as a Standalone App

Plogue chipsynth OPMZ can be launched by itself and played live via MIDI keyboard or other MIDI controller. The standalone version of chipsynth OPMZ effectively makes your computer, audio hardware and MIDI keyboard into a virtual synthesizer that can be played independently of other programs. Unlike using it as a plug-in within a sequencer, your recording ability is limited and you can not edit your performance (though you can use various audio software programs for this).

Launching chipsynth OPMZ in Standalone Mode

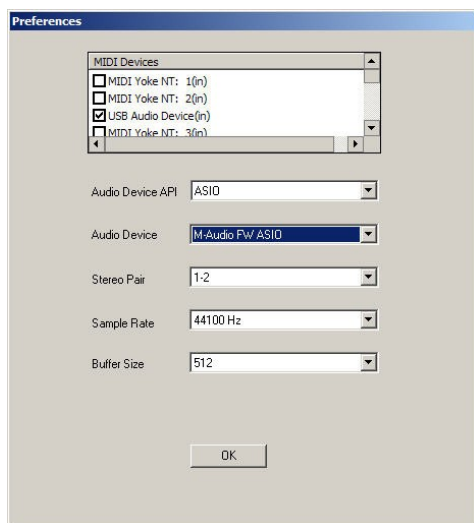
First, make sure that you have followed the instructions in the installation section of this manual. Be certain that your audio/sound interface and MIDI hardware interfaces are properly connected to the computer, your speakers or headphones are connected and everything is powered up.

To launch chipsynth OPMZ as a standalone application, click on the chipsynth OPMZ logo on your desktop or go to the Program Files or Applications folder and launch “chipsynth OPMZ”.

Basic Setup Information for Standalone Mode

To use the standalone version, you have to configure the Audio and MIDI settings in the Preferences dialog box (found in the Tools menu) before you can play. When used as a plug-in, the host sequencer or tracker program has already set up its audio and MIDI connections, and the chipsynth OPMZ “plugs in” to them. However, with standalone operation chipsynth OPMZ communicates directly with your audio and MIDI interface. Setup for Mac and Windows computers is similar, except where indicated. Note that if you change your audio interface, you will almost certainly need to readjust these settings.

Open the Preferences setup dialog from the Tools menu on the chipsynth OPMZ standalone interface. You’ll see drop-down menus for MIDI Device, Audio Devices, Stereo Pair, Sample Rate and Buffer Size.



MIDI Device Menu: All supported & installed MIDI interfaces are available here. Select the desired MIDI device from the list to send and receive MIDI to it.

Audio Device Menu: All supported (and installed) audio interfaces are available in this drop-down list. Select the desired audio device from the list.

Stereo Pair: Here you can define which of the stereo outputs should be used. Many pro audio devices have a variety of outputs, so you may choose which of these you would like chipsynth OPMZ to output through.

Sample Rate: Depending on the sound card and driver you are using, various sample rates are available. Set the desired sample rate here.

Buffer Size: The buffer size setting will determine the delay between pressing a key on your MIDI keyboard and hearing the sound (a/k/a ‘latency’). The default buffer size of 512 samples typically

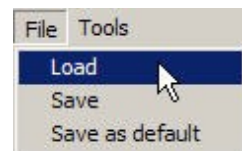
How to use chipsynth OPMZ

works well, but smaller buffer sizes will give a faster response (lower latency) and higher buffer sizes will give better audio performance (more polyphony and higher fidelity). Most modern computers and audio interfaces can handle a buffer size of 512 samples without a significant reduction in polyphony. If the sound is breaking up or crackling when a note sounds, then first check that the audio connections and wiring are good. Then, try a larger audio buffer size setting. Please note that there is typically a trade-off between higher buffer sizes (polyphony and sound fidelity) and lower buffer sizes (faster response or lower latency). Also note that the sound card buffer size settings determine latency, rather than chipsynth OPMZ Player itself.

Once you have your Audio and MIDI set up, and have loaded one of the snapshots, you can begin playing chipsynth OPMZ. Try playing a key on your MIDI keyboard. If the MIDI and audio configurations are correct, you should hear the corresponding synth note. If not, check the MIDI connections and wiring, and the MIDI output channel of your MIDI keyboard. Also check that the channel is specified correctly. If you are hearing the notes play, then the basic configuration is complete, and you are ready to use chipsynth OPMZ.

