



NATIVE INSTRUMENTS
SOFTWARE SYNTHESIS

REAKTOR 5

5.1 Update

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Synthziser

2-OSC

2-Osc, finally, is a synthesizer based on the classical subtractive model: oscillator – filter – effect and vast parameter modulation capacities. This particular implementation of the concept features two parallel oscillators, two serial filters and a final stereo delay effect unit as well as three envelope generators, two low frequency oscillators and, additionally, an arpeggiator.



Like in the **FM4** instrument the technical implementation is more interesting than the underlying synthesis concept. All Oscillator section modes are built completely within Core, providing anti-aliased sine, triangular, pulse and sawtooth waveforms as well as two special modes (Buzz and 2Saw). The second oscillator block also features soft synchronization, i.e. the oscillator is not always re-triggered when the first oscillator's signal rises above zero but only at certain phase states of the second oscillator. The Filter sections contain an additional saturation level that helps to tightly control the filter's resonance; the internal filter processing uses over-sampling for more accurate

sounds. (The second filter is a Ladder filter: a lowpass filter that provides resonance also when using its 1-pole mode with 6 dB damping per octave.) The envelope generators and both LFOs provide similar high-end features; see below for details.

2-Osc - List of Controls

The instrument's panel is rather simple and similar to any analogue-like subtractive synthesizer. Particular features of the sections are explained with the relevant controls.

Sec.	Control	Function	Range
Osc 1 / 2	Pitch	Controls the frequency of the oscillator as offset to the pitch triggered by a MIDI Note On event in semitones. (See also [Key].)	-60...+60
	Fine	Controls the oscillator's frequency in cent. This value is added to the [Pitch] control.	-.5... +0.5
	PW (Pulse Width)	Controls the pulse width of the [Pulse] waveform (50% at a value of 0) and the phase offset of the second sawtooth wave in [2Saw] mode (180 degrees at a value of 0).	-1...+1
	Waveform	Selects one of the waveforms. Beside the well known forms there is the [2Saw] mode within the first Oscillator section that consists of two sawtooth oscillators of the same frequency whose phase offset can be controlled by the [Pulse Width] knob. The second Oscillator section provides a [Buzz] mode that uses a random waveform which is re-triggered at the pitch's frequency.	-
	Key	Available only within the second Oscillator section this disables the MIDI pitch following. The oscillator is set to a fixed frequency adjusted by the [Pitch] control, interpreted as offset to MIDI note 60 (C3).	on / off
	Synchronize	Available only within the second Oscillator section this control adjusts the amount of soft synchronization. At a value of 0 there is no synchronization, at a value of 1 there occurs normal hard sync, i.e. the second oscillator is reset to its initial phase each time the first oscillator's signal rises above zero. In between soft synchronization is used, e.g. at a value of 0.33 the second oscillator is reset when the first oscillator's signal rises above zero but only if its own phase is in the last third of its cycle.	0...1

Ring Mod	Mix	Sets the volume of each Oscillator section when mixed with the Ring Modulator section's signal.	0...1
	Mix	Sets the volume of the Ring Modulator's signal when mixed with the Oscillator section's signals.	0...1
	Cutoff	Sets the filter's center frequency as MIDI pitch. Depending of the filter's operation mode (see [Lp-Bp-Hp] and [Pole Select] resp.) the frequencies below, above or around this frequency are passed, all others are damped.	
	Res(onance)	Controls the resonance of the filter. Within the first Filter section the resonance is also influenced by the [2p-4p] control, i.e. the amount of damping. The second Filter section's Ladder filter features constant resonance independent of the amount of damping, even when only using one pole. Values above 1 produce self-oscillation of the filter. This is controlled with the [Sat Lvl] knob.	0...1.1
	Lp-Bp-Hp	Crossfades between three operation modes of the first Filter section. At the left a lowpass is activated, rejecting all frequencies above the [Cutoff] frequency. At the right a highpass is used, rejecting all frequencies below the [Cutoff] frequency. At a mid position only the frequencies around the [Cutoff] value are passed.	0...1
	2p-4p	Crossfades between the 2-pole and 4-pole outputs of the first filter. At the left the filter offers a damping of 12 dB per octave, at the right the damping is 24 dB per octave.	0...1
	Lp 1 ... Lp 4	Selects the amount of poles and zeros of the second Filter. Each additional pole results in 6 dB damping per octave, i.e. there is maximum damping of 24 dB. Using the Ladder filter model, the signal passes four one-pole stages and is then fed back to the input of the first stage, so that there is a resonance effect at each of the four outputs.	Selector
	Sat(uration) Level	Sets the level where the signal is internally limited by a slight distortion, preventing problems at high resonance values.	-12...+12
	Key(board to Cutoff)	Controls the amount of keyboard mapping of the filters' cutoff frequency. At the left the cutoff frequency is constant – at the right it follows the played MIDI notes, i.e. the [Cutoff] control specifies the offset of the filter's cutoff to the triggered MIDI note's pitch.	0...1

Osc Env, Filter Env, Amp Env	Env(elope to Cutoff)	Adjusts the amount of cutoff modulation by the Filt Enve section in semitones. At negative values the envelopes signal is inverted.	-100...+100
	Osc2 FM	Sets the amount of modulation applied to the first Filter's cutoff frequency by the signal of the second Oscillator. Negative amounts can give a different sound color.	-100...+100
	On	Activates the filter. In the Off position the filter is bypassed and has no load on the CPU.	on/ off
	A (Attack)	Sets the attack time of the envelope generators respectively.	-20...+100
	D (Decay)	Sets the decay time of the envelope generators respectively.	-20...+100
	S (Sustain)	Sets the sustain level at which the envelope generators' signal is hold after the attack-decay phase as long as the MIDI Note gate signal is present.	0...1
	R (Release)	Sets the release time of the envelope generators respectively.	-20...+100
	Vel(ocity to Amplitude)	Sets the amount of velocity mapped onto the envelope's amplitude. At a value of 0 the amplitude is independent of the MIDI note's velocity; at a value of 1 it is completely determined by the velocity.	0...1
	Key(board to Times)	Controls the amount of key following of the envelope generator's transition times (i.e. attack, decay and release). At positive values the times become shorter at high MIDI note pitches (simulating the faster response of mechanical instruments at high pitches); at negative values the times become longer at high pitch settings.	+1...-1
	Legato	If monophonic mode is used (see [Mode] in the Voice Mode section) and this is switched on, tied notes don't re-trigger the envelope generator.	on / off
	P(itch) Range	Controls the range by which the Osc Env section modulates the pitch of the two oscillators. This adjusts the maximum level available to the [Pitch 1/2] controls.	-
	Pitch 1/2	Controls the amount of modulation applied to the oscillators' pitch by this envelope generator. At negative values the envelope's signal is inverted. At maximum settings the value adjusted with [P Range] is reached.	-1...+1

LFO 1 / 2	FM 1->2	Sets the amount of frequency modulation applied to Osc 2 by using the signal of Osc 1. This is the maximum value applied when the envelope reaches its peak amplitude.	0...120
	(Clock) Sync	Switches synchronization of the LFO's rate to the current MIDI clock on or off. Depending on this setting the rate can be controlled in Hz (by the [Speed] control) or as a time specified as multiples of a certain division of a 4/4-bar.	on / off
	Speed	If the LFO is not in Sync mode this knob controls its rate in Hz.	0.05...30
	N (Beats per Cycle)	Controls the duration of one LFO cycle as number of beats. The length of a beat is specified by the [Beats per Bar] control.	1...32
	----- (Beats per Bar)	Sets the number of beats into which one 4/4 bar is divided, e.g. a value of 8 sets a beat's length to a eighth note's duration. The bar length is derived from the current MIDI tempo.	-
	Waveform	Selects the waveform of the low frequency oscillator. [S&H] samples and holds a white noise signal at the given rate, [Brown] is similar but uses brown noise (i.e. with less high frequency components).	-
	PW (Pulse Width)	Controls the pulse width if [Pulse] or [Triangular] are selected as waveforms. At a value of 0 the waveform is symmetrical.	0...1
	Phase	Sets the phase of the LFO in synchronized mode.	-0.5...+0.5
	Wheel	If on, the LFO amplitude is controlled by the MIDI modulation wheel.	on / off
	P(itch) Range	Controls the range by which the LFO section modulates the pitch of the two oscillators. This adjusts the maximum level available to the [Pitch 1/2] controls.	-
	Pitch 1 / 2	Controls the amount of modulation applied to the oscillators' pitch by the LFO (i.e. vibrato). At negative values the LFO's signal is inverted. At maximum settings the value adjusted with [P Range] is reached.	-1...+1
	PWM	Controls the amount of pulse width modulation applied to the two Oscillator sections by the LFO.	0...1
	Filter	Sets the amount of cutoff modulation applied to the Filter sections by the LFO in semitones.	0...120
	Amp	Adjusts the amount of modulation applied to the main amplitude by the LFO (tremolo).	0...1

Voice Mode	Mode	Selects one of the voice allocation modes; the arpeggiator is activated here, too. There is a polyphonic mode as well as a 1-voice monophonic mode; in [Unisono] mode only one note is played at a time (like in mono mode), but all voices are used to play the same pitch, slightly detuned (see [Detune]). This results in an effect similar to a chorus.	-
	Arp Mode	Selects the way the arpeggiator works: [Up] plays all triggered MIDI notes in an upward sequence, i.e. the lowest pitch first; [Down] results in the opposite effect. [Up+Down] alternates between the upward and the downward sequence and [Random] plays the pressed keys in a random sequence.	-
	Arp Speed	Selects the rate at which the arpeggio notes are played, synchronized to the MIDI clock.	-
	Glide	Switches portamento (pitch gliding) on or off.	on / off
	Glide Time	Sets the time used to reach a new note's pitch if [Glide] is active in seconds.	0...60
	Pitchbend Range	Controls the range of the MIDI Pitchbend wheel in semitones.	0...24
Output	Detune	Controls the amount of detuning applied to the voices in cent. In [Unisono] mode it controls the beatings in the monophonic sound. In other modes it simulates the detuned oscillators of a vintage analog synth.	0...0.5
	Spread	Controls the amount of stereo panning applied to each voice independently. At low values all voices are placed in the middle of the stereo panorama; at high values they are spread to the left and right.	0...1
	Volume	Sets the output level of the instrument in dB before it is routed to the final Stereo Delay effect.	-300...0
	(Clock) Sync	Switches between manual delay time adjustment and times synchronized to the current MIDI clock tempo.	on / off
Stereo Delay	Left / Right Delay	Controls the time by which the left and right channel's signal is delayed. Depending on [Sync] the times can be set as multiples of MIDI clock increments (like in the LFOs) or can be adjusted in milliseconds.	-
	Feedback	Adjusts the amount of the delayed signal routed back to the inputs of the two delay lines.	0...1
	X Amount	Controls the amount of cross feedback. between the two channels as part of the [Feedback].	0...1

Hi(gh) Cutoff	Controls the cutoff frequency (in Hz) of a lowpass filter that damps the delayed signal's high frequencies.	100..20000
Mix	Controls the balance between the dry, unprocessed signal (at 0) and the wet, delayed signal (at 1).	0...1
On	Switches the effect unit on or off (saving CPU power).	on / off

Equinoxe Deluxe

Equinoxe Deluxe simulates special features of old analogue synthesizers and effects with Reaktor's new Core technology. First, there is an Octave Lock mode emulating analogue synthesis techniques (see below for details). Second, the *Ensemble* and *KleinStein* effects provide high quality sounds that aim on reproducing the warmth of their old predecessors; particularly the *KleinStein* phaser is of high technical complexity within the Core cell.



