

THORN

Software Synthesizer Plug-In



User Manual

Welcome to Thorn!

Thank you for choosing Thorn! We made Thorn to provide you with a great tool for modern electronic music production. The main goal we wanted to achieve is to develop a top notch software synthesizer, which knows everything about creation process of punchy, snappy and aggressive modern sounds. Simplicity, flexibility and effectiveness are the key principles we tried to incorporate into Thorn. Just take a short tour through the carefully crafted sound library provided by Thorn, we hope it contains lots of sounds you might want to put in your mix right now.

The sound engine in Thorn is built on Spectral Synthesis method, which gives you control over the harmonics involved into a forming process of a final timbre. Three Harmonic Oscillators with an additional Harmonic Filter cover all the needs for producing of a very wide range of modern sounds. Two analog modeled multi-mode filters with a zero delay feedback path provided to charge your sound and make it shine through the mix. Analog envelopes, LFOs and multi-stage envelopes can be used to modulate any internal parameter you would like to. Set of 9 high quality effects polish your sound and breathe life into it.

In order to provide more fun we implemented a pattern-based Glitch sequencer in Thorn. Today glitch-effects become an essential part of many EDM genres and we hope you will find Glitch module very handfuf and inspiring.

We believe you will have lots of fun with Thorn!

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Installation

System requirements

In order to use Thorn you need a system with at least the following specifications:

- Modern powerful processor with SSE3 support
- Windows Vista (or higher) or Mac OS X 10.9.X (or later)
- VST 2.4 or VST 3.X or AAX or AU compatible host software

Installation

1. Download please the latest version of Thorn at the Plugin Alliance website:
https://www.plugin-alliance.com/downloads/ds_thorn
2. Run the installer and follow the instructions

Activation

Thorn is distributed by Plugin Alliance and must be activated in your Plugin Alliance account. You can create and login into your account at <https://www.plugin-alliance.com>.

In order to activate Thorn please check Plugin Alliance Activation Manual, which you can download at the following page: <https://www.plugin-alliance.com/activation>

User Interface



The user interface of Thorn is divided into six sections:

1. The Top Bar and Master section
2. The Oscillators section
3. The Harmonic Filter section
4. The Filters section
5. The Glitch/Arp/FX/Mod Matrix section
6. The Modulators section

Each section provides a group of parameters that are used to control the sound processing in Thorn via a common set of GUI elements:

- Knobs
- Value fields
- Buttons, switches and selectors

Working with knobs

The most common GUI control in Thorn is the knob. Although the appearance of knobs may vary, they are all controlled in the same way.

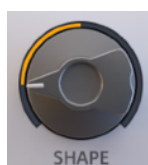


- To change the value of a parameter, left-click on the knob, hold down the mouse button and drag up or down in vertical direction
- The same results are achieved while dragging the mouse left or right in horizontal direction
- For finer control of a parameter hold the ALT key while dragging the mouse
- To reset a parameter to its default value double-click on the knob

Thorn offers a special convenient way to do modulation assigning and editing. This way can be successfully used instead of interacting with the Modulation Matrix in many cases. To assign a modulation to a parameter right-click on the knob and select the desired modulation source from the “Add Modulation” submenu of the popup menu.



When at least one modulation source is assigned to the parameter you can edit the modulation depth with the knob. To do that right-click on the knob, hold down the mouse button and drag up or down (left or right) in vertical (horizontal) direction. Alternatively, you can hold CMD (Mac) or CTRL (Win) key, left-click on the knob, hold down the mouse button and drag to adjust the modulation depth. The same results can be achieved by holding CMD (Mac) or CTRL (Win) key and scrolling with the mouse wheel. The colored arc displays the modulation depth while dragging the mouse.



You can assign more than one modulation source to the knob. To select the desired modulation source for editing the modulation depth right-click on the knob and select an appropriate menu item “Mod N [+XX%]” from the popup menu. To delete/disable all modulations assigned to the parameter right-click on the knob and select “Remove/Disable All modulations” menu item from the popup menu.

MIDI Learn

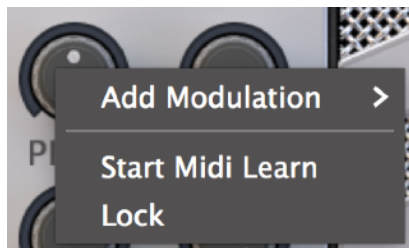
Many of Thorn's GUI controls support MIDI Learn.

- Right-click on the knob and choose "Start Midi Learn" from the popup menu
- Move the desired MIDI control on your controller. Thorn will automatically detect the MIDI control and assign it to the knob
- Choose "Clear MidiCC" from the popup menu if you want to remove the learned MIDI control

You can save all MIDI control assignments into a MIDI Map. How to work with the MIDI Map presets will be explained later.

Locking parameters

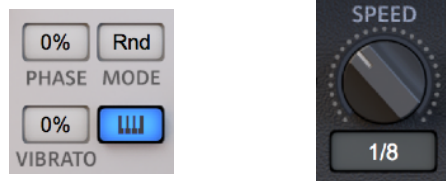
Thorn offers a possibility to prevent specific parameters from changes when you switch presets. This can be useful, for example, to lock the Volume parameter at a certain value while switching through presets. In order to lock a parameter select "Lock" command from the control's context menu:



Uncheck the "Lock" menu item to unlock the parameter. You could use the "Unlock All Parameters" command available in the Main Menu, to release all locks at once.

Working with value fields

Many parameters in Thorn can be controlled via their value fields.

