GrainBrain

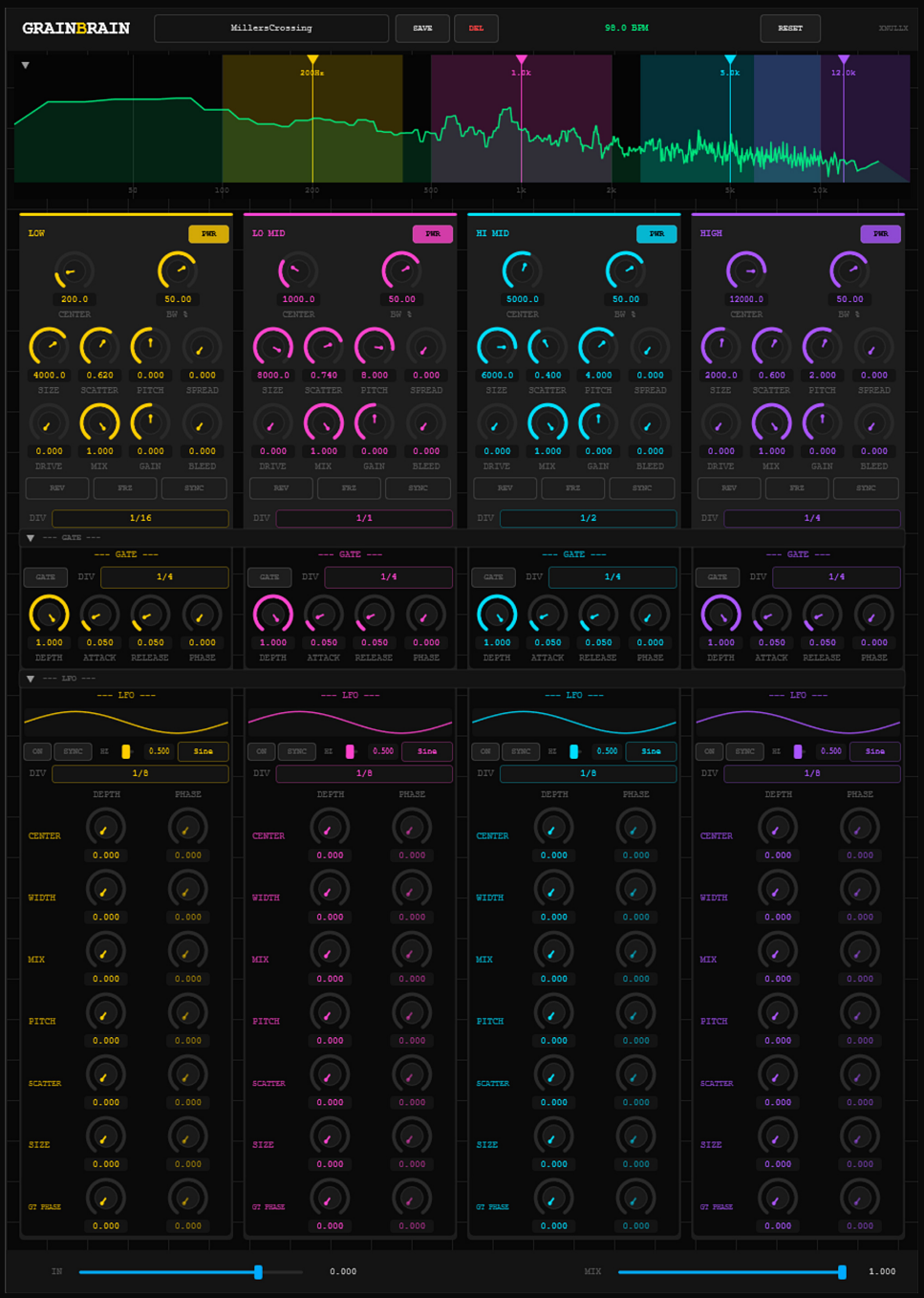
Stereo 4-Band Multiband Granular Processor

User Manual — v1.1 · XNULLX — 2026

GrainBrain is a stereo four-band multiband granular processor. Each frequency band runs an independent 8-voice granular engine capable of time-stretching, pitch-shifting, spectral freezing, reverse playback, and rhythmic scatter. A per-band stutter gate, a cross-band Bleed network, and a full LFO modulation matrix complete the signal chain, making GrainBrain equally suited to subtle texture enhancement and extreme sound design.

1. Interface Overview

The GrainBrain window is organized top-to-bottom into a top bar, the spectrum analyzer, four band strips, and a bottom output bar.



The full GrainBrain interface with all sections expanded. The bottom bar carries the master In and the ducked Mix.

1.1 Top Bar

The top bar carries the GrainBrain logo, the preset interface, the host BPM readout, and global utility buttons.

The top bar.

