MODEL 23

PODIUM LIMITER



OWNER'S MANUAL

A level-locking limiter descended from the 1960s public-address leveler: transformer-coupled, battery-powered and impossible to push past its ceiling. Built for drum rooms, crushed vocals and anything that should sound louder than it is.

TELEMETRY AUDIO

VERSION 0.2.0 · AU · VST3 · AAX

MODEL 23

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“It was built to stop a nervous speaker from blowing up a school gymnasium PA. Fifty years later it is one of the most coveted drum-room sounds in recorded music.”

CONVENTIONS

Control names appear in **bold**. Numbers in blue circles, such as 7, refer to the panel map in Chapter 04. Levels are in dBFS unless stated otherwise; “locked” describes a signal that is above the threshold and being held at the ceiling by the leveler.

01

WELCOME

Podium Limiter is a *level-locking* limiter. Below its threshold it behaves like a clean gain stage. Above the threshold the output is effectively pinned: push thirty decibels more signal into it and the output rises by less than two.

That alone would make it a brick wall. What makes it an instrument is *how* it gets there. The leveler's attack is deliberately slow, so the front edge of every hit gets through before the gain comes down. Its release behaves like a capacitor draining through a resistor, so the gain swells back up between hits. That swell is the pump, and it brings the room, the cymbal wash and the sustain up to meet the transient. Around the gain cell sit a saturating input transformer, a mic-level output transformer, and a 9-volt battery supply you can drain on purpose until the circuit starves.

Every stage was voiced against black-box measurements of a reference level-locking unit: its static transfer curve, its step response, its frequency response, its harmonic distortion and its behavior across a full battery sweep. The fitted constants are checked by an automated suite of 121 measurement points every time the engine is built, so a knob on Podium Limiter does what the measurements say it should.

WHAT IT'S FOR

Drum rooms and overheads. The classic use: lock a room mic so the decay comes up to the level of the attack and the kit sounds twice the size of the room it was recorded in.

Parallel smash. Blend the locked signal under the dry one with **Mix**. The dry path is delay-compensated, so the blend never combs.

Lo-fi and character vocals. A locked vocal through the mic transformer has the urgency of a 1960s PA announcement. Drain the battery for more.

Bass, guitars and loops. Use the sidechain filter to choose what drives the gain, and **Crunch** to square the result off.

> ### AT A GLANCE
>
> Level-locking gain cell · fixed 117 ms attack · 10 ms – 5 s release · three threshold positions · 12 dB/oct high- or low-pass sidechain filter · stereo-linked or dual-mono detection · saturating input and output transformers · 0–9 V battery supply with low-voltage gate · 30 dB asymmetric Crunch stage · stacked 12 dB/oct post filters · equal-power parallel mix · 2× / 4× oversampling · VU meter with IN / GR / OUT selector.

02

FROM THE PODIUM TO THE DRUM ROOM

A TOOL FOR PEOPLE WHO TALK

In the 1960s, sound reinforcement had a problem no studio engineer worried about: the person at the microphone. A school principal, a preacher or a city council member would lean in, back off, shout, then mumble, and the public-address system had to cope with all of it unattended. The fix was a compact *audio level controller*, a box that sat between microphone and amplifier and held the level steady whatever the talker did.

Shure's answer was the **M62 Level-Loc**, introduced in 1967 as part of a family of small mixers and processors for live and broadcast sound. It was simple and affordable, and it was uncompromising: in practice a brick-wall limiter that clamped the level within moments and held it there. Its designers were working to the brief of the day, which was to *minimize* distortion and audible artifacts. An updated **M62V** followed in 1969 and added a volume control. The line was discontinued in 1977, overtaken by better PA systems and automatic gain control, and most units drifted into storage closets and the second-hand market.

THE SECOND LIFE

What the PA designers saw as an unavoidable side effect, studio engineers heard as a feature. Feed a Level-Loc a drum kit and it does exactly what it was built to do: it refuses to let the level move. Because its gain cell is slow to react, the stick attack slips out ahead of the clamp. Then the clamp lands, and between hits the gain recovers so quickly that the room, the ring of the shells and the cymbal wash are lifted to the same level as the hit. Overdrive it and the little transformers and the battery-era electronics begin to break up into a dense, aggressive saturation.