Equinoxe Deluxe - List of Controls

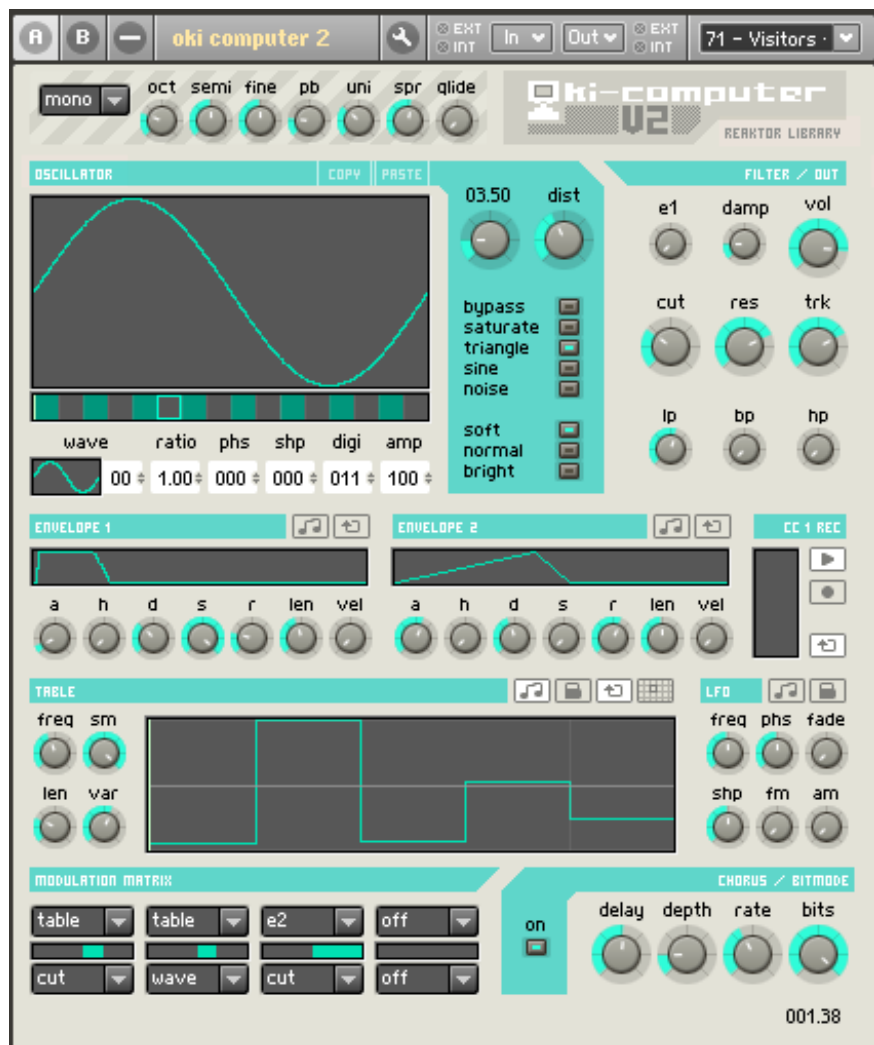
The Strings section is the central sound generator of this instrument. Essentially, this is a sawtooth oscillator shaped by an amplitude envelope and a 4-pole ladder lowpass filter. It features an additional Octave Lock mode simulating an old analogue technique that used twelve oscillators, each one dedicated to one pitch class: By this, octaves are exactly of the doubled frequency, and there occurs no beating while the harmonics are shaped in a special way.

Controller	Functionality	Range
Octave Lock	Switches the Octave Lock feature on or off.	on/off
Cutoff	Controls the cutoff frequency of the lowpass filter shaping the sawtooth signal in semitones.	20..120
Resonance	Sets the resonance of the ladder lowpass filter.	0..1
Envelope Mode	Switches between three envelope modes. They differ regarding - their behaviour if a MIDI note is triggered while another one is still playing. In [Poly] mode the old note isn't changed while the new one starts playing. In [Mono] mode the old note is stopped and the new pitch is played. This is also true for the [Reset] mode, but here the amplitude envelope (see [Attack] and [Release]) is also re-triggered by the new note event.	-
Attack	Adjusts the attack time of the envelope generator controlling the sawtooth oscillator's amplitude.	0...80
Release	Adjusts the release time of the envelope generator controlling the sawtooth oscillator's amplitude.	0...80

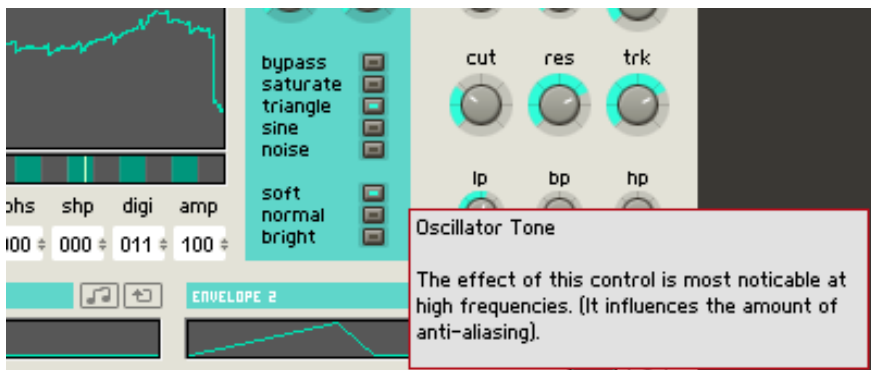
The *Ensemble*, *KleinStein* and *Delay* sections crucially enrich the basic sawtooth sound and make Equinoxe Deluxe to an analogue-sounding string instrument. While the *Ensemble* section applies a high quality chorus effect to the sound the *KleinStein* section is based on a modulated phaser. The *Delay*, finally, provides two (stereo) lines with independent controls.

Sec.	Controller	Functionality	Range
Ensemble	Rate 1 / 2	Controls the rate of the LFO that modulates the delay time controlled by [Time].	-40...10
	Amount 1 / 2	Sets the amount of modulation applied to the main delay time.	0...1
	Time	Adjusts the main delay time in milliseconds.	1...20
	Mix	Controls the balance between dry, unprocessed signal (at the left) and wet effect signal (at the right).	0...1
KleinStein	Rate	Sets the rate of the LFO modulating the phaser's center frequency.	0.01...3.16
	Mix	Controls the balance between dry, unprocessed signal (at the left) and wet effect signal (at the right).	0...1
	Colour	Switches between two phaser modes. If on, the effect is stronger.	on / off
Delay L/R	Time	Sets the delay time in milliseconds	100...1000
	Feedback	Sets the amount of feedback.	0...1
	LFO Rate	Sets the rate of the LFO that modulates the main delay time in Hertz.	0.1...1
	LFO Amount	Controls the amount of delay time modulation in milliseconds.	0...20
	Mix	Controls the balance between dry, unprocessed signal (at the left) and wet effect signal (at the right).	0...1

Oki Computer 2.1

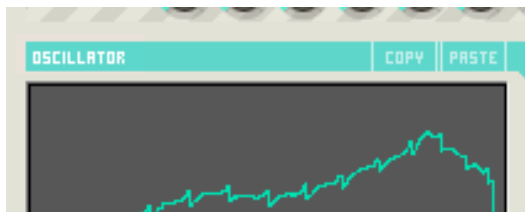


This update version features an improved oscillator section. Internally, the anti-aliasing of the algorithm has been improved; on the panel this becomes visible in the new [Oscillator Tone] control below the [Distortion Mode] selector.



It provides three settings: [bright] represents the old mode while [normal] and [soft] remove the sound's harshness as far as it is caused by aliasing artefacts.

Due to this improvement the [Copy] and [Paste] buttons were moved and can now be found above the waveform display.



The exiting snapshots have been updated to use this new feature; some have even been added. Snapshots saved with Oki Computer 2.0 are compatible to this version, however they will use random settings for the new control unless they are saved with Oki Computer 2.1.

FM4

FM4, as tells the name, is a synthesizer based on the familiar frequency modulation technique. It contains four operator sections; their outputs are not only mixed and sent to the soundcard but they also modulate each others' frequency, controlled by a flexible routing matrix. While this is a well known way to generate sounds since the 1980's, the FM4 excels in its implementation of the basic idea by using Reaktor Core.



The instrument's control logic and logical structure is implemented in classical Reaktor, the audio processing in Reaktor Core. By doing so a huge Core Cell, implementing the complete functionality of the instrument, is avoided, instead this results in several re-usable Cells. But why is the audio processing realized in Core Cells? This makes it possible to enrich Reaktor's default capacities with specialized high quality audio processing. Frequency modulation, for instance, is implemented as phase modulation within this instrument's Core Cells. In contrast to the algorithm used within the standard Reaktor modules phase modulation results in a slightly softer sound that additionally remains constant in its modulation amount all over the MIDI pitch range. As another example the LFO is built as a Core Cell allowing for special features like the One Shot capacity while maintaining the instrument's full polyphony. The chorus, as a last example, uses Core Technology to provide an effect of high quality without consuming loads of CPU power.

See below a detailed description of the instrument's controls and their functions.

FM4 - List of Controls

The four Operator sections of the instrument's panel control the sine oscillators capable of frequency modulation (FM). Each oscillator is defined by its frequency and its amplitude, the latter one specified by an envelope generator. When an oscillator modulates the frequency of another oscillator (controlled by the FM Sources section) the amount of modulation is – obviously – scaled by the amplitude, so the envelope generators also modulate the FM amount.

Control	Function	Range
A (Attack)	Sets the attack time of the envelope controlling the operator's amplitude.	-20...+80
D1 (Decay 1)	Sets the first decay time of the envelope controlling the operator's amplitude. It starts after the envelope generator has passed its attack phase.	0...100
B (Breakpoint)	Sets the level of the breakpoint. This level – relative to the maximum level after the attack phase – is reached after the first decay time and is used as starting point for the second decay.	0...1
D1 (Decay 2)	Sets the first decay time of the envelope controlling the operator's amplitude. It starts after the envelope generator has decayed to the breakpoint. At high settings the envelope becomes similar to a ADSR envelope with B controlling the sustain level.	0...100
R (Release)	Sets the release time of the envelope controlling the operator's amplitude. This is used after the triggering MIDI signal has ceased.	0...100
Vel (Velocity)	Adjusts the amount of MIDI velocity applied to the envelope's amplitude. At a value of 1 the envelope's maximum level is defined completely by the triggering MIDI signal's velocity. At a value of 0 the level is always at its maximum, independent of the MIDI velocity.	0...1
KA (Keyboard to Amplitude)	Controls the influence of the MIDI note's pitch on the operator's amplitude. At a value of +1 the amplitude rises by 6 dB per octave; at a value of -1 it falls by the same amount. At a MIDI pitch of 60 (C3) there is no influence on the amplitude.	-1...+1
KT (Keyboard to Times)	Controls the influence of the MIDI note's pitch on the envelope's transition times. At positive values the times become longer at high keys; at negative values they become shorter. At a MIDI pitch of 60 (C3) there is no influence on the envelope times.	-1...+1

Ratio	Defines the ratio between the instrument's main pitch and the operator's frequency. Musically speaking, this adjusts the harmonic of the fundamental frequency to be played, i.e. at a value of 1 the first harmonic is played etc. Integer values can be controlled at the left side of the control, fractional values at its right. For a fixed oscillator frequency set the Ratio to zero.	0...64
Fix(ed) Freq(ueency)	Adjusts a frequency in Hertz that, as an offset, is added or subtracted to/from all other frequencies of this operator. At the right side a value can be adjusted, at the left side the decade is controlled.	0...9955
Fix Freq Sign	Specifies whether the fixed frequency is added or subtracted from the variable frequency.	- / +
Phase	Sets the phase in degrees at which the operator's oscillator starts when synchronization to the keyboard signal is activated.	0...360
Key Sync	Switches synchronization of the operator's oscillator to MIDI Note On signals on or off. If on, the oscillator starts at the position adjusted by the [Phase] control.	on / off
Out (Output Volume)	Sets the output volume of this operator. This volume is used when mixing the four operators. The FM signal is not affected by this control; to adjust the amount of frequency modulation, the FM Sources Section has to be used.	0...1

The FM Sources section controls the modulation matrix: It defines a signal as a mix of all four Operator sections to be used as modulation source, independently for each oscillator. (this also includes self-modulation.) Each operator's signal can additionally be scaled by a MIDI modulation source (like the pitchbend wheel) or the instrument's polyphonic LFO section by using the controls of the FM Mod section.