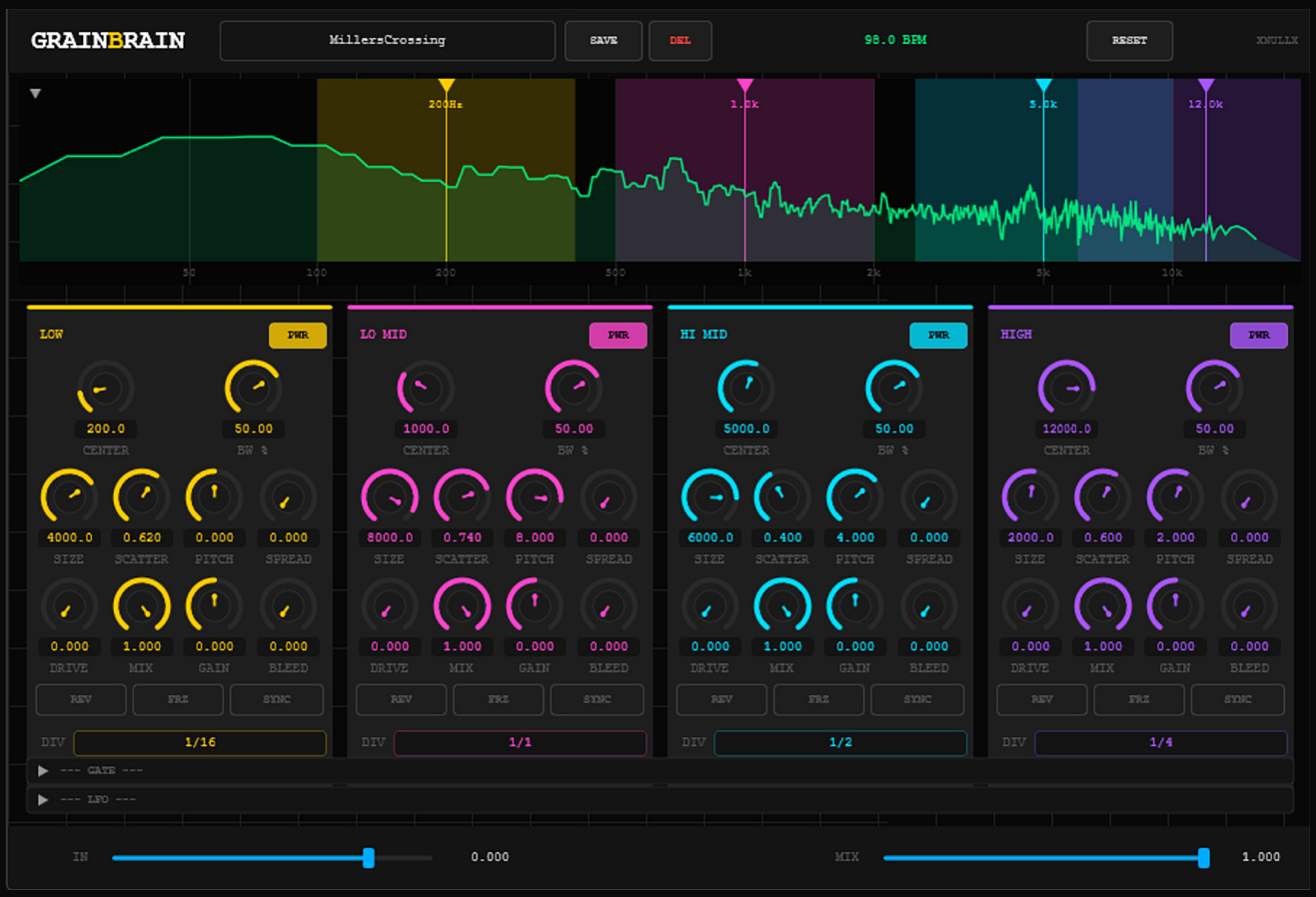
#	Control	Description
1	Logo	The GrainBrain wordmark.
2	Preset menu	Selects a saved preset. Presets store the full plugin state, including the collapse layout (see 1.2).
3	SAVE	Saves the current settings as a named preset to Documents/GrainBrain/Presets.
4	DEL	Deletes the currently selected preset.
5	BPM	Shows the current host tempo, updated in real time. All BPM-sync features derive their timing from this value. If the host is not playing, BPM defaults to 120.
6	RESET	Returns every parameter to its default value in a single click. Affects parameters only; it does not change which interface sections are collapsed.
7	XNULLX	Manufacturer branding.

1.2 Collapsible Sections

Three areas of the interface can be collapsed independently to save screen space: the **frequency display** (spectrum analyzer), the **GATE** section, and the **LFO** section. Click the small triangle at the left edge of a section's title bar to expand or collapse it. A downward triangle indicates the section is open; a right-pointing triangle indicates it is collapsed.

When you collapse or expand a section, the plugin window resizes to fit. The current collapse layout is remembered between sessions and is stored with presets, so the plugin reopens exactly as you left it.

The frequency display has two heights: a full default height and a condensed height roughly one quarter of that. When condensed, the spectrum is vertically compressed and its peaks are accentuated for contrast, so the overall spectral shape and any LFO motion stay readable at the smaller size.



GrainBrain at its most compact: the frequency display condensed and the GATE and LFO sections collapsed. The window resizes to fit, leaving just the band filter and grain controls.

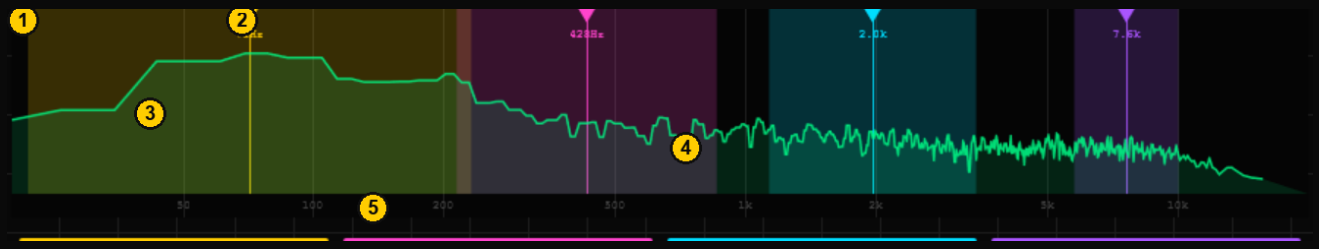
2. Signal Chain

GrainBrain splits a stereo signal into four independent frequency bands, each processed by its own granular engine. The bands are summed, blended with the dry signal, and output. Understanding the signal chain helps you use each section most effectively.

