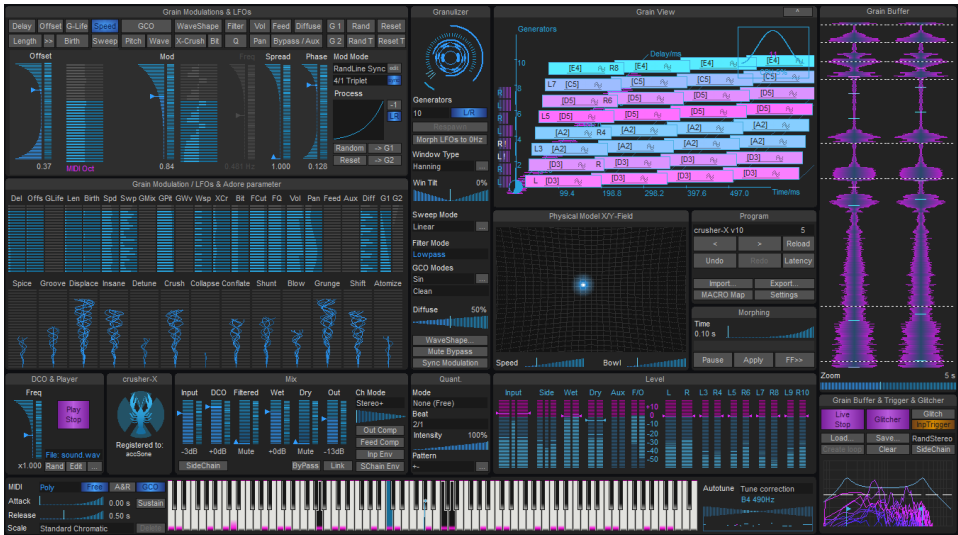


# USER MANUAL



# crusher-X 10

polyphonic multichannel live granular synthesis system

accSone

it's your sound design

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# 1. Welcome!

## **Granular Synthesis revolutionized Sound Design, Electronic and Experimental Music! crusher-X does advanced polyphonic multichannel granular synthesis on live input in real-time**

crusher-X granular synthesizer effect plug-in for Windows (VST 2+3, AAX) and macOS (AU, VST 2+3, AAX, native Silicon/M1 support)

Its powerful algorithm creates very complex sounds, drones and outstanding surround effects. Since 1999, the crusher-X trademark has been "the" granular effect standard. crusher-X is used by famous sound-designers, composers, musicians and film-makers all over the world.

### **Key features:**

- Real-time live, glitch and static, polyphonic and multichannel granular synthesis engine that creates grains from live input signals or sound files
- Real-time modulation of all Grain Modulations: Delay, Length, Birth, Offset, GCO Mix, GCO Pitch, Speed, Sweep, WaveShaper, X-Crush, Bit-Crush, Filter, Diffuse, Volume and Pan
- Real-time, spectral, interactive, formant wave selection/trigger filter
- MIDI Polyphonic Expression (MPE) support
- Sidechain as an alternative audio input or to modulate, trigger and spawn grain modulation
- Grain Controlled Oscillator (GCO) system - crusher-X has Oscillator and Sample grain print-ins that can be generated and mixed with the live- or sidechain input
- Grain Controlled MIDI (GCM) system - crusher-X can generate MIDI Notes and MIDI Controllers along with each grain to keep external sound or light systems in sync with the grain generation
- Grain Life-Time (GLT) System - The life-time of each grainstream can be controlled via UI, LFOs, MIDI and the Live and Sidechain Audio Input
- Autotune and Pitch tracking system
- Unique Grain Controlled Feedback (GCF) system for shimmer reverb design
- Up to 10-channel surround outputs (e.g. 5.1, 6.1, 7.1, 8.2, 9.1) incl. 7.1.2 Atoms bed layout
- Microtonal tuning. Tuned Speed, GCO Pitch and Filter-Cut modulations (Grain-Arpeggiator). Comes with hundreds of different tuning scales and MIDI keyboard control
- Up to 199 individual grain streams (generators) that have multi-core CPU support
- Physical modeling sliders and an unique physical modeling X/Y controller
- Unique 3D grain visualization
- Unique "Grain-Drop" vertical live Grain Buffer visualization
- Real-time Grain Window Tilt functionality
- Over 240 preset programs
- Over 430 assignable real-time plug-in parameters grouped in categories (VST3), free real-time MIDI control assignments
- Factory sounds created by Richard Devine, Robert Dudzic, Ulrich Müller, Andrew Huang and accSone. Unique ASMR sound bank
- Morph system with editable morph curve to morph seamless between parameters changes and between programs
- Undo/Redo and randomize functionalities
- Over 4300 LFOs. Each Grain Modulation has their own individual set of LFOs for each Generator
- 2 Global 4 Slot Grain Modulation Matrices (GMMs) with free assignable modulation targets
- LFO phase and frequency spread modulations (you can spread modulations over several grain stream generators)
- LFOs, Live Triggers and Grain creation can be bound to the tempo of the DAW (beats / second)
- Free editable Envelope Follower for additional Grain modulations
- Grain lengths up to 60 seconds
- Shadow programs
- Meta modifications with 13 adore parameters
- Several granulation live-buffer and freeze modes: Can easily switch between live processing to file processing
- Can stop and save the live granulating buffer at any time
- DCO generator with sample-player. Several player and looping modes
- Offline rendering
- Automatic triggered grain buffer filling modes
- Auto-Normalization during loading of soundfiles
- Two free editable multi-channel Compressor/Expander/Limiters to stabilize feedback and output level
- Smart latency compensation and overload detection system

- Integrated interactive quick-start tutorial
- Screen-less control for sight impaired composers and musicians

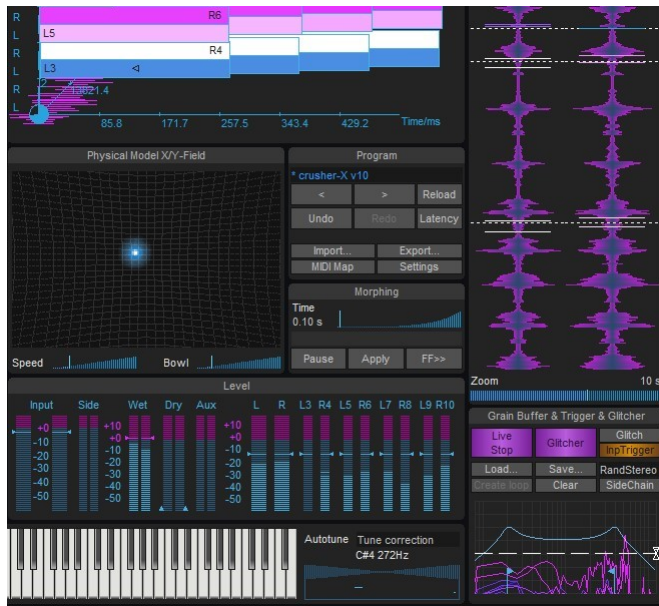
## 2. New in version 10

This is "Glitcher-X" upgrade of crusher-X ! Consider this major version 10 upgrade as a milestone in granular synthesis as it introduces a unique grain generation mode called Glitcher-X!

Switching crusher-X to the Glitcher mode will let your grains surf on an audio wave event! This leads to glitching beats, surround slips, crazy audio jumps, short-term loops and hipster sound scratches. Glitcher Mode anchors grains to auto-selected incoming life audio events and modulates the grain around these anchor points during the grains life-time. A controllable spectral selector will help you to mask the audio input and auto-trigger the respawn of a grains to the next audio transient in the incoming pipe. Expect nothing but less than the next level of granular life experience! This upgrade comes also with a new set of raw ASMR (Autonomous Sensory Meridian Response) sounds are added as a source for granular sound design to make your audience shudder and cringe. The new live spectral controlled transient sensitive trigger system with a twin filtered interactive frequency selector allows to create way more sophisticated grain buffer fills, glitch selections, respawn and quantization event triggers. The output of this interactive formant filter can be used as an additional input signal for the Granulizer. This opens the door for sophisticated granular filtered sweeps and advanced and color rich drones. And crusher-X 10 supports professional sound design studios with providing an AVID AAX version for Windows and macOS (incl. native Silicon / M1 support)!

### **Glitcher-X - let the grains surf the wave**

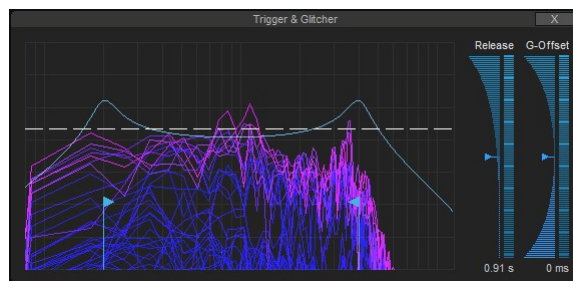
You probably know the "[Eisbach Wave](#)" in Munich? If you come to Munich on your next Germany trip, make sure you drop by and discover this beautiful energized and special place! There are those city surfers waiting in a line to jump on the wave and perform their rides looking for a moment of fame! This is basically what happens when you turn crusher-X into Glitcher Mode: Imagine a grain sitting at the river bank of the audio stream, relaxed but ready to ride the ultimate wave! As soon as the desired wave drops by the grain jumps on the flow and starts performing their moves and modulations until its lifetime is over and it drops off. A so called transient selector vowel filter detects the best moment to jump on the audio stream and the grain adheres on that position. As controlled by the regular Grain Modulations the grain will modulate around its known position. This will happen for each generator (so there will be several grains avail to ride the incoming audio wave) and one can chose how the current trigger will be populated to the different generators. The life-time of the grain will determine the length of each ride and after the drop (death) of the grain a next selection trigger will respawn it again. The result of this unique algorithm is mind-blowing: Glitching beats, audio slips, crazy jumps, loops, scratches - a new universe of life interactive sound design gets at your fingertip. Imagine to use it together with a microphone and your instrument. You will control the river stream and crusher-X will surf on it! You could even create a glitch manually with assigning the Glitch button to a foot controller - curtain up!



*crusher-X 10 introduces Glitcher-X!*

## The spectral selector

Fast detection of interesting sound events in live streams is quite tricky. A spectral response approach combined with a fast real-time state machine is a new crusher way to discriminate between silence, tonal, vocal or spectral interesting parts of an incoming audio stream in real-time. To control this job crusher-X 10 introduces a unique trigger control that allows to select the desired spectral trigger range and its sensitivity with simple mouse moves. The trigger is auto sensitive that means it works on all audio levels, detecting a relative change, not an absolute level. This new trigger system is wired up with the Grain buffer Fill, Respawn and Glitch position launches. And as you already controlling this unique formant filter, you can add the outcome of its spectral manipulation as an additional input signal to granulize. Become ready for sophisticated granular filtered sweeps and advanced and color rich drones. And sure the filter sweeps are morphed by the crusher-X Morphing System.

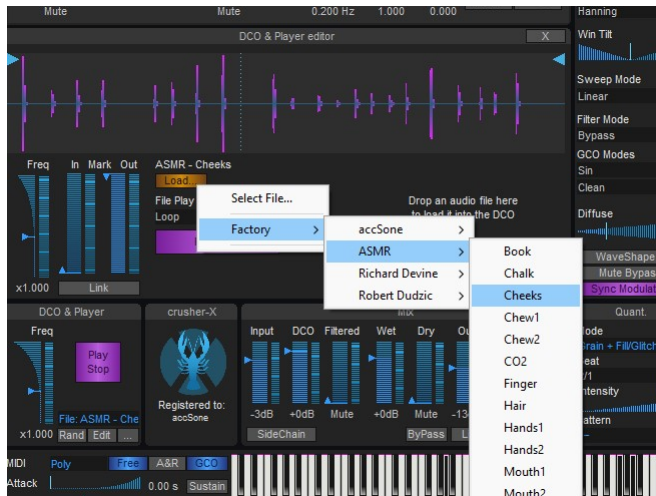


*Spectral Selector Formant Trigger*

## ASMR Sounds ready to become a granulized

ASMR ([Autonomous Sensory Meridian Response](#)) sounds are crazy: The listening will likely triggers a physically tangible reaction for the listener. crusher-X is likely the first software that thinks ASMR sounds together with granular synthesis. Give it a try to let these tiny, fine and quite snippets shimmer around your audience bodies and hijack them into an sensuality experience.

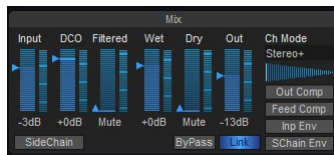




*crusher-X 10 comes with a fine selection of ASMR sounds ready to be granulized*

### Stereo Width Panner

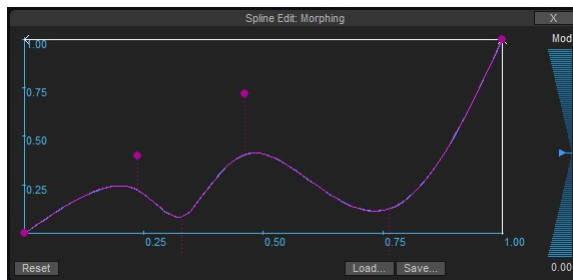
Grain Modulations can be bound to Stereo Pairs but depending on the program the output of the granulizer might create very wide stereo left/right audio pannings. crusher-X 10 introduces an easy way to shrink down the stereo width with a simple panner added to the mixer.



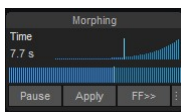
*crusher-X 10 Mixer*

### Next level morphing system

Version 10 comes with a completely reworked morph system. It allows to morph up to 3600 seconds between the most parameters in a smooth way. And one can create a self defined morph curve that allows to morph with a specific "drama" in mind. Even the Morph Position could be controlled with a slider, by MIDI or by a plug-in parameter. With that possibility a simple morph between programs transforms to an individual designed "sound gesture".

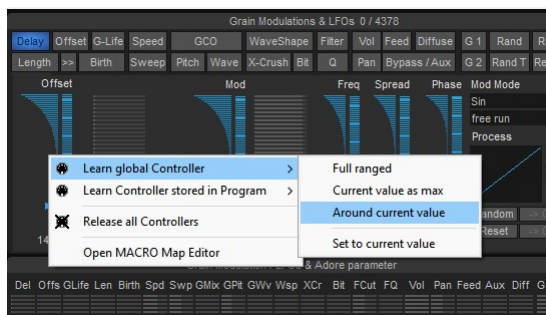


*crusher-X 10 editable Morph curve*



*crusher-X 10 Morph System*

## Macro Controllers stored with Programs

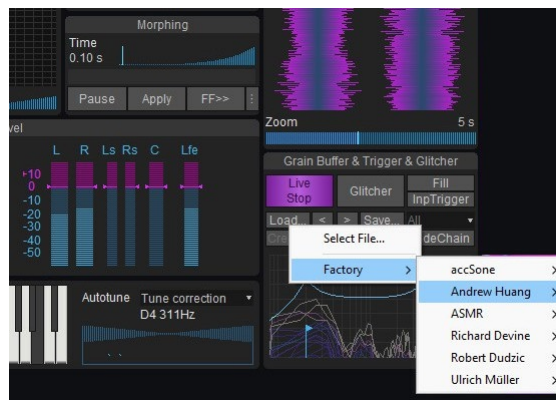


*Macro Controllers can be stored globally or with a Program*

crusher-X 10 allows to store Controllers in a Program. With that feature the same MIDI Controller can act as a "Macro Controller" to control crusher-X differently depending on the setting of the current program. 8 initial unassigned Macro plug-in parameters are available for being utilize as additional Controllers. Thanks to Aphex Twin for this feature request that increases the flexibility of crusher-X for the use during live performances!

## Andrew Huang and Ulrich Müller factory sounds

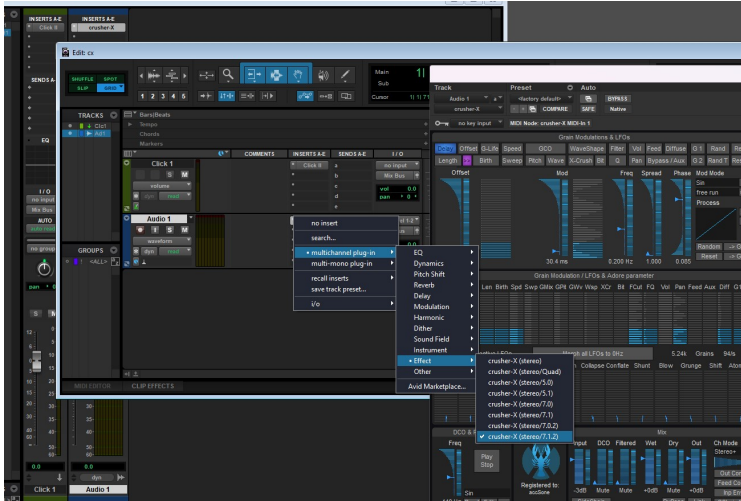
crusher-X 10 features new factory sounds designed by the Canadian YouTube personality, musician, and video producer Andrew Huang as well as by the composer and sound designer Ulrich Müller. Enjoy to take these sounds as an inspiration and starting point for your own granular journey!



*crusher-X 10 "Andrew Huang and Ulrich Müller" factory sounds*

## AAX plug-in Versions

Having Protocols in your studio? With the new AAX plug-in versions of crusher-X 10 you can utilize this unique sound design tool natively in your Atmos surround production. crusher-X 10 is avail as Windows and macOS (including an native Silicon/M1 version). crusher-X AAX supports full flexible stereo and surround configurations up to 7.1.2 channels.



*crusher-X 10 is avail as Windows and macOS (including an native Silicon/M1 version)*

## macOS standalone version

Just want to use crusher-X live on macOS without the overhead of a DAW? crusher-X 10 comes with a 4 channel input and 10 channel audio output, native standalone version for mac (including Silicon/M1 support). It also supports multichannel MPE MIDI input and output. (the feature set is similar to the Windows standalone).



*crusher-X 10 comes with a multichannel audio and MIDI macOS stand alone version*

And of course crusher-X 10 comes with many additional features like the soft bypass function, bug fixes, tweaks, UI and engine improvements (like e.g. 110 and 140% UI scaling). Start now with your granular journey and enjoy the "most powerful granulator on the market" (customer quotes)!

### crusher-X 10 Release Notes:

- Adds Protools AAX plug-in format (64bit, macOS & Win)
- Adds Glitcher-X Mode to "glue" grain modulations to auto detected transients of the input signal
- Adds Formant Input Filter with Input Transient detection to fire triggers of Fills, Respawns and Glitches
- Adds Trigger Mode Types that allow to control a sequence of triggers applied for each generator
- Adds manual or quantization to glitch and respawn triggers
- Adds Morphed Soft-ByPass
- Adds Stereo Width panner to shrink down the Stereo Width of the output streams down to Mono
- Adds a Level Meter reset if signal flow is stopped
- Adds the DCO/Player to the input filter sources if not in side chain mode
- Adds Play/Stop behavior to DCO/Player for the raw wave forms
- Adds 110% and 140% UI Scale Modes
- Adds several factory sounds designed and recorded by the Munich composer and sound designer Ulrich Müller, thanks Ulrich!
- Adds several factory sounds designed and recorded by the Canadian YouTube personality, musician, and video producer Andrew Huang. Thanks Andrew!
- Adds 10 more factory programs using the factory sounds from Ulrich Müller
- Adds clickable Feedback/Output Compression/Expander and Input/SideChain Envelope meter to the Level Panel
- Adds MIDI Key value label and entry to DCO frequency trackbars in case DCO is configured as a file playback
- Adds smart Morph System behavior on changes while the morph process is running (fast value adaption during morphing)
- Adds an editable spline curve to the Morphing System for non-linear morphing transitions

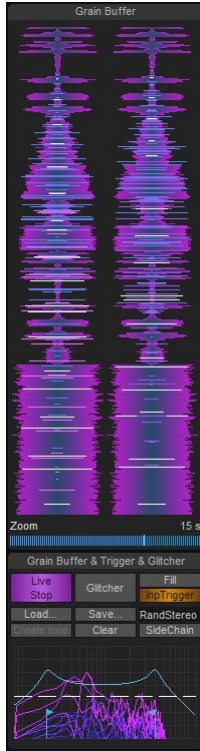
- Adds Morph to MIDI-Keys - but Morph is not started if MIDI-Keys are pressed. This will create smoother transitions between programs with stored MIDI-Keys
- Adds Shift-Click a pressed Key on the UI Keyboard will release the note
- Adds disabling GlitchMode selector when not in Glitcher-X Mode
- Adds plug-in parameter for Clear Grainbuffer
- Adds 8 MACRO plug-in parameters that can be used for free UI Element Mappings in the MACRO Mapping Editor. (\*) Thanks Aphex Twin for this feature request!
- Adds MACRO P Tab in the MACRO Map (formally named MIDI Map) to list Macro Parameter and MIDI Controllers that are stored in Program Memory
- Adds MACRO Map button dimly lit to indicate that MACRO P mapping list is not empty (Controllers loaded by a program are assigned)
- Adds Global and Program Memory options to the Learn Context Menu (\*)
- Adds "Current value as max" in Learn Context Menu to set the range of the controller learning by using the current UI element value as the maximum
- Adds "Around current value" in Learn Context Menu to set the range of the controller learning by using the current UI element value as the center
- Adds "Set to current value" in Learn Context Menu to map a certain UI element value to a MIDI Controller or MACRO Parameter. Useful for live performances to "reset" an UI element to a certain value (\*)
- Adds Learn Context Menu to the Generator wheel
- Adds Program Number edit field to the Program Panel. Useful for a fast program selection also in combination with the new "Learn Controller to set Position" feature
- Adds a Reset of FilterMode and MIDI Mode to the Grain Modulation Reset Buttons
- Adds MIDI Omni Mode for MACRO Map in Settings Editor
- Adds enabling of the MACRO Maps Change button if list entry was already selected by a controller
- Adds Visuals.GrainView.RotateX and Visuals.GrainView.RotateY plug-in parameter to control the Grain Views rotation (\*)
- Adds Standalone App Version for macOS
- Adds triangle symbol on combo boxes
- Adds Auto UI scaling mode
- Adds flashing tutorial arrows
- Adds UI Keyboard enablement when Attack / Release Velocity is activated
- Adds Load next/previous audio file buttons in DCO editor and Grain Buffer panel
- Adds Program management functionalities like New, Rename, Cut, Copy, Paste, Insert, Import, Export, Bank management
- Adds Program Copy/Paste clipboard functionality to copy/paste programs across all running crusher-X instances
- Adds Morph Position Slider that allows to pause and set a morph position manually
- Adds Morph Position plug-in parameter
- Changes opening of Spline Editor instead of File Editor in case of DCO is in Spline Mode
- Cleans up Grain Modulation / LFO view and moved "Morph LFOs to 0Hz" button to Granulizer panel, moves LFO counter to Grain Modulations panel header, moves Grain counter to Grain View panel header
- Improves LFO counter accuracy
- Improves the sound quality of the DCO/Player (doubles the sample rate)
- Improves UI color contrast
- Improves overload protection for high birth rate (low birth time) cases
- Increases grain generator stack for Quantization Modes from 10 to 32 (leads to a more intense Quantization reaction)
- Improves setting of DCO MarkIn and MarkOut while in Play Mode (only range the play head if needed)
- Improves control of Arpeggiator Keys with UI Keyboard (select and deselect single keys with Shift-Click). Latch control of external MIDI Key events remains as usual
- Improves UI fluidity on Formant Input Filter, Grain View, Slider and PM-Field mouse interactions
- Improves X-Crush algorithm so that crackles on high gain input signals are diminished
- Improves Birth Grain Modulation Reset value. Grains are now overlapping 50% on reset
- Improves automated Grain Modulation Tab update
- Improves Program Panel layout and adds New Program button
- Improves GrainBuffer View with a logarithmic scale to get a better display of low signals inside the buffer
- Improves the PM-Field logic so that the PM-Field modulation continues even when the UI is closed
- Improves MIDI overload filter for CC MIDI data with different CC numbers
- Improves MACRO editing while MIDI or plug-in parameter changes coming in
- Improves logarithmic calculations near zero
- Improves the Feedback algorithm so that the left/right input channels are balanced for higher feedback levels

- Improves DCO Morphing smoothness
- Removes limitation to the amount of grains per generator
- Removes the legacy Aliasing Mode button from the UI (Use the new factory program Reset/LegacyAliasingMode or the "Granulizer.Aliasing" plug-in Parameter to create a program with Aliasing Mode On)
- Fixes a seldom hang of the sliders thumb highlight
- Fixes a minor bug that changes the plug-in parameter number when edit the assignment in the MIDI Map/Params grid
- Fixes a minor bug that showed wrong grain status when in slower quantization mode
- Fixes an filter overdrive that could lead to FPU crashes on very low system sample rates (e.g. 8000Hz)
- Fixes an exception on very small files loaded in the grain buffer
- Fixes a glitch on first marker with high DCO file playback rates
- Fixes VST3 output problem under Reason
- Fixes a bug that causes self modulation of global modulators in case a modulation type was selected without a modulation target
- Fixes incorrect display of special characters in the licensor's name
- Fixes DCOs low frequency problem on standard waveforms
- Fixes issue that DCO still running when plug-in is in Bypass Mode (VST3/AU)
- Fixes issue with MACRO Map editor grid scroll bar
- Fixes a bug that changes occasionally Grain Modulation values when changing the tab if a Slider Wheel is running
- Fixes a bug that creates DCO sounds even if Playmode is stopped
- VST3: Fixes saving of the plug-in state under Bitwig 4 and other legacy VST3 hosts
- macOS: Adds support for macOS Sonoma
- Win: Removes 32bit versions, removes "64" extensions to plug-in and application names
- Standalone: Removes dependency to VST dll for the standalone crusher-X.exe
- Standalone: Adds Tempo and Quantization support for standalone crusher-X
- Standalone: Adds full reset when launched with shift key pressed
- Standalone: Restricts reloaded windows position to visible screen coordinates
- Standalone: Recordings are now done with 32bits per sample
- Standalone: Remove click function of recording and audio on/off on status bar
- Standalone: Fixes a problem with synced Grain Modulation frequencies larger than 1/1 quarters
- Standalone: Adds Click on the Status Bar Tempo section restarts internal beat counter
- Standalone: Changes Audio Engine Setup Dialog from modal to floating
- Standalone: Adds "Save Bank to Config" and "Don't save Bank to Config on closing" File Menu entries to support sound installation use-cases
- Standalone: Fixes MIDI device enumeration bug
- Standalone Win: Fixes that selected ASIO device opened by default on app start
- Standalone Win: Fixes keyboard shortcuts issues
- Standalone Mac: Fixes Audio Engine crash under macOS BigSur
- Standalone Mac: Fixes crash when releasing Fullscreen mode with DoubleClick under macOS BigSur
- Standalone: Adds free vertical scaling of Osc Window
- Standalone: Adds saving of MIDI and Osc Window position and settings

### 3. New in version 9.5

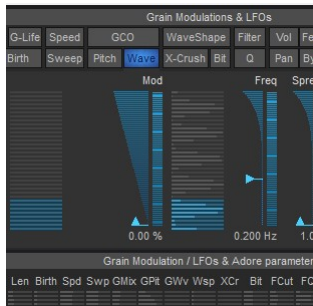
Welcome to the crusher-X 9.5 "Grain Drop" update! As the industry leader of granular synthesis accSone has the obligation to continuously provide state of the art granular synthesis technologies and experiences. accSone aims to boost your creativity by unleash your granular workflow from prewired chains! You can even become your own shimmer reverb designer (see below how this works). That's why we provide this 9.5 update with a huge set of innovative and mind-blowing functionalities that comes free of charge for registered crusher-X 9 users.