Control	Function	Range
1, 2, 3, 4	Sets the amount of phase modulation applied to one of the operators (specified by the row of the Control) by one of the other operators (specified by the number). The amount rises quadratically.	0...10
self	Sets the amount of self-modulation for each of the four oscillators.	0...10
Mod 1, 2, 3, 4	Scales the modulation signal from the FM Mod Source applied to the level of operators 1...4 as sources of the FM matrix (for all destinations). At 0 the full operator level is sent to the matrix. At higher values the level is dynamically attenuated by the FM Mod Source.	0...1
Source	Selects a source, e.g. the LFO or the LFO scaled by the MIDI modwheel, that is routed to control the sources of the FM matrix.	-

CC Nr Adjusts the MIDI CC number if CC is selected as [Source]. The MIDI 0...127 modwheel can be addressed by CC 1.

The LFO section is polyphonic, i.e. each note triggered via MIDI can have its own, independent LFO signal with specific rate and phase. The LFO has a special One Shot feature that stops the modulator after half a period, reducing it to a AD envelope generator (to use this the [Key Sync] has to be activated.) The modulation signal can be used to scale the FM amounts using the FM Mod section, but it can also be routed directly to the oscillators' pitch and amplitude, resulting in vibrato and tremolo.

Control	Function	Range
Waveform	Selects the waveform of the LFO. The negative waveform is similar to the positive one but starts at a phase of 180 degrees; this can be particularly useful when using the [One Shot] feature.	-
Asymetry	Controls the shape of the waveform; higher values shift the point of highest amplitude to the end of the waveform.	0...1
Rate	Sets the LFO's oscillation frequency as a MIDI pitch. This is the fundamental rate modulated by the [Keyboard To Rate] value.	0.05...20
KR (Keyboard To Rate)	Controls the amount of rate modulation by the triggered MIDI note's pitch. At a value of 1 the rate is doubled per octave, using the original [Rate] setting at C3 (MIDI pitch 60). This shows no effect if [Mono] is activated.	-1...+1
Mono	Deactivates the polyphonic mode. If on, all voices use the same LFO signal; if off, each voice is assigned to an independent LFO.	on / off
Key Sync	Switches re-triggering of the LFO by an incoming MIDI Note-On.	on / off
One Shot	If on, the LFO stops oscillating after half a period. This can be used to transform the LFO into an AD envelope generator. It doesn't work if [Key Sync] is off.	on / off
Pitch Amount	Adjusts the amount of pitch modulation as the vibrato's range in semitones. The MIDI Modwheel's vibrato amount is added to this value (see [MW Pitch Amount] in the Voice Mode section).	0...100
Amplitude Amount	Adjusts the amount of amplitude modulation as the tremolo's intensity.	0...1

The Voice Mode section specifies the way the instrument handles polyphony, i.e. several notes that are triggered simultaneously. Beside the polyphonic mode there are several monophonic modes that feature additional functions: legato (no re-triggering of the envelope generators if a note is held when

another one is pressed) and portamento (pitch glide). The Output section spreads those voices within the stereo panorama and controls the main panning and volume.

Control	Function	Range
Pitchbend Range	Adjusts the range by which the instrument's pitch can be changed via the MIDI Pitchbend Wheel in semitones.	0...24
MW Pitch Amount	Sets the range of pitch modulation via the LFO signal in semitones. This vibrato can be scaled by the MIDI Modwheel.	0...5
Voice Mode	Switches between different voice assignment modes. There is one polyphonic mode (i.e. several notes can be played simultaneously) and four monophonic modes (where only one note can be played at a time; a new note automatically stops the previous one). In Legato mode the envelope generators are not re-triggered upon a new MIDI Note On message if another note is already playing, only pitch and velocity are changed. While the [1] modes only use one voice the [All] modes combine the available voices to one unisono chorus that can be controlled with the [Detune] knob.	-
Transpose	Shifts the instruments main pitch in steps of a semitone.	-48...+48
Tune	Shifts the instruments main pitch in steps of a cent.	-0.5...+0.5
Glide	Sets the time used to reach a new note's pitch in seconds.	0...4
Detune	Sets the amount of detuning. In all monophonic modes this specifies the max. interval in semitones between the different voices ment to play unisono. If [Voice Mode] is set to polyphonic, this specifies the spread of the tempered MIDI tuning in semitones per octave.	0...12

The three effects, finally, provide additional sound shaping. The Equalizer, Chorus/Flanger and Delay sections on the panel are straightforward, yet they aim for high quality sound.

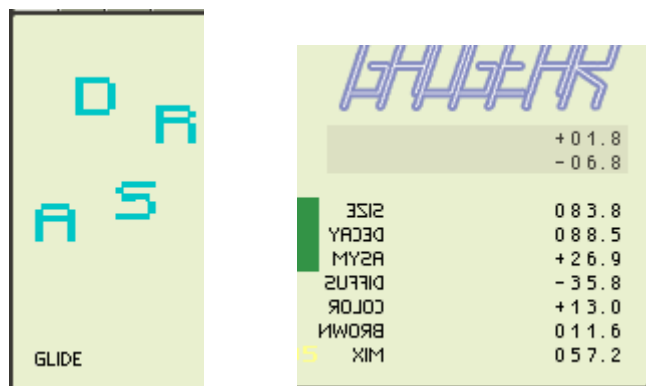
Sec.	Control	Function	Range
Equalizer	Low	Controls the amount of boost/cut applied to the frequencies below [Low Frequency] in dB.	-24...+24
	(Low) Freq(ue)ncy	Specifies the frequency below which the signal is altered in Hz.	30...1000
	Mid	Controls the amount of boost/cut applied to the frequencies around the [Mid Frequency] in dB.	-24...+24
	(Mid) Freq(ue)ncy	Specifies the center frequency for the middle band in Hz; the bandwidth can be controlled with [Mid Width]	100...5000
	(Mid) Width	Adjusts the width of the middle band.	0.01...1
	High	Controls the amount of boost/cut applied to the frequencies above [High Frequency] in dB.	-24...+24
Chorus / Flanger	(High) Freq(ue)ncy	Specifies the frequency above which the signal is altered in Hz.	400...15000
	Left / Right Delay	Controls the average delay times of the left and right channel effect units in milliseconds. The delay times are modulated by an LFO around these values.	0.1...20
	Depth	Adjusts the amount of modulation applied to the delay times as a part of the average delay time.	0...1
	Rate	Sets the modulation speed as rate of an internal LFO modulating the delay time in Hertz.	0...10
	Feedback	Controls the amplitude of the delayed signal mixed with the unprocessed incoming signal. Negative values shift the wet signal's phase by 180 degrees.	-1...+1
	Mix	Adjusts the balance between dry, unprocessed sound (at 0) and wet, delayed sound (at 1).	0...1
Stereo Delay	Left / Right Delay	Controls the delay time for both channels. If [Sync] is activated this time can be adjusted according to the current MIDI tempo; else it can be set in milliseconds.	0.1...1000
	(Clock) Sync	Switches between free delay time control (off) or synchronized to the MIDI tempo (on).	on / off
	Feedback	Controls the amplitude of the delayed signal mixed with the unprocessed incoming signal.	0...1
	X Amount	Controls the amount of cross feedback as percentage of the main feedback amount (see [Feedback]).	0...1
	High Cutoff	Controls the cutoff frequency of a lowpass filter in Hz applied to the feedback signal.	100...20000
	Mix	Adjusts the balance between dry, unprocessed sound (at 0) and wet, delayed sound (at 1).	0...1

Gaugear



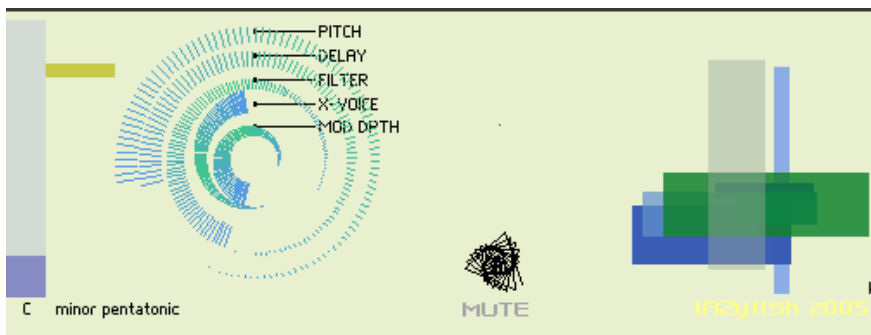
Gaugear is an experimental monophonic synthesizer: its sound explores sonic worlds that cannot be classified by MIDI pitches or a quantized clock, and its unique user interface invites new ways of sound design by omitting conventional knobs or faders.

The basic structure of the instrument is simple to understand: The tone generator's signal is shaped by an amplitude envelope and passed through reverb and equalizer.



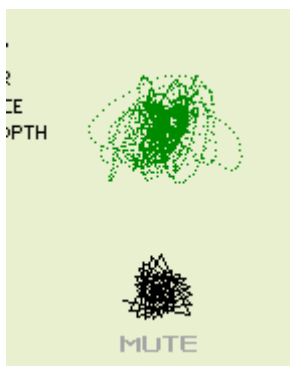
The controls of those additional units are localized at the panel's left (four letters for the envelope's parameters) and right (high and low damping as well as the various reverberation settings).

In between there are the experimental controls of the tone generator. Gaugear's signal is generated by eight parallel FM/AM pulse oscillators with subsequent delays and lowpass filters.

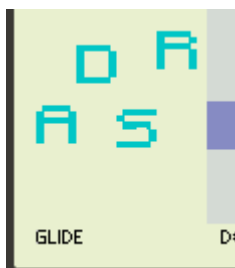


The circular controls at the panel's left adjust the main parameters of these oscillators (like pitch, delay and filter cut-off): vertical movements with the left mouse button pressed alter the position of each control ring, horizontal movements change its spread and polarity. Thus, a range of values is adjusted for each parameter out of which one discrete value is picked by the rectangular control at the right. Each of its eight boxes represents one of the eight parallel oscillators; by moving the mouse within this area the boxes can be moved and their colors can be changed, visualizing a different set of values taken from the range of values provided by the circular controls.

This sounds complicated; but a short tutorial will help using the instrument. But before the tutorial, five more controls should be explained.



A small display between the circular and the rectangular controls shows Lissajous figures of the signal; below, the instrument's volume can be adjusted by dragging the geometrical figure up and down.



The glide label functions as a fader to set the amount of portamento between tied notes.



Beside the envelope sliders two controls select the pitch set to which the pitch control is mapped; e.g. by selecting “b” and “major pentatonic” (topmost entries of both controls) only pitches of the pentatonic major scale with b as fundamental pitch are used for the eight oscillators.

Obviously, this interface does not allow you to assign a particular set of parameters to one of the eight oscillators: you have to trust your ears. For a first exploration of this instrument’s capacities set the reverb’s mix control to zero to listen to the isolated dry signal, then place all five circular controls at the “bottom” and set them to minimum spread. Now the instrument will generate a relatively dull sound upon MIDI note events; as the range of each parameter is small, movements within the rectangular control will only show small effects on the sound. Drag the pitch ring to the right – it will spread around the left side of the control, and the oscillators’ pitches will also spread. If the control ring reaches the upper center, it will wrap around, producing the lowest pitches after the highest ones. Movements within the box area now change the sound audibly as the controller picks values from a larger pitch

range. Drag the pitch ring a bit to the bottom: the complete spectrum will be lowered. Finally, drag the delay ring to the left to add some long delay times and add some reverb – an evolving atmosphere has been created.

By stepping through the instrument's presets you'll hear a great variety of possible sounds. There are deep, percussive bass patches as well as light, ethereal pads. Use them as starting points for your own explorations into the instrument's sonic world (always remember that you can easily alter each preset by moving the boxes of the rectangular display while preserving the main character) or use the random functions: Double-click the center of either the circular or the rectangular display to randomize its settings. (By clicking once within the center of the circular control you can set its colors to random values, but this does not influence the sound.)

Below you'll find is a reference of all available instrument controls; but in order to design new sounds, simply ignore those details and listen.