Stage	Description
Dry In Gain	Global input gain applied before any processing. Scales the signal entering all four band engines simultaneously.
Spectrum FIFO	A real-time FFT feed drives the spectrum analyzer display. This happens pre-processing, so the analyzer shows the unprocessed input spectrum with band region overlays.
Band Split (4x)	Independent bandpass filters isolate each frequency region. Each band has adjustable center frequency and bandwidth. Only enabled bands are processed; disabled bands pass silence to the sum.
Bandpass Filter	Each band's input is bandpass-filtered around its center frequency.
Cross-Band Bleed	Each band can inject a portion of its processed output into the next band (Low → LoMid → HiMid → High, wrapping back to Low). The injected signal is added after the receiving band's filter so the cross-band content is preserved. See section 7.
Granular Engine (per band)	8-voice granular synthesis engine. Reads from a 10-second circular buffer, launches grains at a rate determined by grain size and scatter, applies pitch shifting, drive/saturation, and wet/dry mix. Supports reverse and freeze modes.
Stutter Gate (per band)	BPM-synchronized trapezoid envelope gate applied post-granular processing. Creates rhythmic amplitude patterns with adjustable depth, attack, release, and phase offset within the beat cycle.
LFO Modulation	Per-band LFO with seven assignable targets. Modulation is applied within the sample loop — filter center, width, grain mix, pitch, scatter, grain size, and gate phase are all continuously modulatable.
Band Sum	All four processed band outputs are summed into a full-range stereo signal.
Master Mix	A ducked, equal-power blend between the dry input and the summed wet output. As the wet signal blooms it gently ducks the dry, so the two displace rather than simply stack. At 0% the output is bit-perfect dry; at 100% (the default) fully wet.

3. Spectrum Analyzer

The spectrum analyzer occupies the top section of the plugin window. It displays a real-time FFT of the input signal with a logarithmic frequency axis (20 Hz – 20 kHz). Four colored regions — gold (Low), pink (LowMid), cyan (HiMid), violet (High) — represent each band's active frequency range.



The spectrum analyzer / frequency display.

#	Element	Description
1	Collapse triangle	Expands or condenses the frequency display (see 1.2).
2	Band drag handle	Drag to move a band's center frequency; drag a region's edges to change its bandwidth.
3	Band region	Colored overlay showing a band's active frequency range; animates live under Center/Width LFO modulation (see 3.1).
4	Spectrum curve	Real-time FFT of the input signal.
5	Frequency axis	Logarithmic 20 Hz – 20 kHz scale.

The band regions can be dragged directly on the analyzer to adjust center frequencies and bandwidths visually. This is often more intuitive than using the knobs, especially when you can see where the signal energy sits in the spectrum. Dragging the center of a region moves its center frequency; dragging the edges adjusts its bandwidth.

3.1 Live LFO Visualization

When an LFO is modulating a band's Center or Width (see section 8), the analyzer's band region animates in real time to reflect what the LFO is currently doing. The region sweeps left and right with Center modulation and expands and contracts with Width modulation, exactly in sync with the audio. The frequency label continues to show the band's set (unmodulated) center so the readout stays legible while the region moves. Expand the frequency display to its full height for the clearest view of this motion.

> ***TIP:*** *Use the spectrum to identify problem frequencies before processing. A wide resonant peak in the low-mids? Position the LowMid band center on it, narrow the bandwidth, and apply gentle granular processing to soften it.*

4. Master Controls

Master controls appear in the bottom bar of the plugin window. They affect the overall signal level and dry/wet balance.

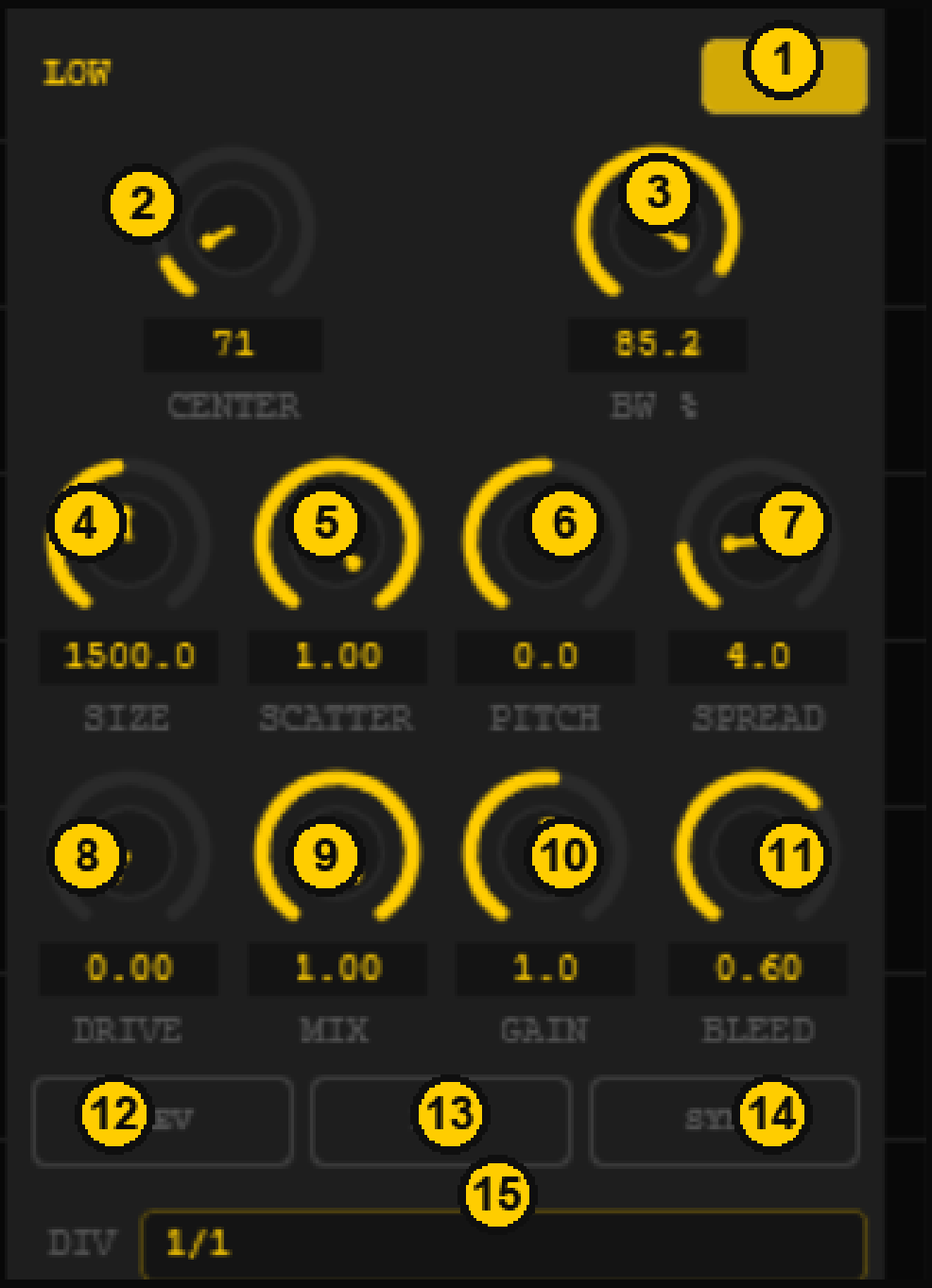
Parameter	Range	Description
In	-48 to +12 dB	Global input gain applied before the band split — how hard you drive all four granular engines simultaneously.
Mix	0 – 100%	The master dry/wet blend, using ducked equal-power crossfading: the dry input and the summed wet output are combined so that as the wet blooms it gently ducks the dry (they displace rather than stack). At 0% the output is bit-perfect dry; at 100% (the default) fully wet. Turn it down to sit the granular texture underneath the source.

