

HeatMan Technical Manual (Or Whatever You Want to Call This Thing)

Look, I spent months staring at Visual Studio until my retinas burned just to make a distortion plugin that looks like an old grey handheld console and sounds like broken electronics. Nobody needed this. The world already has four thousand saturation plugins with rendered photorealistic knobs and fake plastic panels. Yet here we are.

This document explains what every single knob, toggle, and algorithm in HeatMan does. I will explain the actual math and the signal flow, but I will not use words like *synergy*, *warmth*, or *game-changer*. If you want marketing poetry, go buy a subscription from someone in a turtleneck. If you want to know why your 808 is suddenly chewing through the speakers, read on.

The Global Strip (The Stuff That Never Leaves The Screen)

No matter which distortion engine is active, the audio always passes through the same outer chassis. The signal enters through the Input trim, hits whatever mode or dual-mode routing you have selected, runs through the Hardware unit, gets tilted by the Tone control, passes through the Output trim, and finally runs into a ceiling clipper if you leave the little LED turned on.

INPUT (-12 dB to +12 dB)

This is a clean, pre-distortion level trim. It dictates how hard you smack the distortion algorithms.

Every distortion curve in this box reacts differently depending on the incoming amplitude. If a mode is reacting too violently or not breaking up enough, grab this knob first instead of messing up your internal patch balance.

TONE (-100 to +100)

A post-distortion tilt filter. It uses a pair of first-order shelving biquads linked together, pivoting around 700 Hz.



When you dial it positive, the highs go up while the lows drop by the same amount. When you dial it negative, the low end swells while the top end rolls off. At 0, the filters collapse to an exact mathematical bypass and do not touch the phase or frequency response at all. Use this to clean up the fizzy debris after heavy saturation without needing a separate EQ plugin.

HARDWARE (0% to 100%)

This is a one-knob cluster of analog circuit quirks that I spent way too many nights measuring on an oscilloscope. At 0%, the entire block is completely bypassed in code, giving you clean, unforgiving 64-bit digital math. As you turn it up, it injects six separate hardware behaviors at once:

1. **Transformer Core Saturation:** Adds up to 5 dB of internal drive with an asymmetric Class-A triode transfer curve, producing genuine second-harmonic weight.
2. **Pultec Low Bump:** A tuned low-frequency resonant shelf sitting at 70 Hz that adds 2.2 dB of physical weight to the bottom end.
3. **Discrete Slew Limiting:** Restricts how fast the signal voltage can change per sample. This rounds off harsh, spiky digital transients the way an overloaded op-amp does.
4. **FET Glue Compression:** A non-linear feedback clamp that catches the loudest peaks and squashes them down dynamically.
5. **Dynamic Tape Rolloff:** A gentle high-cut filter that rests around 19.5 kHz when idle, but pulls down toward 8.5 kHz whenever the signal gets loud.
6. **Program Hysteresis:** A tiny amount of feedback memory from the previous sample, mimicking the magnetic lag of transformer steel.

OUTPUT (-12 dB to +12 dB)

A clean digital makeup gain stage placed at the very end of the line. Distortion makes things feel louder because it fills in the valleys between peaks. Use this knob to bring the peak level back down so you can do honest A/B comparisons with the bypass button instead of fooling yourself with raw volume.

POST SOFT CLIPPER (Top-Right Faceplate LED)

Click the little red LED on the top right of the case to toggle the safety clipper.

When engaged, it places a ceiling at -0.1 dBFS. Below -3.7 dBFS (0.65 linear), it is bit-exact transparent and does not touch a single sample. Above -3.7 dBFS, it engages a continuous hyperbolic tangent curve to catch rogue peaks smoothly instead of letting your DAW chop them into ugly digital wrap-around distortion.

Mode 1: DYNAMIC (The Un-Compressor Distortion)

Traditional distortion plugins ruin the dynamic punch of drums. You feed a punchy snare into a clipper, the peaks get chopped off, the transients turn into mush, and the whole track sinks into the background.