Gaugear - List of Controls

Envelope	Attack	Sets the attack time of the amplitude envelope generator.
	Decay	Sets the decay time of the amplitude envelope generator.
	Sustain	Sets the sustain level of the amplitude envelope generator.
	Release	Sets the release time of the amplitude envelope generator.
Glide		Controls the amount of pitch glide (portamento) that occurs when notes are tied.
Pitch Map	Fundamental Pitch	Selects the fundamental pitch of the scale selected by [Scale Select].
	Scale Select	Selects a scale out of a vast range of pitch sets. The pitches of all oscillators are mapped to this scale.

Tone Generator	Pitch	Controls the position and range of pitches available for the oscillator units (see also [Scale Select]). The left side provides high pitches; the right side, low pitches.
	Delay	Controls the position and range of delay times available for the oscillator units. The left side provides short delay times; the right side, long ones.
	Filter	Controls the position and range of cutoff frequencies available for the oscillator units' lowpass filters. The left side provides high frequencies; the right side, low ones.
	X-Voice	Controls the routing of the modulation signals. Each oscillator's pitch and amplitude is modulated by another oscillator's output; this control defines the cross-modulation matrix.
	Modulation Depth	Controls the amount of modulation applied to the oscillators' frequency and amplitude. The ring's position adjusts the amount of FM (low FM values at the right side); its length adjusts the amount of AM (low AM values at short length settings).
	Setting Morph	Morphs through the oscillator settings. Each box's position and color represents a set of parameters controlling one of the eight oscillators. The range of available settings is controlled by the circular controls of the Tone Generator like [Pitch] and [Filter].
Volume	Level	Adjusts the main output level.
	Mute	Mutes the entire instrument.
EQ	High	Controls the amount of amplification or attenuation applied to the signal's high frequencies.
	Low	Controls the amount of amplification or attenuation applied to the signal's low frequencies.
Reverb	Size	Sets the size of the room simulated by the reverberation unit.
	Decay	Sets the time that passes until all reverberation signals have decayed.
	Asymmetry	Places the signal to the left (negative values) or right (positive values) of the simulated room's center.
	Diffusion	Sets the amount of diffusion applied to the room simulation.
	Color	Controls the internal damping.
	Brown	Controls the internal room size modulation.
	Mix	Crossfades between the unprocessed signal and the reverb signal.

Grooveboxes

Massive 1.1



This drum computer is “massive” in at least two ways. First, it contains a vast range of signal-shaping capacities: samples in the six drum tracks don’t determine the instrument’s sound (like in a standard drum machine), they only provide the material from which the beats can be sculpted. Envelopes, filters, and a potent grain re-synthesis algorithm mangle the fundamental sound until it is completely different, but still musical. Second, these versatile sound editing features are combined with an advanced step sequencer offering copy and paste functionality, three different roll types, a triplet mode, independent loop length for each of the six drum tracks, three modulation tracks whose signal can be routed to nearly every parameter of the sound engine – the list of features could be continued.

Yet, those capacities are not hidden behind an endless array of knobs and faders that prevent productive working. The panel is optimized for usability and fast access to all controllers, making Massive to a powerful sound design workstation. At the same time – thanks to a complex and glitch-free snapshot

recall system – Massive can be used in live performances, or slaved to a master song sequencer that changes the snapshots automatically (see [Snapper]).

Three panel sets give access to Massive and two related utilities. The default view shows Massive’s main panel alone, ready to program a snapshot’s sound. The alternative view contains a small display of Massive, mainly focused on the list of already existing snapshots, Snapper (the song sequencer), and a soundcard utility to route the instrument’s signals to several output slots. A third view shows nothing: the instrument still works but does not consume CPU power to process the graphical user interface.

Control

At the top of the panel you’ll find the instrument’s control section.



On the left, an edit mode section defines how the various step sequencer displays react to mouse actions. The copy and paste controls are here, too. Next to it a snapshot management system allows for fast storage and recall, and also provides the link to an external song sequencer (see [Snapper]). This section is followed by four edit pages. These control the tracks’ quantization and micro-timing, two effects, and an equalizer. Finally, there are three knobs to control the output levels for the dry signal and both effects.

The effects section contains a delay unit and a gater. The delay consists of a sequenced input level and a pre-delay high-pass filter, a post-delay low-pass filter with modulated cut-off frequency, and controls for feedback and pan. The gater is triggered each sixteenth or eighth triplet note and remains open for an adjustable amount of time. This amount can be modulated by one of the sequencer tracks, and is useful in subtle sound sculpting, e.g. enhancing the sound’s transients in a drum’n’bass context.

Edit	Edit Mode	Selects the way the various step sequencer displays react to mouse actions. When [Draw] is selected, the mouse can set each step value (see also [Lock] and [Sequencer][Value Display]). When [Copy] is activated, an area of steps can be selected with the mouse that is automatically copied to the [Edit Buffer]. In [Paste] mode the buffer's data is copied back to any area selected with the mouse; if the paste area is longer than the buffer's content, the material to be pasted is looped. [Remote] enables the separate [Copy!] and [Paste!] buttons.
	Copy	If [Remote] is selected as [Edit Mode], pressing this button activates the same behavior of the step sequencer displays as the separate [Copy] mode of the [Edit Mode]. This button can easily be activated by pressing the {C} key on the computer keyboard (i.e. MIDI note 52). Thus, one can quickly edit the sequencers' data with one hand on the keyboard and one on the mouse. (See also [Paste!] and [Lock].)
	Paste	If [Remote] is selected as [Edit Mode], pressing this button activates the same behavior of the sequencer displays as the separate [Paste] mode of the [Edit Mode]. This button can easily be activated by pressing the {V} key on the computer keyboard (i.e. MIDI note 53). One can quickly edit the sequencers' data with one hand on the keyboard and the other on the mouse. (See also [Copy!] and [Lock].)
	Lock	Keeps the mouse locked on the selected sequencer step in [Draw] mode (see [Edit Mode]). This can also be activated by pressing the {Z} key on the computer keyboard (i.e. MIDI note 48).
	Edit Buffer	Displays the content of the buffer into which data is copied in [Copy] mode and that is used in [Paste] mode (see [Edit Mode]).
Snapshot	Snapshot Mode	Selects whether the snapshots are only recalled via internal signals or if external control signals received at the instrument's [Snap] port are recognized, too. (See also [Snapper].)
	Snapshot Number	Adjusts the snapshot slot whose data is loaded by pressing the [Snapshot Load] button and to which the data is saved upon pressing the [Snapshot Save] button.
	Snapshot Bank	Selects the bank of snapshots that is used by the complete snapshot management system.
	Snapshot Save	Stores the current controllers' settings to the slot specified by [Snapshot Number] and [Snapshot Bank]. By the smaller buttons (labeled – and +) at the left and right of the button the current instrument's data can be saved to the previous or next snapshot. There is no undo for this function.

	Snapshot Load	Loads the preset selected by [Snapshot Number] and [Snapshot Bank]. The previous or next snapshot can be loaded using the smaller buttons (labeled – and +) at the left and right of the load button. This is particularly useful in live situations.
	Snapshot List	Provides a list of all adjustable snapshots of the currently selected snapshot bank. Clicking on an entry loads the entry's data.
	Randomization	Sets all parameters of the sequencer tracks and effects to random values. The sequencers' data and the tracks' level controls are not randomized.
Quantization and Timing	Quantization Select	Selects one of twelve quantization presets. Horizontally, each preset ranges over sixteen steps; the higher the displayed vertical value, the more delay is applied to this step. The first preset, for example, alternates between low and high values, so each second step will be delayed, resulting in a standard off-beat shuffle. The presets only define relative times; the effective delay time at maximum values is set by the [Master Shuffle] and [Track Shuffle] controls.
	Master Shuffle	Adjusts the maximum delay time. This delay time is scaled for each track individually by the [Track Shuffle] control.
	Grid	Controls the grid of the step sequencer displays. It has no effect on the instrument's sound.
	Track Shuffle	Scales the delay time of the [Master Shuffle] control for each track individually. At maximum value the respective track uses the main delay time; at the minimum value there is no delay.
	Track Timing	Adjusts the static micro-delay (of up to 35 milliseconds) for each track.
Delay	Input Modulation	Selects the modulation track that controls the level of the effect's input. High steps in the modulation track represent full amplitude, at minimum step values the input is muted.
	Highpass Frequency	Adjusts the cut-off frequency of the high-pass filter that is applied to the input signal before it is sent to the delay unit itself.
	Delay Time	Sets the delay time. There are three vertical control boxes: the topmost adjusts the delay time for the left channel and the middle one adjusts the right channel. The bottom control switches between sixteenth notes and eighth triplets as fundamental unit of the delay times.
	Feedback Amount	Controls the amount of feedback.
	Lowpass Frequency	Sets the frequency above which the signal will be dampened.

Gater	Modulation Amount	Sets the amount of modulation applied to the [Lowpass Frequency] (see also [Modulation Rate]).
	Modulation Rate	Controls the speed of modulation applied to the [Lowpass Frequency]. The modulations source is a triangular LFO.
	Lowpass Resonance	Adjusts the resonance of the lowpass filter.
	Pan	Places the delay's signal within the stereo field.
	Gate Display	Shows the current values of the gate length (horizontal axis) and the output level (vertical axis).
	Quantization	Selects the trigger event quantization, switching between sixteenth notes and eighth triplets.
	Length	Sets the gate length; the higher this value, the longer the gate remains open after a triggering event (see also [Quantization]).
	Length Modulation	Selects the modulation track that modulates the value adjusted by [Length].
	Release	Sets the release time of the gate.
	Output Modulation	Selects the modulation track that controls the level of the effect's output. High steps in the modulation track represent full amplitude, at minimum step values the output is muted.
EQ	Shuffle	Scales the amount of shuffle applied to the effect unit. This is independent of the main quantization pattern and is bound to a standard off-beat shuffle.
	Low Frequency	Sets the frequency below which all frequencies will be amplified/dampened by a low shelf equalizer (see also [Low Boost]).
	Low Boost	Controls the amount of amplification or dampening applied to the low frequencies.
	High Frequency	Sets the frequency above which all frequencies will be amplified/dampened by a high shelf equalizer (see also [High Boost]).
	High Boost	Controls the amount of amplification or dampening applied to the high frequencies.
Output	Boost Reset	Sets both boost controls to their default values.
	Delay Level	Adjusts the output level of the delay effect. This is independent of the [Main Level].
	Gater Level	Adjusts the output level of the gater effect. This is independent of the [Main Level].
	Main Level	Adjusts the output level of the main signal that is not processed by an effect unit.

Modulation

The three step sequencers of this section don't trigger samples - they are modulation sources which change sound engine parameters on the six sample sequencers.



Each of the modulation tracks is identified with a color that can be selected within the various modulation source selection controls (e. g. below the [Transpose] control of the Master section). Normally, you adjust the modulation amount below the source selection control of the modulated parameter.

- Track Select** Switches between modulation track 1 (blue), 2 (green) and 3 (orange).
- Sequencer** The modulation tracks' step sequencers act like the one described in the [Sequencer] section; the only difference is the absence of a roll mode.
- Half Tempo** Switches between normal and half speed of the respective track read out: when pressed, each step is interpreted as an eighth note; otherwise each step is interpreted as a sixteenth note.

Sequencer

Each of the six sequencer tracks provides two main areas: the main display and the smaller triplet control below.



The latter one groups each four steps into a unit. If the triplet bar is yellow, these steps will be interpreted as sixteenth notes according to the main MIDI tempo; if red, the steps are played as eighth triplets and the last of the four steps is omitted.

The main display is handled with the mouse. With the left mouse button, the step values (interpreted as the velocity of the steps) can be drawn, copied or pasted, depending on [Edit][Edit Mode]; a gate signal triggering the track's sampler unit is only sent at non-zero steps (see also [Always] in the sound engine). With the right mouse button, the loop start can be set in the low area of the display, and the loop's length in the high area. In the middle, the right mouse button adjusts the roll mode of each step.