Through the late 1990s and 2000s the Level-Loc became a cult object, prized above all on drum room mics. Grammy-winning engineer **Tchad Blake** did more than anyone to make it famous. It turned out that a speech leveler from a gymnasium was one of the most characterful dynamics processors ever made.

WHY “PODIUM”

The name is a nod to where this circuit started: a lectern, a microphone and somebody who needed to be heard. Model 23 keeps the spirit of that brief, *hold the level no matter what*, and adds the controls the original never had: a variable release, a choice of thresholds, a sidechain filter, a parallel mix, post filters, and the ability to drain the battery and overload the output on purpose.

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03

THEORY OF OPERATION

SIGNAL FLOW

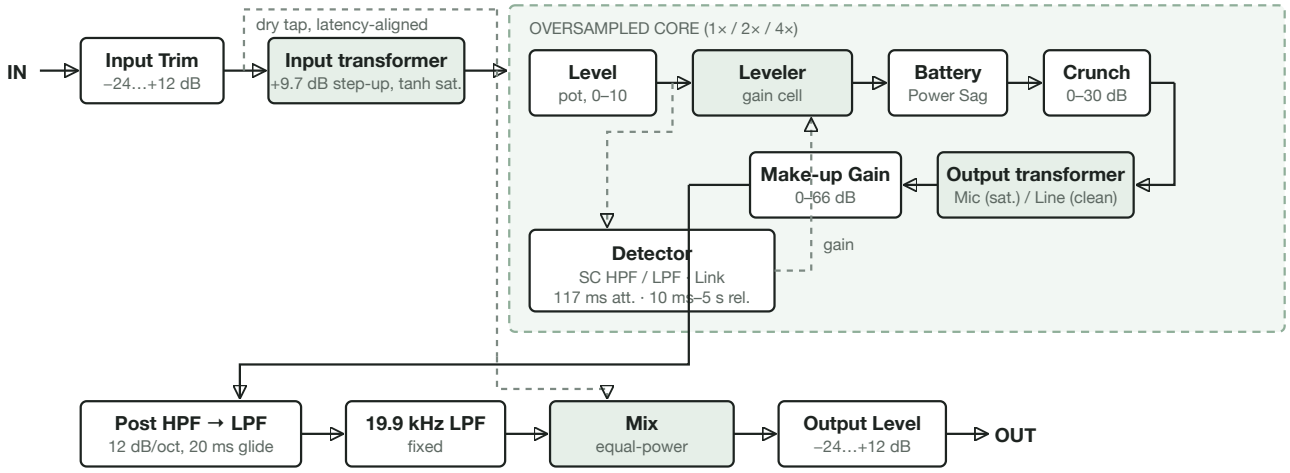


Figure 1. Signal flow with Limiter Lock on. With Limiter Lock off, the level pot, leveler and make-up gain drop out; Power Sag and Crunch keep running (see Analog Grit). Shaded blocks carry the circuit's character. The dashed box runs at the oversampled rate.

Only the nonlinear stages run oversampled: the transformers' saturation, the leveler, the battery and Crunch. The transformers' *linear* coloration, their fitted frequency response, runs at the session rate on either side of the oversampler. So switching oversampling changes aliasing and nothing else: the tone stays the same. The resampling filters are half-band polyphase IIR designs, and their latency is reported to the host so the plugin stays sample-aligned.

THE LEVEL-LOCKING GAIN CELL

The leveler has two parts: a **detector** that measures how loud the signal is, and a **gain computer** that decides how much to turn it down.

The detector is a one-pole *peak follower*. In Stereo link it follows the louder of the two channels sample by sample, $\max(|L|, |R|)$, so both sides receive identical gain and the stereo image cannot wander. Its attack is fixed at 117 ms, slow by limiter standards and the heart of the sound: the envelope cannot catch a transient, so the front of every hit passes before the gain falls. Its release is set by **Release** and modeled on a classic $R \times C$ timing network. The time shown on the knob is how long the envelope takes to fall 40 dB once the input stops, and the default of 200 ms corresponds to 100 kΩ into 2 μF.

The gain computer works in linear amplitude rather than decibels, which is what gives the curve its particular shape. Below a quadratic soft knee the gain is unity. Above it, the output follows

`y = T + (x − T) / R` with a nominal ratio *R* of 180:1. In linear terms the output keeps *creeping* upward rather than stopping dead: 10 dB over the threshold moves the output 0.1 dB, 20 dB over moves it 0.4 dB, and 30 dB over moves it only 1.4 dB. Gain reduction is capped at 38.5 dB, which only the most extreme settings reach.