Dynamic mode fixes this by doing something stupidly simple that requires tricky internal timing: it measures the peak envelope of your audio, squashes the dynamic range flat with an aggressive internal compressor, drives that flattened signal into a saturation curve, and then runs the result through an expander that uses the inverse of the original envelope to push the punch right back out. You get the harmonic grit of extreme distortion, but with the volume contour and dynamic kick of the original clean audio.

The Knobs and Controls

- **SHAPE (Selector):** Picks the mathematical transfer function used in the distortion stage. You get seven options:
 - *Hard:* A raw brickwall clipper. Sharp, aggressive, square-wave harmonics.
 - *Soft:* Pure hyperbolic tangent saturation. The sound of an analog mixing console being pushed into the red.
 - *Sine:* Truncates and folds the signal along a sine curve. Produces a fuzzy, rounded breakup.
 - *Fold:* A Buchla-style wavefolder that reflects the wave back on itself when it crosses the ceiling. Produces hollow, metallic overtones.
 - *Tube:* An asymmetric triode model. The positive half of the wave clips smoothly with second harmonics while the negative half compresses gently.
 - *Germanium:* Emulates a vintage germanium diode fuzz circuit with a soft knee and heavy natural sag.
 - *Acoustic:* A reactive transfer curve that subtly expands quiet micro-details while softly compressing loud peaks.
- **AMOUNT (0% to 100%):** Dictates how hard the internal compressor clamps down (up to a 20:1 ratio) and scales the internal shaper drive (up to +24 dB). At 0%, the mode is totally clean. At 100%, the sound is completely destroyed before being expanded back.
- **DYNAMICS (0% to 100%):** Controls how much of the original dynamic envelope gets restored by the expander. At 100%, the original dynamic punch is fully restored. At 0%, the expander stays off and you get standard, flat, crushed distortion.
- **ATTACK (0.1 ms to 50 ms):** Sets how quickly the internal envelope follower catches transients. Fast values (under 1 ms) clamp the initial crack of the drum immediately. Slower values let the initial stick hit slip through clean before the distortion kicks in.
- **RELEASE (1 ms to 500 ms):** Sets how fast the envelope follower recovers. Fast release tracks frantic hi-hats and double-kick patterns. Slower release glues the saturation across the decay of the sound.
- **AUTO GAIN (Toggle ON/OFF):** Dynamically scales the mode output so peaks stay pinned right around 0 dBFS. Since manipulating the Amount and Dynamics knobs can swing loudness all over the room, leaving this ON keeps your monitoring levels sane.

What To Use It On

- **Acoustic and Electronic Drum Loops:** Put this on a live breakbeat or drum bus. Set Amount to 60%, Dynamics to 90%, and Attack to 0.5 ms. The drums will sound completely filthy and blown out, but the snare crack and kick transient will still jump out of the mix without getting flattened.
 - **Aggressive Rock / Metal Bass:** Run an electric bass through the Tube or Germanium shape. It gives you a massive harmonic grind in the mid-range without leveling out the player's pick attack.
 - **Slap Bass and Funk Guitars:** When you need heavy coloration but cannot afford to lose the percussive pops and thumb slaps.
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Mode 2: PHASE (Delay-Line Phase Modulation)

Most distortion works on amplitude: you take a waveform and you bend or chop its vertical height. Phase distortion leaves the volume alone and messes with time instead.

Audio enters a stereo delay line while a side path takes the same audio, strips out the DC offset, low-passes it, and uses that conditioned wave to physically wobble the read position of the delay at audio rates. In our implementation, we run a cascade of four allpass phase-warping filters paired with a Hilbert quadrature split. Because the audio is bending its own phase in real time, you get rich FM sidebands, vocal vowel sounds, and complex metallic textures with zero latency and zero volume clipping.