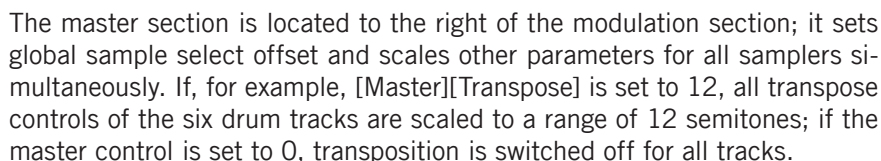
There are three roll modes that change their meaning depending on the triplet control.

Normal	No roll	Sixteenth notes
	Roll 1	Thirty-second notes; the step is triggered twice
	Roll 2	Thirty-second triplets; the step is triggered three times.
	Roll 3	Thirty-second triplets with pauses; at odd steps, the first and third note of the triplet is played, at even steps the second note. Thus, if two subsequent steps are set to this roll mode, a sixteenth triplet is played.
Triplet	No roll	Eighth triplets.
	Roll 1	Sixteenth triplets; the step is triggered twice.
	Roll 2	Thirty-second triplets; the step is triggered four times.
	Roll 3	Similar to Roll 2.

In the last row each track has a loop control, dictating which sequencer area loops when the instrument plays. Click and drag the mouse to select the loop area. A small marker indicates the current read-out position within the loop. A small white bar marks the current read-out position of the sequencer track.

Value Display	Displays the main gate sequence. The height of each step represents its velocity and can also be used as modulation source. With the left mouse button, the values can be drawn, copied or pasted depending on [Edit][Edit Mode]. With the right mouse button, the loop start can be set by clicking in the low part of the display. By clicking in the high part, the loop length can be adjusted. In the middle of the display, the right mouse button adjusts the roll mode of each step.
Triplet Control	Controls whether each group of four steps (1-4, 5-8, etc.) is interpreted as sixteenth notes or as eighth triplet. In the latter case, each fourth step is not played.

The sound engine contains a master section and six independent sampler units.



The parameters that control the samplers are grouped across five pages. The main page contains the sampler module itself where you load sample files; on the panel it is represented by the sample's waveform. Further controls select the sample from the map and adjust the pitch shift. The envelope section

controls the sample's amplitude. The parameters of this page can be used to fine-tune the sample, particularly the influence of the gate velocity on attack and decay times. The start section adjusts the sample playback starting point. The filter section contains a low-pass and a high-pass filter whose sound can be smoothly cross-faded. The grain section, finally, controls the grain re-synthesis of the sampler; it is only available in the upper three sampler tracks. Here the frequency at which the sample is re-triggered can be controlled as [Speed]. At high values the sample is re-triggered so fast that only a very short part of it is heard, creating a familiar grain re-synthesis sound. Use the [Sampler][Start] control to modulate the grain sound.

Master	Sample Select	Adjusts an offset for all [Sampler][Sample Select] controls of the six independent sampler tracks.
	Sample Select	Selects the modulation track that modulates the [Sampler][Select] parameter. (See also [Sample Select Modulation Amount].)
	Sample Select Modulation Source	Controls the amount of modulation applied to the [Sampler][Select] parameter by the track selected in [Sample Select Modulation Source].
	Transpose	Adjusts an offset for all [Sampler][Transpose] controls of the six independent sampler tracks. (See also [Transpose Scale].)
	Transpose	Selects the modulation track that modulates the [Transpose] parameter. (See also [Transpose Modulation Amount].)
	Transpose Modulation Source	Controls the amount of modulation applied to the [Transpose] parameter by the track selected in [Transpose Modulation Source].
	Decay Scale	Scales all decay times for each sampler track with the [Sampler][Decay] control.
	Decay Scale	Selects the modulation track that modulates the [Decay Scale] parameter. (See also [Decay Scale Modulation Amount].)
	Decay Scale Modulation Source	Controls the amount of modulation applied to the [Decay Scale] parameter by the track selected in [Decay Scale Modulation Source].
	Cutoff Scale	Scales all filters cut-off frequencies for each sampler track with the [Sampler][Cutoff] control.
	Drive Scale	Scales all pre-filter saturation drive amounts for each sampler track with the [Sampler][Drive] control.
	Transpose Scale	Scales all sample transpositions for each sampler track with the [Sampler][Transpose] control. (See also [Transpose].)

	Speed Scale	Scales all speed controls for each of the three upper sampler tracks with the [Sampler][Speed] control.
	Reset	Restores the values of all sampler tracks and the master section to default values.
Page Select		Selects the page displayed on the panel, controlling the [Sound Engine][Sample] section. The [Main] page contains the following parameters: [Select], [Transpose] and [Reset]. The [Envelope] page contains the following parameters: [Mute by Track], [Velocity], [Decay], [Dynamic Attack] and [Dynamic Decay]. The [Start] Page contains the [Start] parameter. The [Filter] page contains the following parameters: [Drive], [Filter Power], [Cutoff], [Resonance], [Low-pass / High-pass Crossfade] and [Reset]. The [Grain] page is only available for two of the six sampler tracks; it contains the following parameters: [Speed], [Grain] and [Reset]. The controls for [Pan], [Send Level] and [Track Level] are available in every page. Additional modulation controls are available for some of the controls mentioned above.
Sample	Sample Map Editor	Displays the currently selected sample. Double-click with the left mouse button to open Reaktor's sample map editor. One of the map's samples can be selected with the [Sample Select] control.
	Sample Select	Selects the track's sample played upon a trigger signal of the step sequencer. (See also [Sound Engine][Master][Sample Select].)
	Sample Select Modulation Source	Selects the source that modulates the [Sample Select] parameter. (See also [Sample Select Modulation Amount].)
	Sample Select Modulation Amount	Adjusts the amount of modulation applied to the [Sample Select] parameter by the source selected in [Sample Select Modulation Source].
	Transpose	Sets the amount of transposition applied to the selected sample. For the upper three sampler tracks this transposition does not affect the sample's playback speed (due to the underlying grain resynthesis algorithm); for the three lower sampler tracks it also changes the playback speed. (See also [Sound Engine][Master][Transpose] and [Sound Engine][Master][Transpose Scale].)
	Transpose Modulation Source	Selects the source that modulates the [Transpose] parameter. (See also [Transpose Modulation Amount].)

Transpose Modulation Amount	Adjust the amount of modulation applied to the [Transpose] parameter by the source selected in [Transpose Modulation Source].
Always	If switched on, the pitch modulation (see [Transpose Modulation Amount]) is always active; if switched off, new modulation events are only recognized when the triggering gate is open.
Velocity	Adjusts the amount of influence of the sequencer's gate velocity on the sample's amplitude. Turn to the left for no influence, i.e. constant maximum amplitude at every gate value; turn to the right for a complete mapping of the gate value onto the sample's amplitude.
Decay	Sets the decay time of the amplitude envelope triggered by a gate event. (See also [Dynamic Decay] and [Sound Engine][Master][Decay Scale].)
Dynamic Attack	Sets the amount of modulation by the source selected by [Dynamic Source] applied to the attack time of the amplitude envelope. Turn to the left for no modulation; turn to the right for long attack times at low modulation signals.
Dynamic Decay	Sets the amount of modulation by the source selected by [Dynamic Source] applied to the decay time of the amplitude envelope. Turn to the left for no modulation; turn to the right for long decay times at high modulation signals. (See also [Decay].)
Dynamic Source	Selects the source track that modulates the amplitude envelope's attack time and the [Decay] parameter.
Mute By Track	Selects the mute track. If the specified track receives a gate signal, this track's gate is closed. The feature is particularly useful for programming hi-hats, e.g. the first track plays a closed hi-hat and the second one plays an open hi-hat -- since both tracks mute each other, an open hi-hat sound will be muted when the closed hi-hat sample is triggered. There is also a bypass option to exclude the track from muting.
Start	Controls the sample playback start position upon a trigger signal.

Start Modulation Amount	Adjusts the amount and polarity of modulation applied to the read-out starting point. The value adjusted by [Start] is used as minimum offset: at normal modulation (values at the right), the modulation source's value is simply added to the [Start] value, scaled by the modulation amount of this control. At inverse modulation (values at the left), however, the modulation source's value is not subtracted from the offset, but the amount is inverted and added to the offset: At high modulation signals there is less modulation than at low modulation signals.
Start Modulation Source	Selects the sequencer track whose signal modulates the [Start] parameter.
Drive	Sets the amount of pre-filter saturation drive. (See also [Sound Engine][Master][Drive Scale].)
Cutoff	Controls the cut-off frequency of the track's filter. (See also [Sound Engine][Master][Cutoff Scale].)
Cutoff Modulation Source	Selects the sequencer track whose signal modulates the [Cutoff] parameter.
Cutoff Modulation Amount	Sets the amount of modulation applied to the [Cutoff] parameter by the source selected by [Cutoff Modulation Source].
Resonance	Sets the resonance of the track's filter.
Mode Crossfade	Fades between the unfiltered signal (at the left), the signal of a highpass filter (at mid position) and a lowpass filter signal (at the right). Both filters use the parameters adjusted by [Cutoff] and [Resonance].
Speed	Sets the speed at which the sample is re-triggered and the playback is looped back to the position defined by the [Start] parameter. As the sampler's playback speed remains constant, the played length of the sample is reduced at high re-triggering frequencies; finally only grains of the original sample are heard. The starting sample grain can be selected by the [Start] parameter.
Speed Modulation Source	Selects the sequencer track whose signal modulates the [Speed] parameter.
Speed Modulation Amount	Sets the amount of modulation applied to the [Speed] parameter by the source selected by [Speed Modulation Source].
Reset	Sets all controls of the respective controller page to their default values. Clicking with the right mouse button resets the parameters on all controller pages.
Pan	Positions the track's signal within the stereo field.

Pan Modulation Source	Selects the sequencer track whose signal modulates the track's [Pan] parameter.
Send Level	Sets the volume of the track's signal that is sent to the delay effect (upper control) and the gater effect (lower control).
Track Level	Sets the volume of the track's signal that is routed to the main output.
Solo/Mute	The left mouse button switches the track's signal on or off. Double-clicking with the left mouse button switches all tracks on. Clicking the right mouse button solos the track (i.e. it plays alone).

Snapper

Snapper is an additional instrument that works as a song sequencer.



It synchronizes to the global MIDI clock and automatically recalls snapshots of the slaved instrument, i.e. Massive. As Massive's snapshot management system is optimized for fast snapshot loading, the patterns are loaded immediately, with no interruptions of the audio output. (Be sure to set the [Snapshot Mode] control to external!) Complete songs can be built using Snapper's snapshot timeline.

The instrument has several horizontal rows of controls. The most important one contains the snapshot numbers to be recalled (third from the bottom). A new recall event can be created by double-clicking with the left mouse button into an empty area of the row; double-clicking an existing marker deletes it. Each marker can be dragged horizontally with the left mouse button along the time axis; by dragging with the right mouse button the snapshot number to be recalled can be altered.

Below this main row there is the display row; here, dragging with the left mouse button moves the area to be displayed above while the right mouse button changes the length of the displayed area. Above the main snapshot row there is the loop bar that defines the read-out loop as well as the edit area of the edit functions (see [Copy] etc.). Additionally, there is a small marker to position the read-out pointer manually; its position indicates the place where the readout starts after a MIDI clock reset (i.e. not after a MIDI continue event).

In the top and bottom rows, finally, several values are displayed numerically,

always in the format of bar : quarter : sixteenth note. There are also buttons to copy and paste sequencer data, to zoom the currently displayed loop, to disable recall (during sequence editing) and to switch the sequencer on or off. The sequencer is bound to the MIDI clock, so Reaktor's global clock or an external sequencer's clock has to be running for Snapper to work.