5. Band Controls — Filter & Header

GrainBrain has four frequency bands. Each band strip is color-coded: gold (Low), pink (LowMid), cyan (HiMid), violet (High). The band header contains the filter controls and the band enable toggle.

5.1 Anatomy of a Band Strip

The figure below shows a single band strip's header and grain controls. All four bands share this layout; only their color and frequency range differ. Each numbered control is described in the table that follows.



A single band strip — filter header and grain controls. All four bands share this layout.

#	Control	Function
1	PWR	Enables or disables this band.
2	Center	Band filter center frequency.
3	BW %	Band filter bandwidth (the filter grows more resonant as this narrows).
4	Size	Grain size in milliseconds, or a synced division when SYNC is active.

#	Control	Function
5	Scatter	Randomizes each grain's buffer read position for diffusion.
6	Pitch	Pitch-shifts all grains, in semitones.
7	Spread	Random per-grain pitch variation around the Pitch setting.
8	Drive	Per-grain saturation drive.
9	Mix	Wet/dry blend between the granular output and the dry band signal.
10	Gain	Output level for this band.
11	Bleed	Cross-band feedback amount injected into the next band (see section 7).
12	REV	Reverse grain playback.
13	FRZ	Freeze — loop the current grain buffer indefinitely.
14	SYNC	Sync grain size to host tempo (Size is replaced by DIV).
15	DIV	Grain-size rhythmic division, used when SYNC is active.

5.2 Default Band Ranges

The default center frequencies are designed to split a typical full-range mix into musically meaningful regions. They are a starting point — adjust to suit your source.

Band	Default Center	Default BW	Typical Use
Low	200 Hz	50%	Sub-bass, bass fundamentals, kick body
LowMid	1 kHz	50%	Bass harmonics, midrange body, lower vocals
HiMid	5 kHz	50%	Presence, upper vocals, lead instruments
High	12 kHz	50%	Air, cymbals, high-frequency shimmer

5.3 Filter Parameters

Parameter	Range	Description
Center	20 Hz – 20 kHz	Center frequency of the bandpass filter for this band. Drag the corresponding region on the spectrum analyzer, or adjust the knob directly. The LFO can modulate Center for filter sweep effects.

Parameter	Range	Description
BW %	0.1 – 100%	Bandwidth of the bandpass filter as a percentage. Narrower values isolate a tighter frequency range; wider values capture more of the spectrum. Below about 5% the filter becomes highly resonant. The LFO can modulate bandwidth for dynamic filter-width effects.
Gain	-24 to +24 dB	Output gain for this band, applied after all processing. Use to balance the level contribution of each band relative to the others. Independent of the grain Mix knob.
PWR	Toggle	Enables or disables this band entirely. When disabled, the band produces no output and its Bleed buffer is cleared. The band strip dims to indicate it is inactive. Disabling a band is useful for A/B testing the effect of that frequency region.

6. Grain Engine

Each band contains an independent 8-voice granular synthesis engine with a 10-second circular audio buffer.

The granular engine continuously writes incoming audio into a circular buffer. At a rate determined by the grain Size, it launches "grains" — short audio snippets read back from the buffer. Each grain has a Hann window envelope (smooth fade-in and fade-out) to prevent clicks. Multiple grains overlap, creating a continuous texture. By reading grains from different positions in the buffer, pitch-shifting and time-stretching effects emerge. Scatter randomizes the read position of each grain, creating density and diffusion. In Freeze mode, writing to the buffer stops, so grains loop over the frozen content.