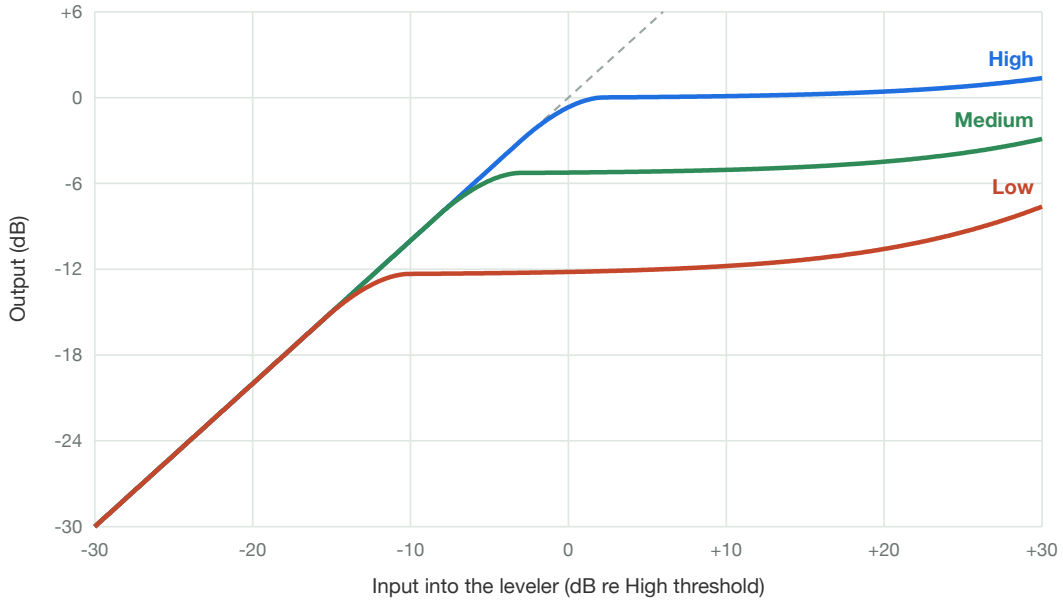


Figure 2. Static transfer curve of the gain cell at each **Threshold** setting, computed from the engine's own constants. The dashed line is unity gain. Above the knee the output is all but flat: the lock.

TRANSFORMERS

Both transformers use a symmetric hyperbolic-tangent saturation, `y = tanh(kx) / k`. It is transparent at low level and rounds peaks progressively as level rises, generating mostly odd-order harmonics the way a real core does as it approaches saturation. The **input transformer** is a low-impedance type with a 9.7 dB step-up. At 0 dBFS its third harmonic sits at −37 dBc, and its frequency response is fitted to the measured coloration to within 0.03 dB rms. The **output transformer** is switchable. The Mic tap saturates; the Line tap is clean and adds 2.85 dB, which an automatic trim removes so the switch changes tone, not level.

THE BATTERY

The original circuits came from the era of battery-powered field equipment, and Podium Limiter models its supply as a 9-volt battery you can drain with **Power Sag**. At full charge the supply is stiff and the circuit is clean. Below about 8.5 V the supply begins to starve. The model blends in a *drained* path, a soft clipper of the form `x / (1 + |x| / C)` with its own ceiling and make-up, in proportions fitted voltage by voltage to the measured output level and third-harmonic distortion. As the voltage falls, limiting turns softer, denser and dirtier.