Host	Turns Snapper into slave mode. A host program (like Logic or Cubase) can send MIDI program change events to select Massive snapshots. In this case, Snapper's song sequence is bypassed. The host's track containing the MIDI program change events should be played a few milliseconds (depending on the host) before all other tracks to ensure correct timing within Massive.
Zoom Loop	Zooms the sequence display (see [Display Marker]) to the current loop area (see [Loop Marker]).
Previous Zoom	After zooming the display to the loop area with [Zoom Loop], this button returns the display to the previous zoom factor.
Zoom All	Displays the complete song sequence.
Start Position	Displays the position at which the sequencer starts running upon a MIDI start event. This position can be edited by using the [Start Marker].
Current Position	Displays the current position of the sequence read-out.
Run Switch	Switches the sequencer on or off. When on, the instrument reacts to MIDI clock events (e.g. from Reaktor's global clock) like start, stop and continue.
Loop Start	Displays the start of the playback loop area. This position can be edited by the [Loop Marker].
Loop Length	Displays the length of the playback loop area. This position can be edited by the [Loop Marker].
Start Marker	Displays the position at which the sequencer starts running upon a MIDI start event. This can be altered by dragging the marker with the left mouse button.
Loop Marker	Displays the playback loop. When the read-out pointer reaches the end of the loop area, it is set back to the loop's beginning. The loop's start can be changed by dragging the marker with the left mouse button, dragging with the right mouse button changes its length.

Sequence Edit	Defines the sequence of snapshot recall events. A new event can be created by double-clicking an empty area of the sequence with the left mouse button; double-clicking on an existing marker deletes it. The markers can be selected and moved along the horizontal time axis with the left mouse button. The snapshot number can be adjusted With the right mouse button. The position and snapshot number of the currently selected marker are displayed as [Recall Position] and [Recall Snapshot] at the bottom of the instrument; they can also be edited there.
Display Marker	Shows the area of the complete song that is shown within the [Sequence Edit] display. With the left mouse button the start position (also displayed at the left of the row) can be moved, with the right mouse button the display length can be adjusted (its end is displayed numerically at the right of the row). The [Zoom Loop] button sets the [Display Marker] to the position and length of the current loop (see [Loop Marker]).
Copy	Copies the snapshot sequence of the current loop area into the internal clipboard.
Paste	Pastes the snapshot sequence stored in the internal clipboard into the current loop area.
Clear	Deletes all snapshot recall markers within the current loop area.
Recall Position	Displays the position of the currently selected snapshot recall event. A snapshot recall event can be selected within the [Sequence Edit] display with the left mouse button.
Recall Snapshot	Displays the snapshot number that is recalled by the currently selected snapshot event.

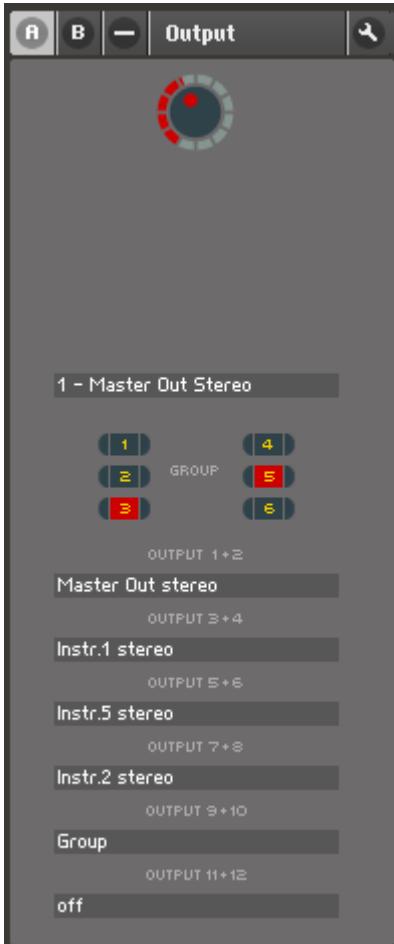
Output

This utility controls the routing of Massive's output ports to the soundcard.

There are six stereo pairs of output channels. Each one can output an individual track, the mixed master stereo signal or a group submix. The group submix can be any combination of the six tracks (e.g. the hihat tracks).

Master Level	Adjusts the master level of the complete ensemble. The ensemble is automatically muted when the MIDI clock is stopped.
Preset Select	Selects one of the instrument's presets. Those presets are normal instrument snapshots, so the list of presets can be extended individually.

- Group** Defines the tracks whose signal is mixed to a group signal. This group signal can then be routed to one of the outputs. Each track can be selected or deselected with the mouse.
- Outputs** The six stereo output slots are connected to Reaktor's soundcard output. Each slot can route an individual track, the group submix, or the complete mix to the soundcard for external mixing.



Sample Transformer

Live Sampling Core Cells

This package consists of five Reaktor Core Cells that are concerned with live sampling; four small instruments have been added to demonstrate the cells' capacities. The incoming audio should be synchronized to the MIDI clock to use the instruments correctly.

All Core Cells contain internal buffers to sample the incoming audio. These buffers are of fixed size. Be sure to check this size when implementing the cells in your own instruments to avoid buffer override when using long samples or high sample rates.

The five Core Cells can be organized in three groups.

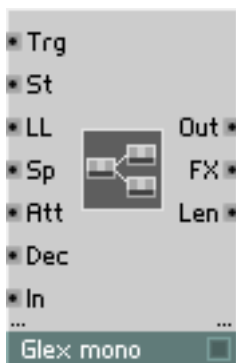
The first group – containing only **ANDB** (Auto-Normalized Double Buffer) – is built up by two independent buffers: One of them is used for playback, the other one for recording.



A trigger event inverts their functions, so that the buffer which was recording before the trigger event is now playing back its content while the previously playing buffer is filled with new incoming audio signals. The recorded signal is automatically normalized which can be very useful in feedback loops as used within the demo ensemble.

This ensemble rhythmically switches the buffer functions due to the programmed sequence. As each buffer is played from the beginning upon a trigger signal, this results in a re-arrangement of the incoming audio. Additionally, a feedback loop roots the output signal back to the input of the Core Cell. By this, the content of the currently playing buffer is recorded again into the other buffer.

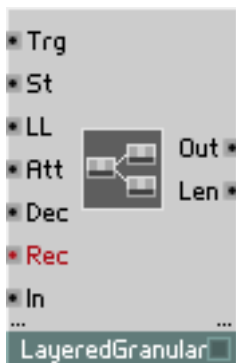
The second group – containing **Glitch** and **Glex mono / stereo** – either outputs the dry, incoming audio signal or a looped, sampled one, depending on a gate signal.



The incoming audio is always written to an internal buffer. When the gate signal rises above zero this buffer is played back by looping a small grain of its content whose length can be adjusted as well as its position within the buffer.

The *Glex* demo ensemble, on the one hand, provides direct access to the cell's parameters and, on the other hand, modulation capacities (two simple sequencers and an envelope generator) to change those parameters over time. The [Trigger] button activates the buffer playback; it can be synchronised to the MIDI tempo like the length parameter to the MIDI tempo to achieve accurate rhythmical effects.

The third group finally consists of **LayeredGranular**.



This cell is less specialized and less automated than the other ones. Recording to the buffer has to be triggered manually as well as the playback of a part of the buffer's content (whose length and position within the buffer can be adjusted). On the other hand, this cell provides polyphonic readout of the

buffer's content so that four independent grains can be layered.

The ensemble demonstrating this cell's usage divides the internal buffer (whose length can be set as a number of quarter beats) into several parts of equal length that can be instantly repeated. For example, a buffer of four beats could be subdivided into eight sections, each of them repeated three times, resulting in sixteenth triplets.

ANDB Core Cell

Section	Port	Function	Typ. Range
Input	Trg	Each zero crossing with rising edge inverts the function of the two internal buffers.	-1...+1
	T	Sets the time used to crossfade between both buffers upon a trigger event. The maximum value depends on the internal buffer's length	0...1000 msec
Output	In	Port for the incoming audio signal to be sampled.	-1...+1
	Out	Port for the effect's output signal	-1...+1
	Len	Port for the length of the internal buffer. The length can be changed manually within the Core Cell.	0...1000 msec

Glitch, Glex Mono and Glex Stereo Core Cells

Section	Port	Function	Typ. Range
Input	Trg	When the signal rises above zero, the sampled buffer is looped; when the trigger signal sinks below zero, the incoming audio is bypassed to the output.	-1...+1
	St	Sets the start position of the repeated buffer part within the complete buffer in milliseconds.	0...1000 msec
	LL	Sets the length of the looped buffer part in milliseconds.	0...1000 msec
	Sp	Sets the speed of playback. At a value of one the buffer is played back at its original speed, at a value of two the speed is doubled etc.	1...4
	Att	Sets the time used to crossfade between the dry signal and the looped one upon a trigger signal as percentage of the loop length.	0...1
	Dec	Sets the time used to crossfade between the looped signal and the dry one upon a closing gate signal as percentage of the loop length.	0...1
	In, L/R	Port(s) for the incoming audio signal to be sampled.	-1...+1

Output	Out, L/R	Output(s) the mix of the dry incoming signal and the looped sampled signal corresponding to the trigger signal. There applies a crossfade between both signals according to the [Att] and [Dec] values where adjustable.	-1...+1
	FX, FXL/R	Output(s) the looped signal; the incoming signal is muted when the trigger signal sinks below zero.	-1...+1
	Len	Port for the length of the internal buffer. The length can be changed manually within the Core Cell.	0...1000 msec

LayeredGranular Core Cell

Section	Port	Function	Typ. Range
Input	Trg	A signal rising above zero plays the buffer's content according to the values of [LL] and [St] one time. There can be four read out processes simultaneously, i.e. if the a triggered play back has not ended when a new trigger signal is received a second playback is started while the first continues independently.	-1...+1
	St	Sets the start position of the played buffer part within the complete buffer in milliseconds.	0...1000 msec
	LL	Sets the length of the buffer to be played back in milliseconds. The buffer playback is not looped automatically.	0...1000 msec
	Att	Sets the time used to crossfade between the dry signal and the triggered, sampled one as percentage of the loop length.	0...1
	Dec	Sets the time used to crossfade between the sampled signal and the dry one as percentage of the loop length.	0...1
	Rec	A signal rising above zero triggers recording to the internal buffer. The complete buffer is filled once recording is started independently of the signal at this port.	-1...+1
Output	In	Port for the incoming audio signal to be sampled.	-1...+1
	Out	Outputs the triggered buffer playback.	-1...+1
	Len	Port for the length of the internal buffer. The length can be changed manually within the Core Cell.	0...1000 msec

ANDB Demo Instrument



The **ANDB** Demo instrument panel consists of two main parts: the engine and the sequencer. The sequencer rhythmically switches between the two internal buffers (each activated step generates a trigger event sent to the Core Cell); the MIDI clock has to be running to make the sequencer work. The engine, on the other hand, controls the amount of feedback and the peak equalizer that additionally shapes the feedback signal.