As requested by many users crusher-X 9.5 provides a real-time audio view of the floating (or fixed) Grain Buffer. As it is vertically arranged, we call it the "Grain Drop" view. It shows also the current Grain generation position and can be also interactive used to set the Delay Grain Modulation in real-time. All Grain Buffer related controls are now positioned in a new Grain Buffer & Trigger panel below.



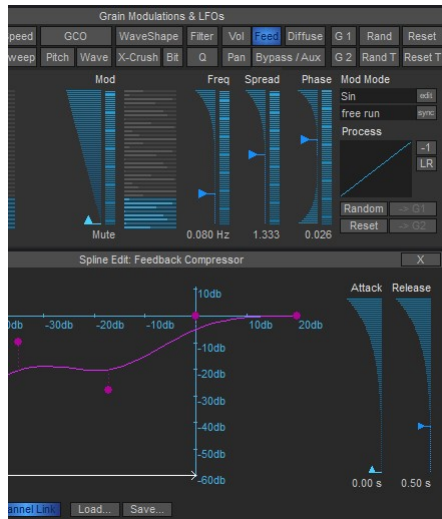
*crusher-X 9.5 introduces the Grain Drop view*

GCOs (Grain Controlled Oscillators) are unique and cool, right? They got an additional Wave-Shape Grain Modulation to control the GCOs Waveform or the GCO-File Mark-In position. Expect hell-sounds out of that! Oh, and the GCO Mode got an update too: "Sidechain Signal with Grain Ringmodulation"



*GCO WaveShape Grain Modulation for massive drones*

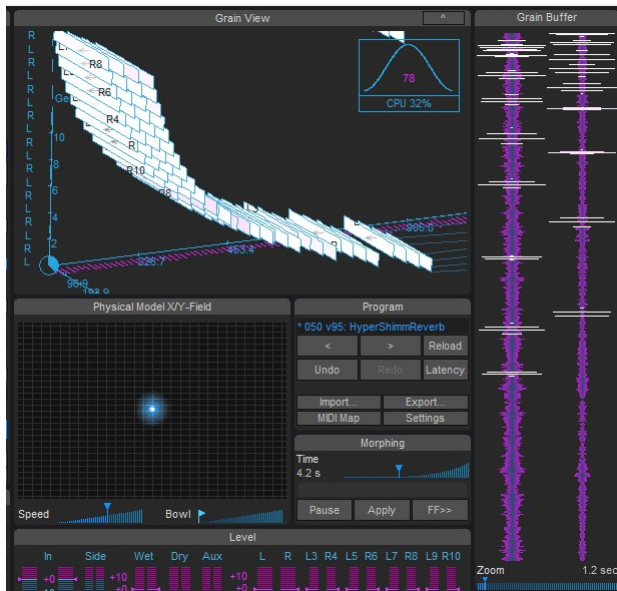
crusher-X 9.5 innovates with a new Grain Controlled Feedback (GCF) system: Each Grain can be individually controlled via a new Feedback Grain Modulation to provide its contribution to the feedback bus. This is actually a multi-dimensional, modulated feedback matrix that could create hyper-shimmer reverbs and non static, floating feedback drones. The feedback bus got its own, individual feedback compressor/limiter/expander to add even more flexibility to design your own signature granular reverb:



*Feedback Grain Modulation and additional feedback Compressor to create hyper-shimmer reverbs*

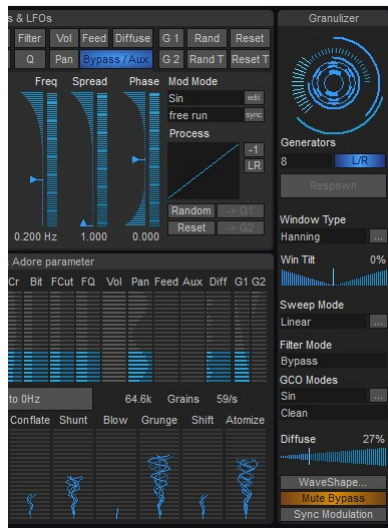
So, with crusher-X 9.5 a dream becomes true: We can now become our own reverb designer! The v95 HyperShimmerReverb program can provide you a nice starting point for endless signature reverb design sessions. And yes, you can make these "Atmos surround" ones! (see the version 9 features below):





*Create your own signature shimmer reverb*

To gain even more Grain Modulation freedom we added a combined Bypass/Aux Modulation. Each Grain can be individually modulated to bypass the other Effect Grain Modulations and/or bleed the pure Grain signal to an additional AUX bus of the VST3 plug-in. From here on you can further process the "dry" Grains with your own effects and feed them into an extra mix. Use the "Bye Mute" button to disable the Bypass Grain Modulation to isolate the Aux functionality if needed:



*crusher-X 9.5 introduces a combined Bypass/Aux Grain Modulation*

And crusher-X 9.5 got even more stuff in terms of UX- and Workflow improvements and bug fixes. Take a look at the complete list and enjoy your granular mayhem. Peace!

- Adds Grain Buffer "Wave Drop" view with Mouse control of the Delay Grain Modulation Offset

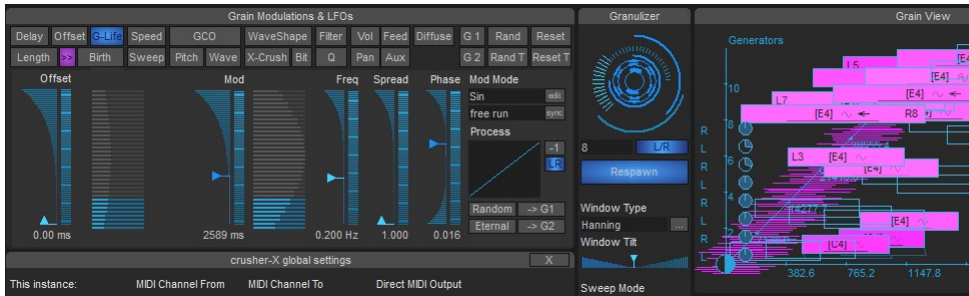
- Adds new Grain Buffer & Trigger panel
- Adds new GCO Wave Grain Modulation that controls wave table deformation of the GCO waveform or sets the GCO files start point
- Adds new Feedback Grain Modulation that controls the amount of feedback for each Grain Generator individually
- Removes the global Feedback Panel (can now be done by setting the Feedback Grain Modulation Offset)
- Adds a new Feedback Compressor/Expander/Limiter for the Feedback line only (independent from the Output Compressor)
- Adds a new Aux Out Bus to the VST3 plug-in. This enables to add an own external effectchain into the grain processing
- Adds a new ByPass and Aux Grain Modulation that controls an effect bypass and auxiliary plug-in output bleed out of each generator individually (for e.g. special surround effects or inserting plug-ins in the later signal chain)
- Adds ByPass Mute button to disable the Effect ByPass if only an Aux bleed too the auxiliary plug-in output is needed
- Adds four new Surround Channel Modes that adds the Aux Channels to the Main Output Bus
- Adds one second "hidden" faded out recording on switching from Live to Stop Buffer Mode. That gives an additional audio source to Grains with a Delay Modulation near 0.
- Adds new layout of DCO & Player panel, adds Play/Stop button
- Adds new GCO Mode "Sidechain Signal with Grain Ringmodulation"
- Adds short flash indicator on Undo button to sign a new Undo step creation after a value change
- Adds logarithmic sliders to Delay, Offset, Length, Birth, G-Life Grain Modulation
- Adds seamless switch from Stop to Live Grain Buffer Mode by no longer clear the Grain Buffer after the switch
- Adds a scrollbar besides the Map Editor grid
- Adds a double click behavior to trackbars launch a reset to the default value (like clicking on label)
- Adds an automatic DCO volume set if DCO volume is muted and a file is selected
- Adds an automatic reset of the Grain Buffer Trigger Level if a Grain Buffer File is loaded (prevents an unwanted refill of Grain Buffer if a Trigger Level was set)
- Adds crusher-X counter factory sound
- Adds several crusher-X 9.5 programs
- Adds an integrated interactive quick-start tutorial that introduces the main workflow and elements of crusher-X
- Improves MouseWheel and PM Wheel behavior on logarithmic sliders
- Improves loading of Mono files to the Grain Buffer
- Improves DCOs Panning randomization
- Improves DCO Waveform view
- Improves Grain To Midi grain volume calculation
- Improves Pitch Tracker accuracy
- Improves Diffuse process automation on longer grains
- Improves Grain Buffer Trigger indicator
- Improves and harden the Bitcrusher Grain algorithm
- Improves spectral balance of Grain Modulation Feedback Loop
- Changes Pitch Tracking routing - now the Pitch Analyzer is connected to the granulizer input and not to the plain plug-in input. This allows to use the Pitch Tracker also for DCO input signals
- Optimizes UI speed under certain conditions
- Optimizes Levelmeter mouse reactions and thumb behaviors
- Optimizes Screenless Parameter Control
- Consolidates Trigger panel into the new Grain Buffer & Trigger panel
- Removes Feed panel (no longer needed due to new Feed Grain Modulation)
- Fixes SideChain Trigger Button not showing right status on opening the editor
- Fixes plug-in parameter DCO.FilePlayMode and DCO.FilePlay mismatch
- Fixes some minor UI update issues on Grain Modulation changes
- Fixes a bug that prevented not detecting every G-Life situations as non eternal
- Fixes a bug that created a wrong morph time for WetL and WetR Volume
- Fixes a bug that didn't updated the GCO Filename after opening the editor
- Fixes Surround Channel Mode issues for Stereo+ and Multichannel modes
- Fixes an issue with bad formatted "smp1" chunks in Wave files
- Fixes a seldom startup crash caused by a Screenless Control parameter race condition
- Windows: Adds SideChain Mono Modes in VST wrapper
- Windows: Increases possible ASIO Output Channels from 6 to 10 in VST wrapper
- Windows: Improves ASIO dialog in VST wrapper
- Windows: Support for Windows 11, adds Windows 11 theme on VST wrapper dialogs

- macOS: Support for macOS Monterey v12

## 4. New in version 9

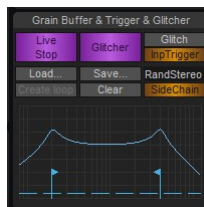
Welcome to the crusher-X 9 upgrade! accSone pushes forward its position as the industry leader on granular synthesis! accSone aims always to unleashed your creativity with crusher-X, so we created another set of bold innovations and mind-blowing features.

accSone invented the Grain Life-Time (GLT) System to let you create and control granulized Percussion Sounds. crusher-X 9 can now control the lifetime of each grain with a full modulation set. That means once you enable the G-Life Grain Modulation, the GLT system controls the time a Generator is "alive" after the first Grain was "born". And - "Sorry Mr. Grain" - if your life-time has been reached, your're killed! But don't worry - you can be "respawned" with a press of a button, via MIDI or via Quantization or via Audio triggers (from the Live-Input or the Sidechain-Input):



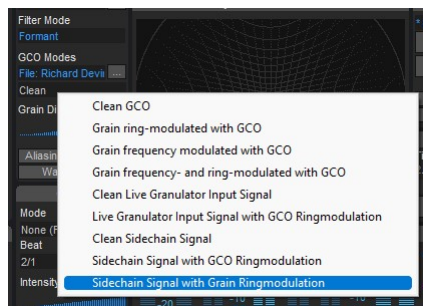
*crusher-X 9 introduces Grain Life-Time (GLT) System*

Why we need an extra Sidechain Input for a granulator? It's an unique opportunity for additional grain modulations (think in the direction of e.g. modulate the grain tune with the audio of the Sidechain), Trigger Grain creation (control the Life-time of a Grain with the Sidechain envelope)



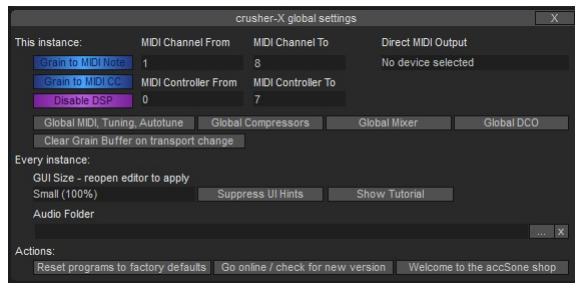
*crusher-X 9 introduces Sidechain Grain control*

And the Sidechain can also be used as a source for GCOs (Grain Controlled Oscillators): Heads up! Grains can now coming in from the "side":



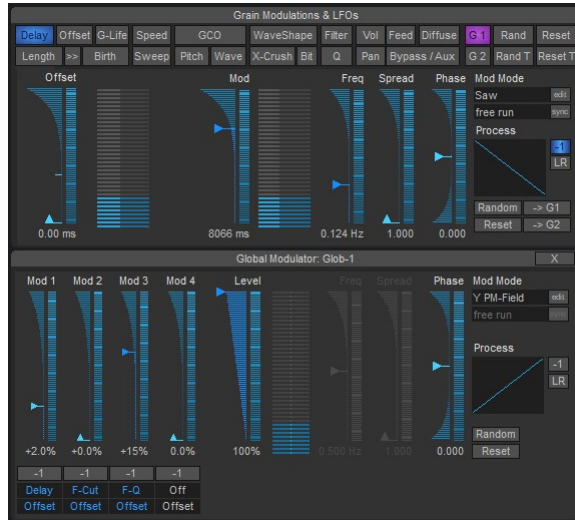
*crusher-X 9 introduces new Sidechain GCO Modes*

Talking about Grains is also talking about Generative Music: Combining the Grain generation with your MIDI setup? With the new Grain Controlled MIDI (GCM) functionality you open the door to generative music with just one click: Enable "Grain to MIDI Note" and let your external MIDI Devices create the Grains according to the crusher-X unique Grain Modulation algorithms. And if the DAW doesn't support an easy way to get MIDI out of the track (normally they don't)? Just use the internal MIDI Output-Device selector from crusher-X:



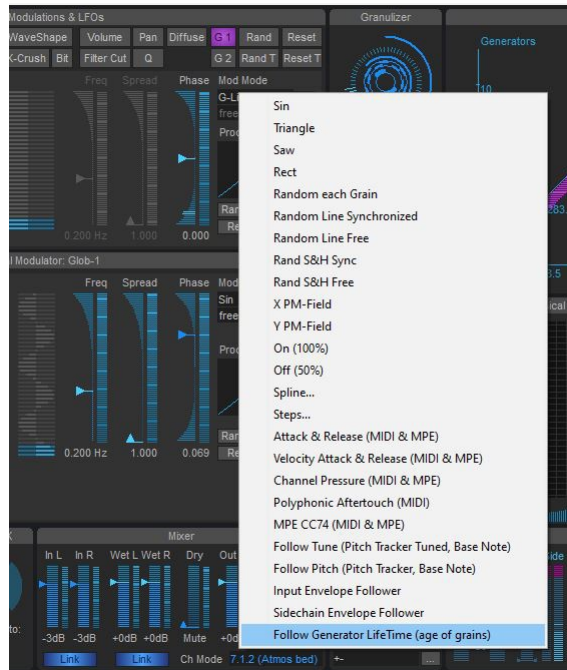
*crusher-X 9 introduces Grain Controlled MIDI (GCM)*

And as we're talking about Grain Modulation - long awaited, now arrived: Two Global Modulation Matrices (GMMs) with each 4 modulation slots guaranties the craziest modulations ever. Each fader parameter of the Grain Modulation can be targeted and the applied modulation is shown on each targeted fader in a cool way:



*crusher-X 9 introduces adds 2 Global Grain Modulation Matrices (GMMs)*

And regarding the G-Life (GLT System) Modulation mentioned above: We made the current "age" of the Grains available as a modulation source! This enables you to create unbelievable Grain Percussion streams developing over time:



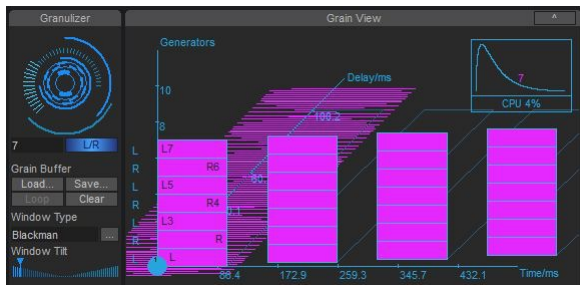
*Modulate Grains with their "age"*

And the same G-Life modulation can be added as Scanner modulation source for each Step or Spline:



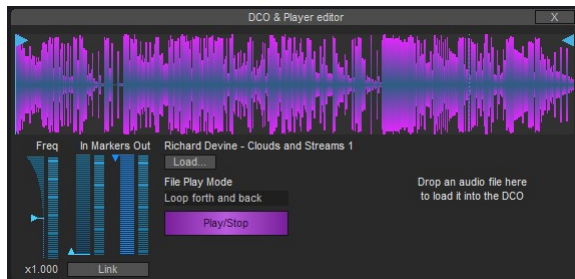
*Scan the Step (and Spline) Modulation with the Grain "age"*

Unreal: Use a "Grain launch" to step thru a Spline or Step Modulation - that is why we introduced the Grain Controlled MIDI (GCM) functionality. Now the time has really come to explore the world of Generative Music! Need more "percussive" Grains for this? The unique Window Tilt function squeezes and tilts the Window function in real-time. Window Tilt is also controlled by the morphing system:



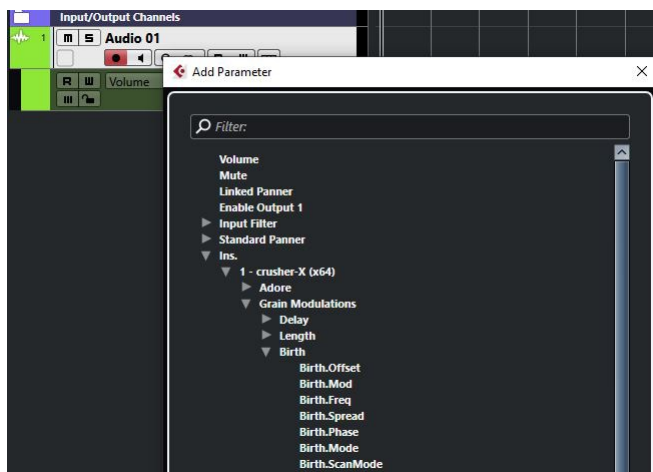
*crusher-X 9 can bend the Grain Window in real-time*

And we're making things easier to play with: On each loading of a sound file an automatic Gain Normalization is applied. So you never have to worry about using low level recordings for granulation:



*crusher-X 9 comes with Gain Normalization on sound files*

crusher-X 9 now comes with a VST3 64bit flavor - that allows easy Sidechain support and parameter grouping (that is might be useful as we're talking about more than 370 parameters crusher-X exports on your automation playground):



*crusher-X 9 adds a VST3 plug-in format that enables parameter categorization*

Surround productions with granular synthesis? It's the best time now to explore the Atmos bed 7.2.1 surround channel layout with crusher-X:



*crusher-X 9 supports the Atmos bed 7.2.1 surround channel layout*

What else? There is so much more in the new version of crusher-X 9 to explore that makes a granular production valuable with more fun: UI improvements everywhere, "handover" buttons to push a modulation to the GMMs, fast sound file selection, categories for the programs, mp3 audio file support, and ... and ... and.

Please give it a try, it's your sound design!

Oh - wait - one more thing (expect an unreal performance boost):



*crusher-X 9 supports native the new M1 Silicon processor*

- Adds VST3 support (64bit)
- Adds Sidechain (2 extra live inputs) support for GCO and Envelopes (Adds 2 Sidechain GCO modes: Clean and Ring)
- Adds 2 Global Grain Modulation Matrices (GMMs). Each have 4 individual configurable modulation slots (Mod 1-4). Each slot can modulate (or invert modulate) the Offset, Mod, Freq, Spread or Phase of a target Grain Modulation. All Modulation and Target switches smooth controlled by the Morph system. The UI shows all modulations on the affected Fader Controls.
- Adds Atmos bed 7.1.2 Surround Modes
- Adds 5.1 Logic and 7.1 SDDS Logic that improves surround channel mapping under DAWs like Logic
- Adds 4.1 surround layout
- Adds Generator LifeTime (G-Life) Grain Modulation. If the Generator Lifetime has been exceeded they can be revived with a new Respawn button, with MIDI-Note Events, a Level Trigger or with Quantization.



Generator Life Time is indicated in the Grain View by a clock symbols

- Adds Generator LifeTime (G-Life) Modulation Type to let Grain Modulations being controlled by the Generators "age"
- Adds Generator LifeTime (G-Life) Scan Mode Type to let Grain Modulations Spline and Steps Modulations being scanned by the Generators "age"
- Adds Grain Launch Scan Mode for Step and Spline Grain Modulations (single step move on each grain launch - supports advanced modulation algorithms). Attached also to "Morph to 0Hz" system.
- Adds Grain Controlled MIDI (GCM) functionality. If enabled, each grain launch creates MIDI NoteOn and NoteOff events to control outboard MIDI devices in sync with the grain creation
- Adds Direct MIDI Out selection in settings to send MIDI direct to external MIDI devices as many DAWs doesn't support MIDI Out routing for Audio Effect Plug-Ins
- Adds a <Disable DSP> button to settings that could disable audio processing when a Grain To MIDI Mode is activated
- Adds a real-time Windows Tilt functionality to squeeze and tilt Grain Amplitudes
- Adds Grain launch counter indicator on Adore Panel
- Adds UI Keyboard enablement for non-pitched MIDI modes
- Adds a Level Trigger visual feedback in Left and Right Trigger Level Trackbar
- Adds Audio File path in settings. All audio files that are contained in the Audio File path will be avail on DCO/GCO/Load Buffer selection Menus.
- Adds MP3 Audio File support
- Adds Normalization to Audio File import (DCO, GCO, Grain Buffer)
- Adds 4 new GCO Modes: Clean Live Granulator Input, Live Granulator Input with GCO ringmodulation, Clean Sidechain, Sidechain with GCO ringmodulation
- Adds GCO Spline shortcut button on Granulizer Panel
- Adds Categories for the Program Selector
- Adds coloring of active Grain Modulations in Grain Modulation Meters
- Adds "Handover To Global" buttons for each Grain Modulation. The current Grain Modulation settings will be transferred to the desired Global Modulation so that it can be used to group with other Grain Modulations
- Adds X/Y Grain Modulation Assignment Hints to PM-Field
- Adds Playback Speed Fader in DCO Editor
- Adds meaningful labels to plug-in mode parameters instead of just a number
- Adds Keyboard Shortcut to Hints, streamlined Shortcut handling and adds shortcut for Granulizer Clear
- Adds DCO Editor open button
- Adds CC74 Grain Modulation Mode also for non MPE MIDI Modes
- Adds an automatic open of the Envelope Follower Editors on Grain Modulation Mode selection
- Adds LR Processing Button to the Grain Modulations to ensure that the modulation stays the same for Left and Right granular streams pairs
- Adds more factory sounds
- Adds 64bit audio processing option for VST3 plug-in (e.g. switch DAV/Cubase to "64bit float" processing precision to use it)
- Adds 4 additional Stereo AUX Output Busses on VST3 plug-in so that stereo tracks (like from Live or Bitwig) can address the additional stereo pairs for surround routings
- Adds several factory sounds designed and recorded by Richard Devine
- Optimizes Grain to MIDI Controller behavior - MIDI Channel and Controller Number Range are now adjustable
- Optimizes speed of the DCO Waveform UI
- Optimizes behavior of Buffer Load button to allow direct switching of Audio Files without switching back to Live Mode
- Optimizes appearing of the Spline/Step Editor (on top of an already opened editor without removing the current editor)
- Optimizes noise generation level
- Optimizes Waveform display in Grain View so that non reachable samples beyond maximal delay lengths are not shown
- Optimizes Level Panel layout
- Improved slider range handling (fixes also the Length->Birth Offset bug)
- Improved slider range reset handling (in case slider value has changed after a range selection the range will be also set appropriately to the reset value)
- Improved the Reset of a WaveShape spline
- Fixes undo/redo all parameter automation send bug
- Fixes bug loading a wav file with unknown chunks
- Fixes crash that happened sometimes during loading of large audio files
- Fixes not cleared grains in Grain View on longer Birth times

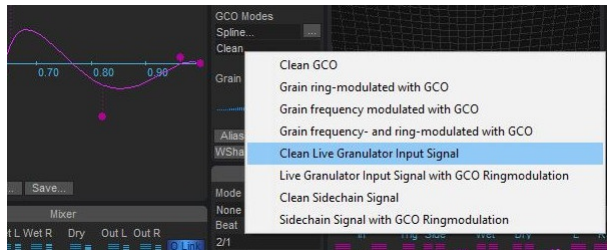
- Fixes morph bug for continuous Grain Modulation Mod changes
- Fixes plug-in parameter scaling issues for discrete parameters
- Fixes a bug that caused a hang of longer grains on program changes
- Fixes a bug that caused a wrong erasing of the MIDI- or Parameter-Map while loading MIDI-Map file
- Fixes a bug that sometime caused Release Controller not to work as expected
- Fixes a bug that caused audio processing to be stalled if Main Output Volumes are muted
- Fixes a bug that caused a crash when Offset of Grain Modulation Speed = 0
- Fixes a bug that caused Mirror function on a WaveShape spline not working as expected
- Windows: Fixes Shortcut Key issues with stand-alone VST wrapper
- macOS: Adds M1 / Silicon native architecture support
- macOS: Adds macOS Monterey support

## 5. New in version 8

Welcome to the ultimate upgrade, crusher-X 8! crusher-X 8 expands its position as the industry leader in granular synthesizers. accSone has unleashed our creativity to create a set of bold innovations and mind-blowing features.