File Menu for Loading and Saving Snapshots in the Standalone

Configuration presets (.fermatax files) for chipsynth OPMZ can be saved and loaded. This gives the user the ability to customize instruments setups to suit personal preferences and save configurations for convenient future use. The File menu choices are:

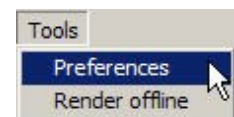


- ◆ **Load**—any saved configuration preset files in Fermata format can be loaded by clicking on this choice and selecting the desired file.
- ◆ **Save**—any configuration can be saved by clicking on this choice, typing a name for the custom preset and saving to a desired location.
- ◆ **Save as default**—any settings can be saved as part of the default, to be loaded automatically at the time the chipsynth OPMZ is booted in standalone mode.

Tools Menu in Standalone ONLY

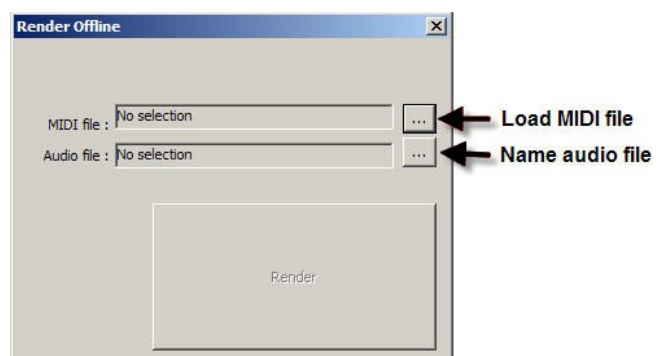
The Tools menu includes:

- ◆ **Preferences**—as described in the basic setup information above.
- ◆ **Render offline**—MIDI files can be rendered to audio offline using this feature.



To use the Render Offline feature:

1. Click on the Load MIDI file button.
2. Select the desired MIDI file
3. Click on the Name audio file button.
4. Name the audio file and specify its location.
5. Once the files are in place, click on the Render button, which will render the files to the selected audio file.



Using OPMZ as a Plug-in

When used as a plug-in, chipsynth OPMZ is not a standalone program, but rather a virtual instrument module that seamlessly integrates into your favorite music software program, sequencer or tracker (the “host”, which is modular in order to accept plug-ins). This has various advantages:

- ◆ MIDI recording and sequencing
- ◆ Easy automation of parameters through the use of MIDI CCs or the host's automation.
- ◆ Audio mixing with other plug-ins and effects within a single program.
- ◆ Integration with other instruments into a “virtual studio”.

A great thing about plug-ins is that they work with a large variety of compatible music programs: chipsynth OPMZ can be used as a VST plug-in in many VST music programs, sequencers, supported tracker programs and hosts. It can also be used as an Audio Unit or AAX plug-in.

Plug-in Standard	Description	Windows 64-bit	Mac 64-bit	Linux 64-bit
VST3 	Developed by Steinberg for Cubase, also used by Ableton Live, FL Studio, Studio One, Reason, Bidule, etc. Note: VST2 isn't supported.	Yes	Yes	Yes
Audio Units (AU) 	Developed by Apple for Mac OS X. Used by Apple GarageBand & Logic and MOTU Digital Performer.		Yes	
AAX 	AAX plug-ins are designed for Digidesign Pro Tools, used extensively in the pro audio and post production communities.	Yes	Yes	
CLAP 	Open source plugin format.	Yes	Yes	Yes

Plug-in Use

To use chipsynth OPMZ as a plug-in instrument, you simply launch your host music application/sequencer first and then launch chipsynth OPMZ from within it. Make sure that your sequencing host program is properly installed and configured, and that it is producing sound properly. Used as a plug-in, chipsynth OPMZ's audio and MIDI data is managed by the host music software.