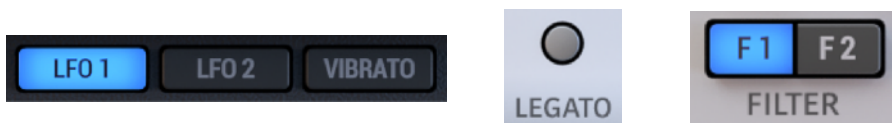


The value fields display text information about the associated parameter. You can perform the following actions on the value fields:

- To set the desired value right-click on the value field and select an appropriate menu item from the popup menu. Note that not all value fields have a popup menu. To change the value left-click on the value field, hold the mouse button and drag up or down in vertical direction
- For finer control of a parameter hold the ALT key while dragging the mouse
- To reset a parameter to its default value double-click on the value field

Working with buttons, switches and selectors

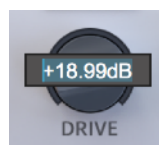
Working with buttons, switches and selectors in Thorn is straightforward:



- Simply click on the button to perform an action
- The first click on the switch enables a function. The second click disables the same function
- A selector is a mutually exclusive group of switches. Enabling one disables all others in the group

Editing parameter value

Thorn allows to enter parameter value from keyboard for most of GUI controls. Hold the SHIFT key and click the control to show it's value editor:



Enter desired value and hit the ENTER key to apply it or ESCAPE key to cancel. Note please, that not all controls allow to edit values.

The Top Bar and Master section



The Top Bar

The top bar in Thorn provides control over different aspects of the synthesizer behavior.

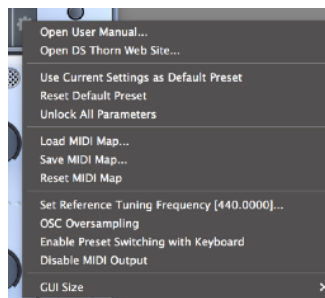
- **UP/DOWN.** Defines the pitch bend range in semitones
- **POLY.** Determines the voice mode. Thorn can play the sounds polyphonically or monophonically depending on the value of the POLY parameter:
 - **POLY.** In this mode Thorn plays polyphonic voices, as on a classic piano
 - **MONO.** This is a monophonic mode. Thorn stores all incoming notes, but only the last note is played. When the active note is released Thorn finds the previous last stored note and plays it and so on. For each of new notes that are played legato, all Envelopes are retriggered
 - **LEGATO.** This is the same mode as MONO, except that all Envelopes are not retriggered for notes that are played legato
- **VOICES.** Adjusts the maximum number of voices that Thorn can play at the same time
- **TUNE.** Adjusts the pitch of all voices in semitones
- **FINE.** Adjusts the pitch of all voices in semitones
- **DECLICK.** If you use the Amplitude Envelope with a zero Attack time, undesired voice clicks may occur. Set the DECLICK value to ON to smooth the clicks. However, these clicks can be used as a special effect for creating drum, bell or plucked sounds. Set the DECLICK value to OFF to allow the clicks
- **GLIDE.** Glide or portamento is a smooth pitch slide from one note to another. The GLIDE knob adjusts the amount of the sliding time
- **LEGATO.** There are two Glide modes in Thorn:
 - **SLIDE.** In this mode the pitch slide is performed for every note. The last played note is remembered by the synth and used as the starting note for the pitch slide to the next note. Turn the LEGATO switch OFF to activate SLIDE mode
 - **LEGATO.** In this mode the pitch slide is performed only for notes that are played legato. Turn the LEGATO switch ON to activate LEGATO mode

The **MIDI IN** led provides visual feedback for incoming MIDI messages. The **VOICES** display shows number of active voices played by Thorn.

The **Preset Browser** allows to manage presets available for use in Thorn and includes the following elements:

- The text area displays the current preset name. Click on the text area to select a patch from a popup menu, which displays all presets available for use as well as commands that allow to save/load/reset/reveal presets
- Two navigation arrows can be used to step through the patches in the forward or backward direction

The **Settings** button provides access to global setting and utility functions of Thorn. Click the **Setting** button in order to access the following popup menu:



- **Open User Manual.** Shows this user guide
- **Open DS Thorn Web Site.** Shows Thorn home page in your browser
- **Use Current Settings as Default Preset.** Allows you to mark the current patch as a template that is loaded when loading the default preset from the Preset Browser
- **Reset Default Preset.** Allows you to set the factory default settings as a default template
- **Unlock All Parameters.** Unlocks all parameters that might be locked via parameter's context menu

- **Load MidiCC map.** Loads a previously stored MIDI Map from the disk
- **Save MidiCC map.** Saves the current MIDI Map to the disk
- **Reset MidiCC map.** Loads an empty default MIDI Map

- **Set Reference Tuning Frequency.** Adjust reference frequency for A4 note, which is 440 Hz by default
- **Enable Preset Switching with Keyboard.** If enabled allows to switch through the available presets with keyboard Up (Right) or Down (Left) keys
- **Disable MIDI Output.** Enable this option if you have issues with MIDI recording in your DAW
- **OSC Oversampling.** Turns on oversampling for Oscillators. This attenuates the aliasing noise that occur when using PWM/SYNC/FM/RM oscillator modes. Oversampling increases CPU usage by improving sound quality. **Warning.** Make sure Oversampling is turned on only when you hear digital artifacts. When no digital aliasing is present, Oversampling does not improve the sound, it only increases impact on CPU
- **GUI Size.** Thorn GUI is designed to provide multiple sizes optimal for different screen resolutions. Try different GUI modes to find the one, which better fits your screen. As well, you can left-click on the Thorn logo image on the Top Bar to access quick GUI size menu.

Use the **Panic** button to reset the internal feedback states of all processing modules in Thorn:



The Panic function is useful for muting decaying tails of modules like reverb or delay, as well as for resetting self-oscillations which may occur in filters/delays.

The **Undo** and **Redo** buttons allow you to roll backwards or forwards any changes you made while adjusting any parameter of Thorn. Note please, that even preset changes and randomization results support undo/redo.

The Master section



The Master section is located at the right of GUI and provides a set of controls to adjust output parameters:

- **VOL**. Adjusts the level of the output sound
- **PAN**. Adjusts the stereo position of the output sound
- **BOOST**. Engages a special circuit that emphasizes low and high frequency content of the output sound
- **LO CUT**. Although processing modules in Thorn are designed to prevent DC offset, it is still possible in some rare combinations of effects to get DC fluctuations at the output. This is an undesired effect and it can be eliminated by turning LO CUT switch on and engaging a special low cut filter.

The Oscillators section

Thorn provides three Harmonic Oscillators with nearly the same functionality and separate Noise module.