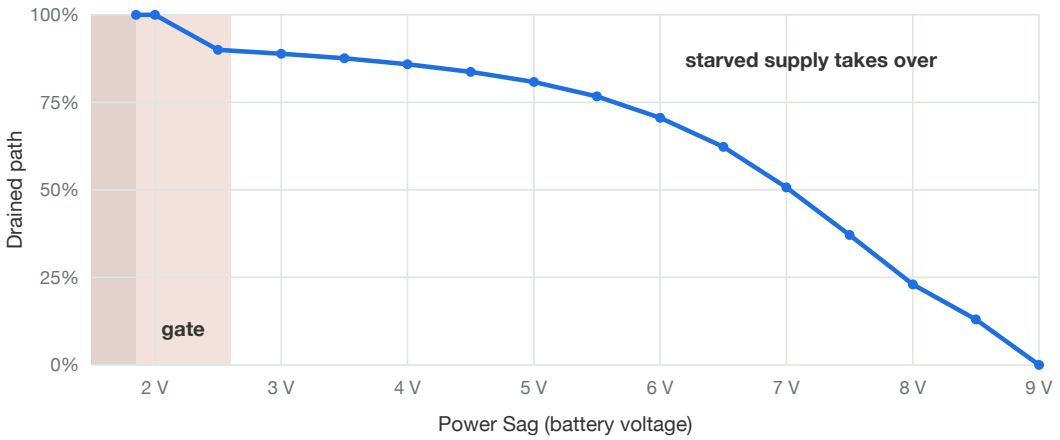


Figure 3. Share of the starved-supply path as the battery drains, one point per measured voltage. Below 2.6 V a gate closes on quiet passages, its threshold rising 20 dB per volt. Below 1.85 V the unit is dead.

An auto-gain stage, fitted at the same voltages, keeps the *locked* level within 0.4 dB as the battery drains, so you hear the character change rather than a volume change. Signals below the threshold are not compensated, so quiet passages rise as the supply sags, which is exactly what a tired battery does.

CRUNCH

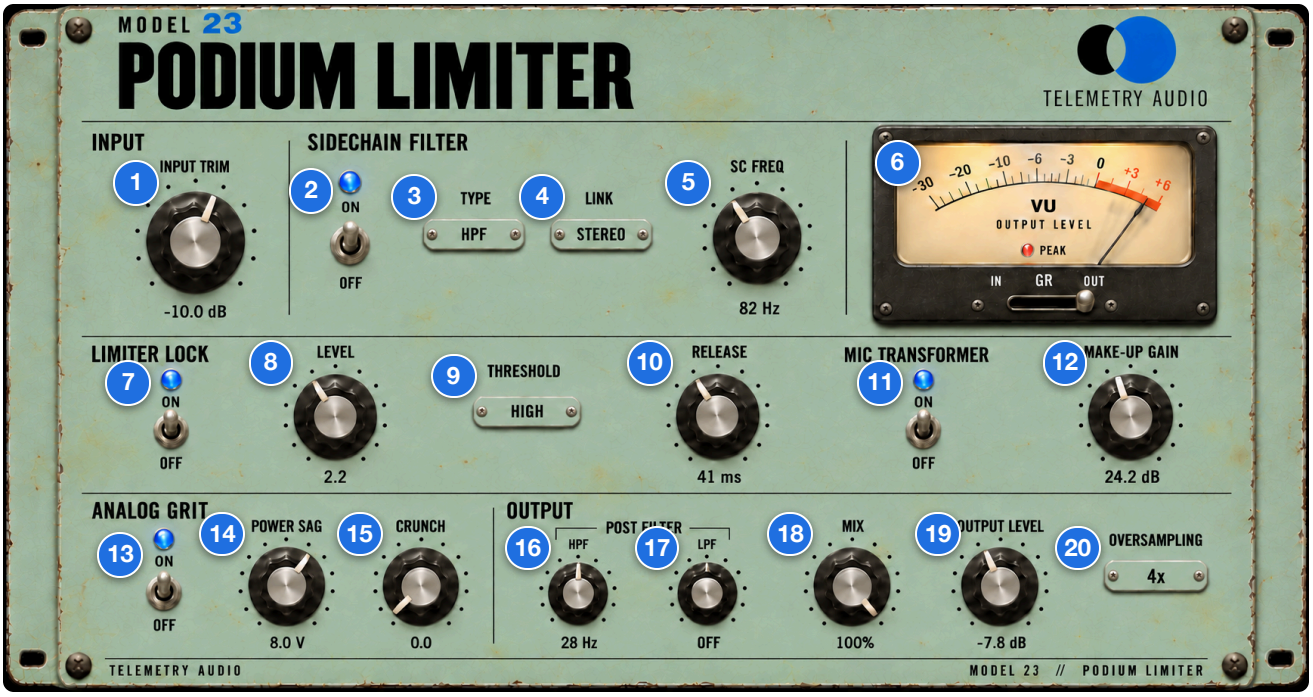
Crunch is a gain stage after the leveler driving an asymmetric clipper, 3 dB per step from 0 to +30 dB, flat from 20 Hz to 20 kHz. The clipper's ceilings sit at fixed distances above the locked sine peak, +7.6 dB on the positive half-cycle and +11.0 dB on the negative. The positive knee is soft and the negative one nearly hard. That asymmetry adds even-order harmonics on top of the transformers' odd ones, for a thicker, more aggressive edge. A first-order DC blocker at about 10 Hz follows and re-centers the asymmetric waveform. Because the ceilings track the locked level, the knob feels the same at any Threshold. Low settings only shave the transients the slow attack lets through, the locked body starts to clip around 3, and from 7 to 10 the output approaches a square wave. Auto-gain, calculated from the clipper's own curve, holds the locked level within 1.2 dB across the whole range.