6.1 Grain Controls

Parameter	Range	Description
Size	1 ms – 10 sec	Duration of each grain (or synced to host tempo when SYNC is active). Small grains (1–30 ms) produce a smooth, smeared cloud. Medium grains (50–200 ms) retain more of the original pitch and rhythm. Large grains (500 ms+) sound like looping or stuttering. The grain rate is tied to Size — smaller grains launch more frequently.
Scatter	0 – 1.0	Randomizes the buffer read position of each grain. At 0, grains read coherently for a pitched output. As Scatter increases, grains pull from increasingly random positions, creating a diffuse, washed texture. High Scatter with small grains produces granular noise; with large grains, unpredictable melodic fragments.
Pitch	-12 to +12 st	Pitch shift applied to all grains, in semitones, by varying grain playback speed. A +12 shift plays grains twice as fast, reading through the buffer more quickly, which also affects the perceived time relationship of the grains.
Spread	0 – 24 st	Random pitch variation applied independently to each grain, within ±Spread semitones (centered on the Pitch setting). Small values (0.5–2 st) add organic shimmer; large values (8–24 st) create dense, harmonically rich clusters.
Drive	0 – 1.0	Saturation drive applied within each grain using a logarithmic tanh curve with added harmonic richness at higher settings. Subtle settings (0.1–0.3) add analog warmth; high settings (0.7+) generate significant harmonic density and grit. Applied per-grain before the wet mix blend.

Parameter	Range	Description
Mix	0 – 1.0	Wet/dry blend between the granular output (wet) and the original band signal (dry). At 0, only the dry band signal passes; at 1.0, only the granular output is heard. The LFO can modulate Mix for dynamic crossfade effects.
Gain	-24 to +24 dB	See section 5.2 (the band Gain control appears in the filter header).
Bleed	0 – 0.9	Cross-band feedback amount. See section 7.

6.2 Grain Mode Controls

Parameter	Range	Description
REV	Toggle	Reverse grain playback. Each grain reads backward through the buffer, creating a reversed-tape-style texture that still follows the input's energy envelope. For partial reverse effects, combine with the Mix knob.
FRZ	Toggle	Freeze. Stops writing new audio into the buffer, so grains loop over the current buffer contents indefinitely. The band strip flashes its accent color when freeze is active. Combined with Scatter and Spread, freeze becomes an infinite granular pad generator.
SYNC	Toggle	BPM sync for grain size. When active, the Size knob is replaced by the DIV selector and grain size is derived from host tempo and rhythmic division.
DIV	1/1 – 1/16T	Rhythmic division for grain size when SYNC is active: 1/1, 1/2, 1/4, 1/4T, 1/8, 1/8T, 1/16, 1/16T. Smaller divisions produce shorter, more rapid grains.

7. Bleed (Cross-Band Feedback)

GrainBrain implements a cross-band feedback network called **Bleed**. Each band's processed output is stored and then injected into the **next** band, following the band order: Low → LowMid → HiMid → High → Low (wrapping). The injection happens after the receiving band's bandpass filter, so the cross-band content survives rather than being filtered away.

Because the routing is cross-band, the Bleed knob on a band affects the band **after** it, not the band itself. For example, the Low band's Bleed knob controls how much of Low's granular output is injected into the LowMid band.

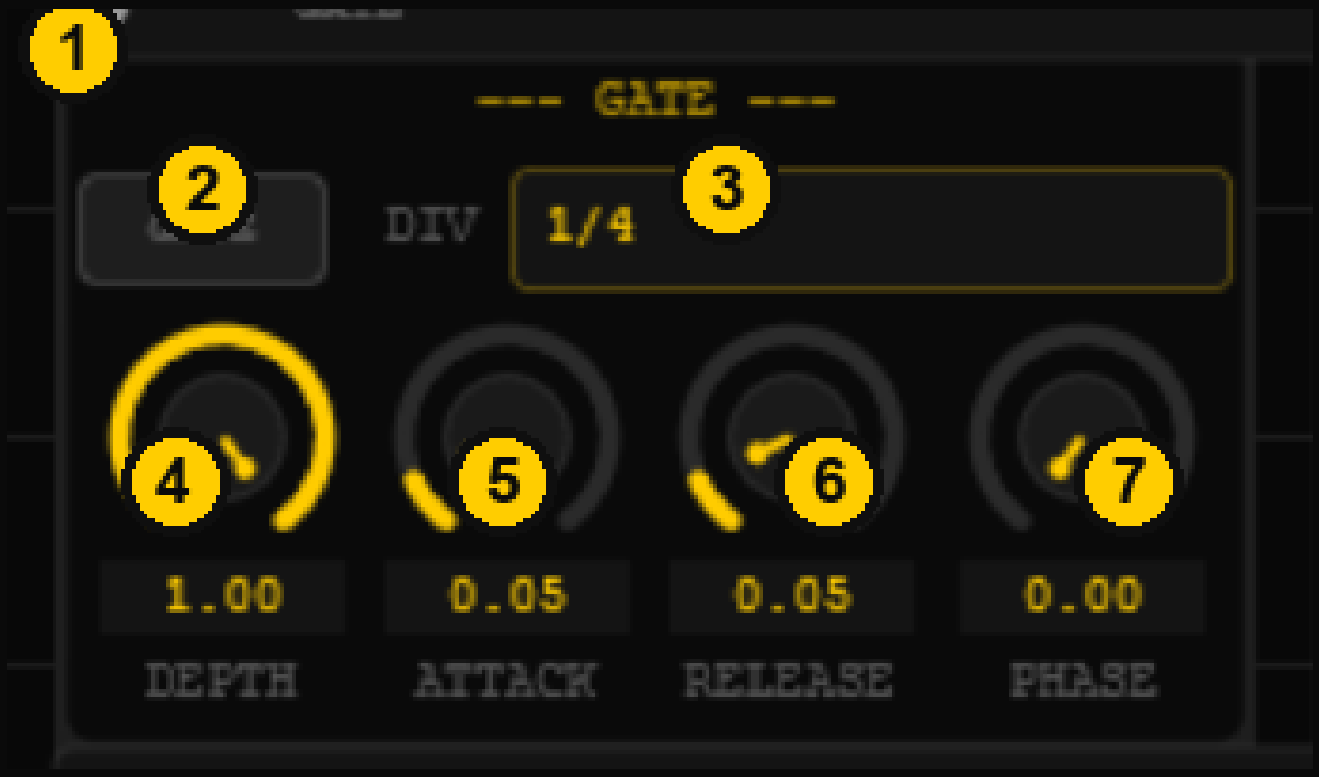
Parameter	Range	Description
Bleed	0 – 0.9	Amount of this band's processed output that bleeds into the next band. At 0, no bleed occurs. Moderate values (0.1–0.3) add cross-band resonance and harmonic intermodulation between adjacent frequency regions. Higher values create pronounced coloration and can build into a sustained, saturated drone when combined with high Drive — dramatic, but use with care.