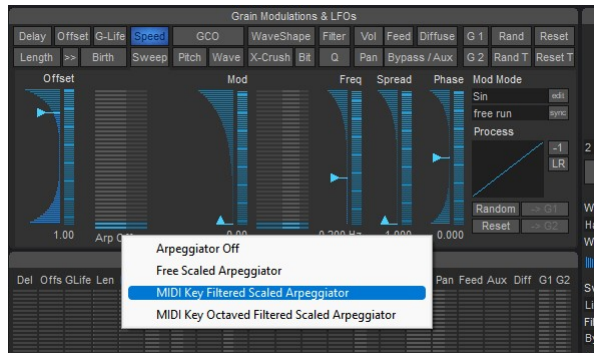
Let's dive in:

crusher-X 8 introduces Grain Controlled Oscillators (GCOs)! Wait...what? I thought crusher-X was a live audio processing granular synthesizer, right? What's preventing us from adding an oscillator to each grain to create unique sonic in-prints while processing the live audio? Well, to explain it, think of hundreds of individual Oscillators or Sample-players that enjoy their crazy life "inside" each grain. With the new GCO Grain Modulation you can "color", "enrich", "destroy", "overlay" or "nibble" live drones with any sonic or tuned audio layer you can dream of, as well as can make them appear or disappear depending on the GCO Mix Modulation. Choose free defined Waveforms or even use audio files as a sample source! And more: Not only can you apply GCOs "on-top" - you can let the GCOs interfere with your audio-input via Ring- or FM-Modulation! Switch the modes thru the crusher-X morphing system. Unlimited fun!



*crusher-X 8 introduces Grain Controlled Oscillators (GCOs)*

Although it's pretty unlikely that you'll get bored by the "classic" crusher-X Modulations, but just in case you do, we have a solution for you: Apply the Speed, GCO Pitch and Filter Cut Modulation with the new Arpeggiator setting! Once selected it will marriage the selected Grain Modulation with the crusher-X micro-tonal scale system (of course, you know that you can use Scala files to fine-tune the grain creation in older versions too, right?):



*crusher-X 8 introduces a micro-tuned scaled Arpeggiator for Speed, GCO Pitch and Filter Cuts*

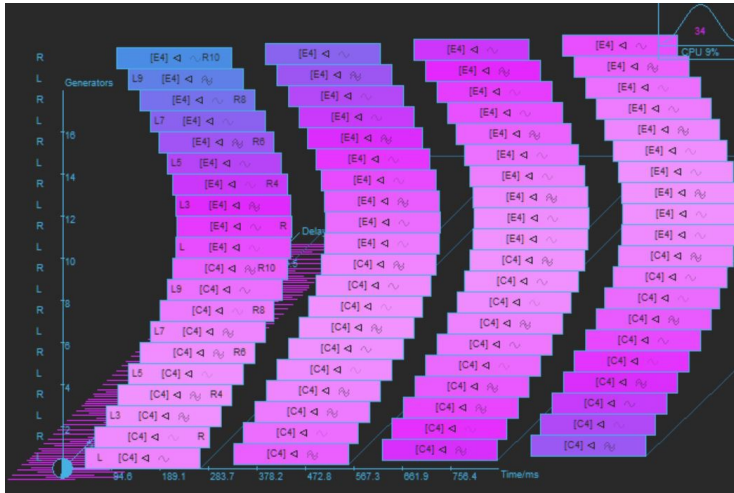
As well, you can modify the current Scale by selecting the tune on your MIDI-Keyboard - take a look at the new indicators that visualize the pressed (and latched) MIDI-Keys and the resulting modulation:



*crusher-X 8 introduces micro-tuned scaled Arpeggiator for Speed, GCO Pitch and Filter Cut*

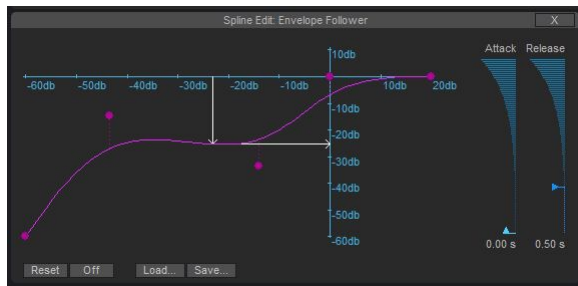
Wait, wait: An Arpeggiator mode for Filter-Cut? Yes! You can micro-tune the way the Filter-Cut center frequency is modulated by selecting MIDI-Keys or even full scales.

Ok, need more? Take this: Length, Birth, Delay - you know that "standard" Grain Modulators, right? crusher-X 8 has come up with an additional idea to control the Grain Modulations: Offset Modulation - meaning you can now control and modulate the time between the point where grains are created and when their processes execute. With this new function you are under full control of the grain's complete life-cycle! e.g. - if you want to create sonic walls without unwanted "holes":



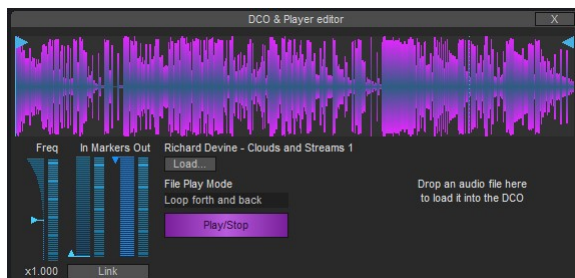
*crusher-X 8 introduces the new Offset Modulation*

Ah! And...by the way...what about if you wanted to bind Grain Modulations to Envelope Followers? Let the grains dance on the amplitude of the live input signal! This wonderful feature was requested by the genius crusher-X community and they envisioned this brand new way to create an interactive grain control. And sure, even if that's not fancy enough for you, we now allow setting up the full curve of the new envelope follower, now having the ability to setup strange input-output relationships as you like (you know this technique probably already from the compressor spine):



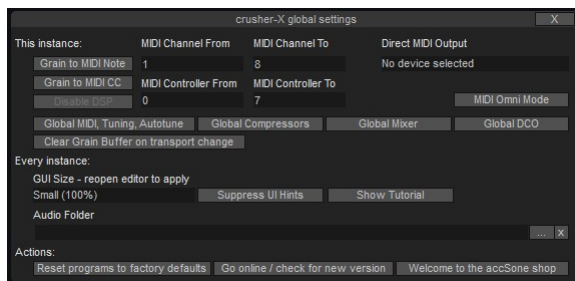
*crusher-X 8 introduces an envelope follower grain modulation source*

Need a sample-player or free DCO waveform editing? The "tiny" DCO got some lifting:



*crusher-X 8 introduces the DCO Sample player mode*

Oh - "and there's one more thing" : crusher-X 8 can scale the UI (because you might own a high resolution screen). And it does it in a "smart" way that gives you more and more details on the controls the higher resolution the chosen scale is:



*crusher-X 8 introduces the GUI Scale option*

And of course you will get with crusher-X 8 a couple of boring "bug-fixes, embellishments, streamlining, adding, changing, engine optimization, new presets and plug-in parameters" - yada yada yada... (and if you are on Windows - take a second to look at the new MIDI-Thru routing feature for the stand-alone vstwrap version - it might help you to wire up your hardware and gear as it does for us):

- Adds GCO-Mixing and GCO-Pitch Grain Modulating as a Grain Controlled Oscillator. Multiple waveforms, spline and sound file grain print-in
- Adds Offset Grain Modulating: Controls the offset of grain creation between the Generators - replaces static Generator Offset control
- Adds a Crush-B Grain Modulator: Grain controlled fractional bit crusher
- Adds a GUI Scale option in settings (e.g. small, medium, big, huge)
- Adds an Envelope Follower Grain Modulator source with free editable spline mapping
- Adds Arpeggiator Modes Scaled, Key and Octaved for Speed, GCO-Pitch and Filter-Cut Grain Modulators
- Adds Visual Feedback for Arpeggiator modes on the Keyboard
- Adds "no pitch" MIDI modes (e.g. to use together with the Grain Modulation Arpeggiator)
- Adds a Waveform selector to DCO
- Adds Sample loading to DCO and GCO; the DCO turns into a loop sample player with variable pitch
- Adds Free Spline editing for DCO and GCO Waveforms
- Adds an Active LFOs indicator in Grain Modulation / LFOs & Adore parameter View
- Adds a Missing Buffer File warning message in Grain View

- Adds a <Loop> button for setting convenient Buffer File looping (we have removed automatic loop setting after buffer file loading)
- Adds Clear button in Granulizer Panel to clear Grain Buffer immediately (good for a fast stop of long lasting grain structures)
- Adds Stereo capabilities to the DCO sample player
- Adds a DCO File editor with MarkIn, MarkOut, MarkLink, PlayMode and Play Button to control DCO File playback
- Adds plug-in parameters for DCO File controls (MarkIn, MarkOut, MarkLink, PlayMode, Play/Stop). Can be also mapped manually to MIDI events
- Adds 3rd decimal place in Grain Modulation Freq edit fields for low values. This allows much finer manual adjustments of low values
- Adds global setting that provides a grain buffer erase on host or MIDI transport changes (good for recording long lasting grain structures with a host)
- Adds global saving of the GUI Scale option for new plug-in instances
- Adds Sustain functionality, can be controlled via UI Button, MIDI sustain pedal controller or plug-in parameter change
- Adds rename of a program after export to the exported file name (no re-import needed anymore to change the program name)
- Adds global setting that suppresses the UI hints
- Adds Global DCO setting button that allows to decouple the DCO settings from program loading
- Adds Drag'n Drop features
- Adds a global settings reset if shift-key is pressed during plug-in initialization
- Adds two new extreme short Grain Windows Types: Dirac 1 and Dirac 2
- Adds a Drop label to the DCO editor
- Adds support for Adore Parameters plug-in automation
- Adds a protection to load a program or fx bank that were created with a newer crusher-X version (safe downgrade behavior)
- Adds Factory Sounds to the GCO and Grain Window selection lists
- Adds Factory Sound Selection to the Grain Buffer Load Button
- Adds GCO screenless spline accessibility for blind / sight-impaired users
- Modifies DCO reset behavior when clicking on DCP Freq labels (only resets frequencies, no longer involves the Waveform selections)
- Changes towards a warmer Diffuse algorithm for shorter grains (no more reverberation noise on short grains)
- Changes to integer plug-in parameters for the selection controls
- Changes to the logarithmic sliders for Speed, Sweep and Phase Grain Modulators
- Changes Grain Modulator "Overdrive" to "WaveShape"
- Changes to the MIDI Generator assignment algorithm so that there is more ownership over the played notes on each generator
- Changes the Base Key set (Ctrl+Keyboard Click) behavior so no Tones are created when using them
- Optimizes the visual feedback in the floating and embedded Grain Views
- Optimizes behaviors of the Load/Save dialogs
- Optimizes the audio quality of the DSP Engine for low volume signals (<-60dB)
- Optimizes silence detection of low volume signals (<-60dB)
- Optimizes plug-in parameters and MIDI mapping behaviors and assignment dialogs
- Optimizes the Granulizer outputs of the DC offset removals
- Optimizes the Grain View of gated Grains
- Cleans up MIDI Modes, introduces Free and A&R buttons to set Free, Gated and Attack/Release behaviors. Buttons can be controlled via plug-in parameters (older programs with old Midi Modes settings are matched to new control states)
- Optimizes global settings panel
- Optimizes Adore parameter MIDI learning
- Optimized the input trigger feature: If a file is loaded to the Grain Buffer and the input level triggers the buffer, the Grain Buffer is released and crusher-X switches automatically back to Live Mode (for live performances where one wants to begin with a static file intro and then automatically continues with the live performance)
- Fixed the behavior of the <Grain Modulation Mode Edit> button
- Fixed audio clicking while switching to and from each generator
- Fixed the default reset of random modulations while in freeze mode and switching between grain modulation views
- Fixed a PM-Field Modulation Phase issue
- Fixes a bug that Pitch Analysis wasn't enabled until the UI was opened
- Fixes wrong behavior that Trigger button needs to be pressed twice to start a buffer refill when Grain

Buffer was in File Mode before

- Fixes behavior that didn't load all Link settings on activated Global Mixer setting
- Fixes wrong level meter width for Music 6.0 surround mode
- Fixes a seldom crash that appeared on loading a new DCO or grain buffer file while processing
- Fixes a bug that didn't allowed a proper restoring of the midi keyboard on/off key status while loading or switching of a program
- Fixes a bug that allowed a note being triggered via the midi keyboard even if the key is disabled by the selected Scale
- Fixes issue with PM-Field Parameter automation
- Fixes a crash while Drag'n Drop files from Bitwig/DAW browser
- Fixes a bug that prevented to "throw the ball" of the PM-Field with a touch input device
- macOS: Fixes UI performance issue under macOS BigSur
- macOS: Fixes hint issue using crusher-X with Logic
- macOS: Fixes license lost in rare cases
- macOS: Sign components to be compliant with macOS Catalina
- macOS: Adds installer to be compliant with macOS Catalina
- macOS: Adds notarization of distributions to be compliant with macOS Catalina
- vstwrap (Windows only): Adds a flexible MIDI Through routing option to conveniently wire up your hardware/gear setup
- vstwrap (Windows only): Adds an Oscilloscope
- vstwrap (Windows only): Adds MIDI In VST Channel Filter
- vstwrap (Windows only): Fixes MIDI input problem with crusher-X 64bit stand-alone VST wrapper

## 6. Older versions

### 6.1. Changes in version 7.5

- Adds a smart latency compensation button/functionality to ensure beat synchronicity in track/loop based productions
- Adds a multichannel free editable compressor/expander/limiter to the output stage. Has both channel linked and non-linked modes
- Adds an overall "Morph Modulation Speed to 0Hz" Mode that allows you to temporarily pause the Grain Modulations . Allows impressive interactive changes between modulated and static drones
- Adds a "Grain to MIDI" feature that translates the current volume envelope of each generator into MIDI controller streams. Supports multimedia/light/DMX installations
- Adds a global mode to decouple the Mixer settings from program changes
- Adds new MIDI MPE Free mode that allows continuous MPE control that doesn't stop the grains on MIDI key off
- Adds new panning processing that leads to much more distinctive grain panning modulations
- Adds a new AR Grain Modulation mode that allows modulation from the Attack/Release MIDI section without impacting grain velocity
- Adds automatic range selection while moving ranged sliders
- Adds the ability to disable overload grain protection when the host does offline rendering (enables huge mass grain processing beyond current CPU capacities)
- Adds protections to plug-in parameter assignments in the MIDI Map editor
- Adds a program reset plug-in parameter
- Adds a DCO waveform plug-in parameter
- Adds initial program loading after importing sound packages
- Adds a Global Settings Editor panel
- Adds a <reset to factory default> button in the Global Settings Editor panel
- Adds a reset of the WaveShape spline when resetting WaveShape modulation
- Optimizes Autotune behavior (if no tuneable signal is detectable then the most recent pitch correction will be applied)
- Optimizes the Pan random function
- Optimizes the background of Grain View 3D window
- Optimizes the speed of importing multiple crusher-X Programs
- Optimizes the Grain View on longer grains
- Optimizes the plug-in's parameters for triggering so that they reflect the states of buttons when they're pressed and only on values > 0.5
- Optimizes support for blind / sight-impaired musicians for the spline editors
- Optimizes the spline point handles in the spline editors
- Optimizes the input visualizations of the spline editors
- Optimizes the layout and colors of the GUI
- Optimizes Volume Left/Light/Surround behavior while being linked
- Optimizes DSP processing
- Optimizes the behavior of extremely long grains
- Optimizes the memory management of the delay buffer
- Optimizes the latency compensation algorithm for delay modulations
- Fixes fixes audio spikes which randomly occurred every 2-6 minutes (depending on the sample rate)
- Fixes missing DCO.Waveform plug-in parameter mapping
- Fixes UI bug that sometimes shows a wrong grain modulation after re-initializing the plug-in
- Fixes issues with the Global Modulator frequency
- Fixes issue for 1st generator modulation if a negative Modulation Phase comes together with either a 100% Modulation or a PM-Field Modulation
- Fixes the issue with random high CPU load in the cases of high volume feedback
- Fixes issue that sometimes the background of the PM-Field would turn black
- Fixes issue with Rand S&H modulation when spread >0
- Fixes issue with RandLine modulation
- Fixes the Feed.level plug-in parameter bug
- Fixes bug in Process UI-control
- macOS: Optimizes UI update speed for older Macs
- macOS: Fixes seldom crashes upon closing the host
- macOS: Fixes crash in the case that a preference file became corrupt
- macOS: Cleans up unnecessary plug-in resources



- vstwrap: Optimizes ASIO dialog
- vstwrap: Add saving/loading of selected sample rate on exiting/launching

## 6.2. Changes in version 7

- Introduces MPE (MIDI Polyphonic Expression) MIDI mode
- Introduces MPE grain modulations modes (Channel Pressure and MPE CC74)
- Reworks UI elements and behaviors, added touchscreen control on tablet and surface devices
- Introduces a grain formant filter mode with a-e-i-o-u vowels that lets the crusher-X "talk"
- Introduces 13 adore parameters that allows for meta modification
- Introduces flexible non linear, editable MIDI mappings
- Introduces DCO waveform adjustment
- Introduces the Physical modeling Generator-Wheel to have a more sensitive adjustment of the number of generators
- Introduces a predictive generator mixer
- Adds Modulation Speed values down to 0Hz
- Adds multiple crusher-X Programs imports
- Adds additional decimal places in the MIDI Attack and Release edit fields
- Changes to the Global Grain Modulation Mod: it now resets to 100% instead of 0%
- Changes that Reset All and Random All now affects the Global Grain Modulation
- Optimizes Spline curve editing
- Optimizes grain processing to be able to have multi-core processing support
- Optimizes MIDI and parameter mapping processing speeds
- Optimizes Generator synchronicity
- Optimizes MIDI processing in the case of an input of a high number of MIDI events (e.g. MPE)
- Optimizes MIDI Key On reactions of longer grains
- Optimizes how Grain View updates
- Improves the 3D grain overview
- Strengthens the WaveShape Grain Modulation
- Streamlines both the macOS and Windows installers
- Replaces former up/dn modulations modes with inverse modulation modes
- Fixes a 5.1 L/R surround mixing bug
- Fixes a surround center level bug
- Fixes several parameter mapping bugs
- Fixes crashes that happen under Vienna Ensemble Pro and Blue cat patchwork (running as an VST/AU <-> AAX bridge under Pro Tools)
- Fixes crashes that happened upon the plug-in opening in the case that it was previously closed with the global MIDI switched on
- Adds a stand-alone VST wrapper to the Windows distribution (supports real-time multichannel ASIO input and output, surround recording, midi-input, midi monitoring, fxb bank saving/restoring as well as a nice fullscreen mode)
- vstwrap: Adds MIDI output capabilities
- vstwrap: Fixes the save on close bug

## 6.3. Changes in version 6.5

- Introduces invert grain modulation processing (supports morphing)
- Introduces invert global modulation (supports morphing)
- Introduces Scan Modes for Spline and Step modulation: You can now steer modulation flow either with random generators or by the X/Y physical modeling controller
- Introduces several support for blind / sight impaired musicians: We introduced hot keys (<1>-<6>, <q>-<z>) for Grain Modulation selection and <o> for loading a wave file into the grain buffer. We also introduced the plug-in parameters cursor-X, cursor-Y, and SetDelete for editing spline curves or step sequences
- Improves the behavior of moving from live- to fixed grain buffer modes: When the <Live Stop> trigger button is released the buffer stops filling immediately
- Adds more than 50 new plug-in parameters
- Fixes the Random S&H modulation bug
- Fixes the Spline/Step Editor open bug

## 6.4. Changes in version 6

- Introduces the pitch tracking and autotune feature
- Introduces an additional "Diffuse" Grain Modulation
- Introduces spline and step editor for Sweep Grain Modulation
- Enhances and simplifies the UI with a centralized Grain Modulation previewer and selector
- Introduces spread modulation: You can now slightly modulate frequency shifts for each generator
- Introduces an additional Randlinefree Grain Modulation Mode that doesn't sync generators the same like Randline modulation
- Enhances Stereo+ and Surround Modes to have Stereo Mixdowns of all generators
- Adds Cubase Surround Modes
- Adds Step editing for each Grain Modulation
- Adds a Host beat synchronization option for each Grain Modulation
- Adds Random and Reset functionalities for each Grain Modulation
- Adds 9 additional Quantization Beat modes
- Adds Delay Grain Modulation automatic setup upon loading the Grain Buffer so that the loaded sound is automatically played
- Adds automatic filter enabling while changing a filter Grain Modulation setting
- Changes floating window editing to embedded editing
- Updates/Adds new plug-in parameters
- Merges crusherX-Studio! and crusherX-Mac! to crusher-X

## 7. Innovations

The following unique innovations were launched by accSone with crusher-X:

- **Glitcher-X Mode** (introduced 2023). Glitcher Mode anchors grains to auto-selected incoming life audio events and modulates the grain around these anchor points during the grains life-time
- **Spectral Selector** (introduced 2023). An interactive spectral selector will help you to mask the audio input and auto-trigger the respawn of a grains to the next audio transient
- **Generator LifeTime (*G-Life*)** (introduced 2021). If the Generator Lifetime has been exceeded they can be revived with a new Respawn button, with MIDI-Note Events, a Level Trigger or with Quantization. Generator Life Time is indicated in the Grain View by a clock symbols. Grains can be modulated by their "age"
- **Grain Controlled MIDI (*GCM*)** (introduced 2021). If enabled, each grain launch creates MIDI NoteOn and NoteOff events to control outboard MIDI devices in sync with the grain creation
- **Grain Controlled Oscillators (*GCOs*)** (introduced 2019). Together with the new GCO feature crusher-X combines fixed and floating sound buffer granulation principles by doing Waveform and Sample print-ins on the live audio material
- **Grain Controlled Feedback (GCF)** (introduced 2022). Each Grain can be individually modulated to provide its contribution to the feedback bus
- **Grain Arpeggiator** (introduced 2019). Tuned Grain modulations with MIDI Keyboard control
- **Bit-Crush** modulation (introduced 2019). Independent modulated Bit-crusher for each grain
- Screenless spline and step edit: New plug-in parameter based (cursor-X, cursor-Y, SetDelete) spline and step edit modes for blind / sight impaired musicians
- The **Diffuse** modulation (introduced 2016) is unique in the world of granular synthesis: It feeds the grain into independent reverb processors (one for each generator, from up to 10 parallel independent reverb lines) before the grain window is applied. The "reverb memory" will be passed from one grain in a series to the next. This leads to a very special, non smearing, precise and sharp - though warm - grain diffusion that can't be compared to a simple granulizer feeding a normal reverb processor
- The **X-Crush** modulation (introduced 2014) is unique in the world of granular synthesis: It adds a special asymmetric ring-modulation transformation feed by overlapping each grain with its successive grain. While dynamically interacting with other grain modulations x-crush will offer you a range of sounds from subtle ringing artifacts up to extreme phase shifting and distortion sounds
- The **Sweep** modulation is outstanding (dynamic grain pitching): Normally grains are created out of a standard set of parameters and executed without any modification. But the Sweep Grain Modulation is different: It allows sample accurate pitch shifting modulations due to a linear or editable spline or step function. Sweep creates sounds which range from warm "Water drop"-like sweeps up to wired pitch modulations or melodic ecstasies
- A **WaveShape** algorithm generates strange grain overdrive effects that are ideally used together with guitar input sounds. The WaveShape curve can be edited via a feature rich spline editor
- A **Formant** filter mode, which is processed on the grain level. It supports modulated vowels (a-e-i-o-u) with adjustable Q factors that control the sharpness of each vowel.
- All Grain Modulations can be controlled by a **Pitch Tracker** and **Autotune** system which tracks the pitch of the input channel in real-time, transforming the pitch by a selected scale and modulating an emphasis or compensation towards the grain pitch.
- Innovative Scaling feature allows harmonic grain clouds generation. Beside the usual Western standard scales the package contains thousands of historical, experimental, microtonal and exotic non western intonation scales that can be used to manipulate the pitch of the grains. Play crusher-X with your midi keyboard!
- A stoppable live **grain buffer** which can also host audio files
- The ability to Save the content of the live grain buffer to disk at any time
- Control the grain pitch and volumes with a **midi keyboard**. Scales can be applied to filter out "wrong" keys.
- Audio spikes will not be created by stating or stopping the grain buffer because smooth small fading is automatically applied
- A sizable and separated **Grain view** window shows the grains in detail. Can be controlled via plug-in parameters
- **Multi CPU / Core / Thread** grain generation allows utilization of all available CPU cores of the host system
- The granular engine supports multichannel input processing
- All interface elements can be assigned to controllers through an easy to use midi / plug-in parameter control mapping and learning function
- Several background assistants ensure quick workflows such as grain density editing

- The innovative ***physical modeling sliders, physical modeling wheels*** and our unique ***physical modeling X/Y controller*** (introduced 2000) allows smooth and intuitive value editing
- A full spline editable ***multichannel surround compressor/expander/limiter*** with flexible channel linking. Allows sophisticated output level and feedback flow control
- A smart ***latency compensation*** system to ensure live beat synchronicity by determining the "granular audio gravity" of a crusher-X Program

# 8. Installation

## 8.1. Requirements



Windows:

- VST 2.4 / 64bit and VST 3 / 64bit
- AAX / 64bit
- Windows7 or higher 64bit
- Requires a 64bit VST host to run the plug-in

macOS:

- Audio Unit (AU) / 64bit and VST 2.4, VST 3 / 64bit, AAX / 64bit
- Intel CPU, 1 GB, 2 GHz CPU
- Runs native on Apple M1 Silicon CPUs (recommended)
- Mac OS X / macOS 10.15 or higher
- Requires a 64bit AU or VST host to run the plug-in

These hosts have been tested for compatibility. If your host is not listed, download the free demo and give it a try with your host:

<a href="#">Ableton Live</a>
<a href="#">Apple Logic Studio</a>
<a href="#">Apple Garageband</a>
<a href="#">Apple Mainstage</a>
<a href="#">Apple aual (Audio Unit Validation)</a>
<a href="#">Sampitude</a>
<a href="#">Cubase</a>
<a href="#">Wavelab</a>
<a href="#">AudioMulch</a>
<a href="#">FruityLoops (FL Studio)</a>
<a href="#">Renoise</a>
<a href="#">Sonar</a>
<a href="#">MiniHost</a>
<a href="#">Plogue Bidule</a>
<a href="#">Reaper</a>
<a href="#">Bitwig Studio</a>
<a href="#">Audacity</a>
<a href="#">Numerology</a>
<a href="#">Vienna Ensemble PRO</a>
<a href="#">Blue Cat PatchWork</a>
<a href="#">AVID Protools</a>
<a href="#">Reason</a>

For information about VST, please visit the [Steinberg Homepage](#) . And here you can find more information about [Apple Audio Units \(AU\)](#)

## 8.2. Installation

### 8.2.1. Installing on macOS



Simply mount the downloaded dmg file and start the installer. After installation find the crusher-X AU, VST and AAX components copied to these folders:

/Library/Audio/Plug-Ins/Components

/Library/Audio/Plug-Ins/VST

/Library/Audio/Plug-Ins/VST3

/Library/Application Support/Avid/Audio/Plug-Ins

If you like you can manually copy the crusher-X user-manual to a favorite location.