BUILT FOR THE SESSION, NOT JUST THE DEMO

Continuous controls are smoothed sample by sample. The switches that change filters or gain stages, including Oversampling, are applied under a short duck of the processed path (5 ms out, 2 ms hold, 5 ms in), so automating them never clicks. The colorations are fitted separately for 44.1, 48, 88.2, 96, 176.4 and 192 kHz, so the plugin has the same frequency response at every session rate. All filters are biquads with double-precision state. The engine is checked against 176 host-condition tests, among them block sizes from 1 to 2048 samples, every sample rate, automation of every control, and silence, DC, NaN and infinite input.

04

THE CONTROLS



Default settings: Input Trim 0 dB · Limiter Lock on · Level 3 · Threshold High · Release 200 ms · Mic Transformer on · Make-up Gain 20 dB · Sidechain filter off · Analog Grit on at 9.0 V · Crunch 0 · Post filters off · Mix 100 % · Output 0 dB · Oversampling off.

INPUT

1 INPUT TRIM

–24 to +12 dB

Gain before everything else, the dry path included. Use it to bring the source into the leveler's working range. With Limiter Lock on, more Input Trim means more gain reduction, not more output.

SIDECHAIN FILTER

The sidechain filter shapes what the *detector* hears. The audio itself is never filtered here.

2 ON / OFF

host name: SC Filter

Switches a 12 dB/octave Butterworth filter (Q = 0.707) into the detector path.

3 TYPE

HPF / LPF

HPF stops low frequencies from driving the gain: a kick or bass note no longer pulls the whole mix down, so the low end punches through the lock. **LPF** stops high frequencies from driving it, so cymbals and sibilance stop triggering pumping.

4 LINK

Stereo / Dual Mono

Stereo runs one detector on the louder channel, so both sides get identical gain and the image holds steady. **Dual Mono** runs an independent detector per channel, so each side locks on its own. That widens and animates a stereo room pair, at the cost of a moving image.

5 SC FREQ

20 Hz–1 kHz (HPF) · 1–20 kHz (LPF)

The corner frequency of the selected filter. The knob shows the corner for the current Type, and each Type remembers its own: 100 Hz and 5 kHz by default.

Tip — On a drum room, an HPF around 120–200 Hz lets the kick breathe while the shells and cymbals stay locked.

LIMITER LOCK

7 ON / OFF

host name: Loc

Engages the whole leveler section, make-up gain included. Off leaves the transformers and Analog Grit in circuit, so the plugin becomes a color box. The detector keeps tracking while the section is off, so switching back on lands straight on the correct gain with no swell or snap.

8 LEVEL

0–10

The drive into the leveler. It follows a $16 \cdot \log_{10}(\text{position}/10)$ dB law: 10 is unity, 3 is -8.4 dB, and 0 is off.

Because the output is locked, Level mostly sets how hard the gain cell works: the depth of the pump, not the loudness.

9 THRESHOLD

High / Medium / Low

Lowers the threshold by 0, 5.3 or 12.3 dB. These are the three positions of the original-style distance selector, which matched the circuit to a talker standing close to the microphone, mid-distance or far away. Lower thresholds lock quieter material and squeeze harder.

10 RELEASE

10 ms – 5 s

The time for the detector to fall 40 dB once the input drops. 200 ms is the classic 100 kΩ × 2 μF network. Shorter times pump harder and bring the room up faster between hits. Longer times turn the leveler into a slow, glued, AGC-like ride. Below roughly 30 ms the gain starts following individual bass cycles and adds its own distortion, which is useful on purpose and unwelcome by accident.

Tip — Time the release to the tempo: the swell should peak just before the next hit.