> ***Two things to know:*** *(1) Because Bleed feeds the *next* band, you must have that next band enabled (PWR on) to hear anything. (2) Turning a single soloed band's Bleed will produce no audible change, because its destination band is disabled. To audition Bleed, enable at least two adjacent bands.*
>
> ***TIP:*** *Set a small Bleed amount (0.15–0.25) on the Low band while the LowMid band has high Scatter. The granular low-frequency energy bleeds into the midrange engine, creating warmth and density that sounds like a naturally resonant acoustic space rather than a digital effect.*

8. Stutter Gate

The stutter gate applies a BPM-synchronized amplitude envelope to each band's granular output. It creates rhythmic pulsing, gating, and stutter effects that lock to the host tempo. The gate uses a trapezoid envelope with a genuine open phase and closed phase (roughly a 50% duty cycle): the envelope rises during Attack, holds open through the first half of the cycle, falls during Release, and then holds closed for the remainder. Attack and Release shape only the rising and falling edges; the Phase control shifts where within the beat the cycle begins.

The gate cycle repeats at the rate set by its DIV control. Using different Phase values across bands lets different frequency regions pulse at rhythmically offset positions — for example, Low gating on the beat while HiMid gates on the offbeat.



The GATE section.

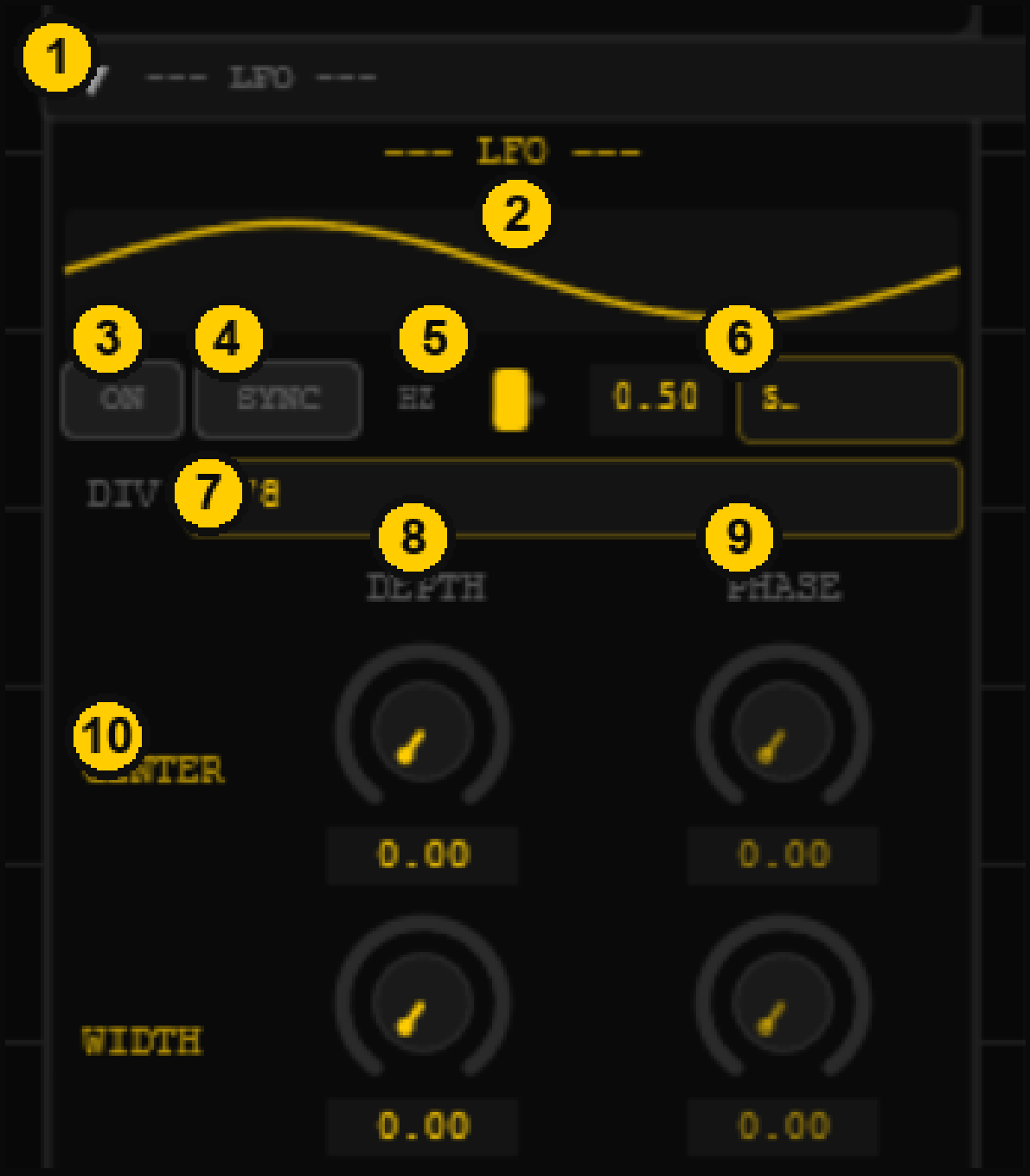
#	Control	Function
1	Collapse triangle	Expands or collapses the GATE section for all four bands.
2	GATE	Enables or disables the stutter gate for this band.
3	DIV	Rhythmic division of the gate cycle.
4	Depth	How deeply the gate attenuates during its closed phase.
5	Attack	Duration of the rising edge (as a fraction of the cycle).