Section	Control	Function	Range
Input	Input	Sets the level of the incoming audio signal as percentage of its original level.	0...1
Engine	Feedback	Sets the level of the feedback signal as percentage of its original level, i.e. at a value of one the feedback does not fade.	0...1
	Boost	Sets the amount of amplification or damping applied to the feedback loop equalizer.	-20...+20 dB
	Res	Sets the resonance of the feedback loop equalizer.	0...0.98
	Center	Sets the center frequency of the feedback loop equalizer as MIDI pitch.	20...120
	Envelope	Sets the amount of modulation applied to the equalizer's center frequency by an envelope generator.	0...2000 Hz
	Decay	Sets the decay time of the modulating envelope generator as logarithmic value.	0...80

	Crossfade	Sets the time used to crossfade between the two internal buffers upon a trigger signal.	1 . . . 1 0 msec
Sequencer	Steps 0...15	Determines whether a trigger signal is generated at this step (on) or not (off).	on / off
	Length	Sets the length of the sequence in setps.	1...16
Output	Output	Sets the level of the output audio signal as percentage of its original level.	0...1

Glex Demo Instrument



Glex Demo's main controls are placed at the left of the panel. There is the trigger button that enables the effect as well as the main parameter controllers like [Length] and [Speed]. Below those parameters the modulation amount and source can be adjusted. In the middle of the panel the three sources A, B and C (two sequencers and an envelope generator) can be handled, and at the right there is a dual band mixer that controls the low and the high band independently

Section	Control	Function	Range
Loop	Trigger	Triggers the effect. As long as the button is pushed a sampled buffer according to [Length], [Speed] and [Start] is looped and routed to the output.	on / off
	Trigger Snc	Synchronises the [Trigger] button to the MIDI clock, i.e. the trigger is delayed until the next sixteenth note event arrives.	on / off

Length	Sets the length of the looped buffer part. If [Length Snc] variable is on, this switches between divisions of a sixteenth note linearly; if the switch is off, this logarithmically morphs between loop lengths corresponding to the MIDI pitches -20 (at the left) and +100 (at the right).	
Length Mod	Sets the amount and polarity of modulation applied to the [Length] parameter. Turn to the right for positive modulation (i.e. longer loop length at high modulation values), to the left for inverse modulation (i.e. shorter loop length at high modulation values) and to a mid position for no modulation.	-1...+1
Length Mod Source	Selects the modulation source: one of the two sequencers (A and B), the envelope (C), the sum of the sources A and C or the product of the sources B and C.	
Length Snc	Switches synchronisation of the loop length to the MIDI tempo on or off. See [Length] for details.	on / off
Speed	Sets the playback speed of the loop with an exponential curve. At mid position the loop is played at its original speed, at the left it is played slower (max. at 12.5 % of the original speed), at the right it is played faster (max. eight times faster).	0.125...8
Speed Mod	Sets the amount and polarity of modulation applied to the [Speed] parameter. Turn to the right for positive modulation (i.e. faster playback at high modulation values), to the left for inverse modulation (i.e. slower playback at high modulation values) and to a mid position for no modulation.	-1...+1
Speed Mod Source	Selects the modulation source: one of the two sequencers (A and B), the envelope (C), the sum of the sources A and C or the product of the sources B and C.	
Start	Sets the position of the loop sample within the buffer from the beginning at the left to its end at the right.	0...1
Start Mod	Sets the amount and polarity of modulation applied to the [Start] parameter. Turn to the right for positive modulation (i.e. a position more to the end of the buffer at high modulation values), to the left for inverse modulation (i.e. a position more at the beginning of the buffer at high modulation values) and to a mid position for no modulation.	-1...+1

	Start Mod Source	Selects the modulation source: one of the two sequencers (A and B), the envelope (C), the sum of the sources A and C or the product of the sources B and C.	
Sequencer	Steps 0...7	Sets the steps modulation value.	0...1
	Snc	If switched on, the sequencer is re-triggered each time the [Trigger] button is pressed.	on / off
Envelope	Length	Sets the number of steps that is played.	1...8
	Attack	Sets the attack time of the envelope generator.	0...80
	Decay	Sets the decay time of the envelope generator.	0...80
	Sustain	Sets the sustain level of the envelope generator.	0...1
Mix	Low	Crossfades between the dry, unprocessed signal at the left and the looped effect signal at the right for the low frequency band. This has no effect if [no Dry] is switched on.	0...1
	High	Crossfades between the dry, unprocessed signal at the left and the looped effect signal at the right for the high frequency band. This has no effect if [no Dry] is switched on.	0...1
	Split	Sets the split frequency for the low and high frequency band as MIDI pitch.	20...100
	Link	Links the [Low] and [High] values.	on / off
	no Dry	Disables the mix section; when the [Trigger] button is pressed, the looped signal is played, when the button is released the dry signal is routed to the output.	on / off

LayeredGranular Demo Instrument



This demo ensemble records a buffer of musical length – therefor the MIDI clock has to be running! - and subdivides this buffer into several steps. Each of those steps is then repeated fast by an adjustable number. E.g. the instrument could record four quarter beats, subdivide them into eight parts and repeat each of them 13 times. The sound is similar to a sequencer controlling a granular sampler, but the capacities are quite different.

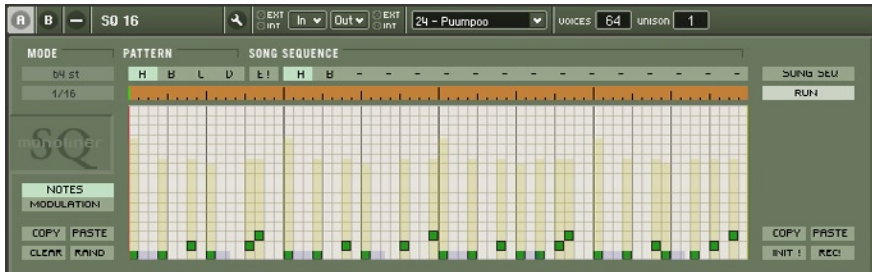
Section	Control	Function	Range
Input	Level	Controls the level of the incoming audio signal in dB. The meters at the left of the control display the level after the amplification.	-38...+12
	Logic	Record	Triggers the recording process. When pressed, the number of quarter notes adjusted by the [Beats] control is recorded into the internal buffer.
	Synchronize	Restarts the buffer playback at its beginning. This can be used to synchronize the buffer playback with the incoming signal when mixing the dry and wet signals.	on / off
	Beats	Sets the number of beats (i.e. quarter notes according to the current MIDI clock tempo) that are recorded into the internal buffer. The [Divide] control subdivides this length into smaller parts of equal size.	1...5
	Over	Indicates whether the adjusted recording length (see [Beats]) is longer than the internal buffer. In this case the length has to be diminished or the buffer size has to be augmented.	on / off
	Divide	Sets the number of parts into which the buffer is divided.	1...32
	Repeat	Sets the number of repetitions that are applied to each part.	1...32
	Length	Sets the length of each part as percentage of the part length. This can work similar to a gate effect. As the main Core Cell handles four independent read-out processes this is not necessarily influenced by the [Repeat] control.	0...1
	Start	Adjustst the loop start point within the internal buffer.	0...1
	Attack	Sets the time used to crossfade between the dry signal and the triggered, sampled one as percentage of the loop length.	0...1
	Decay	Sets the time used to crossfade between the sampled signal and the dry one as percentage of the loop length.	0...1
Output	Dry / Wet	Controls the balance between the dry, unprocessed signal (at the left) and the sampled, wet signal (at the right). Use the [Snc] button to synchronize sample playback and incoming audio.	0...1
	Level	Controls the level of the outgoing audio signal in dB. The meters at the right of the control display the level after the amplification.	-38...+12

Splitter 1.2



The Splitter is a sonically flexible sequenced sample-player. Geared towards granular beat production, it can also be used for melodies or padwork. The main idea behind this sequencer / sample-player combo are the 16 sample slots. You can assign different fragments of the selected sample with individual settings for all parameters to the different slots above the waveform display. You can also assign individual MIDI notes.

Sequencer



The monophonic sequencer delivers classic step-sequencing in a very useable package. It offers 16 parallel tracks where each track represents one of Splitter's sample slots (see also [Splitter] below). The leftmost sample slot corresponds to the bottom track, the rightmost sample slot corresponds to the top track. A note placed on the track triggers the respective slot; the vertical bar crossing the note represents its velocity; the horizontal bar, its length.

By clicking with the left mouse button on an existing note one can alter its position on the horizontal time axis or shift it to a different track vertically. Clicking an empty area with the left mouse button creates a new note, double-clicking deletes an existing one. A note's velocity (vertical movements) and length (horizontal movements) can be adjusted by clicking with the right mouse button.

Beside the notes sequencer there is an additional modulation sequencer. Here, a value can be adjusted for each step of the timeline; this value can be used as modulation source within the [Splitter] instrument.

Finally, a complete song sequencer is also implemented: at the top of the instrument's panel the currently displayed and edited pattern can be selected (A – D). To the right of the pattern select a pattern sequence can be programmed to automatically switch the patterns during playback.

Zoom Level	Selects the number of steps shown within the main [Pattern Edit] display.
Quantization	Selects the rhythmical unit at which the steps of the sequencer are interpreted. The units are always bound to the global MIDI tempo.
Pattern Select	Selects one of the four patterns A/B/C/D to be shown within the main [Pattern Edit] display. If [Song Seq] is off, this also selects the pattern to be played (see also [Loop Bar]).
Song Edit	Switches the edit mode of the song sequence on or off (see also [Sequence Edit]).

Sequence Edit	If [Song Edit] is on, one can program a sequence of patterns by dragging the pattern symbols with the left mouse up and down. The complete song sequence is repeated continuously. Empty steps within the sequence are omitted.
Song Seq	Switches the song sequencer on or off.
Run	Switches the complete sequencer on or off. If on, the sequencer synchronizes itself to the global MIDI clock. Thus, the MIDI clock has to be running to make this sequencer work.
Pattern Copy	Copies the currently selected pattern (see [Pattern Select]) into the internal clipboard.
Pattern Paste	Pastes the contents of the internal clipboard into the currently selected pattern (see [Pattern Select]).
Pattern Init	Deletes all notes of the currently selected pattern (see [Pattern Select]) and resets the modulation sequence. As this cannot be undone, the button must be double-clicked to delete the content.
Pattern Rec	Switches recording of MIDI note input to the sequencer on or off.
Pattern Edit	Displays the currently selected monophonic pattern (see [Pattern Select]). Depending on the [Notes/Modulation Switch] sixteen note tracks or a modulation curve is displayed. The pattern can be edited with the mouse or recorded via MIDI (see [Pattern Rec]).
Notes/ Modulation Switch	Switches between displaying the note tracks or the modulation curve of the currently selected pattern.
Loop Bar	Selects the range of the current pattern that is played back. This range is stored for each pattern independently, so each can have a different length. Use the left mouse button to position the loop. The length can be adjusted with the right mouse button (Mac: ctrl-click).
Loop Copy	Copies the currently active loop into the internal clipboard.
Loop Paste	Pastes the contents of the internal clipboard into the currently active loop.
Loop Clear	Initializes the note tracks and the modulation curve within the range of the currently active loop.
Loop Rand	Sets the note tracks and the modulation curve within the range of the currently active loop to random values.

Effects

Flatblaster Update 2.0.2



- Version 2.0.2 of Flatblaster 2 sports the following improvements:
- Lookaheads in compressors and limiter
- Smoother behaviour of envelope the followers
- Knee instead of saturation in the limiter
- Overall CPU consumption reduced

Sequencer

Snapper



Snapper is a song sequencer. It can be connected to a slave instrument (e.g. Massive – please refer to the new Massive 1.1 ensemble) to automatically recall the slave instrument's presets, synchronized to the global MIDI clock. Thus, complete songs can be built within Reaktor, pushing the program's standalone usability – especially in live situations – to a new level.

Interface

The instrument consists of several horizontal rows of controls. The most important one (third from the bottom) contains markers that display the snapshot numbers to be recalled at the respective position on the horizontal timeline. A new recall event can be created by double-clicking with the left mouse button; double-clicking an existing marker deletes it. Each marker can be dragged with the left mouse button along the time axis; by dragging with the right mouse button the snapshot number to be recalled can be altered.

Below this main row there is the display row; here, dragging with the left mouse button moves the area to be displayed in the main row while the right mouse button changes the length of the displayed area. Above the main row there is the loop bar that defines the read-out loop as well as the edit area of the edit functions (see [Copy] etc.). Additionally, there is a small marker to position the read-out pointer manually; its position indicates the place where the read-out starts after a MIDI clock reset (i.e. after a MIDI start event, but not after a MIDI continue event).

In the top and bottom rows several values are displayed numerically, always in the format of bar : quarter : sixteenth note. There are also buttons to copy and paste sequencer data, to zoom the current loop within the display, to disable recalling (during sequence editing), and to switch the sequencer on or off. As the sequencer is bound to the MIDI clock, Reaktor's global clock or an external sequencer's clock must be running for Snapper to work.