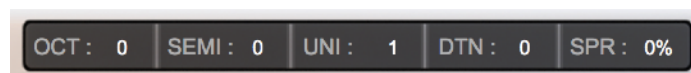


All Oscillators generate sounds by utilizing Spectral Synthesis method. This method allows to define exact amount of harmonics mixed together in order to produce complex output sound. Oscillators in Thorn uses 128 harmonics tables available for editing and processing with a set of spectral effects.

Each of three Oscillators has common controls. The Oscillator can be turned on with the power switch:



With the top panel you could control Oscillator's tuning:



- **OCT.** Adjusts the pitch of the generated sound in octaves
- **SEMI.** Adjusts the pitch of the generated sound in semitones
- **DTN.** Adjusts the pitch of the generated sound in cents
- **UNI.** Defines number of unison voices generated by the Oscillator
- **SPR.** Spreads all unison voices over the left and right channels according to the value set

Thorn provides 3 phase modes for the Oscillator controlled with the **MODE** selector:



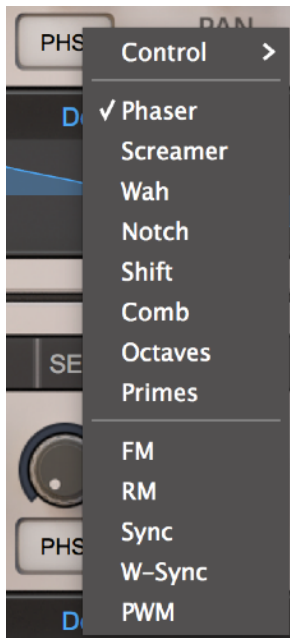
- **GATE**. In this mode phase of each voice is reset when the voice starts. Unison sounds in this mode has a harsh and distinct attack
- **FREE**. The free-running mode is useful for creating subtle unison sounds
- **RND**. The random phase mode. The phase of each voice get a random value at start. The mode is useful for achieving random timbre shifts per each key played

The **PHASE** control defines the starting phase of the Oscillator. The **VIBRATO** determines amount of the pitch modulation applied from the Vibrato LFO. If the **KEYTRACK** switch is turned on, the Oscillator will follow incoming MIDI note number.



Each Oscillator has an integrated SubOscillator, which generates a signal one octave below Oscillator's pitch. The **SUB** knob defines amount of the sub signal added to the output, while the value field below the knob allows to select one of three waveforms as a SubOscillator source.

The **OSCFX** control provides access to set of Spectral and Real-Time Effects, that process sound inside the Oscillator.



The Spectral Effects applied in spectrum domain and works with Oscillator's harmonics. Use the knob to define amount of the effect applied, the value field provides list of available modes:

- **PHASER**. Generates Phaser-like harmonics in the source spectrum
- **SCREAMER**. Rises "screaming" harmonics
- **WAH**. Produces "WAH-WAH" style effect
- **NOTCH**. Makes deep cuts in the source spectrum
- **SHIFT**. Shifts the source spectrum up by the specified amount
- **COMB**. Generates comb-filter-like spectrum
- **OCTAVES**. Duplicates source harmonics, shifts them few octaves up and mix with the source harmonics
- **PRIMES**. Emphasizes prime numbered harmonics in the source spectrum

Real-Time Effects operate in time domain, there are five effects:

- **FM**. Frequency modulation between two oscillators
- **RM**. Ring modulation between two oscillators
- **SYNC**. Synchronize Oscillator's phase with an internal master-oscillator
- **W-SYNC**. The same as Sync mode with an additional window applied
- **PWM**. Applies pulse width modulation to generated signal

NOTE. Both **FM** and **RM** require an additional Oscillator as a modulation signal. For instance, FM in OSC1 will use OSC2 as a modulator. OSC2 uses OSC3, while NoiseOSC is a modulator for OSC3.

The output section of the Oscillator provides **PAN** and **VOL** knobs to control stereo position and level of the output signal respectively:



Thorn has 2 independent filters. Each oscillator can route its output to both filters. Use the **FILTER** selector to specify which filter (or both) should process the Oscillator's output.

Use **COPY/PASTE** buttons to copy settings from one Oscillator and paste it to another one:



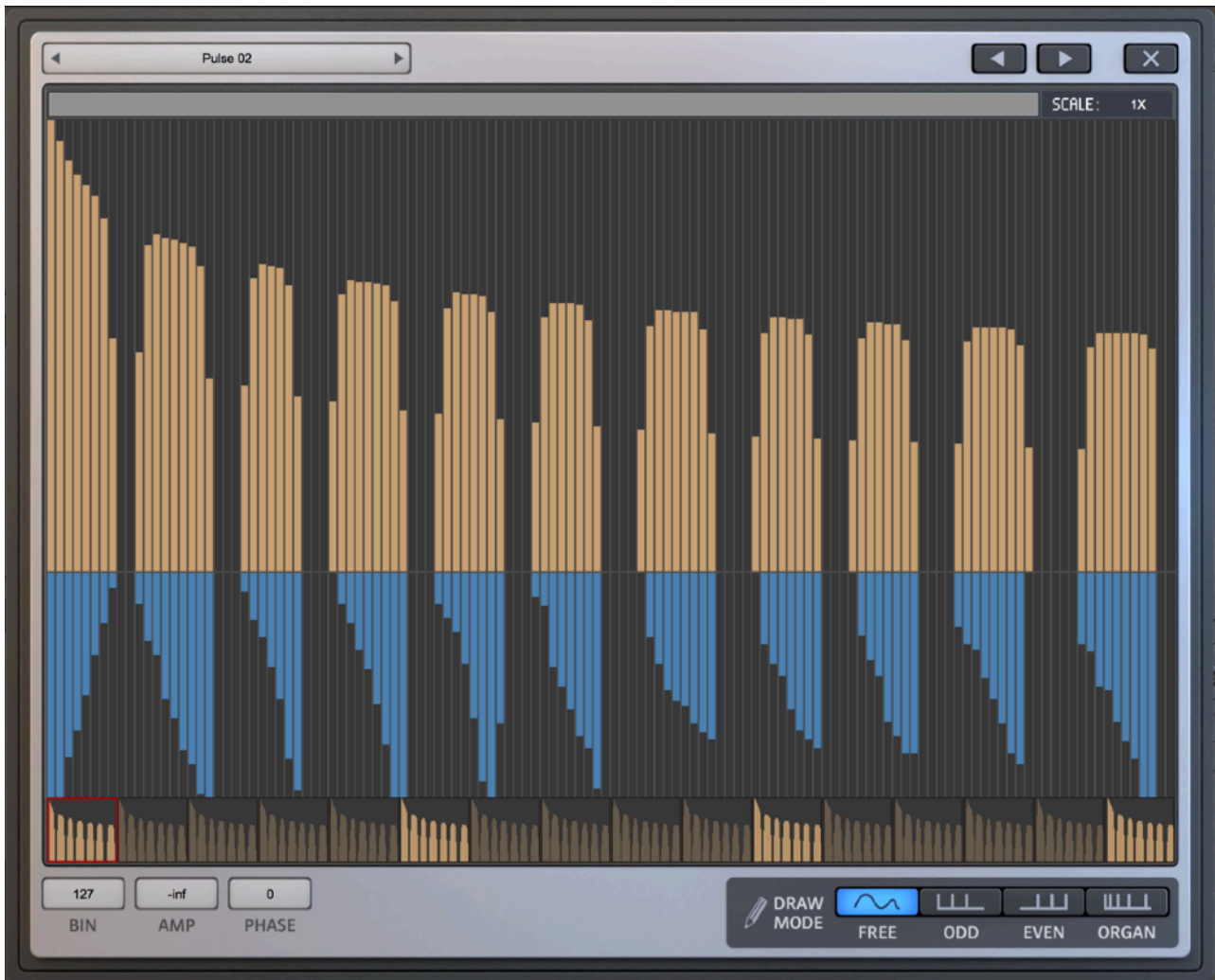
Each Oscillator uses spectrum tables of 16 frames to generate harmonics. The **POS** knob allows to morph between adjacent frames and produce smooth harmonic output:



The preset selector provides access to factory spectrum tables to be loaded into the Oscillator. Click the waveform display to access the Harmonic Editor.

The Harmonic Editor

The Harmonic Editor allows to edit spectrum tables. Each spectrum table contains 16 frames, consist of 128 harmonics. With the Harmonic Editor you could specify amplitude (orange lines) and phase (blue lines) for each 127 harmonic, the first harmonic is reserved and can't be edited:



Left-click on the editor, hold the mouse button and drag to draw amplitude and phase of harmonics. Click on the **Frame Selector** to choose one of 16 available frames to edit. Hold ALT key and drag any desired frame to move it to another position. The current frame is marked with the red outline.

Each spectrum table can contain two types of frames:

- **KEY** frames. Frames that actually contain user-defined harmonics
- **MORPH** frames. These frames do not contain any data, instead Thorn morphs between two adjacent Key frames to calculate harmonic content of the Morph frame. Morph frames are displayed as dim cells in the Frame Selector

The status bar below the harmonic editor provides useful information about current harmonics number (**BIN**), it's amplitude in decibels (**AMP**) and phase (**PHASE**):

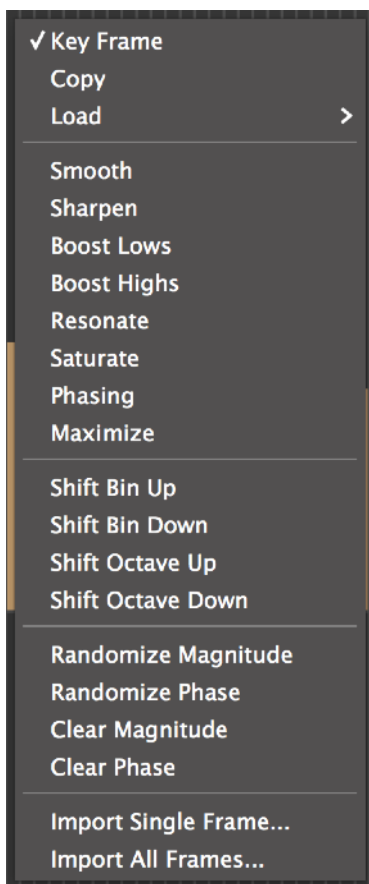


The Harmonic Editor provides four drawing modes for your convenience:



- **FREE.** In this mode you can draw all harmonics without restrictions
- **ODD.** Allows you to draw only odd harmonics, while all even harmonics are locked
- **EVEN.** Use this mode to draw only even harmonics
- **ORGAN.** This mode helps to draw organ-like harmonics

Thorn provides a set of commands that can be useful for editing spectrum tables. Right-click the editor to access commands menu:



- **Key Frame.** Marks the current frame as Key Frame
- **Copy/Paste.** Copies current frame's content, use paste command to paste the content to another frame
- **Load.** Provides a quick list of several predefined harmonic sets
- **Smooth.** Smoothes transitions between adjacent harmonics
- **Sharpen.** Make transitions between adjacent harmonics sharper
- **Boost Lows.** Emphasizes lower frequency harmonics
- **Boost Highs** Emphasizes higher frequency harmonics
- **Resonate.** Produces resonating harmonics
- **Phasing.** Generates sort of phasing effect
- **Maximize.** Normalizes amplitudes of all harmonics
- **Shift Bin Up.** Shifts the whole spectrum one harmonic up
- **Shift Bin Down.** Shifts the whole spectrum one harmonic down
- **Shift Octave Up.** Shifts the whole spectrum one octave up
- **Shift Octave Down.** Shifts the whole spectrum one octave down
- **Randomize Magnitude.** Generates random amplitude values
- **Randomize Phase.** Generates random phase values
- **Clear Magnitude.** Sets all amplitudes to zero
- **Clear Phase.** Sets all phases to zero
- **Import Single Frame...** Opens a dialog windows to import frequency content for current frame from a WAV-file
- **Import All Frames...** Allows to import frequency content from WAV-file to all frames

Once you applied any command to the spectrum table, you can repeat it without accessing the menu again. You can use **Next/Prev** buttons for that. Note please that some commands can be treated as "bidirectional". For instance if you have used "Shift Bin Up" command, then the Next button will repeat "Shift Bin Up" command, while the Prev one will invoke "Shift Bin Down" command.