11 MIC TRANSFORMER

On / Off

On routes the output through the saturating mic-level transformer, the classic tone. **Off** takes the clean line-level output instead, and an automatic trim removes its 2.85 dB lift so the switch compares tone at matched level.

12 MAKE-UP GAIN

0–66 dB

Clean gain after the leveler, applied to the processed signal only, so it never affects the dry path in a parallel blend. The default is 20 dB. The locked signal sits far below full scale inside the circuit, so expect to use plenty.

ANALOG GRIT

13 ON / OFF

host name: Analog Grit

On runs the circuit from the battery, so **Power Sag** sets the supply, and enables **Crunch**. **Off** is a stable AC supply with Crunch bypassed. Both stages also work with Limiter Lock off. There is no leveler to set their operating level then, so they run on a copy of the signal 40 dB down: a −12 dBFS input sags and clips about as a locked signal would, louder material gets more grit and quieter material less.

14 POWER SAG

0–9 V

The battery voltage. Between 9 and about 8.5 V the supply is stiff. Below that it starves and limiting turns softer, denser and dirtier, while auto-gain holds the locked level within 0.4 dB. Under 2.6 V quiet passages gate off, sputtering like a dying battery. Under 1.85 V the circuit dies.

Tip — 6–7 V is the sweet spot for a thick, compressed room that still sounds like drums.

15 CRUNCH

0–10 (0 to +30 dB)

Drive into the asymmetric clipper, 3 dB per step. 1–2 rounds off only the transients the slow attack lets past. Around 3 the locked body starts to clip. From 7 to 10 the output is close to a square wave. Auto-gain holds the locked level within 1.2 dB as it squares off, so turn it up for character, not volume. 0 bypasses it completely.

OUTPUT

16 POST FILTER — HPF

20–400 Hz · outer ring

A 12 dB/octave high-pass on the processed signal only. At 20 Hz it is out of circuit. Use it to keep a locked room from piling up low-end mud under the close mics.

17 POST FILTER — LPF

1–20 kHz · inner knob

A 12 dB/octave low-pass on the processed signal only. At 20 kHz it is out of circuit. Darkening a heavily locked signal tames the cymbal hash that limiting brings up. Both post filters glide to a new corner over about 20 ms, so sweeping or automating them never clicks.

18 MIX

0–100 %

An equal-power blend of the processed signal with the dry signal. The dry signal is delayed to match the processed path exactly, so any blend is phase-coherent, even with oversampling on. At 0 % the output is exactly the delayed input.

19 OUTPUT LEVEL

–24 to +12 dB

Final gain on the mixed output, dry included.

20 OVERSAMPLING

Off / 2× / 4×

Runs every nonlinear stage at two or four times the session rate to push aliasing out of the audio band. The tone is identical in every mode, because only aliasing changes. Off has zero latency. 2× and 4× add a few samples, which are reported to the host for automatic delay compensation.

VU METER

6 METER & IN / GR / OUT SELECTOR

0 VU = –18 dBFS

A classic moving-needle meter. Slide the selector beneath it to choose what it shows. **IN** and **OUT** read RMS level on the VU scale with 0 VU calibrated to −18 dBFS. **GR** reads gain reduction on its own scale. The needle rises quickly with a touch of overshoot and falls back slowly, like a mechanical movement. The **PEAK** lamp lights for half a second whenever the watched signal reaches −0.3 dBFS: the input in IN mode, the output otherwise. The selector position is saved with your session.

05

STARTING POINTS

These are places to begin, not presets to obey. Start from the defaults, change only what is listed, then adjust Make-up Gain or Output Level to match levels before you judge the result.

THE CLASSIC DRUM ROOM

CONTROL	SETTING	CONTROL	SETTING
Level	5–7	**Release**	120–250 ms, timed to tempo
Threshold	Medium	**SC Filter**	On, HPF ≈ 150 Hz
Power Sag	9 V	**Post HPF**	80–120 Hz

The stick hits pass, then the room swells up behind them. The sidechain HPF stops the kick from ducking everything, and the post HPF keeps the locked room from muddying the close mics.

PARALLEL SMASH FOR THE WHOLE KIT

CONTROL	SETTING	CONTROL	SETTING
Threshold	Low	**Crunch**	2–4
Release	80–150 ms	**Post LPF**	8–10 kHz
Mix	20–40 %	**Link**	Stereo

Lock the kit as hard as it will go, darken the top so the cymbals don't sizzle, then tuck it under the dry kit with Mix. The latency-aligned dry path keeps the blend phase-coherent.