Carrier Path -> [Stereo Delay Line] -----> [Phase Warper] -> Audio Out
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Modulator Path -> [DC Block] -> [Smoothing LPF] -> [Hilbert Split]

The Knobs and Controls

- **AMOUNT (0% to 100%):** Controls the modulation depth of the phase excursion. At 0%, the delay time sits completely still and the audio passes through untouched. At 100%, the phase is warped violently, creating dense FM harmonics.
- **WIDTH (Mono / Stereo):** In Mono mode, both channels receive the exact same phase modulation. In Stereo mode, the right channel is modulated with a 90-degree phase shift via the Hilbert transform. This flings the stereo field wide open without introducing ugly mono phase cancellation.
- **SMOOTHING (20 Hz to 20,000 Hz):** The cutoff frequency of the low-pass filter on the modulator path. When set low (50 Hz to 250 Hz), only the sub and bass frequencies wobble the phase, giving you round, vocal, rubbery distortion. When opened all the way up, high-frequency transients modulate the phase too, turning the sound harsh, buzzy, and metallic.
- **DEPTH (1 ms to 50 ms):** Sets the maximum time window for the phase modulation sweep. Smaller values produce tight, laser-focused harmonic resonance. Larger values produce deep, resonant frequency modulation that sounds like an analog modular synth tearing itself apart.

What To Use It On

- **808 Sub Basses and Sine Waves:** Take a boring pure sine wave 808, load Phase mode, set Smoothing to 120 Hz, and push Amount to 50%. The sub will generate nasty, growling upper harmonics that cut right through phone speakers while keeping the fundamental bass intact.
 - **Stereo Lead Synths and Plucks:** Turn Width to Stereo, set Depth to 8 ms, and dial Amount to 40%. It transforms static, thin synthesizer patches into wide, moving, three-dimensional textures.
 - **Reese Basses and Sound Effects:** Automating the Depth and Smoothing knobs during an EDM buildup or riser creates massive, swirling, vowel-shifting sweeps.
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Mode 3: RING MOD (Sub-Bass High Frequency Chopper)

Standard ring modulators take an external oscillator (like a 400 Hz sine wave) and multiply it against your track, turning everything into a dissonant robot voice that is almost entirely useless in a musical mix.

This mode is different. It is a sub-cycle sidechain attenuator. We split the incoming audio into a low band and a high band using a phase-aligned fourth-order Linkwitz-Riley crossover filter. The low band is silent in the control chain; it gets rectified and used as a high-speed volume gate on the high band. Every time your sub bass swings through a cycle, the high end is ducked out. You hear the high frequencies stuttering, fluttering, and breaking up in exact mechanical rhythm with your track's own bass notes.

The Knobs and Controls

- **CROSSOVER (40 Hz to 800 Hz):** Sets the frequency split point between the sub-bass trigger path and the high-frequency audio path. Keeping this set around 100 Hz to 180 Hz ensures that only clean sub notes dictate the chopping behavior.
- **AMOUNT (0% to 100%):** Dictates how deeply the highs get ducked, and inflates the waveshaper on the control path. At low settings, the high end receives gentle amplitude modulation. At 100%, the control signal becomes a squared-off pulse, turning the high end into an aggressive, machine-gun stutter.
- **WAVE (Full / Half):**
 - *Full:* Rectifies both the positive and negative swings of the bass wave. The highs duck twice per bass cycle (2x rate), creating a tight, raspy, chattering sizzle.
 - *Half:* Only triggers on the positive half-cycle of the bass wave (1x rate). This produces a looser, pulsing, rhythmic groove.
- **BALANCE (-100 to +100):** A +/-6 dB tilt between the clean, untouched low band and the ducked high band. Dialing it left keeps the bottom heavy and clean; dialing it right pushes the raspy, chopped high-end harmonics forward.

What To Use It On

- **Modern Trap and Drill 808s:** When you have an 808 playing underneath a dark synth pad or vocal chop. Ring Mod lets the 808 carve rhythmic distortion holes into the top end instruments every time the bass hits.
 - **Full Drum Loops:** Set the Crossover to 120 Hz and Wave to Half. Every time the kick drum strikes, the hi-hat sizzle and snare top end will flutter in sync with the kick's sub decay.
 - **Dubstep / Neuro Bass Stabs:** Blend Balance to +30 and crank Amount to 80%. It adds that signature mechanical buzzing top end without altering the sub pitch.
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Mode 4: MORPH (Wavetable Vector Waveshaper)

If you get bored of fixed distortion algorithms, Morph lets you draw your own transfer functions on an interactive LCD screen across four independent frames, and then smoothly glide between them using a single knob.