The Noise Oscillator



Thorn provides a Noise Oscillator, which can generate a white noise and play arbitrary WAV-samples.

The **POWER** button turns on and off the Noise Oscillator. The **Preset Selector** allows to load predefined samples from the factory library as well as import an user sample from a WAV file.

The **LOOP** switch allows to enable or disable sample looping during playback. If the **KEY** switch is turned on, sample pitch will follow incoming MIDI note number.

The **PITCH** knob adjusts base pitch of a sample to be played, while the **OFFSET** knob determines it's start position.

The **PAN** and **VOL** knobs control stereo position and level of the output signal respectively.

The **FILTER** selector determines which filters will process the generated output.

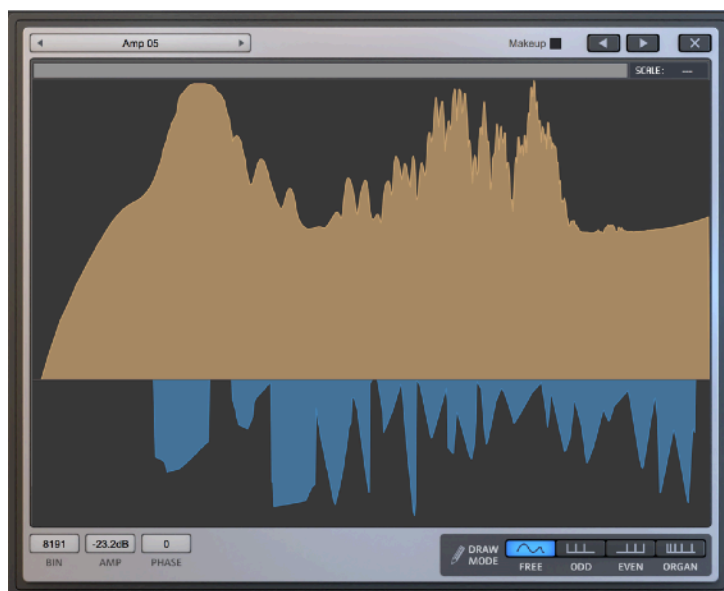
The Harmonic Filter

The Oscillators in Thorn generate harmonics according to Spectral Synthesis method. This allows to "post-process" generated harmonics with a special filter, which operates with harmonics instead of real-time audio. The Harmonic Filter takes 128 harmonics from each Oscillator, applies a spectrum curve to them, and converts harmonics into an audio signal. The Harmonic Filter can be treated as an equalizer, that boosts or attenuates certain harmonics in the Oscillators.



You can use the **Preset Selector** to load different curves to be applied to the input spectrum. The **SHAPE** knob shifts filter's curve up or down in frequency. The **BALANCE** knob adjusts amount of low and high frequency content in the output spectrum.

Click on the Preset Selector to open Harmonic Filter Editor, where you can edit filter's curve:



The Harmonic Filter's editor provides the same controls, commands and operation modes as the Oscillator's Harmonic Editor does. However, Harmonic Filter's editor has no frame selector and number of editable harmonics is 8192.

The Filters section

Thorn provides two independent analog modeled, high quality filters, that can process sound in serial or parallel.



Both filter can be set to operate in different modes:

- **CLEAN LP/BP/HP**. Analog filter with a zero delay feedback topology and 24dB/octave slope. You might consider it as the best filter for LEAD sounds
- **DIRTY LP/BP/HP**. Analog filter with a zero delay feedback topology and 12dB/octave slope. Provides strong self-oscillations at high resonance values. Probably the best choice for BASS sounds
- **FAT LP/BP/HP**. Analog filter with both 12 and 24 dB/octave slope. Nice alternative to CLEAN and DIRTY modes
- **CRISP LP**. Analog zero delay feedback filter with a highly strong self-oscillations
- **SUBTLE LP**. A very soft analog filter with a gentle saturation, probably the best choice for UNISON/PAD sounds
- **BANDPASS**. Handful 48 dB/octave bandpass filter
- **HYPERCOMB**. Multi-comb filter optimized for making formant-like sounds

The key component of the Filters section is **DRIVE** control. The DRIVE boosts input signal in order to saturate internal stages of the filters. The saturation effect is very different for each filter type. You might consider always trying to tweak the DRIVE control whenever you would like to achieve "Punchy" or "Sparky" effect.

The **KEY TRACK** and **VEL TRACK** controls determine response of both filters to note pitches and velocities respectively. The **CUTOFF** knobs adjust cutoff frequencies of the filters, the **RES** - amount of resonance. The **ENV** knobs control amount of modulation applied to the cutoff frequency, while the selectors under the ENV knobs allow to choose which envelopes to use as modulation sources. The **VOL** knobs control amount of signal of each filter routed to the output.

The filters by default operate in parallel mode. The **F1** switch engages serial scheme for the Filter 2 and routes output of the Filter 1 to the input of the Filter 2. The **OSC** switch can bypass signal that is sent by the Oscillators to the Filter 2.

The **LINK** switch is useful to link the Filter 2 controls to the Filter 1. For instance, if the LINK is turned on, the cutoff control of the Filter 2 will always follow the cutoff control of the Filter 1.

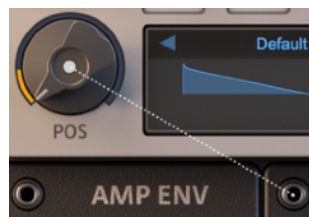
The Modulators section

Thorn offers 3 analog modeled envelopes, 2 LFO, Vibrato and 2 multi-stage envelope as modulators:

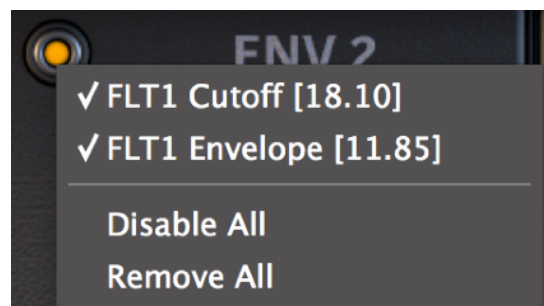


Drag and Drop

Thorn provides an additional easy way to assign and edit modulations. Hold the mouse button down on a switch with a socket icon at the top of each modulator and drag onto any desired parameter to assign a modulation:



For additional convenience, Thorn provides a popup menu, which displays all modulations assigned to a modulator. Right-click on a corresponding switch with a socket icon to open the menu:



The switch is lit when any modulation is assigned to the modulator:



The Envelopes

There are two general-purpose Envelopes and Amplitude Envelope available in Thorn:



The Amplitude Envelope (**AMP ENV**) is internally connected to control the output volume. **ENV1** is by default assigned to modulate the Filter 1 and 2 cutoff parameter. **ENV2** has no default assignments.

