

ENGINEERING EDITION / VERSION 1.0

SHARK CHROMA

Four color engines. Three circuits. One living finishing system.



DESIGN INTENT

Add weight, density, articulation, air and organic stereo motion without sacrificing the original musical identity or honest level comparison.

From first color to technical verification

For producers, mix engineers, mastering engineers and sound designers who want both an immediate workflow and an exact model of the current v0.7.7 architecture.

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A color instrument, not a static EQ

Chroma separates spectral personality, nonlinear density, stereo motion and comparison tools so enhancement remains musical and accountable.

STEREO INPUT

FILTER BANK

BODY / DENSITY

PRESENCE / AIR

CIRCUIT

LIFE

OUTPUT

WHAT CHANGES

The four color controls redistribute energy and nonlinear residue around musically chosen regions. Circuit changes the transfer family. Life adds slow stereo movement.

WHAT STAYS CONTROLLED

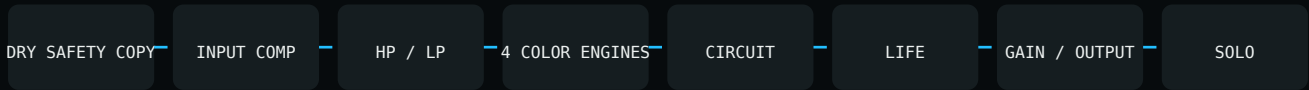
Focus, Calm, HP/LP filtering, Mono Safe, Gain Match, compensation trims, band solo and A/B/C make the effect production-ready.

ENGINEERING PRINCIPLE

Judge color at equal loudness, inside the mix, and after the source has settled. Chroma is designed to make the record feel more complete - not merely louder.

Where tone becomes movement

The confirmed v0.7.7 path is full-wet. The original input is retained as a safety and metering reference, not as a user Mix path.



STAGE	FUNCTION
Input Compensation	-12 to +12 dB before filters and color engines.
HP / LP	Cascaded utility filters before the musical engines.
Color stages	Body, Density, Presence and Air run sequentially.
Circuit	Magnetic, Valve or Iron nonlinear transfer.
Life	Stereo motion after spectral and circuit processing.
Output	Optional slow gain match, Output Compensation, then band monitoring.

Body and Density

The first two stages create foundation and cohesion before upper-frequency articulation is added.

BODY / 0-100

Builds a low-passed component around Focus and adds both direct low-frequency weight and a nonlinear low-harmonic residue.

FOCUS / 40-500 HZ

Sets the Body one-pole cutoff. Lower values concentrate warmth deeper; higher values let Body reach into low mids.

DENSITY / 0-100

Applies a tanh-derived compression/saturation blend with level normalization for compact, glued energy.

MODULE SWITCHES

Body and Density can be removed independently. Their analyzer response also stops animating when disabled.

STARTING POINT

Begin around 15-30% on a mix bus. Raise Focus only when the source needs low-mid authority; use Density after Body to convert weight into cohesion.

Presence, Air and Calm

The upper stages add definition and openness while nonlinear restraint prevents uncontrolled edge.

CONTROL	MODEL / AUDIBLE PURPOSE
Presence / 0-100	Extracts an upper component around 2.6 kHz and adds it through an amplitude-dependent restraint term.
Air / 0-100	Derives a fast high component and adds polished high-frequency energy.
Calm / 0-100	Increases denominator restraint as Air transients grow; higher values sound smoother and less splashy.
Module switches	Presence and Air can be bypassed independently without changing the other stages.

PAIRING RULE

Set Air for the amount of opening, then turn Calm upward until cymbals, esses and bright synth edges sit naturally. Presence is for intelligibility; Air is for horizon.

Slow motion without chorus

Life modulates stereo side energy with two very slow sine components and a smoothed deterministic random component.

```
motion = 0.62 sin(phiA) + 0.28 sin(phiB) + 0.10 randomSmooth
```

```
movingSide = side x [1 + 0.162 x Life x motion]
```

```
L = mid + movingSide + asymmetry      R = mid - movingSide - asymmetry
```

Rates	Approximately 0.113 Hz and 0.071 Hz.
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Depth	Maximum side scaling depth is intentionally restrained.
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Random motion	Target refresh around 0.37 seconds with slow interpolation.
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Life at 0%	Exact bypass of the motion path.
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Mono material	Requires two channels; mono input remains unchanged by Life.
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Three nonlinear color families

Harmonics controls the amount entering the selected transfer model; musical controls also influence the

MAGNETIC

Tanh shaping with short signal memory and a restrained dry component. Rounded, cohesive and slightly history-dependent.

VALVE

Gentle asymmetric shaping with bias cancellation and a low-level even-harmonic term. Open, dimensional and level-stable.

IRON

Higher-drive tanh shaping plus quadratic asymmetry and a small sinusoidal ripple. Firm, forward and authoritative.

HARMONICS / 0-100

The control is clamped to a valid 0-1 amount. Each circuit has a dedicated drive relationship and normalization factor, so switching circuits changes topology rather than only changing gain.

LISTENING ORDER

Compare Magnetic, Valve and Iron at matched output. Magnetic often suits buses, Valve suits vocals and keys, and Iron suits drums, bass and assertive masters - but source behavior decides.

Utility filtering before color

The filters shape what the color engines receive, so sub energy and extreme brightness can be controlled before nonlinear processing.

CONTROL	IMPLEMENTATION
HP Filter	20 Hz-5 kHz, skewed musical control.
HP slope	24 or 48 dB/oct via two or four cascaded biquad stages.
LP Filter	500 Hz-20 kHz, skewed musical control.
LP slope	24 or 48 dB/oct via two or four cascaded biquad stages.
Coefficient behavior	Updated from the current parameter values for each processing block.