To keep this from sounding like harsh digital garbage, the audio is processed through a 4x oversampler using linear-phase polyphase half-band FIR filters. The curves are rendered into lookup tables using monotonic PCHIP cubic interpolation, which guarantees that the curve goes exactly through the nodes you draw without weird wild oscillations or overshoot.

The Knobs and Controls

- **MORPH (0% to 100%):** Sweeps through the four transfer frames. 0% is Frame 1, 33% is Frame 2, 66% is Frame 3, and 100% is Frame 4. Any position in between calculates a real-time linear interpolation between adjacent frames without zipper noise or clicking.
- **DRIVE (0 dB to 24 dB):** Gain pushed into the drawn transfer curve. At 0 dB with a standard diagonal line, the shaper is mathematically transparent. Pushing the drive forces the signal into the outer extremes of your curve.
- **MIX (0% to 100%):** A latency-compensated dry/wet balance. The dry path is delayed internally to match the FIR oversampling filter latency so your phase remains perfectly aligned.
- **DC BLOCK (Toggle OFF/ON):** An internal 10 Hz high-pass filter placed on the wet path. When you draw asymmetric or rectified curves, the audio develops DC offset (a steady voltage that pushes speaker cones out). Turning this ON removes the offset without altering your dry signal.

Screen Tools and Curve Editing

- **Frame Buttons (1, 2, 3, 4):** Selects which frame is currently active on the visual LCD editor.
- **Morph Tracker Bar:** A row of retro LCD pixels under the frame buttons showing your real-time morph position.

- **Drawing Canvas:** Double-click anywhere on the line to add a new point. Right-click a point to delete it. Drag the tension handles between nodes to create smooth exponential or logarithmic bends.
- **Preset Shapes and Banks:** Quick-load individual shapes (Linear, Soft Tanh, Buchla Fold, Sine Fuzz, 8-Bit Chiptune Stairs, Razor Clip) or load entire four-frame morph banks (Tube Odyssey, West Coast Synthesis, Tape to Blown Desk, Octave Fuzz).

What To Use It On

- **Evolving Synth Leads:** Draw a smooth tape curve in Frame 1, a mild tube curve in Frame 2, an asymmetric wavefolder in Frame 3, and an 8-bit stepped curve in Frame 4. Automate the Morph knob across a four-bar phrase to let the synth degrade over time.
- **Guitar and Bass Amp Profiling:** draw an asymmetric soft saturation curve on Frame 1, turn DC Block ON, and use 6 dB of Drive for authentic tube preamp coloration.
- **Extreme Glitch and Industrial Sound Design:** Load the multi-fold or bit-stair shapes, push Drive to +18 dB, and modulate the Morph knob with a fast LFO in your DAW.

Mode 5: MS DUCK (Mid/Side Dynamic Sub Clamp)

Stereo width in modern mixes is tricky. If your bass and sub frequencies are wide, your mix falls apart in clubs and sounds hollow on phone speakers. But if you collapse everything to mono, your mix feels small.

MS Duck solves this by splitting the stereo signal into Mid (center information) and Side (stereo difference information). The Mid channel is filtered, rectified, and turned into a dynamic control signal that ducks or expands the Side channel sample by sample. The split is performed with pure vector addition and subtraction: zero crossovers, zero latency, and “100% phase alignment”.

The Knobs and Controls

- **MODE (Tighten / Bloom / Crush):**
 - *Tighten:* The default mode. Whenever a loud bass or kick transient occurs in the center channel, the side channel is instantly ducked. This locks your low-end firmly to the mono center on every hit while letting the sides breathe open during quiet passages.
 - *Bloom:* Inverts the ducking logic. The side channel gain expands dynamically between center hits (up to +250% stereo width), creating a massive, breathing stereo bloom that wraps around your kick and snare.
 - *Crush:* Pushes the Mid channel through an internal tube saturation stage while simultaneously ducking the sides. It creates a dirty, aggressive center punch with clean spatial edges.