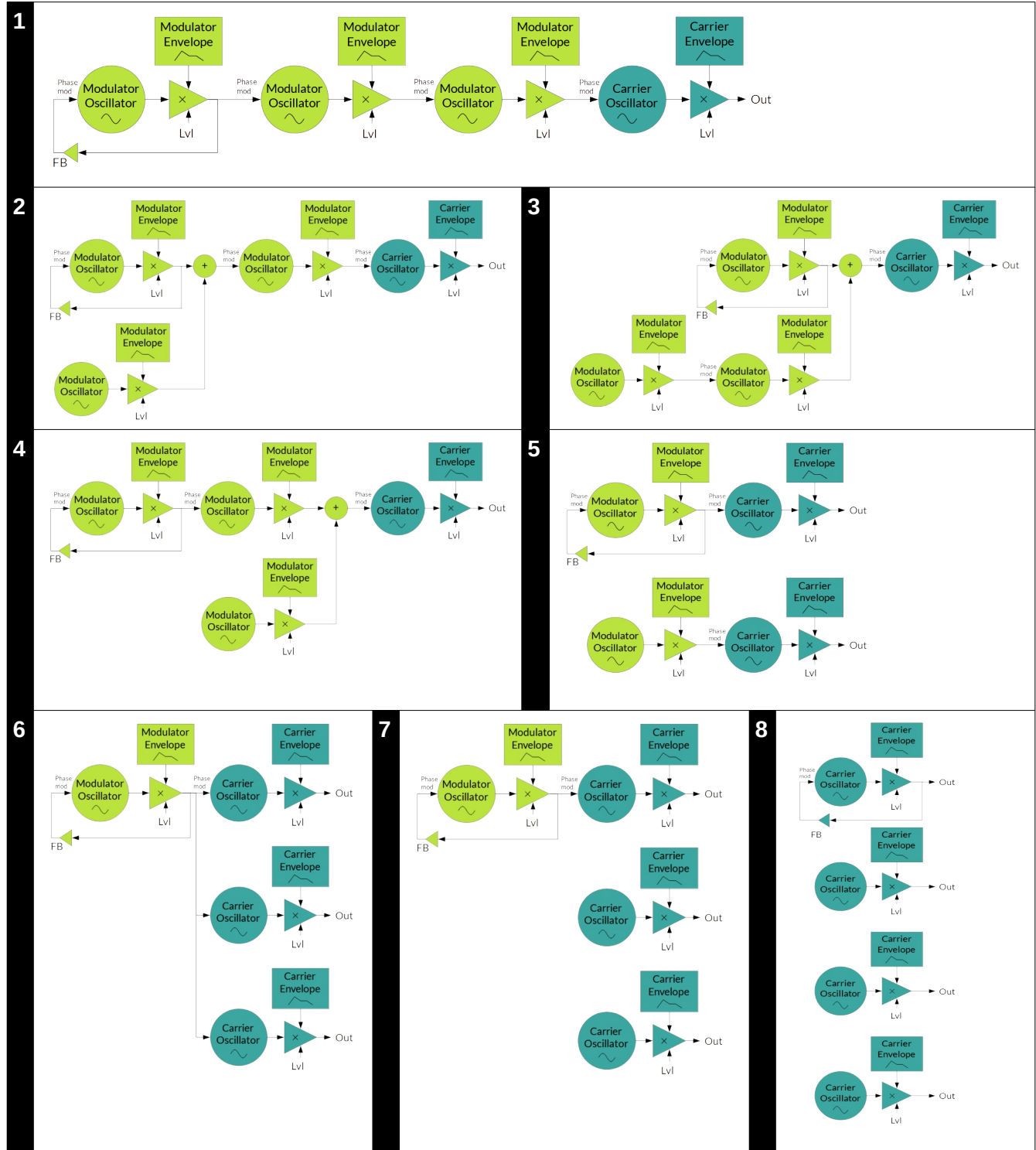
Each music software application has its own approach to handling plug-in instruments. They each have a different method of installation as well as differing means of loading and accessing plug-ins. It is important to make sure that you refer to the instructions in your music software application's manual regarding the loading and operation of plug-in instruments.

Windows VST Setup

Make sure the chipsynth OPMZ plugin is within the VST plugin folder used by your host, so that it can be scanned and recognized on startup.

Appendix: Algorithms

This is the internal structure of each algorithm:



Credits

Plogue chipsynth OPMZ®

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Chorus2	Ross Bencina, Plogue Art et Technologie, Inc.
Ambience Reverb	Magnus Jonsson
UX early concepts and logo	JCPP
V50 PCB Donation	Markus Fuller

Acknowledgments

We would like to give special thanks to the following people:

Markus Fuller	Mathew Valente (tssf)	A_Rival
Jonathan Gevaryahu	Peter Swimm	Cuckoo
Akira Key	VECTRAX	Alex Hauptmann
Johnny Collazo Jr.	ImATrackMan	Inverse Phase
XC3N	Alexander Brandon	Adélaïde (GGS)
Wohali	Chris Randall	Chad Beckwith
toho	cancel	DeltaRazero
Fade Runner	Xenos Soundworks	F E R R O

Thank you!

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