***Important: Reboot your system after installing the plug-in! Otherwise the plug-in might not show up in your DAW / host.***

Be sure that your DAW / host is running in 64bit mode otherwise the plug-ins are not visible or accessible. To change the mode, use Command-I in the Finder with the application selected and uncheck "Open in 32-bit mode".

After installation, your DAW / host will find the following plug-ins:

- crusher-X VST component
- crusher-X VST3 component
- crusher-X AU component
- crusher-X aaxplugin component

Start your DAW / host. After loading the desired plug-in and then feeding it with some input sound you'll hear your first crusher-X sound!

As an alternative you can use the crusher-X stand-alone app (crusher-X.app). With your Mac's desktop selected, click **Go > Applications** on the menu bar. Then double click on the crusher-X App to launch crusher-X. It supports real-time stereo input and output and surround recording.

Note: You can't save any plug-in presets or plug-in parameters with the demo version. Please purchase a license if you like what you hear!

## 8.2.2. Install on Windows



Just unzip the package and move the VST2 plug-in (\*.dll) or/and the VST3 plug-in (\*.vst3) or/and the AAX plug-in folder (\*.aaxplugin) into the the VST2, VST3 or AAX plug-in directory of your host or DAW.

For example:

File crusher-X\_.dll -> C:\Program Files\Common Files\VST2

File crusher-X\_.vst3 -> C:\Program Files\Common Files\VST3

Folder crusher-X\_.aaxplugin -> C:\Program Files\Common Files\Avid\Audio\Plug-Ins

Please refer to the documentation of your VST host for details about using VST plug-ins.

All plug-ins are in 64bit format. So only 64bit hosts are supported.

Optional you can copy the user manual pdf file to a location of your choice.

If you like to use scala tuning files (not supported in the demo version) you can unzip the scales.zip folder to a location of your choice.

Start your host. After loading the desired plug-in and feeding it with some input sound you'll hear your first accSone sound.

As an alternative you can use the crusher-X stand-alone application (crusher-X.exe). It supports real-time multichannel ASIO input and output and surround recording.

Note: You can't save any plug-in bank or plug-in parameter with the demo version. Please purchase a license if you like what you hear!

## 9. Introduction

### 9.1. Granular Synthesis

*"For this purpose the qualification "beautiful" or "ugly" makes no sense for sound, nor for the music that derives from it; the quantity of intelligence carried by the sounds must be the true criterion of the validity of a particular music."*

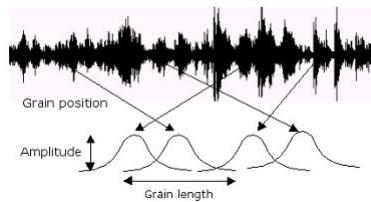
Iannis Xenakis in "Formalized music: Thought and mathematics in composition.", 1963-1992

The crusher-X algorithm is based on the traditional granular synthesis algorithm (Xenakis, Roads, Wilkins), which was invented in the early 1950s. In granular synthesis, short sound fragments (e.g. 50 milliseconds), "the grains," come from a fixed file buffer. The starting time, length and silence between the grains can be modulated. Working with more than one grain at a time is possible, thus you can create complex sound "clouds" from any sound signal.

*"When experimenting with those (length of grains), I have discovered a certain confusion as to what effect one can expect when setting parameters to certain values. Not only it seemed that length and density each had an impact of its own on the character of the granulated sound, but it also appeared that their relational value was highly important."*

Leon Zadorin "Composing with Granular Synthesis"

A "window function" blends in and out the grains at the beginnings and endings of their life-cycles. This function determines the character of the continuum and thus the different perceptions. Xenakis recommended the Gaussian window because of its theoretical considerations.



*"All sound is an integration of grains, of elementary sonic particles, of sonic quanta. Each of these elementary grains has a threefold nature: duration, frequency, and intensity. All sound, even all continuous sonic variation, is conceived as an assemblage of a large number of elementary adequately disposed in time. (...) Hecatombs of pure sounds are necessary for the creation of a complex sound."*

Iannis Xenakis in "Formalized music: Thought and mathematics in composition.", 1963-1992

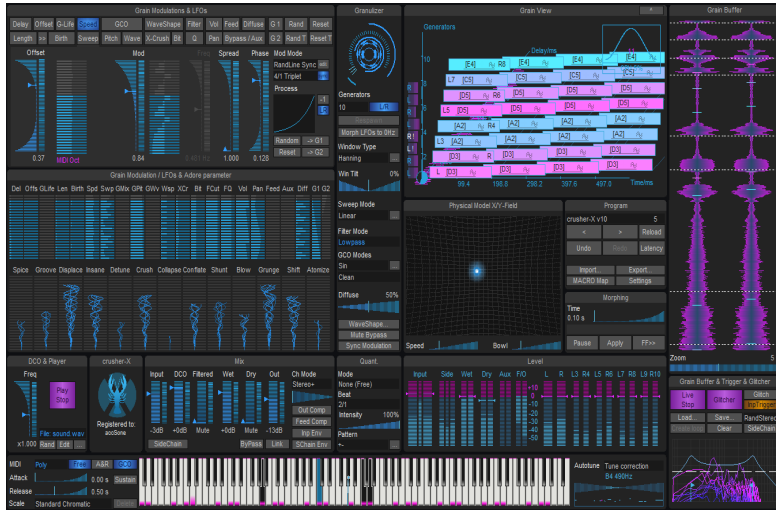
Instead of the "classic" file-based approach, the crusher-X algorithm provides a floating grain buffer which allows real-time input and output. In this floating buffer, the grains are created by several generators routed to several outputs (surround modes) or combined to become single outputs (mono and stereo modes). You are able to apply many unusual Grain Modulations to the grains such as Reverse-Speed, Filter, Pan, X-Crush, WaveShape, Bit-Crush as you like - all modulated by independent modulation sources and modulation phases, either synchronized or not synchronized to the host. The X-Crush parameter is unique in the world of granular synthesis: It applies a ring modulation between the overlapping areas of the grains that follow each other. A feedback loop from the output towards the input is capable of generating extremely complex and non-linear sounds.

*"A complex sound may be imagined as a multi-colored firework in which each point of light appears and instantaneously disappears against a black sky. But in this firework there would be such a quantity of points of light organized in such a way that their rapid and teeming succession would create forms and spirals, slowly unfolding, or conversely, brief explosions setting the whole sky aflame. A line of light would be created by a sufficiently large multitude of points appearing and disappearing instantaneously."*

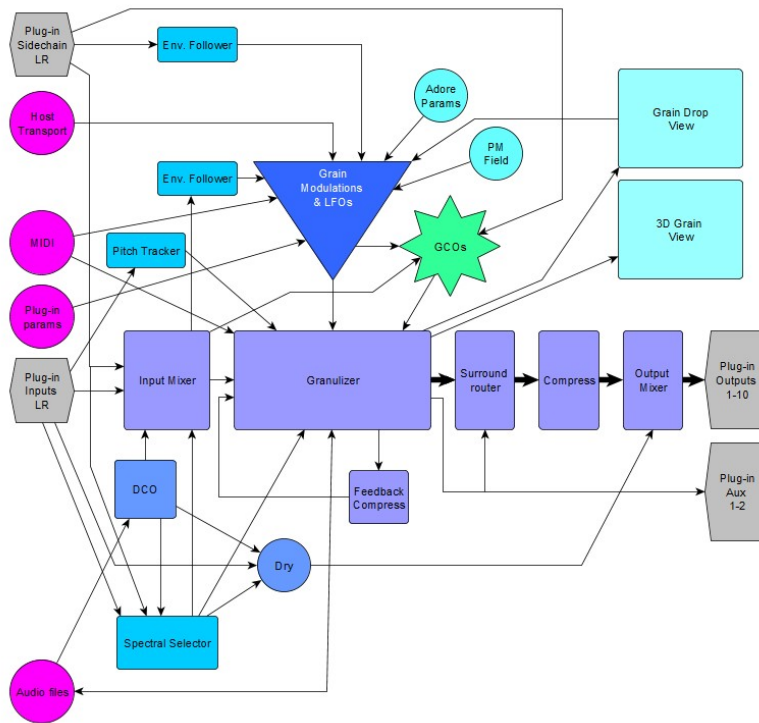
Iannis Xenakis in "Formalized music: Thought and mathematics in composition.", 1963-1992



## 9.2. crusher-X signal flow



crusher-X plug-in UI



Audio and control flow through the crusher-X plug-in

### Audio flow:

The plug-in's stereo inputs or the SideChain inputs are routed through the **Mixer** towards the **Granulizer** which generates the **Grains** from up to 199 **Grain Generators** which run in parallel. The **GCOs** (Grain Controlled Oscillators - one for each Generator) provide an audio print-in (driven from a .wav or other audio file) for each grain on top of the input signal. The input channel is also routed towards the **Pitch Tracker** (pre fader) and to the **Envelope Follower** (post fader). The output of the **DCO** and the **Feedback** signal is added to the **Granulizer's** input via the **Mixer**. The plug-in's 10 outputs are fed by the Mixer and Compressor's output which gets its input from the Granulizer. The **Surround router** determines the routing from the **Generators** towards the **Output channels**. The **Dry** signal can be mixed to each **Output channel**.

### Modulation:

The differing **Grain Modulations** determine the following for the grains: grain generation, its life-cycle, GCO amplitude/pitch and processing. Each **Grain Modulation** has its own set of **LFOs** (one for each generator, up to 199) The **Global Modulation function** is the global modulator for all **Grain Modulations**.

### Controlling:

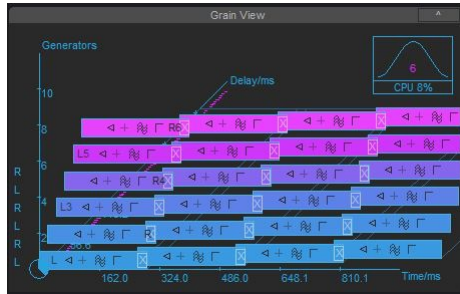
Various **Grain** and **GCO** processing modes are determined by the **Granulizer** settings. The **PM Field** is able to be a modulation source of the **Grain Modulations**. The **Grain Modulations** can also be randomized by a **Random** generator. The Grain pitch can be controlled by **MIDI** key events. The filling of the **Grain buffer** is controlled by **Live and Glitcher Mode** the **Spectral Selector** and **Quant** settings.

All settings can be stored and restored as a **Program**.

### Visualization:

The **Granulizer's** status is displayed in the **Grain View**. The Grain Buffer audio data is displayed in the **Grain Buffer view** ("Grain Drop" view). Audio levels are visualized in the **Level view**. Current modulations are visualized in **Grain Modulation, LFO, and Adore parameter** views.

### 9.3. The Grain View



The Grain View

The **Grain View** depicts all **Grain Modulations** and grain generations. If you press the <^> button the Grain View will open in an additional floating window.

Note: To change the perspective, hold the left mouse button and drag the mouse over the window. To switch the mouse mode to **Zoom**, **Move** or **Rotate**, press the right mouse button. The actual mode is indicated by the mouse cursor.

At the bottom left, you will find a representation of the grain buffer filling. Depending of the **Auto** mode setting (see Trigger panel) this pie circle indicates the filling sequence of the grain buffer.

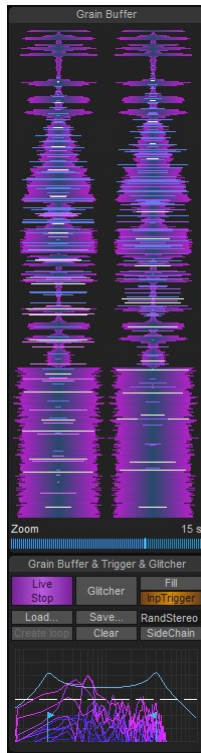
At the top right, you will find a representation of the current **Window Type** setting including a CPU load indicator. The small number gives the actual number of the generated grains at this time.

Grains are represented by the colored rectangles. Those most recently generated (the grains you currently hear) on the left side, followed by 3 older "dead grain" generations.

A description of the grain representation (signs and color scheme) of the **Grain View** is given in the **Grain Modulations & LFOs** chapters below.

The rotation of the Grain Views can also be controlled and automated via the plug-in parameters `Visuals.GrainView.RotateX` and `Visuals.GrainView.RotateY`

## 9.4. How the Grain Buffer works



The "Grain Drop" View

The **Grain Buffer View** shows the current audio content of the Grain Buffer. On top of the Waveform the basic **Grain Modulations** are painted with horizontal colored lines. The same color scheme from the **Grain View** is used to visualize the current Grain processing. Dragging the Mouse with the left mouse button pressed sets the Offset of the **Delay Grain Modulation**. If the Grain Buffer is not in Live Mode (disable the Live Mode by releasing the **<Live Stop>** button) a right click on the Grain Buffer View will Trigger a new Fill of the Grain Buffer (same like a click on the **<Fill>** button from the **Grain Buffer & Trigger** panel below).

### 9.4.1. Live, Stop and File Mode



Grain Buffer & Trigger & Glitcher panel

If the **<Live Stop>** button is pressed the grain buffer will be continuously updated (Live Mode). Releasing the button means it will switch over to a fixed buffer mode (Stop Mode)

If the **<Live Stop>** button is off you can trigger the buffer to update by either:

- pressing the **<Fill>** button
- Triggering with the plug-in parameter called Grainbuffer.Fire
- With the **Quantization** mode **Fill/Glitch** or **Grain+Fill/Glitch**
- Enabled with the **<InpTrigger>** button, the live signal of the Real-time Input or Sidechains Channels can be used to create Auto-Triggers: Use the **Spectral Selector Filter** below to set the desired frequency ranges of the detector (See the Chapter about the Spectral Selector). Press the **<SideChain>** button to set the input of the Spectral Selector to the Sidechain input.

Tip: Use a Microphone as an input signal and release the <Live/Stop> button (Stop Mode). Reset the Delay Modulation and adjust to small, slightly overlapping grain lengths. Enable the <InpTrigger> button. Each time you speak into the microphone the grain buffer is triggered. This will generate robot like sounds and the grain generation will stop with your last spoken word / syllable.

When releasing the **<Live Stop>** button, the buffer mode will change to a fixed buffer mode. That means the buffer will no longer be updated by the input signal and the current buffer input will become "frozen". The buffer content could be saved by the **<Save>** button on the **Granulizer** panel. In Stop mode the Trigger Level slider is enabled and it allows to set the level trigger of the Grain Buffer and Respawn.

Note: Without saving the buffer the content will be lost if you change to a program that switches to **Live** mode and therefore triggers refilling of the buffer. If you want to have a certain buffer sound associated to a program you must save the buffer.

The **<Load>** Button loads a WAV, MP3 or AIFF audio file which can be mono or stereo into the grain buffer. One could also choose some factory sounds from the list. After loading a file into the buffer, the **<Live Stop>** button is automatically released. A visual representation of the wave form will appear near the z-axis of the **Grain View** and the filename and path will be displayed at the bottom of the **Grain View**. In the case that the file is not found under the stored path during loading the program then a note will be displayed in this position. The same can be achieved by drag'n drop audio files to the plug-in interface (if not dropped on the DCO or Edit panel, as this will load the file into the DCO). <Ctrl>+Click the Load button launches the file open dialog directly.

Tip: You can start an intro to your live performance using a preloaded buffer and move seamlessly to the live mode by let the granulizer being triggered by the audio level trigger

The **<Loop>** Button is enabled once a audio file is loaded to the Grain Buffer. It sets the **Delay** and **Speed** Grain Modulations, especially the Delay **Offset**, the Delay **Modulation** and the Delay LFO **Frequency** to automatically adjust in such a way so that a non-pitched and forward playback of the buffer is ensured.

Tip: Use the **<Loop>** Button to start your granular experiments on fixed buffers. Simply press **<Undo>** if you want to revert to your previous settings

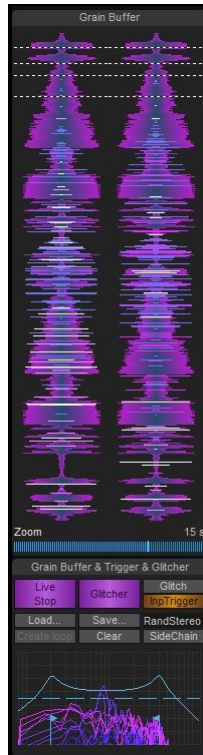
The **<Save>** button saves the current buffer into a WAV or AIFF sound file. The save area ranges from 0ms up to the maximum Delay Modulation (given by the offset and depth).

Note: Don't expect that what you hear is automatically saved... The content of the sound buffer is not automatically saved from the output of the grain generators!

The **<Clear>** Button immediately clears the Grain Buffer - use it in case you want to "clean" long lasting grain structures with long grain lengths and/or high feedback. In case a file is loaded into the Grain Buffer the button will also trigger a switch back to the Live mode.

#### 9.4.2. The Glitcher-X Mode

If the **<Glitcher >** button is pressed the Glitcher-X Mode is enabled (works only together with Live Mode).



*Glitcher-X Mode enabled*

You probably know the "[Eisbach Wave](#)" in Munich? If you come to Munich on your next Germany trip, make sure you drop by and discover this beautiful energized and special place! There are those city surfers waiting in a line to jump on the wave and perform their rides looking for a moment of fame! This is basically what happens when you turn crusher-X into Glitcher Mode: Imagine a grain sitting at the river bank of the audio stream, relaxed but ready to ride the ultimate wave! As soon as the desired wave drops by the grain jumps on the flow and starts performing their moves and modulations until its lifetime is over and it drops off. A spectral formant transient selector filter detects the best moment to jump on the audio stream and the grain adheres on that position. As controlled by the regular Grain Modulations the grain will modulate around its known position. This position is depicted with a dotted white line in the Grain Buffer View. Each Glitch Trigger can be potentially happen for each generator (so there will be several grains available to ride the incoming audio wave) and one can choose how the current Glitch Trigger will be populated to the different generators with the Glitcher Mode selector:

- **All:** Each Glitch will be applied to all Generators at the same time
- **Random:** Only one random chosen Generator will get the next Glitch
- **RandStereo:** Same as Random but L/R pairs will be selected together
- **Rot:** The next Glitch will be applied to the next higher Generator
- **Rot Stereo:** Same as Rot but L/R pairs will be selected
- **Rot2:** The next Glitch will be applied to the next two higher Generators
- **Rot3:** The next Glitch will be applied to the next three higher Generators

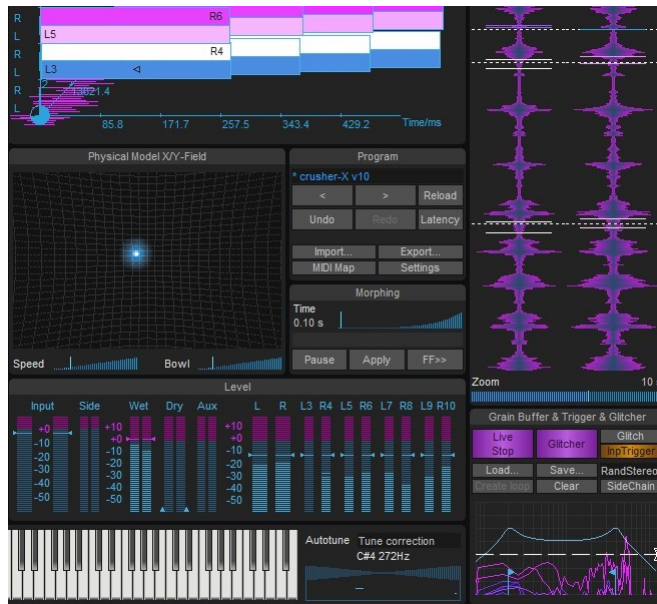
Depending on the numbers of active Generators the selection of the Glitcher Mode creates different Glitch generator patterns.

Besides with the Spectral selector you can also trigger a new Glitch by either:

- Pressing the **<Glitch>** button
- Triggering with the plug-in parameter called Grainbuffer.Fire
- With the **Quantization** mode **Fill/Glitch** or **Grain+Fill/Glitch**

Note: The **Life-time** of the Grain will determine the length of each ride and after the drop (death) of the grain a next Glitch trigger will respawn it again.

Tip: Use Glitcher-X Mode together with a microphone and your instrument. You will control the river stream and crusher-X will surf on it! You could even create a glitch manually with assigning the Glitch button to a foot controller - curtain up!

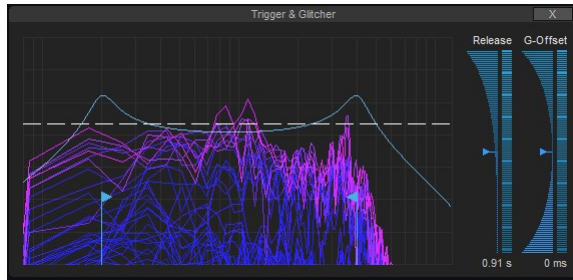


*Glitcher-X Mode enabled*

### 9.4.3. The Spectral Selector

Fast detection of interesting sound events in live streams is quite tricky. A spectral transition response approach combined with a fast real-time state machine is a the new crusher way to discriminate between silence, tonal, vocal or spectral interesting parts of an incoming audio stream in real-time. To control this job crusher-X 10 introduces a unique trigger control that allows to select the desired spectral trigger range and its sensitivity with simple mouse moves. The trigger is auto sensitives that means it works on all audio levels, detecting a relative change, not an absolute level. This new trigger system is wired up with the Grain buffer Fill, Respawn and Glitch position launches. And as you already controlling this unique formant filter, you can add the outcome of its spectral manipulation as an additional input signal to granulize. Become ready for sophisticated granular filtered sweeps and advanced and color rich drones. The filter sweeps are morphed by the Morphing System.

Move the Selector Arrows left/right to control the low and high center frequency so that the desired formant response is selected. Move the Selector Arrows up or down to discriminate the formants or frequency range sharper or weaker. The response function of the filter is shown with the blue humps graph and with resulting spectrum underneath. The dotted horizontal line depicts the current trigger level and when it turns to white it represents a fired trigger. The **Release** slider determines the time until the next trigger will happen. In Glitcher-X Mode The **G-Offset** Slider determines the Delay offset (positive or negative) on the trigger event when the event is attached to a generator.

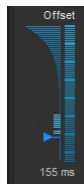


*Spectral Selector Formant Trigger*

Tip: Move the G-Offset up to auto-select the "body" of an audio event after it was triggered (e.g. skip the transient at the beginning)

## 9.5. Physical Modelling sliders

The UI of the plug-in gives access to all crusher-X settings. The editor is designed to provide full control over all sound processing features while providing visual feedback of all changes.



*crusher-X slider with PM-Wheel*

Tip: Most of crusher-X's sliders are also able to be controlled with a physical-modeling "wheel" (**PM-Wheel**) on the right side of each slider. Just "push" the wheel with the mouse (holding the left mouse-button down) and observe how the wheel and the slider moves. The same functions can be accomplished by using the scroll-wheel of a mouse or by a finger on a touch screen.

This unique technique which accSone invented in 2003 allows you to have full control to fine-tune and delicately calibrate changes very quickly and smoothly simply by scrolling slowly or quickly. You can also push the wheel by scrolling the mouse wheel. Simply move the mouse over a slider and turn the wheel. The text value inputs can also be controlled by mouse scrolling or mouse dragging.



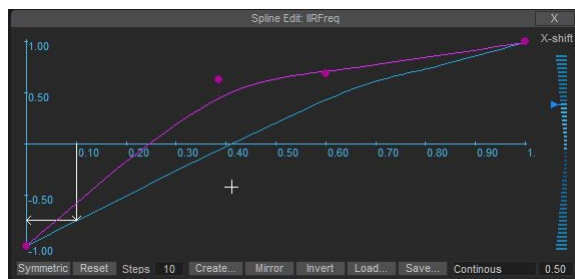
## 9.6. Screenless control for sight impaired musicians

crusher-X also has the ability to be almost fully controlled without requiring the GUI. All of the plug-in's parameters can be used to control each function. Inspired by the blind composer David Hindmarch, accSone has developed several features which enable blind / sight impaired musicians to control crusher-X:

With the new plug-in parameters cursor-X, cursor-Y, SetDelete you can edit spline curves and step sequences without using a mouse: Change a **Grain Modulation** (e.g. Speed.Mode = 65%) to select the targeted Modulation. If the mode of the Modulation is "Spline..." or "Steps..." one can control a virtual cursor on the X- and Y- Axis with the parameters cursor-X and cursor-Y. As long as the parameter SetDelete =0 no editing will happen. Once you select a position you can set the SetDelete parameter to the positive maximum; If a Spline Point is near the cursor-X position the Spline Point is "caught" and set to the cursor-X and cursor-Y position. If you press the <Shift> key while moving the SetDelete parameter up, it will insert a **Knee Point**. If there is no Spline Point near the cursor-X position, a new point is created and can be moved with the cursor-X and cursor-Y parameters. By moving the SetDelete to minimum the nearby Spline Point will be deleted. Leaving SetDelete to the minimum and moving the cursor-X around will delete all Spline Points that were caught.

Tip: The virtual cursor is visualized in the Spline or Step editor as a white cross. This can be used to train the usage of the edit parameters together with a sighted peer.

Some plug-in hosts such as Ableton Live or Reaper allows you to edit plug-in parameters while having the plug-in editor open. Some hosts like Ableton Live need plug-in parameters to be automated to setup access to a plug-in parameter. To generate a one-shot automation of the cursor-X, cursor-Y and SetDelete parameters, simply hold down the <shift-key> and click on the **<MACRO Map>** button in the **Programs Panel**.



To edit the **Sweep Mode** or **WaveShape** Splines from the **Granulizer Panel** you must only modify a Sweep or WaveShape Grain Modulation first without setting the modulation to Spline Mode or Steps Mode...