- **AMOUNT (0% to 100%):** Dictates how aggressively the Mid channel controls the Side channel. At 0%, the sides are left alone. At 100%, the side channel drops sharply whenever center peaks arrive.
- **SMOOTHING (20 Hz to 2,000 Hz):** The low-pass cutoff filter on the Mid detector path. At 80 Hz to 150 Hz, only sub-bass and kick drums trigger the stereo clamp. Pushing it up past 1 kHz lets vocal plosives and snare hits clamp the stereo image as well.
- **STEREO WIDTH (0% to 200%):** A direct multiplier on the Side channel before dynamic processing takes place. 0% turns the entire signal into pure mono; 100% is untouched original stereo; 200% super-widens the stereo difference.

What To Use It On

- **Mix Bus and Master Chain:** Select Tighten mode, set Smoothing to 100 Hz, Amount to 35%, and Stereo Width to 105%. Your low-end will stay rock-solid and mono-compatible, while the stereo elements on the sides will stay wide and clear.
- **Electronic Drum Buses with Stereo Room Reverb:** Use Tighten mode to suck the reverb out of the stereo sides during the initial kick transient, preventing low-end rumble from washing out the groove.
- **Ambient Pads and Synth Textures:** Switch to Bloom mode. Every time your center lead or kick drops out, the background pad will swell outward into an ultra-wide stereo field.

Dual Engine Mode (Running Two Algorithms Together)

If one distortion engine is not enough, you can engage Dual Engine mode by clicking the dual mode toggle on the screen. This unlocks a routing matrix that lets you run any two of the five distortion engines at the same time.

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+----- ROUTING CONFIGURATIONS -----+
|
| SERIAL A->B: In -> [ Slot A Engine ] -> [ Slot B Engine ] -> Out
|                                     |
| SERIAL B->A: In -> [ Slot B Engine ] -> [ Slot A Engine ] -> Out
|
|           +-> [ Slot A Engine ] --\
| PARALLEL:  In           +-> [ BLEND ] -----> Out
|           +-> [ Slot B Engine ] --/
+-----+
```

The Controls

- **SLOT A / SLOT B (Selectors):** Choose which distortion algorithm is assigned to each slot (Dynamic, Phase, Ring Mod, Morph, or MS Duck).

- **ROUTING (Serial A->B / Serial B->A / Parallel):**
 - *Serial A->B*: Audio processes through Slot A first, and that distorted output directly feeds the input of Slot B.
 - *Serial B->A*: Inverts the order, running through Slot B first before hitting Slot A.
 - *Parallel*: Splits the dry input into both engines simultaneously and combines their outputs at the end.
- **BLEND (0% to 100%)**: In Parallel routing, this acts as the balance slider between Slot A (0%) and Slot B (100%). In Serial routing, it acts as a crossfader between the single-stage and double-stage output.
- **Dual Flow Scope**: A real-time visualizer on the screen that shows the live waveform path flowing through the active slots.

What To Use It On

- **Phase into Dynamic (Serial A->B)**: Put Phase Distortion in Slot A to generate FM vocal harmonics, then feed that into Dynamic Distortion in Slot B with Dynamics at 100%. You get screaming synthesizer harmonics with drum-tight transient control.
- **Parallel Morph and MS Duck**: Run a severe, overdriven wavefolder in Slot A and MS Duck in Slot B. Blend them 50/50. You get abrasive, crushed fuzz that stays neatly tucked into the center of the stereo image without washing out your mix.

Quick Reference Guide

Mode	Core Mechanism	Main sonic character	Grab this knob first
DYNAMIC	Pre-compression into saturation with envelope expansion	Punchy, heavy saturation that retains transients	DYNAMICS
PHASE	Audio-rate modulated delay lines and allpass phase warping	Rubbery, vocal, metallic FM growl without clipping	SMOOTHING
RING MOD	Low-band envelope ducks high-band audio	Rhythmic, sub-synchronized high-end chattering	AMOUNT
MORPH	4-frame oversampled drawable wavetable shaper	Custom, evolving, automated distortion curves	MORPH
MS DUCK	Mid channel dynamically ducks or blooms Side channel	Tight, club-ready mono sub with wide stereo air	AMOUNT

And across all modes: use **INPUT** to set your drive level, **HARDWARE** to turn clean digital math into imperfect analog iron, **TONE** to balance brightness, and **OUTPUT** to keep your levels honest.

Niels (Plea Tech) x DontCallMe