All three Envelopes has the same controls:

- **ATTACK**. Adjusts the amount of time taken to reach the maximum level after a note is played
- **DECAY**. Sets the amount of time taken to lower the level down to the Sustain Level
- **SUSTAIN**. Defines the Sustain Level that is held while the note is pressed
- **RELEASE**. The Release stage is started, when the note has released. Use the **RELEASE** knob to define the amount of fade-out time
- **KEY**. Controls the sensitivity of the Envelope to pitch. At higher pitch values the Envelope shortens all time values
- **VEL**. Defines the sensitivity to velocity. At higher velocity values the Envelope raises the Sustain Level faster

The LFOs

There are two LFOs and Vibrato available in Thorn:



The **SPEED** control sets the frequency of the LFO, use the correspondent value field to select exact time values from the popup menu. The **SYNC** switch selects whether SPEED controls the timings in seconds (OFF) or in beat divisions (ON). The **SHAPE** knob determines the waveform of the generated modulation signal. Use the **PHASE** knob to set start phase of the LFO signal.

The LFO can run in different modes defined by the **POLY MODE** value field:

- **POLY**. In this mode the LFO generates signals on the per-voice basis. Each new voice restarts the phase of the LFO
- **MONO**. The LFO produces the same signal for each voice. The phase is never restarted
- **MONO SYNC**. The same as MONO mode, however the phase of the LFO is controlled by the Host playback position

The **FADE IN** parameter adjusts the time of the gradual amplitude level fade in. The **AMT CTRL** allows you to select one of the available modulation sources, which will control the LFO's amplitude. The LFO can produce both monopolar (signals in [0, ..., +1] range) and bipolar (signals in [-1, ..., +1] range) signals. Turn the **BIPOLAR** switch to ON to activate the bipolar mode.

The Vibrato has less parameters than the LFO, all controls in the Vibrato has the same functions as ones in the LFOs:

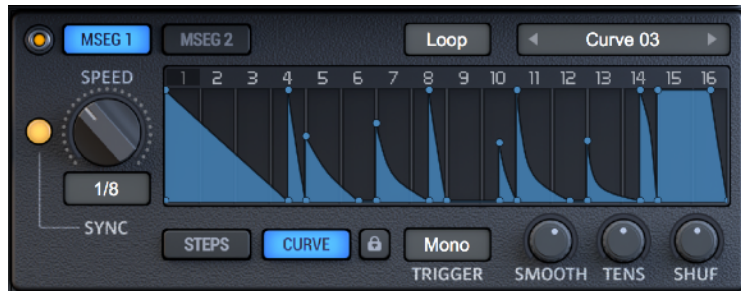


The Multi-Stage Envelopes

Thorn provides two Multi-Stage Envelopes, which can operate in **STEPS** and **CURVE** modes:

- **STEPS**. In this mode the modulator produces a series of steps with an adjustable level
- **CURVE**. In this mode the generated modulation signal is a set of variable-slope curves

The CURVE mode



In the **CURVE** mode you can define up to 64 nodes, which connected by curves with adjustable slope. In order to create your custom modulation shape you can:

- Right-click on the editor to add a node
- Left-click on the node, hold the mouse button down and drag to define the node's position
- Right-click on the node to delete it. Note that the first and the last node can't be deleted
- You can delete several nodes with a single click. Right-click on the node, hold the mouse button down and drag over the other nodes you want to delete
- Click on the desired line between two nodes and drag up or down to change the slope. Note that you don't need to click exactly on the curve. To reset the slope and make the line straight double-click on it

In the CURVE mode you can use one of two available edit modes:



In the **SLIDE** mode, if you change the node's position, then all nodes to the right of the selected one change their positions as well. In the **LOCK** mode you can move the node only within the distance between neighboring nodes. Please note that in the Step mode the Slide/Lock switch is disabled.

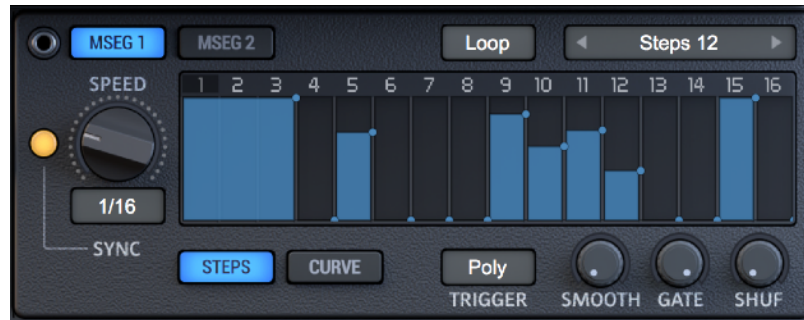
Additionally in the CURVE mode you can adjust overall slope of your shape with the **Tension** knob:



The **Shuffle** knob controls the swing amount applied. The swing effect is produced by pulling every second step of the curve forward in time. Please note, in the STEPS mode only odd steps are affected by the swing effect.

The **Loop Mode** control defines whether the curve will be played only once per voice (Oneshot) or looped (Loop).

The STEPS mode



The **STEPS** mode allows you to create modulations composed from series of steps with adjustable levels and width.