To edit the **Compressor** spline use one of the Compressor plug-in parameters first.

To edit the **Envelope follower** spline use one of the Envelope Follower plug-in parameters first.

If the editor is open and the host supports keystroke routing towards the plug-in, you can utilize hot keys such as <1>-<6>, <q>-<z> for Grain Modulation selections and <o> for loading a wave file into the grain buffer.

## 9.7. Drag'n drop files

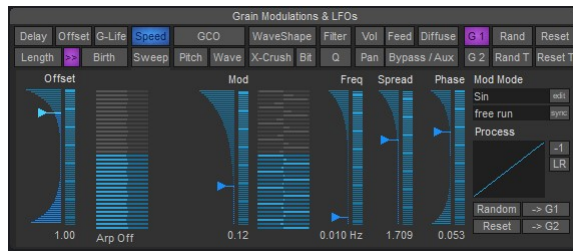
Audio files (WAV, MP3 or AIFF files) can be dragged and dropped on the plug-in interface. If an audio file is dropped on the DCO or Edit panel the file will be loaded into the DCO and opens the DCO editor. If an audio file dropped elsewhere the file will be loaded to the Grain-Buffer and the Live Mode will be switched off. For more details on loading audio files see also the Granulizer panel and DCO panel topics.

crusher-X Program files and crusher-X Sound Package files can be dropped on the UI as well: Drop one or several crusher-X Programs to the UI it will load the program(s) to the program slots and do a morph to the last program. Drop a crusher-X sound package file to the UI will load the complete sound package (see also **<Import>** button on the Program Panel)

## 10. Grain Modulations and LFOs

### 10.1. Grain Modulations and LFOs

The **Grain Modulations & LFOs** panel allows control over grain generation. **Grain Modulation** defines the way in which a grain is generated (**Delay**, **Birth**, **Offset**), the Grain's lifetime (**Length** and **G-Life**), the Grain's pitch **Speed**, **Sweep**, the **GCO** audio in-print **Mix**, **Pitch**, and **Wave** and the Grain's audio processing (**WaveShape**, **X-Crush**, **Bit-Crush**, **Filter Cut**, **Filter Q**, **Volume**, **Pan**, **Bypass/Aux** and **Diffuse**).



*Grain Modulations & LFOs panel*

Each **Grain Modulation** applies to all **Generators**.

To adjust the modulation of Grain Modulation simply choose the desired Tab and adjust the sliders.

All Grain Modulations share the same structure:

The **Offset** slider sets the general offset of the Grain Modulation which is defined in the left upper corner of the panel.

**Mod** defines the modulation depth of the Grain Modulation's LFOs

**Freq** determines the frequency of the Grain Modulation's LFOs

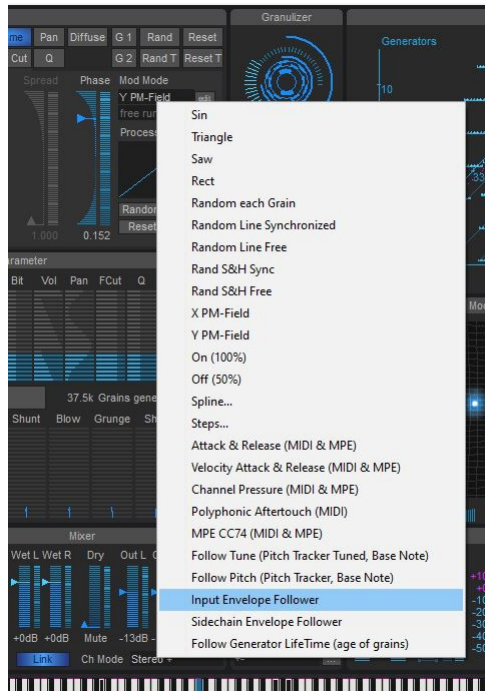
The **Phase** slider defines changes of modulation phasing between the individual **Grain Generators**. Note: Changes between individual generators can only be made by using the **Phase** slider

The **Spread** slider defines changes of the modulation frequency for each **Grain Generator**. The first Generator (the lowest) will be modulated by the selected base frequency. The other Generators are modulated by the base frequency multiplied by the Spread factor and the Number of the generator (e.g. 1,2,3,4)

Note: With the Phase and the Spread functionalities you are able to control the frequency's and phase's relationships between the LFOs for each generator. Think of up to 199 LFOs being controlled by only 2 sliders for each Grain Modulation. One of crusher-X's "unique-sounding secrets" is this concept of "spread LFO" control over a series of granulation streams

The pressed <LR> button will ensure that the modulation stays the same for each Left- and Right Stereo Generator pair even if Spread or Phase is used. This will regulate the stereo depth of the applied modulation and ensures a more balanced modulation output if desired. One can mix several <LR> settings for each Grain Modulation (e.g. only apply it to Speed or G-Life).

**Mod Mode** sets the modulation modes. Several types are available:



*Grain Modulations Modes*

- Standard modulation forms such as: Sin, Triangle, Saw, Rect
- **Each Grain** is randomized: Every grain will be created with a random value
- **RandLine Sync**: A random "travel line" floating modulation will be applied to all generators (spread & phase can be applied to sync)
- **RandLine Free**: A random "travel line" floating modulation will be individually applied to each generator
- **Rand S&H Sync**: A random "sample and hold" modulation will be applied to all generators (spread & phase can be applied to sync)
- **Rand S&H Free**: A random "sample and hold" modulation will be individually applied to each generator
- **X PM-Field, Y PM-Field**: Modulate with the PM-Field
- **On (100%)**: no modulation will be applied with an offset of 100% (can be used together with **Phase** to spread an offset over the generators)
- **Off (50%)**: no modulation will be applied with an offset of 50%
- **Spline**: enables custom spline editing of the modulation
- **Steps**: enables custom step sequence editing of the modulation
- **Attack & Release (MIDI & MPE)**: ties the modulator to the Attack and Release values that are able to be changed in the **MIDI Key** panel
- **Velocity Attack & Release (MIDI & MPE)**: same like above, but takes the MIDI Velocity into account
- **Channel Pressure (MIDI & MPE)**: ties the Modulator to the Channel Pressure MIDI event. In MPE mode (**MIDI Key** panel) each generator will be steered by each individual MPE channel
- **Polyphonic Aftertouch (MIDI)**: ties the Modulator to the Polyphonic Aftertouch MIDI events.
- **MPE CC74 (MIDI & MPE)**: ties the Modulator to the MPE CC74 controller for each MPE channel individually. Works only in MPE mode
- **Follow Tune (Pitch Tracker Tuned, Base Note)**: Modulates the output of the pitch tracking system by

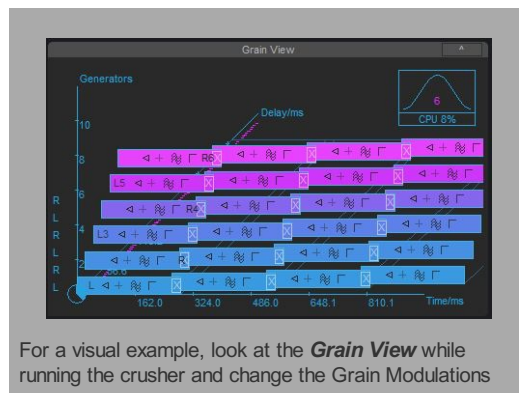
compensating to the selected Scale in the **MIDI Key** panel.

- **Follow Pitch (Pitch Tracker, Base Note):** Modulates the output of the pitch tracking system by following the selected Scale in the **MIDI Key** panel.
- **Input Envelope Follower:** Modulates with the output of the envelope follower system. To adjust the Envelope Follower characteristic curve or Attack and Release times press the **<Env>** Button in the **Mixer** panel or click on the Input Envelope Meter in the **Level** panel.
- **Sidechain Envelope Follower:** Modulates with the output of the envelope follower system for the Sidechain. To adjust the Sidechain Envelope Follower characteristic curve or Attack and Release times press the **<Env>** Button in the **Mixer** panel or click on the Sidechain Envelope Meters in the **Level** panel.
- **Follow Generator Lifetime:** Modulates according to the "age" of the grains (see GLT System)

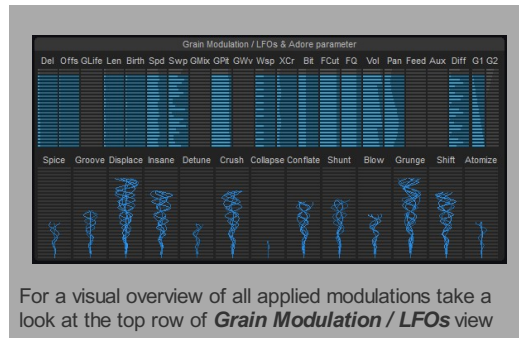
Each modulation is passed through logarithmic or exponential processing. You can adjust the curve of processing by the **Process** graph. This little graph will show you the resulting processes. The mouse can be used to further modify them. In combination with the modulations sources this function is very useful to generate more "human-sounding" modulations. By pressing the small **<-1>** button you can "invert" the processing. Although it is a binary control it will be morphed on larger morph time settings:

Tip: Use the **<-1>** button together with a morph time set >0. The process graph will display the processing changes. Along with **Phase** this generates a smooth forward/back like effect

To define the slider range, use the small buttons above the sliders if they are available on the selected Grain Modulation. The range is also auto-selected once you drag the mouse above or below the current selected range. All modulations can run independently of the host's beat in the **free run** mode. Choosing a **beat** will sync the modulation to the host's beat.



For a visual example, look at the **Grain View** while running the crusher and change the Grain Modulations



For a visual overview of all applied modulations take a look at the top row of **Grain Modulation / LFOs** view

Pressing the **>>** *button* between the Length and the Birth selectors will enable a proportional following of the Offset on the Birth Grain Modulation if the offset of the Length Grain Modulation is changed manually. That feature ensures easy adjustment of the grain density (you might know that type from other granular synthesizer effects). The link is only unidirectional meaning that you are still able to change the relationship between Length and Birth by editing the Birth Grain Modulation first.

The **<Random>** and **<Reset>** buttons apply and reset the currently selected modulations.

Tip: Use the **<Random>** button together with **<Undo>** or **<Redo>** and the **Morphing** System to generate interesting modulation floats

The **<G1>** or **<G2>** buttons will show the **Global Modulation Matrices (GMMs)**. Use the GMMs to add more global modulations on top of the current modulation. It is useful to add synchronous modulations to different Grain Modulations (e.g. Length and Speed).

The **<-> G1>** and **<-> G2>** are shortcuts to move the current Modulation towards a GMM slot.

## 10.2. Global Modulation Matrices (GMMs)



*Two Global Modulation Matrices (GMMs) to add global modulations*

To show a GMM, press either the **<G1>** or the **<G2>** button on the Grain Modulations Panel.

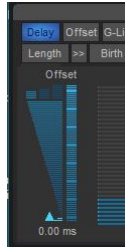
Each GMM has 4 Slots **Mod 1-4** that defines the amount, a target and a type of global modulation. The **Level** fader will steer the overall amount of all 4 modulations.

By pressing the **<-1>** button on each slot one can "invert" the modulation of the slot. This allows opposing Grain Modulations (e.g. increasing the length and lowering the speed with the same global modulation source). Any setting including the inversion will be further morphed depending on the Time setting in the Morphing Panel.

Note: Experienced users may start their sound design workflow at the GMMs first and then add individual modulations later as the GMM slots allow full control for each modulation target and type. This makes it easier to define first the Grain Modulation Targets that should run synchronously to create to more coherent sound gestures.

Tip: Use the Global Modulation Phase slider to change the phase of the modulation. This allows for creating interesting sounds where the Grain Modulations are modulated synchronously but with an offset for each generator.

## 10.3. Delay, Length, Birth and Offset Modulation



*Delay, Length, Birth and Offset Modulations*

### 10.3.1. Delay Modulation

The **Delay** Grain Modulation defines the delay between the audio input into the buffer and the grain(s) output. It can be seen as a delay line where the read-head is moving. It is defined in msec (1/1000 Second).

Tip: Modulating the **Delay** Grain Modulation allows "scrolling" through the audio in the buffer.

### 10.3.2. Length Modulation

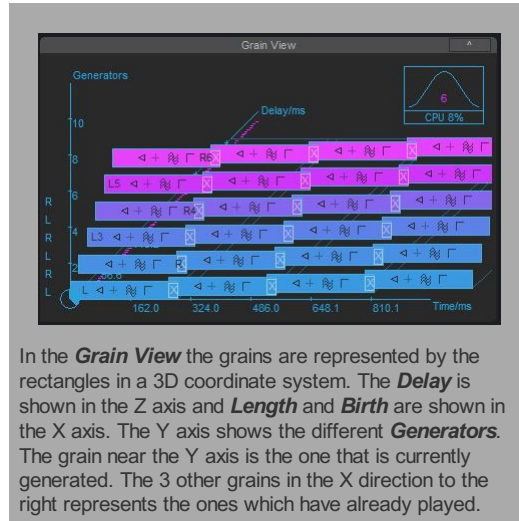
**Length** determines the length of the grain in msec.

Tip: Extremely short (1ms - 20ms) grains sound like "spikes" or "sparks". Longer overlapping grains (100ms - 500ms) are appropriated for pitch shifting effects. Lengths > 10sec can be used for longer lasting sound moves or sound collages.

### 10.3.3. Birth Modulation

**Birth** determines the time (in msec) the generator will wait until a new grain is born. If the Birth time is smaller than the Length of the grain the grains will overlap. The generator prevents the birth time from decreasing under 10% of the actual grain length. This prevents it from overloading the system. The actual generated numbers of the grains are shown in the **Grain View**.

Adding the Length and Birth Grain Modulations together will determine the **grain density**. Longer length times and smaller Birth times will lead to higher grain density that will finally end up in an overload. Take a look at the Grain View in the upper right corner to determine the amount of grains running at the same time.

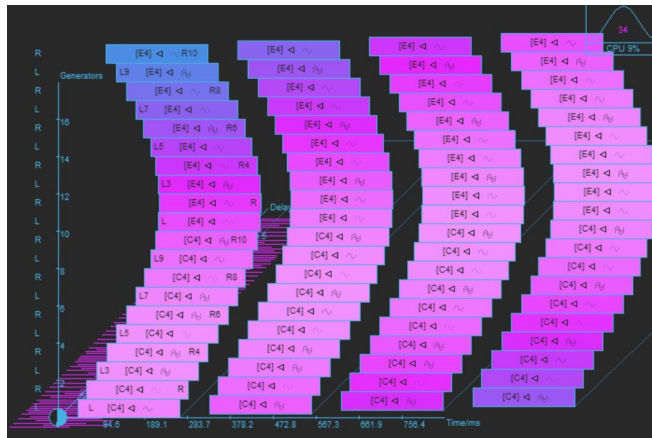


Pressing the **>> button** will enable a proportional following of the Offset on the Birth Grain Modulation if the offset on the Length Grain Modulation is changed manually.

Tip: To get started understanding grain generation principles use the program "**to start with**", feed in some audio from your DAW and experiment with the **Length**, **Birth** and **Delay** Grain Modulations by using the **Offset** sliders. It's best to start with audio material that you're familiar with or that has some good observable structures (like e.g. spoken text or reduced drum loops with some melodic elements)

### 10.3.4. Offset Modulation

**Offset** determine the time (in msec) each generator waits until a grain - that has given birth - is actually processed (in older versions of crusher-X this was partially the result of a static, global Generator Offset setting). This Modulation needs some Phase or Spread applied to have an outstanding effect: It determines if all the grains from each generator are created at the same time (No Offset) or at a different point in time for each generator.

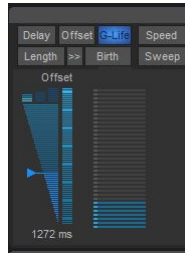


*Offset Modulation example*

Tip: Use a Phased Offset modulation together with longer Birth times to "smear" the grain generation into pauses. This generates smooth but very light "drones". After that you can control the Density of the drones with the Birth Modulation

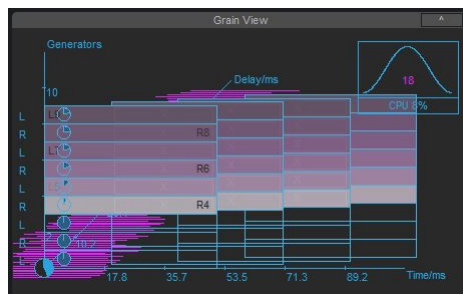


## 10.4. G-Life Modulation



*The GLT (Grain Life-Time) System*

The **GLT** (Grain Life-Time) System is a unique crusher-X feature that gives detailed control over the time each grain generator is alive. The GLT is activated by adding an Offset or a Modulation to G-Life. Once activated a count-down timer for the generator is launched for each generator (Spread and Phase allow to create different life-times for each generator).



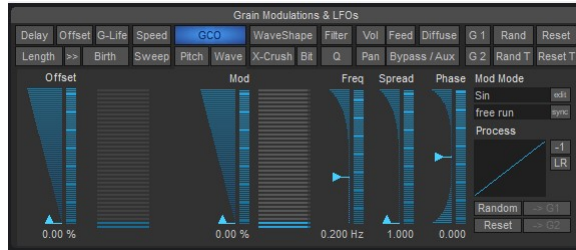
*The GLT countdown timers*

Once the count-down timer has expired the attached generator is deactivated until one of the following events occur:

- A click on the blinking **<Respawn>** button on the Granulizer Panel
- A MIDI-Note On event (or a fixed MIDI-Note On state)
- A trigger of the Audio-Signal (Trigger Level) either with the Input Signal or with the Sidechain Signal (depends on the **<Sidechain>** switch on the Trigger panel)
- Quantization if selected to trigger a Respawn Event (see Quantization Panel)

Tip: Use the GLT System to create percussive grain developments that doesn't sound static. As the lifetime can also control the modulation itself one can create very interesting developments of time limited drones (see Grain Modulations)

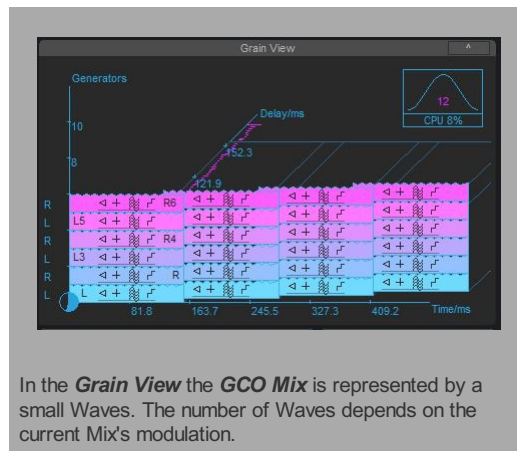
## 10.5. GCO Mix, GCO Pitch and GCO Wave Modulation



*GCO Mix and GCO Pitch Modulation*

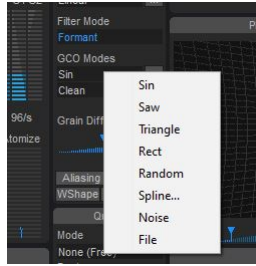
The **GCO** (Grain Controlled Oscillator) is a unique crusher-X feature that allows you to add audio waveforms and samples on top of the live input signal from the grain buffer. Think of an Oscillator or Sampler that is only alive during a grains lifetime. The **GCO Mix** modulation determines the balance between the buffer's audio and the GCO. The **GCO Pitch** modulation determines the pitch or tuning of the GCO. If a **GCO Waveform** is selected, the **GCO Wave** modulation applies a wave phase modulation. If an audio file or factory sound is selected, the **GCO Wave** modulation sets the starting point (0%-100%) of the GCO file playback.

Tip: Use the GCO to "color" your live processed signal. Together with the Arpeggiator Modes you can add a tuned "flavor" to your drone that can be "played" via the MIDI Keyboard



In the **Grain View** the **GCO Mix** is represented by a small Waves. The number of Waves depends on the current Mix's modulation.

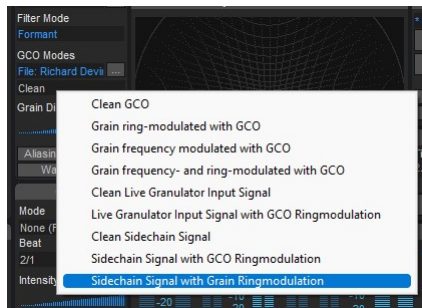
## 10.5.1. GCO waveforms



*GCO waveforms*

The **GCO Modes** can be set in the **Granulizer** panel. Different Waveforms, Splines, Factory sounds and an individual audio file selection are possible.

## 10.5.2. GCO processing modes

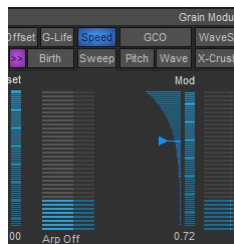


*GCO processing modes*

Besides a clean Oscillator print-in, Ring modulation and Frequency Modulation are also available that interfere with the live input buffer audio of the grains. Switching the mode is processed thru the morphing system so that you can blend thru the modes (e.g. by using a MIDI controller)

Tip: In FM or Ringmodulation Modes you can "detune" either the GCO with the GCO pitch modulation or the "live input" with the Speed or Sweep modulation to create outstanding sonic interferences

## 10.6. Speed and Sweep Modulation



*Speed and Sweep Modulation*

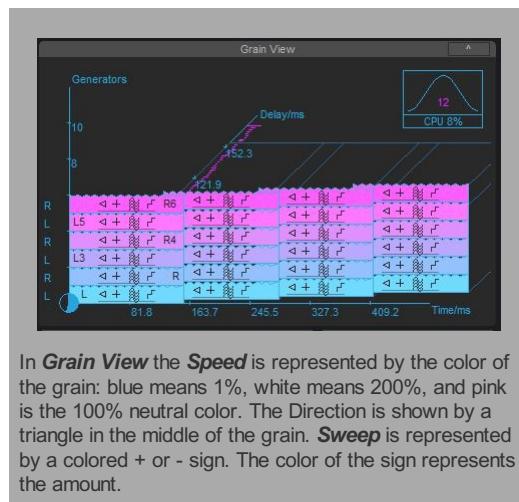
## 10.6.1. Speed Modulation

**Speed** refers to the pitch of the grain. It is defined as a multiplication factor and ranges from -5 to 5. 1 indicates no pitch shifting. 2 means a double pitch. Values > 1 scale the pitch up. Values from 1 down to 0 scale the pitch down. Values below 0 represent backwards pitch shifting (-1 without pitch shift, 0 to -1 pitch down, < -1 pitch up).

Depending on the **Aliasing** switch (see Granulizer panel) a sample rate conversion is made. Pressing the **<Aliasing>** button disables that feature and you hear up- and down-sampling artifacts that make the crusher sound more aggressive.

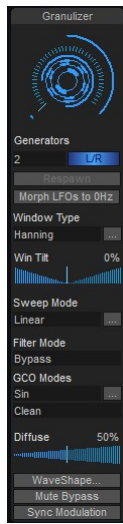
Note: Speed modulation doesn't affect the GCO pitch, which allows you to independently control the input-signal pitch and GCO pitch of the GCO Ring modulation or FM Modes.

Tip: Use modulation to create scratch effects on longer grains.



## 10.6.2. Sweep Modulation

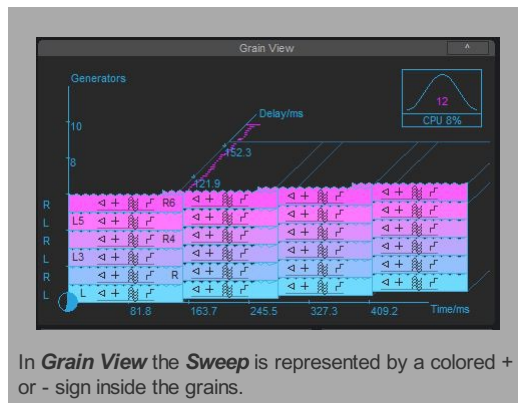
**Sweep** determines grains pitch-shift during its life-cycle. (dynamic grain pitching). Positive values increase the speed during a grain's lifetime, negative values decrease the speed. The following modulation types of pitch changes can also be selected in the **Granulizer** panel: Linear (normal sweep), Spline and Steps.



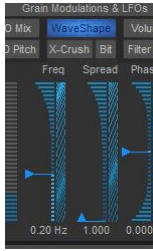
*Sweep Modes Linear, Spline and Step*

Note: Sweep modulation doesn't affect GCO pitch

Tip: Use a linear sweep to make the sound "wet"! Longer grains will sound like water drops with Sweep amounts different from 0. With the Spline and Step modes you can create very sophisticated "sweep and pitch changes" that are executed during the grain's generation and depends on the length of the grain (which is relative in time to the grain's **Length**). E.g. - You can use Step mode to create a kind of "melody" on longer grains (>1s) which is played back to you for each grain. Modulate the Grain Length to let the grain melodies interfere in time and space. This crusher-X feature alone can provide you hours of joy exploring the land of dynamic grain pitching!

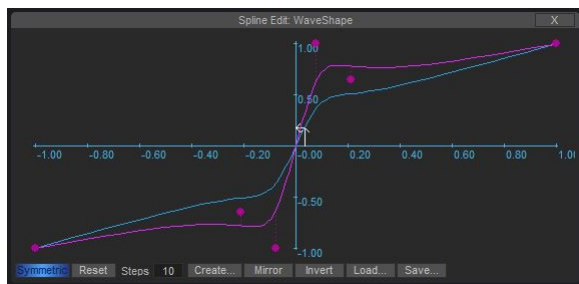


## 10.7. WaveShape Modulation



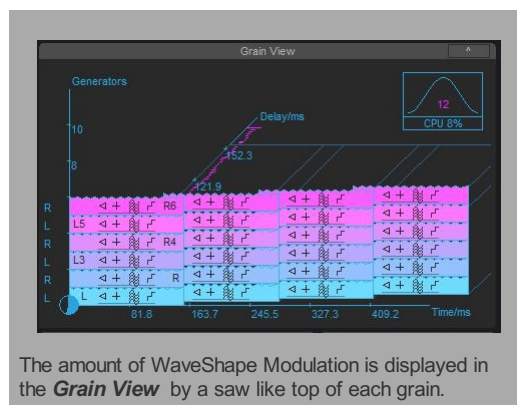
WaveShape Modulation

Each sample of a grain is manipulated by a **WaveShape** amplitude modulator. WaveShaping is a generic way of defining various flavors of an overdrive effect. The characteristics of the overdrive can be controlled by the relationship between the input and output level of each sample. The curve's characteristics can be edited in the WaveShape spline editor that is able to be opened from the **Granulizer** panel:



WaveShape Spline Editor

The WaveShape Modulator controls the amount of modulation of the edited spline (pink) curve. The result is represented by the blue curve. In **WaveShape Spline Editor** the white arrows representing the current input and output sample is mirrored on the blue line. It depicts the current applied modulation of the first generator. The modulations range from 0% ("linear" - meaning input=output) to 100% (the current edited spline).