ENGINEER NOTE

Because filters precede the nonlinear engines, changing HP or LP also changes which harmonics are generated. Treat them as operating-point controls, not merely cleanup after the effect.

Band solo and analyzer interaction

Three draggable crossovers divide the monitored output into Body, Density, Presence and Air regions.

ACTION	BEHAVIOR
Cross 1	60-500 Hz; default 180 Hz.
Cross 2	500 Hz-4 kHz; default 1.4 kHz.
Cross 3	3-16 kHz; default 7 kHz.
Single click	Solo one band; click again to return to full output.
Command / Control click	Add or remove bands from a multi-band solo mask.
Linked band editing	When multiple bands are selected, dragging one selected color amount moves the other selected amounts relatively.

IMPORTANT

Band solo is a monitoring filter after the completed output chain. It does not change how the four musical color engines process the signal.

Compare honestly and recall safely

The utility layer supports level discipline, state comparison and non-destructive workflow.

CONTROL	BEHAVIOR
Input Compensation	-12 to +12 dB before processing.
Output Compensation	-12 to +12 dB after processing.
Link	Counter-links compensation: raising Input lowers Output by the same dB amount.
Gain Match	Slow RMS estimate with gain limited to 0.25x-4x and approximately 900 ms smoothing.
Bypass	Returns the host input unchanged while output meters remain live.
A / B / C	Stores three parameter-state snapshots; theme is global and remains unchanged when switching.
Undo / Redo	Uses the project UndoManager for reversible parameter and preset actions.

Starting points, not finishing decisions

Chroma includes 100 categorized factory presets covering mastering, mix bus, vocals, drums, bass, guitars, keys, synths, creative color and repair.

CATEGORY	PRESETS
MASTERING	18
MIX BUS	16
VOCALS	16
DRUMS	10
BASS	8
GUITARS	8
KEYS	6
SYNTHS	6
CREATIVE	6
REPAIR	6

USER EXCHANGE

Save and Load write or read the complete Chroma state as XML. Factory presets are protected; favorite stars are browsing aids. Always rebalance Input/Output Compensation for the source.

Practical starting sequences

Use broad moves first, then compare at matched loudness. Suggested values are ranges, not rules.

SOURCE	STARTING SEQUENCE
Mix bus polish	Body 10-25, Density 15-30, Presence 10-25, Air 10-25, Calm 55-75, Magnetic or Valve.
Mastering finish	Small moves, Gain Match on, HP near open, Air balanced with Calm, compare all circuits.
Lead vocal	Body for chest, Presence for diction, Air for openness, Valve, Life 5-20 with Mono Safe.
Drum bus	Body 20-40, Density 25-50, Iron, Presence to recover attack, Life only if rooms benefit.
Bass	Body and Focus first, Density second, Iron or Magnetic, Mono Safe on.
Harsh mix repair	Reduce Presence, add restrained Air with high Calm, Valve, LP only if edge remains.

Simplified stage equations

These equations expose topology and scaling. x is the current sample, a is a one-pole coefficient and each user amount is normalized to 0-1.

STAGE	SIMPLIFIED MODEL
Body low state	$l[n] = x[n] + a(l[n-1] - x[n])$
Body residue	$r = \tanh(l(1.2 + 3B)) - l; y = x + B(0.22l + 0.55r)$
Density	$d = \tanh(y(1 + 2.6D)); y = \text{lerp}(y, d/(1 + 0.24D), 0.72D)$
Presence	$u = y - h; y += 0.34P u / (1 + u (2 + 6P))$
Air / Calm	$\text{aero} = y - h_{\text{fast}}; y += 0.22A \text{ aero} / (1 + 8C \text{aero})$
Gain match	$G = \text{clamp}(\text{RMSin} / \text{RMSout}, 0.25, 4.0), \text{smoothed}$

What to measure and what to hear

A technically valid color processor must preserve stability, state recall and intended translation across levels and formats.

TEST	PASS CONDITION
Unity / bypass	Bypass must null against the unprocessed input.
Silence safety	Non-finite output or unexplained numerical collapse with valid input restores the dry safety copy.
Level comparison	Gain Match should converge slowly without audible pumping.
Mono compatibility	Check Life with Mono Safe on and off; confirm low-frequency center stability.
Sample rates	Verify common host rates and HP/LP behavior near their endpoints.
Automation	Sweep all controls and crossovers for clicks, NaN/Inf, stale meters or state mismatch.
Quality selector	Current v1 audio core remains native-rate; 2x/4x/8x/16x stores workflow intent pending validated production oversampling and latency reporting.

Fast diagnosis in the session

Start with host routing and state, then isolate Chroma utilities before changing musical controls.

SYMPTOM / ITEM	ACTION / REFERENCE
No audio	Confirm host insert routing, disengage band solo, press Bypass, reset Output Compensation and reload the current build.
Unexpected thin sound	Check HP cutoff, selected solo bands, Body switch and compensation link.
Too bright / sharp	Raise Calm, lower Air or Presence, compare Valve, then lower LP if needed.
Stereo feels unstable	Reduce Life and engage Mono Safe; verify the source is truly stereo.
Level jumps	Enable Gain Match, wait for its slow convergence, then trim Output Compensation.
Session state surprise	Recall A/B/C deliberately; theme is global and not stored per slot.
Formats	AU / VST3 / Standalone. Mono and stereo layouts. Resizable fixed-aspect interface.
Support	sharkplugs.com

MAKE COLOR MOVE.