- Left-click on the node, hold the mouse button and drag in horizontal direction to define width of the step and in vertical direction to define step's level.
- Right-click on the background between two nodes to reset level of the step
- Left-click on the background and drag the mouse in both directions to consecutively define levels for multiple steps

You can change the number of steps generated between 16 to 2. Left-click the header of the editor, hold the mouse button and drag left or right to define number of active steps:

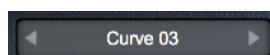


In the STEPS mode you can use the **Shuffle** control, which operates in the same way as in the Curve mode, but affects odd steps instead of even ones. As well there is an additional **Gate** knob:



The Gate control allows you to fill each generated step with silence. The width of all steps is shortened by the Gate amount, while the start position of each step preserved. Note please, the Tension control disabled in the STEPS mode.

There is the Preset Selector control, which allows you to manage predefined and custom presets for the modulator:



The **Loop Mode** control defines whether the curve will be played only once per voice (Oneshot) or looped (Loop).

The Glitch/Arp/FX/MM section

Thorn provides a four-tab control to navigate between the Glitch Sequencer, the Arpeggiator, the Effects and the Modulation Matrix pages. Use the tab selector to open respective pages:



Use the **LOCK** button to prevent each section from changes when switching through presets:



The Glitch Sequencer

The Glitch is a rhythmic effect that "deconstructs" sound on a pattern-based grid of effects.



The sequencer provides a grid of 16 x 6 cells. Each cell represent a glitch effect that is applied to the input signal. The effects can be applied with variations at each of 16 available steps. There are 6 different effects:

- **RP**. Repeater. Latches a part of the input signal and repeats it several times, the value set on the grid determines how many times the signal is repeated
- **LP**. Low Pass filter with a cutoff frequency controlled by the grid value
- **HP**. High Pass filter with a cutoff frequency controlled by the grid value
- **BT**. Bit Crusher. Reduces bit resolution of the input signal by the amount specified by the grid value
- **SR**. Sample Rate Reducer. Resamples the input signal at a lower sample rate. The grid value defines decimation factor
- **GATE**. Applies a gate effect, the grid value controls how long the input signal is muted

There is a **Randomize** button in each row of effects, which allows to generate random effects values across all 16 steps:



Use the arrow buttons to shift the grid left and right.

The top panel of the Glitch Sequencer provides access to several global module's parameters:

- **SPEED**. Sets the speed at which each single step is played
- **STEPS**. Defines number of steps of the grid that are used for processing
- **SYNC**. Determines the synchronization mode of the Sequencer:
 - **KEY**. The Sequencer is reset when a key is pressed
 - **ENV**. The Sequencer does not reset until the amplitude envelope is released
- **MIX**. Adjusts the balance between the input and processed signal
- **PRE FX**. The Sequencer can be inserted in the processing chain before the Effects section (ON) or after it (OFF).

There is as well a Preset Selector, which allows to manage predefined and custom presets for the Glitch Sequencer.

The Arpeggiator



Thorn provides the Arpeggiator module, a MIDI processor that generates sequences of notes: The center part of the Arpeggiator is occupied by the pattern editor, which is used to define the notes played. The editor consists of four sections of four steps. Each step is used to generate a note and provides several controls to define the note properties:

- The **NOTE** value fields define the pitch that is added to the pitch of the pressed key
- The **GATE** value field allows you to shrink the duration of the generated note
- Use the **VEL** slider to set the velocity of the generated note. To change the slider value click on the control, hold the mouse button and drag up or down
- If the **TIE** switch is turned on then two notes of the adjacent steps are played legato

Use the arrow buttons to shift the pattern left and right.

There are a set of controls located above the pattern editor:

- The **SPEED** value field defines duration of the generated by each step note
- The **STEPS** value field sets the number of steps used to generated sequence
- The **MODE** value field determines the order in which the Arpeggiator plays pressed notes:
 - **UP**. The notes are played from the lowest to highest one
 - **DOWN**. The notes are played from the highest to lowest one
 - **UP-DOWN**. The notes are played from the lowest to highest one and back
 - **DOWN-UP**. The notes are played from the highest to lowest one and back
 - **RANDOM**. The notes are played in the random order
 - **POLY**. All pressed notes are played at the same time
 - **MONO**. Only the first note is played
- The **OCTAVES** value field sets the number of octaves for the generated arpeggio
- Use the **SHUFFLE** value field to define the swing amount
- The **GATE** value field adjusts the global hold time for the generated by each step note

The Preset Selector can be used to manage the Arpeggiator's presets and reset all parameters of the module to their default values.

The Effects section

Thorn has 9 high quality effects organized as a serial chain.



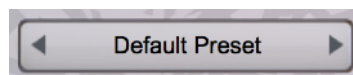
You can adjust processing order of the effects with the **Routing** control:



Click the module, hold the mouse button and drag in horizontal direction to define the position of the module in the processing order. The power switches enable/disable individual effects.

All nine effect has two common elements with the same functions - the Preset Selector and Mix knob.

With the Preset Selector you can manage presets for each effect:



The Mix knob adjusts balance between DRY and WET signal:



The Distortion

This effect provides a high quality multi-stage circuit-modelled distortion:



The **DRIVE** knob controls the amount of amplification of the incoming signal before it enters the distortion stages. Turn the **BOOST** switch on too add an extra 18 dB amplification and get extreme saturation, for subtle results turn the **BOOST** switch off.

Before transforming audio at the main distortion stage it is preprocessed in a special Fuzz stage, which provides a model of a classic analog fuzz pedal. With the **FUZZ** control you can adjust the amount of pre-distortion, which results in altering the high frequency contents.

After the Fuzz section signal enters the main distortion stage. The **MODE** selector allows you to choose different distortion modes, which used for processing in the main stage.

The output of the distortion stage is processed by the Tone section, which actually consist of a specialized filter chain intended for the simulation of tonal changes inside analog amplifiers. Use the **TONE** control to alter the color of the output sound.

Finally, the signal at the output is sent to a serial chain of a high pass and low pass filter. Use **HP** and **LP** knobs to adjust filters cutoff. The **POST** switch determines position of the filters in the processing chain. If the **POST** switch is turned off, the filters process the output wet signal only. If the **POST** switch is turned on, the filters process the post-mix-fader output signal. In this case, the filters do not depend on value of the **MIX** control, this allows to use the filters as an extra filter chain at the end of synthesizer's processing path.