The amount of WaveShape Modulation is displayed in the **Grain View** by a saw like top of each grain.

Tip: By using the **Phase** sliders you can assign different modulations to different generators. This will generate a mix of distorted and clean grains.

## 10.8. X-Crush Modulation



*X-Crush and Bit-Crush Modulation*

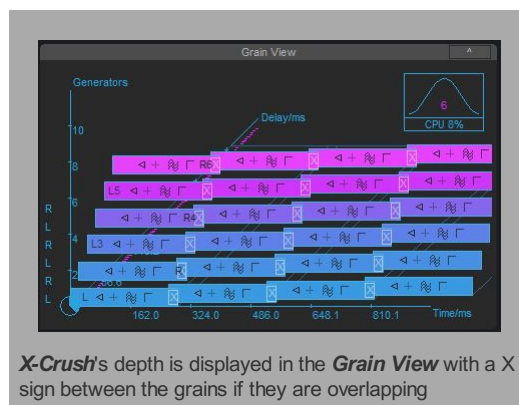
**X-Crush** is a very special grain modulation that was invented by accSone in 2014 and is unique in the world of granular synthesis: It adds a special asymmetric ring-modulation transformation feed by overlapping each grain with its successive grain.

Grain overlapping happens if the grains are longer (defined by Length Grain Modulation) than the birthing time (defined by the Birth Grain Modulation). X-Crush is only applied inside each generator, not across several generators (so to speak, only in X-direction, not in Y-direction – to see this you can take a look at the **Grain View**).

If the X-Crush Grain Modulation is 0% a normal summary of the grain's output is performed on each generator stream. But once the X-Crush Grain Modulation becomes >0% (due to offset setting or modulation), the overlapping area is processed by a special asymmetric ring-modulator algorithm. It processes the final part of the previous grain and also the beginning of the current grain. Because grains are normally windowed the effect is faded in and out by each grain's window.

Note: You won't be able to hear the X-Crush Grain Modulation's effects if the grains are shorter than their birthing time.

The X-Crush effect varies a lot depending on the settings of other Grain Modulations: For example, by using static Length/Birth times without any Depth modulation X-Crush will sound like nonlinear, fixed distortion. However, by adding Depth/Length/Birth modulations it will dramatically change the effect towards ringing or other types of artifacts. Try to add some X-Crush modulations on top, possibly with a phase between the generators, to change the window type...



**X-Crush's** depth is displayed in the **Grain View** with a X sign between the grains if they are overlapping

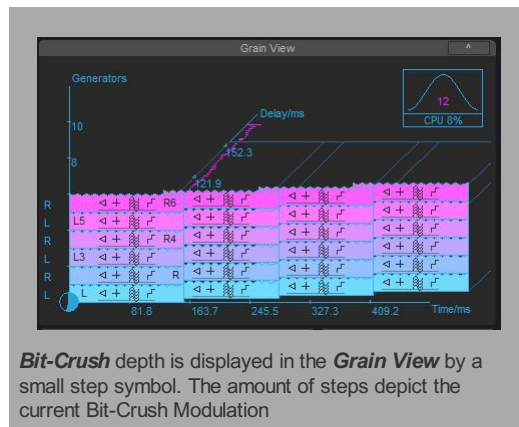
## 10.9. Bit-Crush Modulation



*Bit-Crush Modulation*

**Bit-Crush** is a grain modulator that individually processes a Bit-Crusher lo-fi effect on each grain that depends on the amount of modulation on the current grain. It produces distortion by the reducing the sample resolution and creating additional quantization noise. It ranges from 12Bit (1% Modulation ) to 1Bit (100%).

Tip: Utilize the Phase and Spread functionalities of the Bit-Crush Modulation to create Bit-Crush interferences between grains. This leads to warm, ever changing and colorful Bit-Crush sounds.



**Bit-Crush** depth is displayed in the *Grain View* by a small step symbol. The amount of steps depict the current Bit-Crush Modulation

## 10.10. Filter Cut and Q Modulation



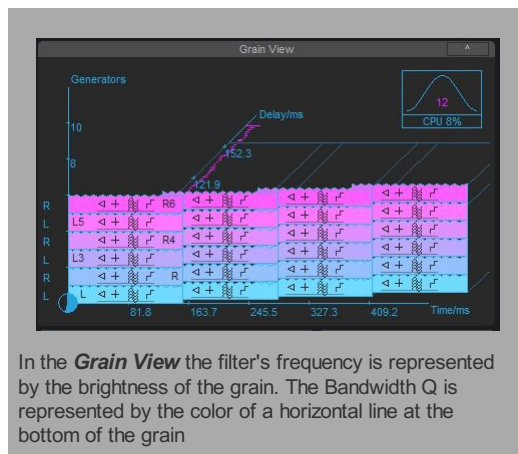
*Filter Cut and Filter Q Modulation*

Each Grain has its own IIR-Filter that can be set up by its **Filter Cut** Frequency and its Bandwidth **Q** Modulation. The **Filter Mode** is defined in the **Granulizer** panel.



Note: If the **Filter Cut** or **Q** modulation is changed and the **Filter Mode** is set to **Bypass** the Filter Mode is automatically set to Lowpass

Changes of the **Filter Mode** will be morphed by the **Morph** system.



### 10.10.3. Formant Filter mode



*Filter Cut and Filter Q Modulation*

If the **Filter Mode** in the **Granulizer** panel is set to **Formant** the **Filter Cut** modulation changes to a formant selection Modulation.

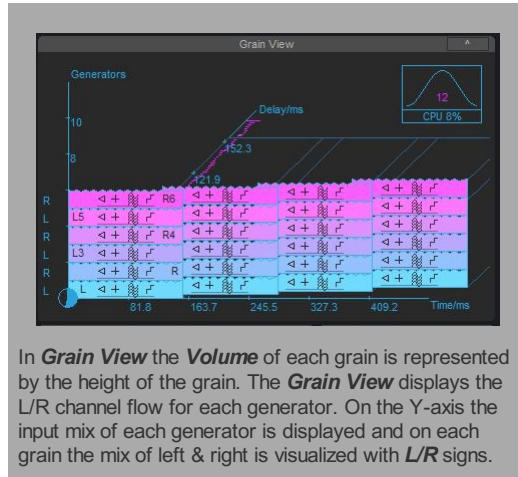
Tip: Set the starting vowel with the offset and modulate the Grain Modulation with a S&H modulation. Provide a noise or saw oscillator input sound. The crusher will start talking!

### 10.11. Volume and Pan Modulation



*Volume and Pan Modulation*

Each grain can be modulated in its **Volume** and **Pan**.

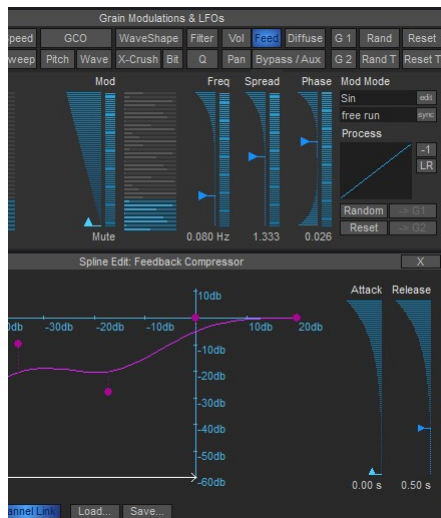


In **Grain View** the **Volume** of each grain is represented by the height of the grain. The **Grain View** displays the L/R channel flow for each generator. On the Y-axis the input mix of each generator is displayed and on each grain the mix of left & right is visualized with **L/R** signs.

Tip: Using the **Spread** or **Phase** sliders of the **Pan** Modulation creates fluent panorama shifts

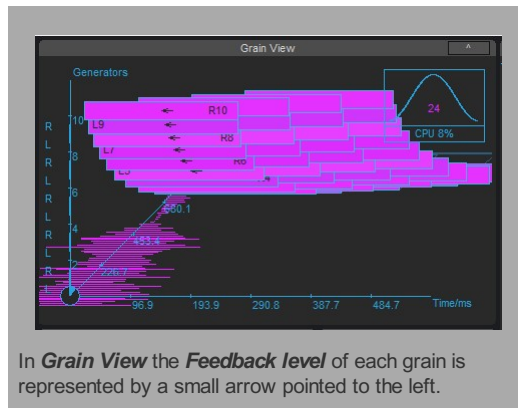
The **Volume** and **Pan** Modulations also effect the multichannel output levels depending on the **Surround Mode** setting in the **Mixer** panel.

## 10.12. Feedback Modulation



*Feedback Grain Modulation and Feedback Compressor*

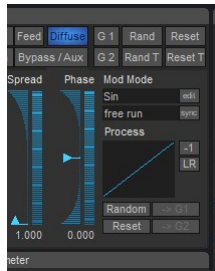
The **Grain Controlled Feedback (GCF)** system (invented by accSone 2022) controls the contribution of each Grain to the feedback bus. This is actually a multi-dimensional, modulated feedback matrix that could create hyper-shimmer reverbs and non static, floating feedback drones. The feedback bus got its own, individual feedback compressor/limiter/expander.



Tip: Become our own reverb designer! The v95 HyperShimmerReverb program can provide you a nice starting point for endless signature reverb design sessions. Consider to use it in combination with **Surround Modes**

Tip: Use the feedback together with the **Delay**, **Speed**, **Filter** and **Sweep** Modulations to create "Dub Delay" like effects.

## 10.13. Diffuse Modulation

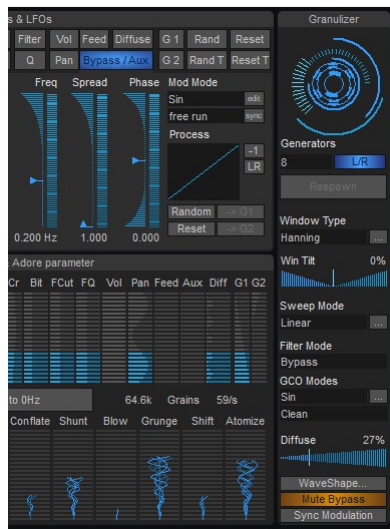


*Diffuse Modulation*

The **Diffuse** Modulation (invented by accSone in 2016) is unique in the world of granular synthesis: It mixes a reverb output for each grain generator (from up to 10 parallel independent reverb lines) before the grain window is applied. The "reverb memory" will be taken from one grain to another in the grain series that diffuses the grain content but not from the grain output! This leads to a very special, non smearing, precise and sharp - though warm - grain diffusion that can't be compared to a simple granulizer feeding a normal reverb processor.

Tip: Use the Diffuse Modulation on longer Birth times to get this specific effect of a sharply defined but internally diffused sound impression.

## 10.14. Bypass / Aux Modulation

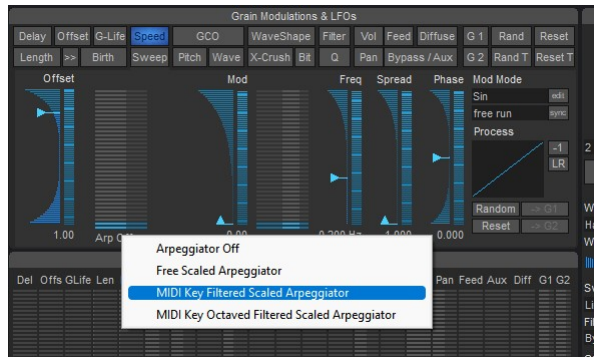


*Bypass / Aux Modulation*

With the **Bypass/Aux** Grain Modulation each Grain can be individually modulated to bypass the previous Effect Grain Modulations and/or bleed the pure Grain signal to an additional Aux bus of the VST3 plug-in. For VST2 or AU plug-ins you can use additional **Surround Modes** that provides the Aux Channels at different channels on the main output bus.

Tip: With the Aux bus one can further process "dry" Grains with own external effects and feed them into an extra mix. Use the **<Byp Mute>** button to disable the Bypass Grain Modulation to isolate the Aux functionality if needed

## 10.15. Arpeggiator Modes



*Arpeggiator Modes*



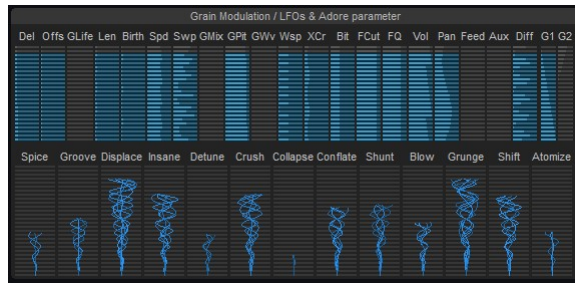
*Visual Arpeggiator Feedback*

For the **Speed**, **GCO pitch** and **Filter Cut** Modulations an Arpeggiator Mode selector is available. Once the Arpeggiator is enabled it translates the incoming Modulations (Which is a sum of the Offset, Mod and Glob Mods) into dedicated Keystrokes on the MIDI Keyboard - which you can see as pink highlighted Keys when they're selected. Depending on the selected Scale (also Microtonal Scales) the Arpeggiator generates the pitch information and uses this instead of the origin modulation source to modulate the pitch. This powerful feature enables a tuned, Arpeggiator like modulation and allows you to give "color" to the Grain generation in the dedicated scale. The Modulations Mod Mode determines the Arpeggiators type and direction. The Frequency determines the Speed of the Arpeggiator effect. And the Modulation Depth the Range of the Arpeggiator effect. The following Modes can be selected:

- **Arpeggiator Off.** No Arpeggiator Modulation will be applied
- **Free Scaled Arpeggiator.** The full selected Scale is used - no Keyboard MIDI events are needed
- **MIDI Key Filtered Scaled Arpeggiator.** Applies a filter to the pressed MIDI Keys and the selected Scale (MIDI Keys are latched) The Scale can be selected independently from the pressed MIDI Key and their Octaves in the MIDI panel
- **MIDI Key Octaved Filtered Scaled Arpeggiator.** Applies a filter to the pressed MIDI Keys and all of their Octaves and the selected Scale (MIDI Keys are latched). The Scale can be selected independently from the pressed MIDI Key and their Octaves in the MIDI panel

Tip: Use the Arpeggiator modes on Speed or GCO pitch to "color" the grain's Modulations in the selected Scale and change this harmonic layer by pressing different Chords on an attached MIDI Keyboard. If you don't want to interfere with the global MIDI harmonic layer use the MIDI Mode "No Pitch"

## 10.16. Grain Modulation Overview and Adore parameter



*Grain Modulation Overview & Adore parameters*

In the top row you can observe all the active **Grain Modulations** at the same time. The active **Generators** are colored. Clicking on specific graphs will highlight the corresponding Grain modulations tabs.

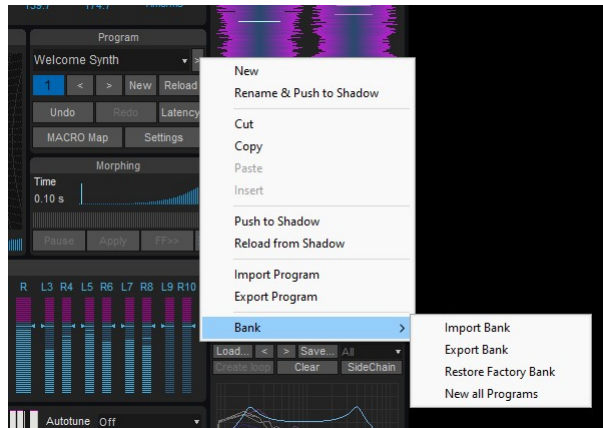
For curiosity's sake, the amount of currently used LFOs are displayed in the Grain Modulations panel header. Each Grain Modulation owns a set of up to 199 (for each Generator) LFOs.

At the bottom there are 13 so called **Adore parameters**. These are mapped to corresponding plug-in parameters and can be understood as meta parameters to control several Grain Modulations and other crusher-X settings at once. Each Adore parameter is mapped to several Grain Modulations via a specified mapping (Refer to chapter "Remote control or automate crusher-X). Adore parameter modifications are treated as normal Grain Modulation modifications, so therefore can be morphed or undo/redo. However, due to its nature of being a meta parameter that is only applied once, positions of the Adore parameters are not stored with the program.

Tip: You can modify or add more mappings for each Adore parameter by opening the <MACRO Map> button on the program panel and editing the mapping.

# 11. The Panels

## 11.1. Program Panel



Program Panel with the Program Management Menu

The plug-in's programs can be changed by selecting one from the **Program List** or by pressing the < > buttons. Each program holds the entirety of the current status of the plug-in with all its values and settings. Depending on the Morph time switching between the programs will change the settings faster or slower.

Tip: Use the program change buttons with higher morph time values (see **Morph panel**) to morph from one program to another

A right click on the **Program List** or a Click on the < > button will open the Program Management Menu. This allows to cut/copy/paste programs inside or to other running crusher-X instances. New as well as the <New> button will create a full reset, untitled program. **Import Program** and **Export Program** allows to save and load single crusher-X Programs to or from the hard disk. The full Bank (all Slots) can be imported/exported with **Import Bank** and **Export Bank** (e.g. crusher-X Sound Packages). crusher-X Programs are compatible with previous crusherX-Live!, crusherX-Studio! and crusherX-Mac! versions. When more than one crusher-X Program is selected from the file open dialog all files are imported to the corresponding program slots in sequence. The current filename will be used to change the program name.

Tip: If a filename contains a "\_" character then it is displayed and sorted into a group. The group name is defined by the part of the filename that is before the "\_" character. Same can be achieved on using **Rename** if the entered new name contains a ":" character e.g. enter "group:programname" or "group:subgroup:programname"

crusher-X program files can be dropped on the UI as well: Drop one or several crusher-X Programs to the UI it will load the program(s) to the program slots and do a morph to the last program. Drop a crusher-X sound package file to the UI will load the complete sound package

All new imported or loaded programs will be stored in a shadow program "under" the current modified program. Choosing **Reload from Shadow** or pressing the <Reload> button will reload the underlying shadow's program. If no shadow program was imported before, the factory default program will be reloaded. The shadow programs are stored into the host's project and are also available after a reload of your project. With this feature you can reset your modifications very quickly to a predefined set of programs. This will give you higher freedom for live modifications. While modifying the program by changing a setting a \* will be displayed in front of the program name and the color of the name will change.



Tip: For supporting live performances, import several programs and assign the **<Reload>** button to a MIDI-Controller. This enables you to switch back to the initial sound immediately after changing several values

### 11.1.1. Undo/Redo

After changing any value, the entire program (without the program names) of the crusher is streamed into memory; you can undo each change step by pressing the **<Undo>** button. The **<Redo>** button will redo the change.

Tip: Use the **<Undo>** / **<Redo>** buttons with higher morph time values (see **Morph panel**) to morph between the changes

### 11.1.2. Macro Map / Settings

The **<MACRO Map>** button opens the **MACRO mapping editor** (see the corresponding chapter below). If the **<MACRO Map>** button is dimly lit this indicates that certain Controllers are stored with the current Program.

The **<Settings>** button will launch the Global Settings Editor (see the corresponding chapter below). Find the button in the **Settings Editor** called **<Restore all programs to the factory settings>** to restore all programs to the factory defaults.

### 11.1.3. Latency compensation system

The **<Latency>** button in the **Program panel** creates a calculation of a latency compensation for the current or modified program.

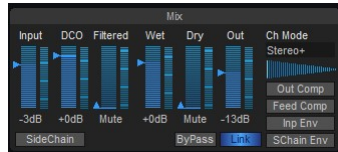
Use this if you want to make sure that your audio generated by crusher-X stays in sync with the track that feeds crusher-X (e.g. to stay synchronized on a drum-beat). If a program contains deeper modulations of the Delay, Length, Speed or Sweep Grain Modulations then the smart latency compensation algorithm will calculate a "grain gravity compensation" so that the compensation remains meaningful. Although in these cases a full compensation is not desired nor possible. If the current calculated compensation fits the current program then the button will stay blue, but if the compensation will not fit, it will turn purple (e.g. after a setting or program change). As every new calculation will force the host to re-synchronize its audio processing there will be some audio outages you'll easily be able to notice (depending on the host) depending on if the button is pressed or released. Releasing the button will reset the compensation back to 0 samples - Use this with live input sources to ensure a minimum of processing latency in this case. The current latency compensation is stored as a global setting (not with each program). This enables the following: Initial loading of a compensation on launching the host or a smooth morphing between programs

Note: The functionality of this feature is highly dependent on the ability of the host to receive the reported latency compensation from the plug-in into account:

**Live** does a pretty good job as it cross-blends changes, even during playback.

**Logic** has problems with applying the changes during playback. But if this happens, sometimes clicking the **<Stop>** button in Logic Transport and then clicking the **<Latency>** button in crusher-X helps.

## 11.2. Mixer Panel



Mixer Panel

The **Mixer** panel allows you to have full control over the volume of all relevant inputs and outputs and allows you to choose the assignments of both the surround output and the Compressor settings.

The **Input** slider adjusts the level of the plug-in's stereo inputs that is mixed together with the **DCO** and **Filtered** Signal to feed the Granulizer.

If the **<SideChain>** buttons is pressed, the SideChain (plug-in in input channel 3+4) inputs are used as an audio input. This allows more flexibility on the insert position of the plug-in. The switch will be faded by the morphing system.

The **DCO** slider mixes the DCO into the Granulizers input.

The **Filtered** slider mixes the output of the **Spectral Selector** into the Granulizers input.

Note: The **Pitch Tracking** System (pre-fader) and the **Envelope follower** (post-fader) also gets their audio input from the plug-in's input

Note: Grouped sliders are moved together if one slider is moved or one slider is manipulated through a plug-in parameter or MIDI controller

The **Wet** sliders control the stereo input volume of the granulizer.

The **Dry** slider mixes the stereo input, the DCO and Filtered signal directly to the outputs.

Note: The **Wet** and **Dry** sliders are also morphed by the morph system which allows smooth fading and muting - even with a volume change resulting from using the **Undo/Redo** function or altering other values. This will only happen if the **Global Mixer** setting in the **Global Settings Editor** is disabled.

The **Out** sliders determine the volume of the stereo output of the plug-in.

The **<Link>** button links the Out slider volume and the surround sound channels together.

Note: The surround channel output volumes and the other volumes can be also controlled in the level panel.

Grain Modulations can be bound to Stereo Pairs but depending on the program the output of the granulizer might create very wide stereo left/right audio pannings. The **Stereo Width Panner** shrinks the stereo width down to Mono (slider on the right).

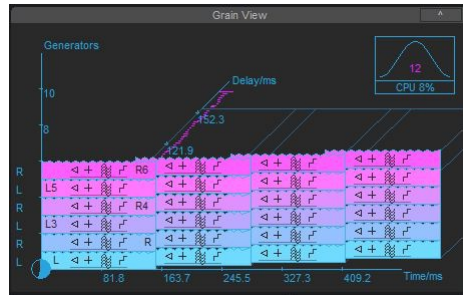
The **<Out Comp>** button launches the output compressor editor.

The **<Feed Comp>** button launches the feedback compressor editor.

The **<Inp Env>** button will show the Input Envelope follower editor and the **<SChain Env>** will show the Sidechain Envelope follower editor. Both Envelope Followers can be used to control the Grain Modulation (see Grain Modulations & LFOs)

With the **Channel Mode** selector you can choose several outputs and surround modes. These modes will not only affect the assignment and labeling of the 10 output channels but will also affect the routing of the generator streams towards the outputs and provides the sum of the **LFE** (Low Frequency Effect) channels and the **Aux** channels.

If the generator count exceeds the active channels, the output of the generators are summed up towards the next available channel (generator rotation).



The assigned routing is displayed on the left-hand of the Y-axis inside **Grain View** and as labels on top of the output peak meters.