#	Control	Function
6	Release	Duration of the falling edge (as a fraction of the cycle).
7	Phase	Shifts the gate open point within the beat cycle.

Parameter	Range	Description
GATE	Toggle	Enables or disables the stutter gate for this band. When off, the granular output passes through at full amplitude.
DIV	1/1 – 1/16T	Rhythmic division of the gate cycle — how many times the gate cycles per bar. At 1/4 the gate cycles once per beat; at 1/16, four times per beat. Triplet divisions (1/4T, 1/8T, 1/16T) create polyrhythmic effects.
Depth	0 – 1.0	How deeply the gate attenuates the signal during its closed phase. At 1.0, the signal is fully muted during the closed half of each cycle. At 0.5, attenuated by half. Moderate Depth (0.4–0.7) creates rhythmic pumping rather than hard gating.
Attack	0 – 0.49	Duration of the gate's rising edge as a fraction of the cycle. At 0, the gate opens instantaneously. Longer attack times create swelling, breathing rhythmic effects.
Release	0 – 0.49	Duration of the gate's falling edge as a fraction of the cycle. At 0, the gate closes instantaneously. Combined with a long Attack, a long Release produces a soft, tremolo-like modulation.
Phase	0 – 1.0	Shifts the gate open point within the beat cycle. At 0.5 with a 1/4 division, the gate opens on the offbeat. Different Phase values across bands create polyrhythmic gating patterns. The LFO can modulate Phase for slowly evolving rhythmic variation.

9. LFO Modulation System

Each band has a dedicated LFO that can modulate up to seven parameters simultaneously. The LFO system uses a phase-offset architecture — a single oscillator runs per band, and each target reads the oscillator at its own phase offset, making each target's modulation feel independent while sharing a common rate.



The LFO section — global controls and the per-target Depth/Phase columns.

#	Control	Function
1	Collapse triangle	Expands or collapses the LFO section for all four bands.
2	Waveform preview	Live preview of the selected LFO shape.
3	ON	Enables or disables the LFO for this band.
4	SYNC	Syncs the LFO rate to host tempo (uses DIV instead of the Hz rate).
5	HZ (rate)	Free-running LFO rate, used when SYNC is off.
6	Shape	LFO waveform: Sine, Saw+, Saw-, Tri, Step, or Rand.
7	DIV	Rhythmic division, used when SYNC is active.
8	Depth column	Per-target modulation amount.
9	Phase column	Per-target phase offset into the LFO cycle.
10	Modulation targets	The seven targets (Center, Width, Mix, Pitch, Scatter, Size, Gate Phase), each with its own Depth and Phase knob.

9.1 LFO Global Controls (per band)

Parameter	Range	Description
ON	Toggle	Enables or disables the LFO for this band. When off, the LFO phase does not advance and all targets receive zero modulation. Other LFO settings are preserved.
SYNC	Toggle	BPM sync for LFO rate. When active, the rate is derived from host tempo and the DIV selector rather than the Hz slider.
HZ	0.01 – 20 Hz	LFO rate when SYNC is off. 0.01 Hz is one cycle per 100 seconds (very slow drift); 0.5 Hz is subtle natural movement; 4–10 Hz is tremolo-like; 15–20 Hz creates audio-rate timbral effects.
Shape	Sine / Saw+ / Saw- / Tri / Step / Rand	Waveform of the LFO. Sine is smooth and symmetric; Saw+ rises then resets; Saw- peaks then falls; Tri is linear rise/fall; Step alternates hard between +1 and -1; Rand holds a new random value each cycle.
DIV	1/1 – 1/16T	Rhythmic division for LFO rate when SYNC is active, using the same divisions as grain size and gate.

9.2 LFO Targets

Seven parameters can be modulated by the LFO. Each target has two controls: **Depth** (how much modulation is applied) and **Phase** (where in the LFO cycle this target

reads). Using different Phase values across targets within the same band creates complex, evolving modulation from a single oscillator.

Target	Depth Range	Description
CENTER	±2 oct	Modulates the band's filter center frequency. At full depth the center sweeps ±2 octaves. Modulation is exponential (in semitones), so it tracks musically. The band region animates in the spectrum display (see 3.1).
WIDTH	±50%	Modulates the band's filter bandwidth. Narrowing under LFO control creates a resonant sweep; widening opens the filter. Combined with Center, creates complex filter animation, visible in the spectrum display.
MIX	±1.0	Modulates the wet/dry blend between granular and dry band signal. A slow Sine LFO makes the granular effect breathe in and out.
PITCH	±12 st	Modulates grain pitch shift. A slow Sine creates vibrato; a Step LFO creates rhythmic pitch switching; a fast Rand creates pitch instability.
SCATTER	±1.0	Modulates grain scatter, moving between coherent/pitched and diffuse/noisy textures. Step or Saw LFOs create alternating passages of clarity and wash.
SIZE	proportional	Modulates grain size. The modulation is multiplicative (proportional to the current Size), and the Depth control has an inverse-exponential response — most of the knob's travel is devoted to small amounts, giving fine control over subtle size variation. Even tiny depths add organic, shimmering movement to the grain texture; larger depths produce dramatic, swooping size sweeps.
GT PHASE	±0.5	Modulates the stutter gate's phase offset within the beat cycle, slowly shifting the rhythmic emphasis across the beat for an evolving, phase-shifting stutter quality.