Zoom Loop	Zooms the sequence display (see [Display Marker]) to the current loop area (see [Loop Marker]).
Start Position	Displays the position at which the sequencer starts running upon a MIDI start event using the format of bar : quarter : sixteenth. This position can be edited by the [Start Marker].
Current Position	Displays the current position of the sequence read-out in the format of bar : quarter : sixteenth.
Run Switch	Switches the sequencer on or off. When on, the instrument reacts to MIDI clock events (e.g. from Reaktor's global clock) like start, stop and continue.
Loop Start	Displays the start of the playback loop area in the format of bar : quarter : sixteenth. This position can be edited by the [Loop Marker].
Loop Length	Displays the length of the playback loop area in the format of bar : quarter : sixteenth. This position can be edited by the [Loop Marker].
Start Marker	Displays the position at which the sequencer begins running upon a MIDI start event. This can be altered by dragging the marker with the left mouse button.
Loop Marker	Displays the playback loop. When the read-out pointer reaches the end of the loop area, it returns to the loop's beginning. The loop's start can be changed by dragging the marker with the left mouse button. The loop length can be changed by dragging with the right mouse button.
Sequence Edit	Defines the sequence of snapshot recall events. A new event can be created by double-clicking with the left mouse button in an empty area of the sequence; double-clicking on an existing marker deletes it. The markers can be selected and moved along the horizontal time axis with the left mouse button. The snapshot number to be recalled can be adjusted with the right mouse button. The position and snapshot number of the currently selected marker are displayed at the bottom of the instrument as [Recall Position] and [Recall Snapshot]; they can also be edited there.
Display Marker	Shows the area of the complete song that is visible within the [Sequence Edit] display. The start position (also displayed at the left of the marker) can be moved with the left mouse button, the display length can be adjusted with the right mouse button (its end is displayed numerically at the right of the marker). The [Zoom Loop] button sets the [Display Marker] to the position and length of the current loop (see [Loop Marker]).
Copy	Copies the snapshot sequence of the current loop area into the internal clipboard.
Paste	Pastes the snapshot sequence stored in the internal clipboard onto the current loop area.

Clear	Deletes all snapshot recall markers within the current loop area.
Recall Position	Displays the position of the currently selected snapshot recall event in the format of bar : quarter : sixteenth. A snapshot recall event can be selected within the [Sequence Edit] display with the left mouse button.
Recall Snapshot	Displays the snapshot number that is recalled by the currently selected snapshot event.
Recall Switch	Switches the transmission of recall events to the slave instrument on or off.

Integration

Snapper itself does not generate any sound – as a meta-sequencer it only controls synthesizers and drum machines. The connection to those slaved instruments is simple: Snapper provides several output ports that give access to five data streams. The most important port is labeled [Snap]: Each time a snapshot recall event is generated within Snapper, it is routed to this port and outputs the relevant snapshot number. Slaved instruments simply have to use this event to recall their own snapshots. All other ports of Snapper provide additional information that can be used, but can also be ignored: the instrument will work regardless.

T16	Outputs the duration of a 16th note (according to the global MIDI tempo) in milliseconds.
96	Outputs the global MIDI song position in 96th notes, i.e. the number of 96th notes that passed since the last MIDI clock reset.
(96)	Outputs the number of 96th notes that passed since the last snapshot recall event.
Snap	Outputs an event each time a snapshot recall event is generated by the sequencer. The event's value equals the snapshot to be recalled. Typically, this is connected to a Snapshot module within the slaved instrument to control its presets.
LL!	Outputs an event each time the sequencer's loop wraps around.

There is a macro included – called [Snap Slave] – that can be placed within the sound-generating instrument. Connect this macro to the [Snap] port of [Snapper]. All recall events will then be routed to a Snapshot module within the [Snap Slave] macro that causes the slaved instrument to react to the sequencer.

SQx



This ensemble enlarges the collection of sequencer instruments supplied with Reaktor 5. It provides four tracks designed to trigger drum sounds. Each track is bound to a maximum length of eight quarters; however – this is what makes the instrument special - each quarter can be subdivided into an individual number of smaller steps, giving access to complex, polyrhythmic beat programming.

The ensemble also contains an additional song sequencer that can be used to automatically recall snaps of the sequencer to build large-scale patterns. Finally, a small but versatile percussive tone generator demonstrates the sequencing capacities.

SnapSeq



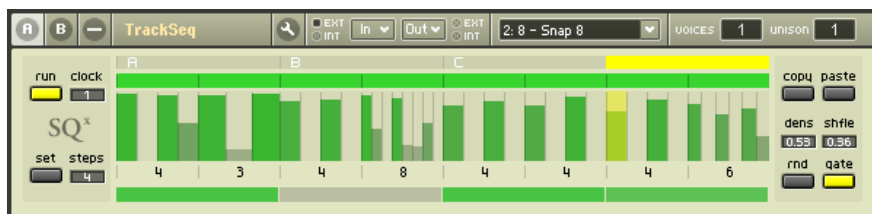
The snap sequencer recalls a maximum of 16 different snapshots of the dependent instruments *TrackSeq* and *ToneGen* (see below). They are recalled

according to the line defined by the steps 1 to 16. Upon a MIDI start signal the playback begins at the step defined by the *Start* control and loops back to this point after a number of steps to be set with the *Length* controller. The duration of each step is regulated by the *Unit* control. The *Run* button switches the snap sequencer on or off. The sequencer is synchronized to the MIDI songposition; therefore, there has to be a MIDI clock signal (e.g. the global Reaktor clock) to make this instrument work.

The *SnapSeq* recalls its own snapshots. By doing so, however, both other instruments are also controlled: although they are complete instruments with their own snapshot management (that can both be used without *SnapSeq*), in this ensemble they are placed within the *SnapSeq* instrument's structure; thus they are slaved to the master snapshot management of *SnapSeq*. This also enables the feature to create a set of sequences and a set of drum sounds independently as snapshots of the subordinated instruments. A variety of combinations can be saved as snapshots of the *SnapSeq* and can then be recalled by the snap sequencer.

Run	Switches the snap sequencer on or off. If on, MIDI clock signals are recognized.
Unit	Defines the length of each step as a multiple of bars. Each bar is made up of 96 MIDI clock ticks, interpreted as 96th notes: a bar represents four quarters. This length is divided by the lower value of the control, the result is multiplied by the upper value. For instance, a setting of 3 (in the upper field) and 2 (in the lower one) results in dividing the bar by two – each step will last for two quarters – and then multiplying it with five, so that, finally, each step of the snap sequencer will last for six quarters.
Step 1 to 16	Controls the sequence of recalled snapshots.
Start	Controls the step at which the playback begins upon a MIDI clock start event.
Length	Defines the length of the playback loop. It adjusts the number of steps after which the playback jumps back to the snap controlled by Start and begins again.

TrackSeq



This is the main part of the ensemble. Each of the four parallel tracks (named A to D) triggers one of the four channels of the *ToneGen* instrument (also called A to D). A track is made up by eight parts normally interpreted as quarters (this can be changed by the *Clock* control); the *Loop* control above the main edit area defines which parts are played back when the MIDI clock is running. Each part can contain three, four, six or eight steps, adjustable for each part individually by the *Subdivision* controls. A step's bar height represents the velocity of this step that can be used inside the *ToneGen* instrument to modulate the ensemble's sound.

There are several additional edit features. The *Copy* and *Paste* buttons can be used to duplicate the current loop area at a different position or within a different track. The *Randomize* button sets all steps of the current loop area to random velocities; if the *Gate* button is switched on, only steps that already have a velocity above zero are randomized to preserve the rhythmical structure. The *Set* button sets all parts of the current track to the selected division factor.

Except the *Run*, *Copy* and *Paste* buttons all controls are bound to one of the four tracks and can be set to individual values.

Run	Switches the track sequencer on or off. When on, MIDI clock signals are recognized. This is independent of the snap sequencer's Run control.
Clock	Controls the speed at which the track is played back. A value of one represents normal speed: each part is interpreted as a quarter note according to the global MIDI tempo. Lower values slacken the tempo (at a value of 0.5 the sequence is played at half speed, i.e. each part lasts for two quarters), higher values accelerate the read-out (at a value of 2 each part represents a eighth note).
Set /Steps	Pushing the Set button resets all parts of the track to the subdivision adjusted by the Steps control.
Track Select	Selects one of the four tracks named A to D. Each track is hard-wired to the respective channel of the ToneGen instrument.

Loop Control	Controls the length (right mouse button) and position of the loop (left mouse button). This area is played back when the sequencer is working; additionally, it defines the area that is modified by the Copy, Paste and Randomize buttons.
Sequence Edit	Edits the main sequence. Each step triggers a sound of the ToneGen instrument if its velocity is higher than zero. The steps' velocity can be used to shape the respective channel's sound. A yellow bar represents the current read-out position during playback.
Subdivision	Sets the number of steps available per part. As the length of each part is fixed (depending on the Clock control), a higher number of steps also accelerates the read-out, e.g. at a Clock value of one a Subdivision value of three interprets each step as eighth triplet, a value of eight results in 32th notes.
Trigger Display	Shows the trigger signals that are sent to the four channels of the ToneGen instrument.
Copy	Copies the content of the current loop area to an internal buffer. This buffer is not bound to a specific track and can also be used to copy between them.
Paste	Pastes the content of the internal buffer to the current loop area. This buffer is not bound to a specific track and can also be used to copy between them.
Shuffle	Sets the amount of delay applied to each second step. At Subdivision values of four this results in standard swing shuffle; at other Subdivisions this produces more experimental rhythmic shifts.
Randomize	Sets the steps within the loop area to randomize velocities. This function uses Density and Gate as parameters.
Density	Controls the density of the rhythmic pattern generated when pressing the Randomize button.
Gate	If switched on, only steps with a velocity above zero are randomized; if off, every step within the loop area is set to new velocity.

ToneGen



This instrument audibly illustrates the programming capacities of the track sequencer; however, its sound quality exceeds that of a mere demonstration instrument. It consists of four identical channels, connected to the four tracks of the *TrackSeq* instrument. Each channel contains (on the instrument's panel from top to bottom) a trigger envelope; a noise generator whose signal is shaped by the trigger envelope; a high quality resonant filter (based on Reaktor's Core Technology) attracted by the envelope/noise signal; and, finally, an output section. Each channel's sound can additionally be routed to a second stereo output where further effect instruments can be chained.

Envelope	Decay	Sets the decay length of the envelope triggered by the TrackSeq instrument. After this period, the Release time starts; thus, the envelope is divided into two parts with individual duration and slope.
	Release	Sets the length of the release that starts after the decay period of the envelope has ceased. Thus, the envelope is divided into two parts with individual duration and slope.
	Velocity	Switches on or off the influence of the trigger signal's velocity on the envelope's amplitude.
Noise	Noise	Sets the amount of noise that is mixed to the envelope signal. Turn to the left for no noise and the pure envelope signal; turn to the right for a noise signal shaped by the envelope. This signal is used to attract the resonant filter, so different amounts of noise result in very different resonance sounds.
	Color	Shapes the filtering of the noise; in each Filter Mode this control cross-fades between two characteristic settings of the filter. This control can be modulated by the trigger signal's velocity (see Velocity).
	Filter Mode	Selects one of three filter types that can be used to shape the noise generator's output. A fourth entry turns the noise signal off; the Noise control then only dampens the envelope signal instead of mixing it with a noise sound.
	Velocity	Controls the amount of influence of the trigger signal's velocity on the Color control.
Resonator	Invert	Inverts the polarity of modulation applied to the Color control by the trigger signal's velocity.
	Resonance	Sets the amount of self-oscillation (i.e. resonance) of the filter.
	Frequency	Sets the frequency of the filter; at high Resonance settings, this frequency is audible as a distorted sine sound.
	Filter Mode	Cross-fades between a lowpass (at the left), a bandpass (at mid position) and a highpass filter's output.
	Envelope	Sets the amount of modulation applied to the Frequency control by the trigger envelope.
	Invert	Inverts the polarity of modulation applied to the Frequency control by the trigger envelope.

Output	Saturate	Thickens the channel's signal, i.e. quiet sounds are amplified and loud ones are slightly distorted.
	Gain	Sets the amplification of the channel within the output signal's mix.
	Pan	Controls the channel's position within the stereo panorama.
	FX	Controls the routing of the signal. At the left, the signal is sent to the normal output ports of the instrument; at the right the signal is sent to the additional effect output.
FX	Mute	Mutes the channel's signal in the output mix.
	Level	Sets the level of the effect signal.
	Mute	Mutes the effect signal.
Out	Level	Adjusts the main output level.
	Mute	Mutes the main output signal.