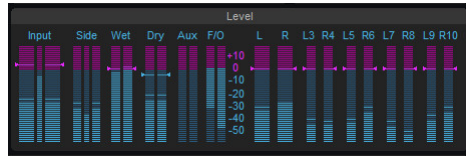
## 11.3. Surround Modes

The following **Channel Modes** can be chosen with the **Ch Mode** selector on the Mixer Panel. Choose the one that fits best to the surround channel layout of your DAW:

Name	Comment	Main L / R output contains the sum of all Left / Right Generators	Generator rotation	Active output channels	Out 1	Out 2	Out 3	Out 4	Out 5	Out 6	Out 7	Out 8	Out 9	Out 10
Stereo +	Normal Stereo assignment, Out 3 starts with 3rd generator	yes	10	10	L	R	L3	R4	L5	R6	L7	R8	L9	R10
Multichannel	Every generator is routed to each output individually	no	10	10	L	R	L3	R4	L5	R6	L7	R8	L9	R10
5.1 (ITU 775)	5.1 Stereo Setup, Stereo is routed to L/R, LFE is a sum up of out 1-5	yes	5	6	L	C*	R	Ls	Rs	LFE				
4.1	4.1 (rotating, symmetrical L/R routing)	no	4	5	1	2	3	4	LFE					
5.1 (Cubase)	5.1 (rotating, unsymmetrical L/R routing)	yes	5	6	L	R	C*	LFE	Ls	Rs				
5.1 (Logic)	5.1 optimized for Logic usage	no	5	6	L	R	Ls	Rs	C*	LFE				
6.0 (Cine)	6.0 Stereo Setup, Stereo is routed to L/R	yes	6	6	L	R	C*	Ls	Rs	Cs*				
6.0 (Music)	6.0 Stereo Setup, Stereo is routed to L/R	yes	6	6	L	R	Ls	Rs	Sl	Sr				
6.1 (ES/EX)	6.1 Stereo Setup, Stereo is routed to L/R, LFE is a sum up of out 1-6	yes	6	7	L	C*	R	Ls	S*	Rs	LFE			
6.1	6.1 (rotating, unsymmetrical L/R routing)	no	6	7	1	2	3	4	5	6	LFE			
7.1 (3/4.1)	7.1 Stereo Setup, Stereo is routed to L/R, LFE is a sum of outs 1-7	yes	7	8	L	C*	R	Lm	Rm	Ls	Rs	LFE		
7.1 (SDDS)	7.1 Stereo Setup, Stereo is routed to L/R, LFE is a sum of outs 1-7	no	7	8	L	Lc	C*	Rc	R	Ls	Rs	LFE		
7.1 (SDDS Logic)	7.1 Setup, optimized for Logic usage	no	7	8	L	R	Ls	Rs	C	LFE	Lc	Rc		
7.1	7.1 (rotating, unsymmetrical L/R routing)	no	7	8	1	2	3	4	5	6	7	LFE		
7.1.2 (Atmos bed)	Optimized 7.1 layout for Atmos bed tracks (e.g. Nuendo)	no	9	10	L	R	C*	LFE	Ls	Rs	Sl	Sr	Tsl	Tsr
7.1.2 (Logic Atmos bed)	Optimized 7.1 layout for Atmos bed tracks in Logic	no	9	10	L	R	Ls	Rs	Lm	Rm	C	LFE	Ltm	Rtm
8.1	8.1 (rotating, unsymmetrical L/R routing). This is a typical setup for experimental venues with a surround system, LFE is a sum of outs 1-8	no	8	9	1	2	3	4	5	6	7	8	LFE	
8.2	8.2 (rotating, unsymmetrical L/R routing). Two LFE channels with L/R sum (L=1,3,5,7,9 R=2,4,6,8,10)	no	8	10	1	2	3	4	5	6	7	8	LFE left	LFE right
9.1 (7.2.1)	9.1 Stereo Setup, Stereo is routed to L/R, LFE is a sum of out 1-9	yes	9	10	L	C*	R	Lm	Rm	Ls	Rs	Lfh	Rfh	LFE
9.1	9.1 (rotating, unsymmetrical L/R routing)	no	9	10	1	2	3	4	5	6	7	8	9	LFE
Stereo + Aux (9-10)	Same like Stereo + but with mapped Aux Channels on Channel 9 and 10	yes	8	10	L	R	L3	L4	L5	R6	L7	R8	AuxL	AuxR
Stereo + Aux (3-4)	Same like Stereo + but with mapped Aux Channels on Channel 3 and 4	yes	8	10	L	R	AuxL	AuxR	L3	R4	L5	R6	L7	R8
Multi + Aux (9-10)	Same like Multichannel but with mapped Aux Channels on Channel 9 and 10	no	8	10	L	R	L3	R4	L5	R6	L7	R8	AuxL	AuxR
Multi + Aux (3-4)	Same like Multichannel but with mapped Aux Channels on Channel 3 and 4	no	8	10	L	R	AuxL	AuxR	L3	R4	L5	R6	L7	R8

\*= no generator panning

## 11.4. Level Panel

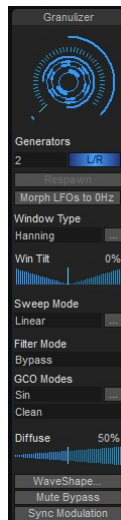


*Level panel*

In the **Level** Panel you can observe the input and output levels on several meters. Dragging the mouse on the meters is also another way to adjust the levels.

Note: The internal structures allow internal overload close to +40dB! It depends on the DAW's ability if the output of the plug-in has to be below 0dB or not to prevent distortion.

## 11.5. Granulizer Panel



*Granulizer Panel*

The **Granulizer Panel** allows to control the settings of the grain generation engine.

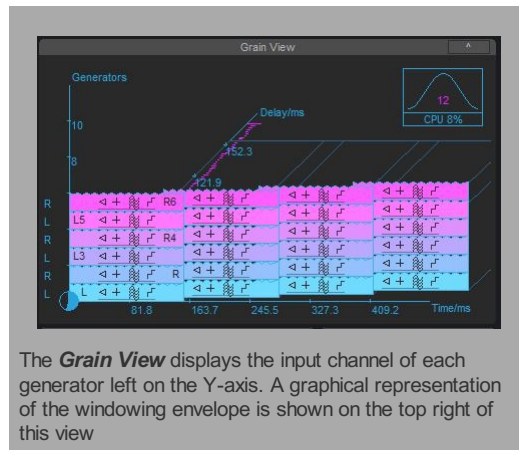
The **Generator** input box and wheel allows to set the number of generators (up to 199) that will generate the grain stream. Each generator adds a set of additionally generated grains for an output channel. Each generator receives its input depending on the setting of the **<L/R>** button: If it's not pressed then each generator will receive a down-mix to mono of the input channels. If the **<L/R>** button is pressed then input of the generator's channel will depend on the generator number (odd/even) and the setting of the **Surround Mode** (see **Mixer Panel**).

If the G-Life Grain Modulation is "non eternal" and grains becoming "dead", the **<Respawn>** button starts to blink and is ready to launch a respawn of the grains.

A very powerful modulation effect can be achieved by pressing the **<Morph LFOs to 0Hz>** button: Depending on the morph time setting, all Grain Modulations will become decelerated and finally pause until the button is released. This button is mapped to a plug-in parameter called Granulizer.Freeze.

Tip: To use this feature in for a live performance, map the **<Morph all LFOs to 0Hz>** button or the Granulizer.Freeze plug-in parameter to an external MIDI controller device.

**Window Type** selects the Grain Window. It is used to prevent noisy switching sounds between grains, as each grain is windowed by an envelope. This envelope type can be selected from the **Window Type** list. The Window could be also free designed by using **Spline** editing, using factory sounds or loading a Mono WAV, MP3 or AIFF file.



The **Grain View** displays the input channel of each generator left on the Y-axis. A graphical representation of the windowing envelope is shown on the top right of this view

Switching/Nasty sounds can be achieved by selecting a **SharpRect, Dirac 1 or Dirac 2** window type. Choosing **Spline** from the list brings up the **Spline Editor**. In this editor the window envelope can be edited manually.

Tip: Window types with several X-axis crossings will generating ring-modulation artifacts (e.g. together with the live input or the DCO). This is of coarse the case if a Factory Sound or an Audio File is used. The pitch of these artifacts depends on the **Length** of grains. In that case you can use a simple DCO waveform (e.g. like Sin) and change the DCO frequency to produce very strange ring-modulation grain effect.

The **Window Tilt** slider allows to control the shape of the Grain Windows in real-time. This applies also for Audio File Windows. Mapping e.g. the Window Tilt plug-in parameter to a MIDI device will allow to steer the granular sound in a very unique way. Give it a try!

The **Sweep Mode** selects the way how Sweep processing is performed. **Linear** will do a linear increment (+ modulation value) or decrement (-modulation value) of playback speed during the processing of the grains. Spline will automatically open the spline editor for designing a speed curve. **Steps will** open the step editor to enter a step sequence of pitch changes that will be processed during grain processing.

Tip: Using Steps with longer grain lengths will lead to very interesting melodic sequences. The tempo of the sequence is bound to the grain length. Use it in combination with a grain Length modulation!

The **Filter Mode** selection sets the filter type that is applied during generation of the grains (see the **Filter Cut** and **Filter Q** Modulations). To disable the filter select **Bypass**.

Note: Changes of the Filter Mode will be morphed through the Morph system.

The **GCO Modes** determines the audio source of the GCO (simple waveform or files) and the way the GCO is processing and interacting with the live signal (e.g. Clean/FM/Ring modes)

The **Diffuse** Slider selects the size of the Diffuse Room for Diffuse grain processing. See the section on Diffuse Modulation to learn more about specialties of Diffuse processing - it's not a normal reverb!

Tip: You can easily hear the difference of the two modes if you input a sine wave and change the pitch up/down by using the **Speed** Grain Modulation.

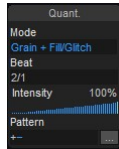
The **<WaveShape>** button brings up the **WaveShape** Editor (see the **WaveShape** Modulation)

The **<MuteBypass>** button will mute the Bypass Grain Modulation so that only the Aux bus is fed by the Bypass/Aux Grain Modulator

The **<Sync Modulations>** mode sets all Modulations in sync with the scrubber position on the DAW timeline. This doesn't affect no-oscillation modes such as PMField, OFF, MIDI or Pitch Tracking modes.

Note: if the host DAW is in stop or pause mode, the oscillator modulation will also be stopped and become paused in a reproducible state depending on the position of the timeline scrubber. Use this feature if you would like to create reproducible LFO modulations depending on the scrubber's position. If you are processing live audio, e.g. in combination with a host that runs in a looping mode, it is recommended to release the sync mode.

## 11.6. Quantization Panel



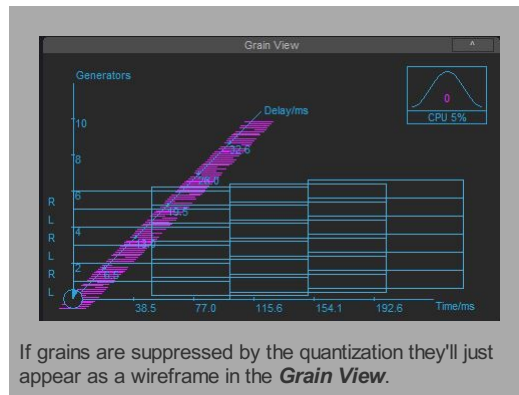
*Quant. Panel*

The whole grain generation process can be synchronized to the bar positions of the host sequencer.

The **Mode** selects the action that is triggered once a quantization point is reached by the host:

- **None** (No quantization)
- **Grain** (Grains are generated but will wait for a quantization point to become alive)
- **Fill/Glitch** (Filling of the grain buffer - in Live Mode, or a Glitch - in Glitcher Mode, will be triggered)
- **Grain + Fill/Glitch** the above two modes combined
- **Respawn** (A Respawn event is fired once a quantization point is reached)

The **Beat** selects the "speed" of the quantization in bars.

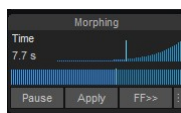


With the **Intensity** slider you can control what percent of the grains are quantized. 100% means all grains will be affected, 0% means no quantization at all.

You can choose or enter a bar **Pattern** for the quantization. Choose one from the list or type in your own rhythm. Use <+> (step on) and <-> (step off) keys.

Tip: You can generate your own "grain beats" by entering complex sequences in the **Pattern** text box

## 11.7. Morph System Panel



*Morphing panel*



One special feature of crusher-X is the morphing system. Each time you change one or more settings (e.g. via loading a program, changing settings in the UI, or using MIDI) the Morph system will try to find a smooth transition between changes in settings. With the **Time** slider you can determine the time between the changes (from 1ms up to 1 hour). During the Morph process the process can be paused and manually controlled by using the morphing position slider. This slider can be external controlled by a plug-in parameter or a MIDI mapping.

Tip: Click on the value field to enter morph times longer than 60s (up to 3600s are possible!)

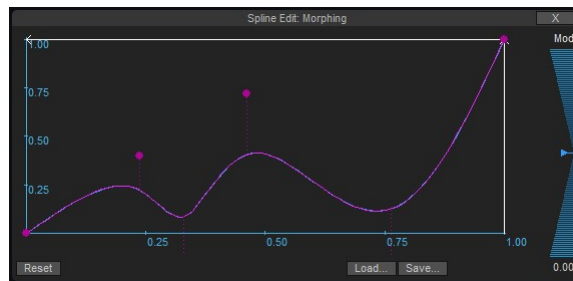
During morphing the following buttons can control the morphing process:

**<Pause>**: Pauses the morphing process until you press the button again.

**<Apply>**: Transfers the actual morphing values to the UI and stops the morphing. Use this button if you like the actual sound and want to save it.

**<Fast Forward>**: Stops the morphing process and sets the destination settings immediately.

**<S>**: This button opens the Morph Spline Editor and enables to edit the path the morphing system will change the parameters. With that feature one can create an individual "gesture" for the morph transition itself (in contrast to a simple linear transition)



*The Morph spline editor*

Tip: Using the Morphing System together with Program changes, **<Undo>**, **<Redo>**, **<Reset>** or **<Random>** buttons.

Note: Morphing also occurs if you change the settings with the UI sliders. Use smaller morph times if you like to have faster audible reactions to your changes. Also pitch shifts that are caused by MIDI-Key changes are morphed (though a MIDI key receive will by design not trigger the morph system).

## 11.8. DCO Panel



*DCO Panel*

The **DCO** can be used either as an internal test generator or as a source to generate complex granulizer input sounds. Turn the DCO on by pressing the **<Play/Stop>** button and increasing the **DCO Level** in the Mixer.

Set the Waveform of the DCO by changing to the desired Waveform mode. Alternatively an audio file can be selected as a waveform.

Tip: Use a Saw or Noise generator together with the **Formant** filter to generate human like sounds

Press the **<Rand>** button to create unusual FM sounds. Release the **<Rand>** button to switch back to the preselected waveform. The **Freq** slider determines the frequency of the DCO.

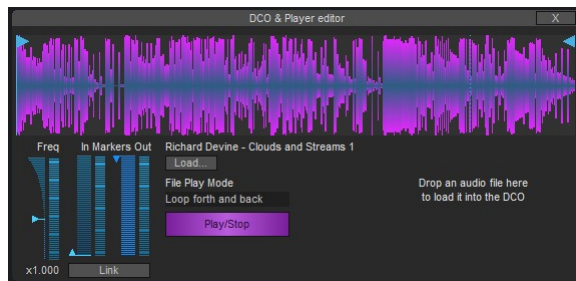
Tip: Use the **<Rand>** button together with longer **Morph** times to generate strange FM sequences. Use the **Dry** sliders in the **Mixer** Panel to hear the original DCO sounds.

A click on the "Freq" label or double-click on the slider resets the frequency of the DCO to 440Hz.

Use the **<...>** button to select a sound file to be played by the DCO. **<Ctrl>+Click** launches the file open dialog directly.

The **<Play/Stop>** button will enable or stops the DCO.

Press the **<Edit>** button to open the DCO & Player editor:



*DCO & Player editor*

Use the **<Load...>** button to select a sound file. **<Ctrl>+Click** launches the file open dialog directly. The same can be achieved by drag'n drop audio files to the Editor or DCO panel areas of the plug-in interface (if dropped elsewhere it will load the file into the Grain buffer). The DCO editor will automatically open if the file is dropped and the Granulizer will switch to Live Mode.

You can load also some prerecorded Factory ROM Sounds with the **<Load...>** button.

**Mark In** and **Mark Out** can be dragged by moving the flags or can be modified by the sliders to select a part of the file.

Select a **Play Mode** to define how the file play back should behave:

- **Loop:** Loops continuously between Mark In and Mark Out
- **Loop backwards:** Loops continuously backwards between Mark Out and Mark In
- **Loop forth and back:** Loops continuously forth and backwards
- **One shot:** Playback one time from Mark In to Mark Out, then stop
- **One shot backwards:** Playback one time backwards from Mark Out to Mark In, then stop
- **One shot forth and back:** Playback one time forward from Mark In to Mark Out, then backwards and then stop

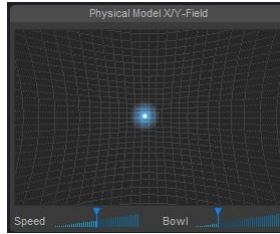
The **<Play/Stop>** button will enable or stops the DCO.

The **<Link>** button will link Mark In and Mark Out together.

All File playback controls can be linked to MIDI messages or controlled by plug-in parameters

Tip: Press the Marker Link button, use a Loop mode and then move the Mark In or Mark Out button to "scan" thru a file.

## 11.9. PM-Field



*Physical Model X/Y-Field*

Every **Grain Modulation** and **Global** Modulation can be steered by the X or Y coordinates of the PM-Field. This X/Y PM-Controller was invented by accSone in 2001.

This enables you to control complex modulations manually. If one of the **PM-Field** Modes is chosen and **Mod** is not 0, the light on the **PM-Field** turns on.

Move and "throw" the light with the mouse. Shift + Click will center the light.

The **PM-Field** is not a normal X/Y controller: It is a physical model of a ball in a cave or a bowl. The left slider controls the speed of the ball and the right slider will turn the field into a bowl enabling an auto-centering system.

Fast movements of the mouse results in fast movements of the light. You can use the MouseWheel or the Magic Mouse (Mac version) to increase and decrease the ball's speed.

If the PM-Field is assigned to a Grain Modulation the Tool-Tip (mouse hover over the field) shows the current assignments to the X and Y axis (if Mod and Mod Mode of the Grain Modulation is set).

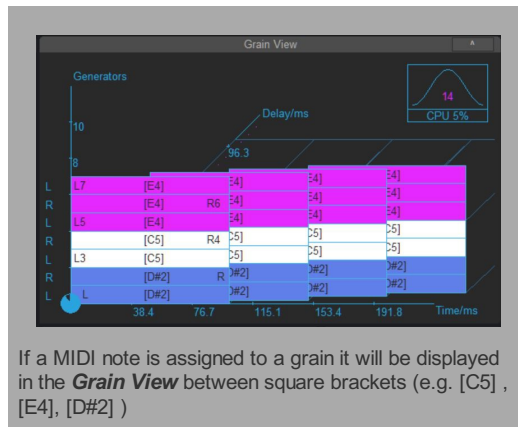
Tip: You can use MIDI-events or plug-in parameters to control the light.

## 11.10. MIDI Modes, MPE and Scales



*MIDI panel*

The virtual MIDI Keyboard can be played by simply clicking it with your mouse. Hold down the Shift-Key to generate multiple keyboard Note On events. The Keyboard is enabled if MIDI Mode is not in the mode "No Pitch", an Arpeggiator mode is selected in the Grain Modulations or Free or AR Velocity Mode is enabled. Each time a MIDI-Key signal is received it will be mapped to the Virtual-Keyboards.



If a MIDI note is assigned to a grain it will be displayed in the **Grain View** between square brackets (e.g. [C5] , [E4], [D#2] )

### MIDI Mode:

There are several MIDI-Modes that determine how the granular engine will be modified by the MIDI keyboard events:

- **No Pitch:** No grain pitch change is generated. Arpeggiator Modes are fed by MIDI events
- **Poly:** Each generator will run continuously and the speed of each generator has an individual offset that maps to the keyboard events defined by the current tuning map. Generators are pitched in stereo pairs (except for Center Channels in Surround modes).
- **Unisono:** Each generator runs continuously and the speed of all generators have the same keyboard event offset
- **MPE (MIDI Polyphonic Expression):** Like Poly Mode but each generator will react to a different MPE MIDI channel. Depending on the amount of MPE channels needed the number of generators will be created automatically. Generators are pitched in stereo pairs (except for Center Channels in Surround modes). Use this mode together with an MPE capable MIDI controller. Together with the Grain Modulations MPE modes this allows very sensitive performances

Use the above MIDI Modes together with a combination of these buttons:

#### <Free> button

- On: Free Mode - Generators are always on and generating sound.
- Off: MIDI Lock Mode: Generators are muted and unmuted if a MIDI Key is pressed

#### <A&R> button

- On: The Generator Volumes are controlled by Attack & Release times and the Velocity of the MID Key
- Off: Gated Mode - Full Volume when MIDI Key is pressed - Release time determines the gate duration

#### <Sustain> button

- On: Sustain Mode: No release of generator voices when MIDI Keys are released. Can be controlled by a MIDI Sustain Pedal

Note: The voices of the "synth" are the grain generators. That means you can determine the maximum of used voices which can be used by setting the generator count in the Granulizer panel. In MPE mode the amount of needed generators are set automatically.

In A&R mode the tuning assignments to the generators are saved by saving a program. This means that the tuned sound is restored upon loading the program (not available in the demo version).

### **<GCO> button:**

If the **<GCO>** button is pressed MIDI-key and MIDI-Pitchwheel data are also sent to the GCOs and determine their pitch according to the selected MIDI-mode (see above). If the button is released the GCOs aren't connected to the MIDI System and their pitch stays independent.

Tip: Release the GCO button in combination with the Ringmodulation GCO-Mode to achieve an intense interference between the GCO waveform and the processed live signal.

### **Global or local MIDI Settings:**

In the **Global Settings Editor** you can choose whether the MIDI settings are stored global (on each plug-in instance) or on each program.

### **Setting the Base-Key:**

While holding down the Ctrl-Key on your computer's keyboard you can set the Base-Key. On the Base-Key there will be no changes in the speed offsets.

Note: If the virtual Keyboard is not enabled the Base-Key can be also selected without pressing the Ctrl-Key!

### **Scale:**

A couple of scales can be selected that filter out keys that are not part of the scale. The filtered keys are painted gray. The Base of the scale is set by the **Base-Key**. The selected Scale is also used to determine **Autotune** pitch corrections.

### **Scala tunings:**

In addition you can load a Scala file (\*.scl) or AnaMark tuning files (\*.tun) by using the combo box "Insert File..." entry. While clicking on the **<Delete>** button you can remove the selected files from the list. The whole list is saved on the current preset. (The file loading support is not available in the demo version).

Scala was created by Manuel Op de Coul in the Netherlands. crusher-X comes with thousands of predefined tunings. And you can edit your own tuning by simple adding or editing a Scala file (it's a simple text file). Please visit their Homepage to learn more about Scala and update your tuning archive: <http://www.huygens-fokker.org/scala/> ).

Additionally you can load AnaMark tuning files (\*.tun). Please refer to <http://www.mark-henning.de/eternity/tuningspecs.html> to learn more about AnaMark tunings originally designed by Mark Henning.

Tip: Scala tunings are also used by **Autotune** pitch correction. With this feature you can create very sophisticated Autotune pitch corrections that go beyond any standard tuning. Create your own Tuning by creating your own Scala file and loading it.

### **Attack & Release:**

With these two sliders you can adjust the attack and release time. These timings are also used to generate the Velocity Ramp for the Velocity Ramp modulation Mode of the Grain Modulations.

### **Scala Archive:**

Find a list of all available Scala files in scalesdir.txt inside the scales.zip package

## 11.11. Pitch Tracker and Autotune



*Pitchtracker and Autotune System*

Pitchtracker allows the analysis of the audio of the input channel (pre-fader)). The frequency being analyzed will be displayed. If the pitch is exactly matched within  $\pm 10\%$  it will be displayed in red. If it is not possible to detect a pitch (e.g. on noisy input) the previously detected frequency will be displayed in grey. The graph shows the history of pitches detected. The results of this analysis can be used to steer the Speed of the grains. This result depends on the selected autotune mode. In any case the resulting analysis can be used as a modulation source by each **Grain Modulation**.

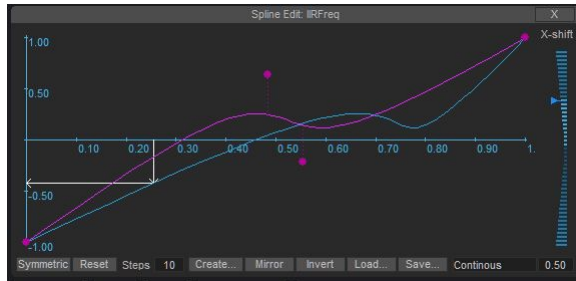
There are several **Autotune** Modes available:

- **Off:** No pitch correction is applied, though it is possible to select the analysis result as a source of modulation in each **Grain Modulation**.
- **Tune correction** (based on selected scale): Based on the selected Scale a correction of pitch is applied to the Speed of each grain automatically.
- **Force to Base Key:** A very special mode: **The pitch correction is done in a way that a target pitch determined by the Base Key is always achieved.**
- **Generate MIDI Notes:** No pitch correction is applied but MIDI Note events are generated from the resulting analysis. The MIDI events will steer the Speed of the grain processing like is described in the **MIDI Modes** section.

Tip: Combine the Autotune system with additional MIDI events or Speed modulations to create chorus effects or tuned Accords. Add small Sweep modulations to create "living crowd" chorus or "Darth Vader" effects. Also lower tuned Force to Base Key effects are very impressive.

## 12. Spline and Step Editors

### 12.1. Spline Editor



Spline editor

The **Spline editor** is used for editing a spline curve, e.g. for **Grain Modulation** Spline Modes, **Window Type** Modes or to edit **Sweep** or **WaveShape** curves.

You can add, move or edit **Knee / Spline** Points by using the following mouse and the keyboard modifiers:

- Left Mouse Button: Insert Spline Point
- Left Mouse Button + Shift Key: Insert Knee Point
- Click on "the point handle" and drag it out of the window's view: Delete
- Drag First or Last Point + Ctrl Key: Set same Y value
- Click on "the point handle" + Ctrl Key: Set only Y value
- Click on "the point handle" + Alt Key: Match X,Y to Grid
- Right Mouse Button: Zoom -> Scroll -> Normal Mode
- DblClick: Reset ViewMouse Wheel: Zoom

The button row allows you to modify or generate the following curves:

- **<Symetric>**: The curve will be symmetric on the X/Y axis. Unsymmetrical editing is not allowed
- **<Reset>**: The curve is reset to the default Steps: You can enter the amount of creation steps
- **<Create>**: Choose different spline generators
- **<Mirror>**: Mirrors the curve at the Y axis
- **<Invert>**: Inverts the curve at the X axis
- **<Load>**: Loads a spline definition from a \*.spi file
- **<Save>**: Store the current spline in a \*.spi file

Note: Spline editing is fully integrated into crusher-X's **Undo/Redo** system.

In some Modes a **X-shift** slider is visible. It allows to "modulate" the current spline curve. The blue curve displays the resulting spline that is currently applied.

Tip: You can control the spline modulation slider through MIDI events or plug-in parameter changes, and by right-clicking you can use the Learn Function on the slider

If the **Scan Mode** selector is visible the "scan" of the curve can be controlled by several modes:

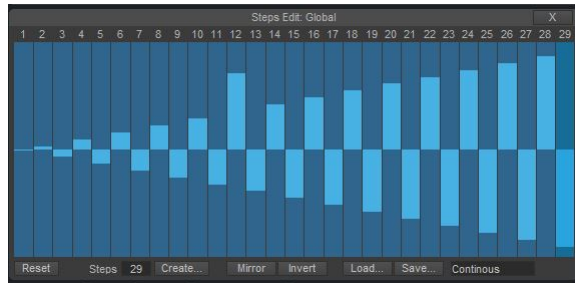
- **Continous**: The modulation is steered by either the frequency or the host beat (in regard to the Grain Modulation settings)
- **Random**: Random selection of a curve segment steered by either the frequency or the host beat
- **X Up PM-Field**: X-Axis position of PM-Field ball
- **X Dn PM-Field**: X-Axis position of PM-Field ball (reverse)

- **Y Up PM-Field:** Y-Axis position of PM-Field ball
- **Y Dn PM-Field:** Y-Axis position of PM-Field ball (reverse)
- **Grain launch:** The next Spline point will be selected on each launch of a grain (use this for generative music approaches)
- **G-Life:** The "age" of the grains will determine the "scan"

Tip: Use the PM-Field Scan Modes to steer a speed modulation so that a small "melody" or "gesture" can be controlled just with the move of the ball (or with MIDI controllers)

The Spline curve can be also edited "screenless", see section "Screenless control of crusher-X, e.g. for blind / sight impaired musicians".