9.3 Phase Offset in Practice

The Phase knob for each LFO target (0 – 1.0) determines where in the LFO cycle that target reads its value. At Phase 0.0 the target reads the LFO at its current phase; at 0.5 it reads half a cycle later (inverting a sine); at 0.25, a quarter cycle offset.

This allows complex relationships from a single oscillator: setting CENTER Phase to 0.0 and WIDTH Phase to 0.5 means the filter center sweeps up while the bandwidth narrows, then center sweeps down while bandwidth widens — a natural, coherent filter animation from two controls.

Phase offset is equally useful *across* bands. Because each band's LFO is independent but stays phase-locked when bands share the same rate and shape, giving the same target a different Phase value on each band staggers their modulation relative to one another. For example, set the CENTER target's Phase to 0.0, 0.25, 0.5, and 0.75 on the Low, LowMid, HiMid, and High bands (all at the same rate) for a rotating, cascading filter sweep that moves through the four bands in turn.

10. Tips & Workflow

Start With One Band. Enable only the Low band initially, disable the others with their PWR buttons. Set Mix to 1.0 and slowly increase grain Size from small to large while listening. Repeat for each band before combining them.

Grain Size and Texture Type. Sizes below 30 ms produce cloud-like textures; 50–150 ms retains source character; above 300 ms, individual grains become distinct events. The most "invisible" granular processing typically lives in the 40–100 ms range.

Freeze as a Pad Generator. Route any instrument in, play a sustained note or chord, then enable FRZ at the moment you want to capture. Increasing Scatter and Spread transforms the frozen moment into a continuously evolving granular pad. Freeze different bands at different moments for layered spectral freeze composition.

Scatter + Spread for Shimmer. On the High band, try Size 60–80 ms, Scatter 0.3–0.5, Spread 4–8 st, Mix 0.4–0.6 for a shimmer-reverb effect. Layer with the LowMid band at low Scatter for clarity below and shimmer above.

BPM Sync for Rhythmic Textures. Enable SYNC on grain size and set DIV to 1/16 or 1/8. Combined with the stutter gate at a related division, this creates tight rhythmic granular patterns. Try opposite divisions — grains at 1/8, gate at 1/16T — for polyrhythmic stutter.

Subtle SIZE Movement. Assign the LFO's SIZE target with a very low Depth and a slow Sine. Because the SIZE Depth is inverse-exponential, small knob settings produce gentle, organic variation in the grain texture without obvious pitch or rhythm artifacts — ideal for keeping pads and textures alive.

Gate Phase Staggering. Enable the gate on all four bands with the same DIV but different Phase values (Low 0.0, LowMid 0.25, HiMid 0.5, High 0.75) for a waterfall-like cascade of frequency-specific gating.

Bleed for Spectral Blur. Enable at least two adjacent bands. Set small Bleed values (0.1–0.2) on the Low and LowMid bands while keeping HiMid and High at 0. The low-frequency granular content bleeds slightly into the midrange engine, creating a subtle spectral blur that makes the overall texture feel more spatially cohesive.

Drive as a Saturation Layer. Grain Drive is applied inside each grain before the wet mix. Even at Mix 0.1–0.2 with Drive 0.3–0.5, the small wet portion adds harmonic density that blends almost imperceptibly with the dry signal.

Collapse What You're Not Using. Collapse the GATE and LFO sections to keep the window compact while dialing in grain and filter settings, then expand the frequency display to full height to watch Center/Width LFO motion in detail. The layout is saved with your presets.

11. Quick Reference

Per-Band Parameters (× 4 bands)

Control	Section	Range	Default
Center	Filter	20 Hz – 20 kHz	varies
BW %	Filter	0.1 – 100%	50%
Gain	Filter	-24 to +24 dB	0 dB
PWR	Filter	On/Off	On
Size	Grain	1 ms – 10 sec	80 ms
Scatter	Grain	0 – 1.0	0
Pitch	Grain	-12 to +12 st	0
Spread	Grain	0 – 24 st	0
Drive	Grain	0 – 1.0	0
Mix	Grain	0 – 1.0	0
Bleed	Grain	0 – 0.9	0
REV / FRZ / SYNC	Grain	On/Off	Off
DIV	Grain	1/1 – 1/16T	1/4
GATE	Gate	On/Off	Off
DIV	Gate	1/1 – 1/16T	1/4
Depth	Gate	0 – 1.0	1.0
Attack	Gate	0 – 0.49	0.05
Release	Gate	0 – 0.49	0.05
Phase	Gate	0 – 1.0	0
LFO ON / SYNC	LFO	On/Off	Off
HZ	LFO	0.01 – 20 Hz	0.5 Hz
Shape	LFO	6 shapes	Sine
DIV	LFO	1/1 – 1/16T	1/8
CENTER / WIDTH / MIX / PITCH / SCATTER / SIZE / GT PHASE (Depth + Phase)	LFO	0 – 1.0 each	0 / 0

Master Controls

Control	Range	Default
In	-48 to +12 dB	0 dB

Control	Range	Default
Mix	0 – 100%	100%

GrainBrain is developed by XNULLX. Built with the JUCE framework. The granular synthesis engine uses a Hann-windowed 8-voice architecture with a 10-second circular buffer per band per channel.