ANNOUNCER VOCAL

CONTROL	SETTING	CONTROL	SETTING
Mic Transformer	On	**Post HPF**	250–400 Hz
Power Sag	6.5–7.5 V	**Post LPF**	4–6 kHz
Release	300–600 ms	**SC Filter**	On, LPF ≈ 6 kHz

A level that never moves, a band-limited transformer edge and a slightly starved supply: the sound of a 1960s PA announcement. The sidechain LPF keeps sibilance from snatching the gain.

DYING-BATTERY LO-FI

CONTROL	SETTING	CONTROL	SETTING
Power Sag	2.2–2.8 V	**Crunch**	5–8
Release	40–80 ms	**Oversampling**	2× or 4×

The gate begins to chop quiet passages while Crunch squares off the rest. Oversampling keeps the heavy clipping from folding aliasing back into the audio band.

BASS THAT HOLDS STILL

CONTROL	SETTING	CONTROL	SETTING
Level	3–4	**Release**	400 ms – 1 s
Mic Transformer	On	**Mix**	50–70 %

A long release turns the lock into a steady, glued ride, and the transformer adds harmonics that help the bass read on small speakers. Keep release times above about 30 ms on bass, unless you want the gain to follow each cycle.

06

SPECIFICATIONS & INSTALLATION

SPECIFICATION	VALUE
Plug-in formats	Audio Unit, VST3, AAX (Pro Tools)
Platform	macOS 11 or later; universal binary, native on Apple Silicon and Intel
Channel configurations	Mono in / mono out; stereo in / stereo out
Sample rates	44.1–192 kHz; coloration fitted separately at 44.1, 48, 88.2, 96, 176.4 and 192 kHz
Latency	0 samples with oversampling off; a few samples at 2× / 4×, reported for delay compensation
Oversampling	Off / 2× / 4×, half-band polyphase IIR, nonlinear stages only
Detector	Peak follower, stereo-linked (max |L|,|R|) or dual mono
Attack / Release	117 ms fixed / 10 ms – 5 s (time to fall 40 dB)
Gain computer	Linear-domain quadratic soft knee, nominal 180:1; +1.4 dB out for +30 dB in
Maximum gain reduction	38.5 dB
Threshold positions	0, –5.3, –12.3 dB
Sidechain filter	12 dB/oct Butterworth; HPF 20 Hz–1 kHz, LPF 1–20 kHz
Input transformer	+9.7 dB step-up; H3 –37 dBc at 0 dBFS
Battery model	0–9 V; starvation below 8.5 V; gate below 2.6 V (20 dB/V); dead below 1.85 V
Crunch	0 to +30 dB in 3 dB steps; asymmetric ceilings +7.6 / +11.0 dB; 10 Hz DC block
Post filters	12 dB/oct HPF 20–400 Hz, LPF 1–20 kHz, 20 ms glide
Output band limit	Fixed 19.9 kHz low-pass
Metering	VU, 0 VU = –18 dBFS RMS; GR scale; PEAK lamp at –0.3 dBFS

INSTALLATION

Open **Podium-Limiter-0.2.0.dmg**, run **Podium Limiter 0.2.0.pkg** and choose the formats you want. Each one installs system-wide, so macOS asks for your password:

FORMAT	LOCATION	HOSTS
Audio Unit	`/Library/Audio/Plug-Ins/Components`	Logic Pro, GarageBand, other AU hosts
VST3	`/Library/Audio/Plug-Ins/VST3`	Ableton Live, Cubase, Reaper, other VST3 hosts
AAX	`/Library/Application Support/Avid/Audio/Plug-Ins`	Pro Tools

The installer and the disk image are signed and notarized by Apple, and the AAX is PACE-signed for retail Pro Tools. Logic scans Audio Units on launch. In Live, open **Preferences** › **Plug-Ins** and click **Rescan**. Pro Tools picks up the AAX the next time it launches. Podium Limiter appears under Dynamics.

> **GAIN STAGING**
>
> Because the output is locked, the most common surprise is level: the processed signal is held well below full scale inside the circuit and brought back up by **Make-up Gain**. Set Make-up Gain so the meter's OUT reading roughly matches its IN reading, then use **Output Level** for the final trim.

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