## 12.2. Step Editor



Step editor

The **Step editor** is used to edit steps for **Grain Modulation** Step Modes or **Sweep** settings. Set the step value by dragging the bars with the mouse. Hold the <Shift> key to apply discrete value steps.

Select the desired amount of steps with the **Steps** edit box. Steps can run in free run mode or - depending on the Grain Modulation **Mode** setting - bound to the host beat.

The button row allows you to modify or generate the curve:

- **<Reset>**: All steps are cleared
- **<Create>**: Choose between different step generators
- **<Mirror>**: Mirror the curve at the Y axis
- **<Invert>**: Invert the curve at the X axisLoad: Load a steps definition from a \*.stp file
- **<Save>**: Store the steps definition in a \*.stp file

Note: The steps editing is fully integrated into the crusher-X's **Undo/Redo** system.

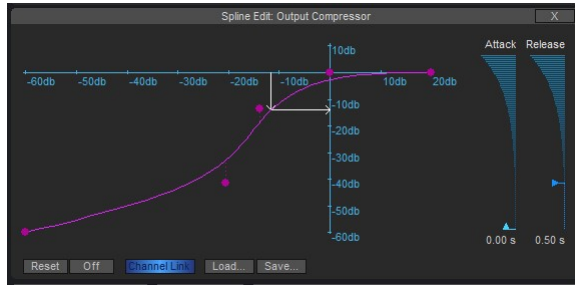
Tip: Use several step modulations with slightly different step counts to create repetitive but dancing modulations.

If the **Scan Mode** selector is visible the "scan" of the curve can be controlled by several modes (see Spline editor above)

Steps can be also edited "screenless", see section "Screenless control of crusher-X, e.g. for blind / sight impaired musicians".



## 12.3. Compressor/Expander/Limiter



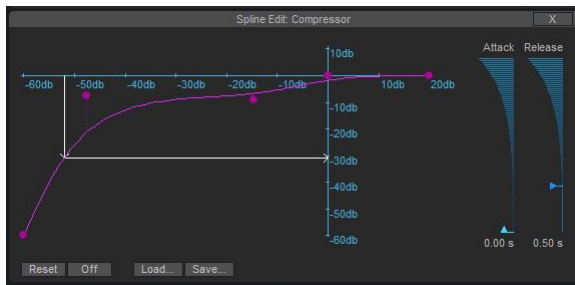
*Compressor/Expander/Limiter editor*

The **Compressor/Expander/Limiter editor** is used to edit a level compensation spline curve for the compressor/expander/limiter.

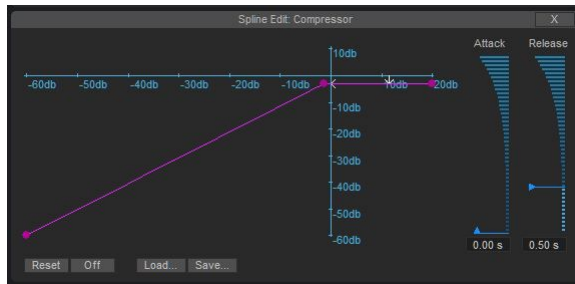
The X-Axis represents the input level (in dB) and the Y-Axis the target output level (in dB). Depending on the spline curve form you can achieve either compressor, limiter or expander-like behaviours (or any combinations). Adjust the **Attack** and **Release** timing of the level analyzer with the corresponding controls on the right.

If the **<Channel Link>** button is pressed all channels are synced together. Release the button to let the system process each channel individually.

The **<Global Compressor>** button in the **Global Settings Editor** determines whether the Compressor settings (incl. the spline curve) are stored global (on each plug-in instance) (pressed) or on each program (released).

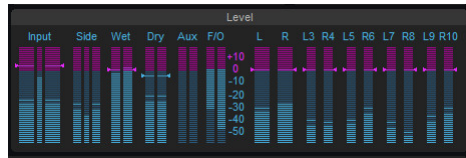


*Expander setup*



*Limiter setup*

Tip: As the relationship between input and output levels can be completely freely defined by the spline curve, you can do very special (incl. inverse) channel level behaviors that are able to be programmed in **the following Feedback** scenarios: Pumping and swelling drones. Play also with longer Attack and Release times!



Compressor/Expander meter F/O

The Feedback and Output Compressor/Expander activities can be also monitored in the Level Panel (F/O). It indicates the current compression (down) or expansion (up) factor in dB. A click on the meters also opens the dedicated editor.

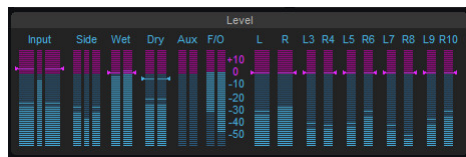
## 12.4. Envelope Follower



Envelope Follower spline

For each **Grain Modulation** an Envelope Follower Mode can be selected. The curve of the Input or the Sidechain Envelope Follower can be edited by pressing the **<Inp Env>** or **<SidCh Env>** button in the **Mixer** Panel. Modify the Attack and Release times and the spline of the curve.

Tip: Set up curves with "up" and "downs" to achieve non-linear modulations based on the input signal volume

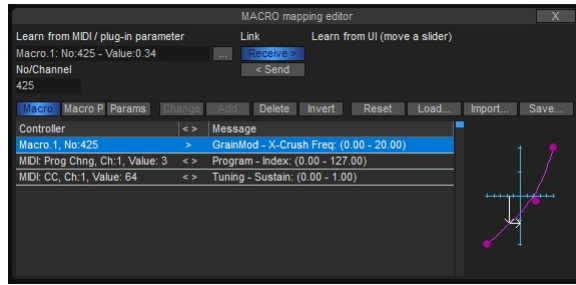


Input and SideChain Envelope meters

The current state of the Input and SideChain Envelope Followers can be monitored by the Envelope meters in between the Input and Side Level meters. A click on the meters also opens the dedicated editor.

# 13. MACRO, MIDI and Parameter Mappings

## 13.1. Remote control and automation



MACRO Mapping editor

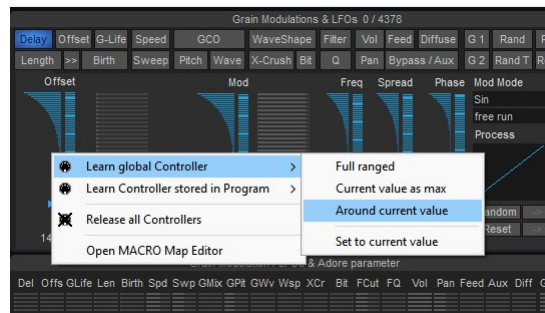
The MACRO mapping editor is opened by pressing the **<MACRO Map>** button in the **Program Panel** or with the context menu entry **Open MACRO Map editor** of each UI element. The Mappings define the connections between the MIDI or plug-in parameter inputs and the UI elements. This can be used for either controlling remotely or automating crusher-X settings. To view or edit the current MIDI or Macro Parameter mappings select the **<Macro>** or **<Macro P>** tabs. The list below contains all the assigned MACRO Parameters or MIDI Controllers.

Opening the **<MACRO Map>** will generate plug-in parameter changes for the Macro.1 - Macro.8 parameters. This enables a host to learn the Macro plug-in parameters in case this is needed (e.g. Ableton Live)

The **<Macro P>** list contains all MACRO Parameters or MIDI Controllers that are assigned to a single program. Switching the program might clear or change the **<Macro P>** list. Depending of the UI elements Context Menu selection the Controller will be added to the global **<Macro>** or the program related **<Macro P>** list.

If the **<MACRO Map>** button in the Program Panel is dimly lit this indicates that certain Controllers are stored with the current program.

## 13.2. The Learn Controller context menu



Each UI element can be assigned to a Controller with the Learn Context Menu (right click)

To learn or release a controller on an UI Element select one of the Context Menu (right click) entries:

**Learn global Controller** and **Learn Controller stored in Program** sub menu entries prepare the UI element to learn a controller. The next received MIDI Controller or MACRO Parameter will be added to the **<Macro>** or **<Macro P>** list and therefore attached to the UI Element.

The following options are available to set initial controller ranges (not all UI elements offer all options). After assignment it is possible to edit the range of the entries in the **<MACRO Map>** editor.

- **Full ranged:** The full range of the UI element is spanned by the learned controller.
- **Current value as max:** The maximum of the controller range is defined by the current UI element value. On negative values the minimum range will be set accordingly.
- **Around current value:** The controller range will be defined such that the controller will span a reasonable range around the current slider value.
- **Set to current value:** The controller is learned such that the current UI element position is recalled once the controller is received (independent from the controller's value)

**Release all Controllers:** Releases all attached Controllers and deletes the related entries in the **<Macro>** or **<Macro P>** lists.

**Open MACRO Map Editor:** Opens the **<MACRO Map>** editor to edit the Controller assignments.

Tip: Use **Set to current value** on the Program selector UI element in the Program Panel to learn a certain Hardware Controller button to select and load a specific Program.

### 13.3. MACRO Map editor details

To view or edit the current plug-in parameter or current Adore parameter press the **<Params>** tab.

The relationship between mapping in and out can be defined with the mapping x/y table. Spline and Knee points are available to define the relationships of the input and output mapping values (for details see the Hint that is displayed when hovering over the control).

Note: More than one UI element can be attached to the same Controller - that allows you to create **Macro Controller** with different mappings to several UI elements. If the Controller is learned for the current program (added it to the **<MIDI P>** list) this allows to organize programs to react differently to the same Hardware MIDI Control Number

Each time crusher-X receives MIDI or detects a plug-in parameter change it will be displayed in the left **Learn control** panel of the MIDI and Parameter Mapping editor.

Alternatively you can choose a default controller by pressing the **<...>** button. Depending on the type of controller one or several properties of this controller can be adjusted by simply entering them with the channel or value fields.

Note: regarding MIDI NoteOn/NoteOff: You can easily select the range by pressing one key and while holding down this key while also pressing another key on the keyboard. Releasing the first key will end up in setting a note range.

For each mapping the direction of the mapping can be selected:

**Receive** pressed: The UI element reacts when the target controller is received

**Send** pressed: Upon manipulating a UI element in the editor the target controller will be sent out (MIDI-Out, plug-in parameter change).

Each time you touch an UI element the changed value will appear in the **Learn Message** panel. For example, this happens during slider movements, button pressing or entering values. The slider on the right of the panel will be mapped temporarily to the UI element. Depending on the value type you are able to assign a control range via minimal and maximum values. Only values in this range will be mapped to a controller.

You can "teach" crusher-X a range by pressing the **<Learn range>** button and edit the UI element or the mapped slider.

The **List** displays all active mappings. **<Macro>** and **<Params>** lists will be saved globally and **<Macro P>** with the current program. You can edit the list by using the buttons **<Change>**, **<Add>**, **<Delete>** or **<Invert>**.

Upon selection of a list entry the list entry is then copied to the Learn controller and Learn message panel. Now modifying is possible in these panels (including learning controller or/and messages). To store the changes in the list, press the **<Change>** button.

The **<Reset>** button will reset all lists to the factory default. Ctrl + **<Reset>** will clear the selected list.

The **<Save>** button stores all list entries to a file.

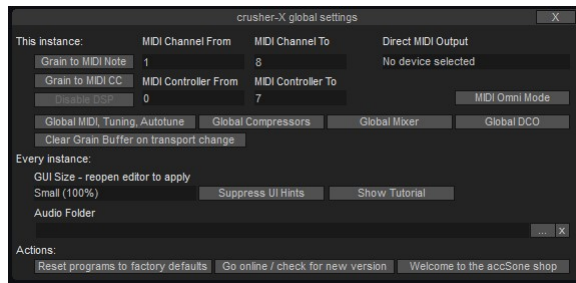
The **<Load>** button will clear the selected list (Macro, Macro-P or Param) and load only the selected list from a file.

The **<Import>** button will not clear the selected list but adds items from the file to the selected list.

Tip: Organize your mappings by grouping them into different files. This allows to setup different mappings by using **<Import>**.

If the **<MIDI Omni Mode>** button in the Global Settings Editor is enabled, the learned MIDI Channels are ignored.

## 14. Global Settings Editor and UI size



*Global Settings Editor*

These settings are stored globally within the plug-in's storage of the plug-in host. To reset, simply reload the plug-in in your host.

The **<Grain to MIDI Note>** button will enable the generation of MIDI-Notes according to each grain speed.

The **<Grain to MIDI CC>** button will enable the generation of MIDI controller streams according to the generator's grain flow.

To send the MIDI events directly to a MIDI Output device choose the desired device in the **Direct MIDI Output** selector. As most DAWs have a not very sophisticated handling of plug-in MIDI out events this functionality can be used as a shortcut.

In case crusher-X is only be used as a MIDI generator the **<Disable DSP>** switches off the audio processing so that CPU resources are reduced.

The **<MIDI Omni Mode>** button switches the Macro Map into Omni Mode - that means MIDI Channels for CC and Note messages are ignored.

The **<Global MIDI, Tuning, Autotune>** button determines whether the MIDI settings are stored either globally (on each plug-in instance) (pressed) or on each program (released).

The **<Global Compressor>** button determines whether the Compressor settings (incl. the spline curve) are stored either globally (on each plug-in instance) (pressed) or on each program (released).

The **<Global Mixer>** button determines whether the Mixer settings (the levels) are stored either globally (on each plug-in instance) (pressed) or on each program (released).

The **<Global DCO>** button determines whether the DCO settings are stored either globally (on each plug-in instance) (pressed) or on each program (released).

If the **<Clears Grain Buffer on transport change>** button is enabled the grain buffer is cleared when the Host / DAW transport is changed (e.g. from stop to play or play to stop). Use this option if you want to do a clean recording of very long grain structures (e.g. with long grain lengths and/or high feedback)

Settings that are stored for every crusher-X instance:

**<GUI Size>** selects a scale of the UI. Use higher scales for higher resolution monitors. Auto will calculate a decent scale according to the main monitor resolution. Reopen the UI to applies the setting.

Note: The UI is scaled in a "smart" way so that the details of the controls like sliders or editors are increased when utilizing larger scale factors

**<Audio Folder>** selects a path that is parsed recursive for audio files to create shortcuts for any audio file selections (e.g. DCO, GCO, Grainbuffer). Press the **<x>** button to remove the path.

The **<Suppress UI Hints>** button could be used to disable the UI Hint display

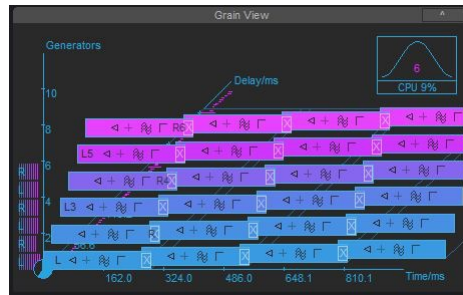
The **<Show Tutorial>** button re-enables the quick-start tutorial

The **<Reset programs to factory defaults>** button resets the programs without the need of a fresh plug-in reload.

The **<Go online / check for new version>** button opens the crusher-X online resource web page. It automatically checks your version and connects you to other crusher-X users. Get video tutorials, exchange programs and learn more about crusher-X, as well as get more tips, tricks and secrets.

Use the **<Welcome to the accSone shop! >** button if you want to get the latest crusher-X or sound pack offers.

## 14.1. Grain to MIDI

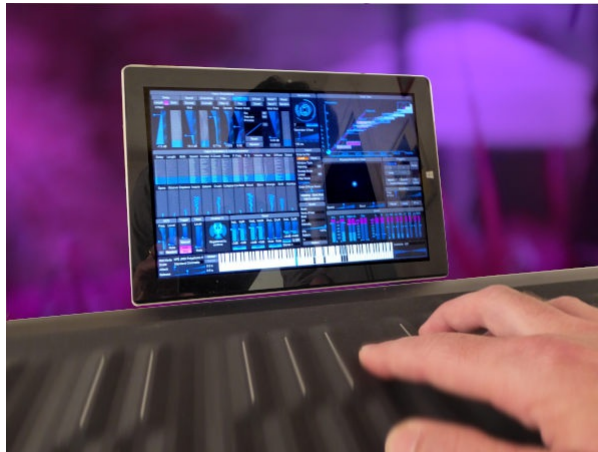


*Grain View with enabled "Grain to MIDI" function*

**Grain to MIDI:** Once enabled in the Global Settings Editor, crusher-X will create MIDI Note or controller events from the current grains and generator. The MIDI Controller Values represents the current Envelope of the Volume Grain Modulation and Grain Window. For example, you can route these MIDI events via your host to other MIDI controllable devices such as DMX Light controllers, mixers, instruments etc. This supports advanced multimedia installations in which a MIDI controlled environment follows the current grain flow. When this function is enabled the currently generated control value is displayed in the **Grain View** left to the Y-Axis. The generated MIDI Note event will be displayed on each grain.



## 15. Tutorial - MPE with crusher-X



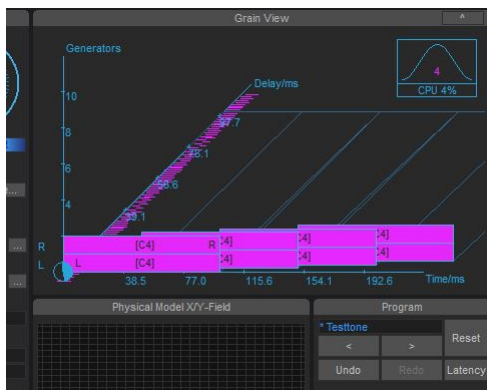
*MIDI Polyphonic Expression with crusher-X*

Steer the live grains with your fingertip? Let a drone take off by moving your fingers to the top of the keyboard? Let the grain drone drift left or right by sliding your fingers? This is what you can do with MPE (MIDI Polyphonic Expression) function and the MPE feature set of crusher-X!

### Step 1: Connect your MPE keyboard

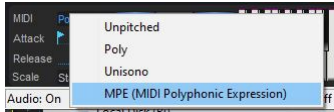
Connect an MPE-ready keyboard to your host. "MPE-ready" means that the host should not suppress the MIDI channel's information when it passes the MIDI data to the plug-in. Under Windows you can also use the "MPE-ready" stand-alone VST host that comes with the crusher-X Windows installation package. Make sure that your keyboard is set to MPE mode.

### Step 2: Select test-tone program



Select the "test-tone" program in the Program Panel. You will hear a simple 440Hz tone that is generated from the DCO. If that's too boring for you you can mute the DCO in the DCO panel and feed crusher-X with a live input sound. The "Test-tone" program let the grains overlap themselves by 50% that results in a continuous grain generation without any major sound modification.

### Step 3: Set crusher-X to MPE MIDI mode

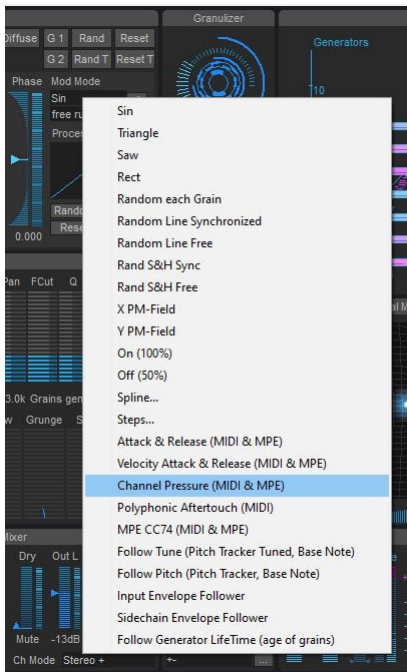


In the MIDI panel, set the MIDI Mode to MPE. In this mode each generator will become bound to one of the MPE MIDI channels. The amount of generators needed will be created automatically upon receiving the first MPE MIDI event. (For everything except for Center Channels in Surround mode, the Generators will pitch everything in stereo pairs by default.) If no MIDI key is pressed all generators are muted.

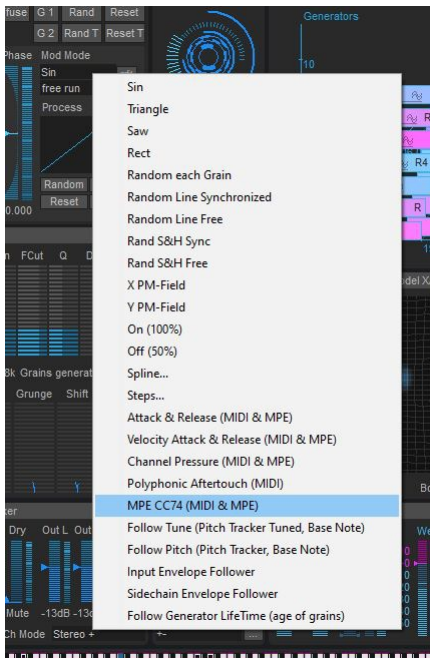
Now you can play the MPE Keyboard. Each touch of the keyboard will be routed to the dedicated set of generators and the generators are correctly pitched according to the selected scale. The same happens upon receiving MPE Pitch data. You can hold the keys and swipe them to the left or right to create individual sweeps of the dedicated grain generator.

*Note: If every generator starts enabling themselves by a single key-press, your Keyboard or Host is not set to MPE Mode!*

### Step 4: Control Grain Modulations with MPE Expressions



Now let's control the Grain Density of each generator by your finger's pressure: Select Birth in the Grain Modulations, increase the modulation depth (e.g. to 200ms) and select Mode "Channel Pressure (MIDI & MPE)". Birth Grain Modulations will now be controlled by the amount of pressure you choose for each finger.



And let's control the amount of distortion with the Y-position of your finger: Select WaveShape in the Grain Modulations, increase the modulation depth (e.g. to 100%) and select Mode "MPE CC74 (MIDI & MPE)". The Y-Position of your finger will now control the WaveShape Grain Modulation.

### STEP 5: Create your own MPE programs

Provide some input sound to become granulized within crusher-X. Modulate other Grain Modulations with the Channel Pressure or MPE C74 Modes like Filter or Sweep. In the case that you have a surround setup, try to modulate the grain volume e.g. with MPE CC74 to let the grains make sounds from different directions depending of the Y-Position of your finger!

Enjoy!



## 16. crusher-X full version

The full version of crusher-X provides the following:

- External control of the Adore faders via plug-in parameters
- The ability to save and load all programs, banks and the Grain Buffer
- No nagging dialog boxes and no silent mode during editing
- Read and write plug-in parameters
- Add an unlimited amount of entries in the Control Mapping List
- Save the Control Mapping List
- Import/export crusher-X programs and banks
- Save/load splines, steps, WaveShape curves and envelopes
- The ability to use tuning files
- Up to 199 generators
- Full 10-channel surround sound
- The latest bugfixes and updates are provided free of charge
- Special upgrade/crossgrade offers
- You will get secure enhanced technical support!

[Find your crusher-X offer at the accSone shop](https://accsone.com/shop)



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## 17. crusher-X Soundpacks

Wanna get more out of your crusher-X? Here are some suggestions for you:

### 17.1. crushed Guitars

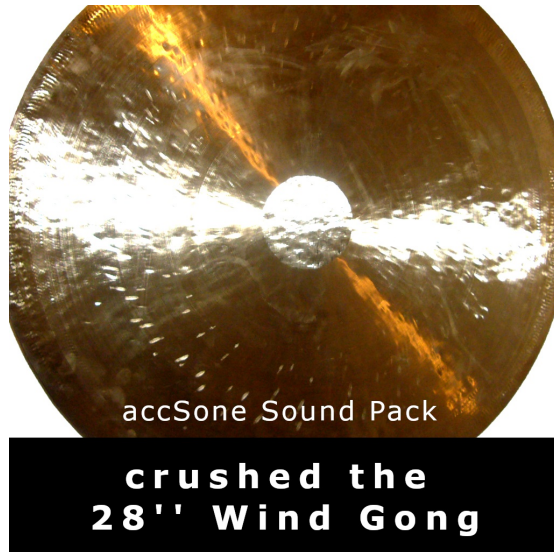


120 crusher-X programs. Granulize your licks!

120 excellently designed sounds and effects programs for crusher-X. This package is the ideal starting point for guitarists and sound designers to get deeper in the unlimited world of granular synthesis. The source material for these awesome crusher-X effects could be from any kind of electric guitars. But human voices can be extremely modified and granulized too. The effects range from smooth doubler effects down to very strange crushed and granulized sounds.

A must-have for advanced sound orientated designers and guitarists!

## 17.2. crushed with the 28" Wind Gong



Push the grains to the next level: Dedicated to the real sound experimentalists!

120 awesomely designed surround sounds and effect programs for crusher-X. Based on more than 40 high quality sound recordings of a 28" Wuhan Wind Gong this sound packages pushes you to the next level of grain experience! And yes, it is dedicated to all of you who have interest in strange, unconventional, and extreme surround sounds. The effects range from never-ending tuned gong phrase environments over barking explosions to extreme percussion eruptions which whip around the listener's head. A must-have for advanced sound-orientated designers and percussionists!



### 17.3. Going Down The Grain



Going Down The Grain - DJ/Dance/Trance/Techno/MPE - Granulize your Tracks!

148 exquisite effects programs for crusher-X designed for DJs, Dance, Trance, Techno and MPE performers. Each program is available as either an interactive or MPE (MIDI Polyphonic Expression) version. From crusher-X 7 version and up, the MPE programs can be live performed directly from your MPE keyboard.

Give your track the grain!

[Find all crusher-X soundpacks at the accSone shop](https://accsone.com/shop)



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## 18. Appendix

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## 18.2. Credits & Copyrights

### crusher-X Credits & Copyrights

#### 18.2.1. Credits

- Thanks to Jan, Sven, Nina and Anke for supporting this strange project over the last decades
- Thanks to Ulrich Müller for his continuous motivation to help start and continue the development and thanks for supporting crusher-X with factory sounds
- [TobyBear](#) for tuning file support
- Scala was created by [Manuel Op de Coul](#) in the Netherlands. Scale Archive is exceptionally licensed for a distribution with crusher-X, Thank you!
- Thanks to Mark Henning for [AnaMark tuning file](#) support
- Thanks to [Rolf Kasten](#), [Felix Petrescu](#) and [Simon Stockhausen](#) for creating and sharing tons of high quality video tutorials and audio samples
- Thanks to David Hindmarch for inspiring us on screenless editing and accessibility for blind users
- Thanks Richard Devine for supporting crusher-X with factory sounds
- Thanks [Robert Dudzic](#) for supporting crusher-X with factory sounds
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- Thanks to the whole crusher-X developing team and all the people who send us comments and suggestions!

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We're always looking forward to hear from you

Peace!

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