The LoFi

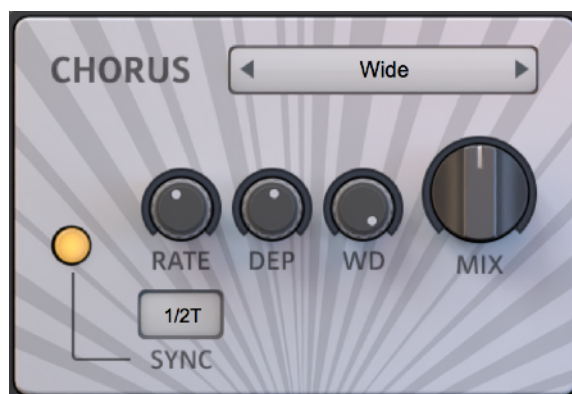
The most common use of the Lo-Fi effect is to destruct the incoming audio signal. Sounds processed by the Lo-Fi effect get a harsh, digital and dirty character.



The **BIT** knob allows you to control the amount of sound degradation by reducing the bit depth of the signal. The Lo-Fi module also includes a decimator stage, which destroys your sounds by resampling the signal at a lower sampling rate. With the **SRC** control you can adjust the decimation factor. The **TONE** control allows you to change the color of the output sound. Algorithms behind the TONE control simulate the spectral loss in the telephone lines.

The Chorus

The Chorus effect is used to simulate an ensemble of several instruments through the mixing the input signal and some number of its delayed copies. Use the Chorus to add wideness and warmth to your sounds.



The **RATE** and **SYNC** controls define the speed of an internal LFO that is used to modulate the delay time. The **DEPTH** knob controls the modulation depth. The **WIDTH** knob adjusts the width of the generated stereo image.

The Phaser

The Phaser effect is used to create moving frequency peaks and notches in the spectrum of the input signal. The effect makes the sound “talking”.



The **CENTER** knob adjusts the frequency of the middle peak. The **FB** knob controls the resonance of the effect, or the “height” of the peaks and notches. The knob is bipolar, the feedback is negative if turned to the left, and positive if turned to the right. Use the **WD** knob to adjust the width of the generated stereo space. The **RATE** and **SYNC** controls define the speed of an internal LFO that modulates the frequency of the middle peak. The **DEP** knob controls the modulation depth. Use the **PHASE** field to set the starting phase of the LFO.

The Flanger

The Flanger is a common classic effect produced by mixing the input signal and some number of its delayed copies. The Flanger widens your sounds and colorizes them.



Use the **DLY** control to adjust the delay time between the input signal and its delayed copies. The **FB** knob controls the amount of output signal that is sent back to the input. The **WD** knob defines the width of the produced stereo image. The **RATE** and **SYNC** controls adjust the speed of an internal LFO that is used to modulate the delay time, while the **DEP** knob defines the modulation depth. The **PHASE** field sets the starting phase of the LFO.

The Delay

The Delay is the most commonly used effect for adding dimension into sounds. Producing rhythmic decaying echoes is another major utility of the Delay effect.



With the **LEFT** and **RIGHT** control you can adjust the delay time for the left and right channel respectively.

A part of the output signal is sent back to the input of the Delay effect. The **FB** knob controls the amount of the output that is sent back. The **LP** and **HP** controls allow to adjust the cutoff frequency of the Lowpass and Highpass filter applied to the feedback signal respectively. Use the **WD** knob to narrow stereo image of the WET signal.

The Reverb

The Reverb effect is used to add a dimension to your sounds. Thorn provides PLATE and SPACE reverb models, use the **MODE** selector to choose the model.

Plate Reverb. Emulates plate reverb sound, provides less controls than SPACE model. Performs better on percussive sounds.



Space Reverb. Generates more dense space than PLATE model. Performs better on PAD and atmospheric sounds.



The **PRE** knob controls delay time before the reverb starts. With the **SIZE** control you can adjust the size of the simulated virtual room. Use the **DAMP** to define the time it takes for the reverb to fade out. The **LO** and **HI** knobs control the boost amount performed by the low pass and high pass filter inserted into the feedback path. These filters are used to simulate the dampening of high and low frequencies in natural acoustic spaces.

The Equalizer

The three-band Equalizer can be used to adjust the frequencies of the sound, before it hits the output:



Use the **G BASS**, **G MID** and **G HIGH** knobs to control the boost of low, middle and high frequency content respectively. The knobs are bipolar. The boost is zero when the knob is in the center position. The **F** knobs define the center frequency of the filters.

The Compressor

Although dynamic effects can rarely be found in synthesizers, Thorn provides a generic compressor to control dynamic range of the generated sound.



The **THRES** and **RATIO** knobs are the standard threshold and compression ratio controls. The **ATT** knob determines how fast the compressor reacts to the input dynamics. The **REL** knob controls how fast the compressor 'relaxes' when the input level has fallen below the threshold. Use the **OUT** knob to adjust output volume.

The **GR** is a gain reduction meter, it shows how much the gain is reduced when the compressor activates.

The Modulation Matrix

There are 27 modulation slots available to maintain all modulation assignments in Thorn.



Use the Page Selector at the right to access one of three available pages. Each page contains 9 modulation slots. Each slot in the Matrix is used to define the link between Modulation Source, Modulation Control and Modulation Target. Click the **SOURCE**, **CONTROL** or **TARGET** text fields to access the menu, where you can select available modulation sources and destinations. Use the **DEPTH** control to adjust the modulation depth. Additionally you can bypass individual slots by clicking the **BYPASS** switch located near each slot.

The modulation to be applied is calculated by the following formula:

$$\text{modulation} = \text{source} \times \text{control} \times \text{depth}$$

where 'X' denotes multiplication. If the CONTROL is not selected then it is treated as being equal to 1 and the formula transforms to:

$$\text{modulation} = \text{source} \times \text{depth}$$

Credits

Concept, programming, sound design

Dmitry Sches

Graphic design

VOGER Design

<http://vogerdesign.com>

<https://www.facebook.com/vogerdesign>

Updates, Support and Contact

If you have any questions, need help or want to check for updates please visit our web site at <http://www.dmitryshes.com>. Feel free to use the contact form on the website, we are always happy to support you.