

Desert Moon Audio

PUSH PULL

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Push-Pull Tube / Passive EQ



The passive program equalizer is the one every studio kept. Four knobs, three switches, and the same trick for seventy years: boost and cut the same low frequency at once and the bottom gets bigger while the mud gets out of the way. Push Pull is that circuit — the passive network solved node by node, the push-pull tube amplifier that makes up its loss, and the output iron that gives it weight — with a drive control of its own.

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A NOTE ON THE MODEL

Push Pull is an original Desert Moon Audio design: a circuit model of a passive program-equalizer topology. The boost and attenuate networks are solved by nodal analysis of real component values, and the amplifier and transformer stages are modelled from how push-pull triodes and iron physically behave — nothing in it is a curve drawn to look right.

1.1 What Gets Installed

FORMAT	LOCATION
Audio Unit	/Library/Audio/Plug-Ins/Components/Push Pull.component
VST3	/Library/Audio/Plug-Ins/VST3/Push Pull.vst3
AAX	/Library/Application Support/Avid/Audio/Plug-Ins/Push Pull.aaxplugin
VST3 (Windows)	C:\Program Files\Common Files\VST3\Push Pull.vst3
AAX (Windows)	C:\Program Files\Common Files\Avid\Audio\Plug-Ins\Push Pull.aaxplugin

After installing, restart your DAW or rescan its plug-in list. Push Pull appears under **Desert Moon Audio**. Mono and stereo tracks are both supported; on stereo tracks the two channels run through matched independent circuits.

2.1 Five Minutes In

Put Push Pull on the bass or the kick. Load the factory preset **Low End Trick**. Play.

What you should hear: the bottom octave gets bigger and the region just above it — the boxy part around 300–600 Hz — steps back at the same time. That is the point of this circuit: the LOW **BOOST** shelf begins lower than the LOW **ATTEN** shelf, so running both at once redistributes energy from the mud into the fundamental instead of cancelling out.

Now go to the top. Set HIGH FREQUENCY to **10** or **12** and bring HIGH **BOOST** up with **BANDWIDTH** towards BROAD: air without hash. Then dial in a little HIGH **ATTEN** at 20 to take the glare off the very top. Boost and attenuate on the high band are meant to be used together.

Finally, **IRON** on the lower panel. At zero the tube stage sits at its calibrated operating point — barely a whisper of second harmonic. Push it and the push-pull output stage and its transformer lean in, most of all in the bass.

2.2 Resizing

Drag the window's corner. The panel keeps its shape and every control scales together; the size is remembered per session. The grey button at the bottom-left of the blue panel folds the lower panel away when you only want the rack unit on screen.

DEFAULTS

Double-click any knob to return it to its resting position. The host's own bypass control and the OFF/ON switch on the panel drive the same parameter, so neither fights the other, and bypass is time-aligned to the plug-in's latency so comparisons are honest.

1.2 The 14-Day Trial

Push Pull runs **fully featured for fourteen days** from the first time it loads — every control, every preset, nothing muted and nothing held back. The strip along the bottom edge of the panel — **TRIAL – 14 DAYS** — counts the days down. When the trial ends the plug-in stays in your sessions but passes audio through dry until a license is entered, so a session opened later is never damaged — just dry. Licenses are sold at **desertmoonaudio.com**.

1.3 Entering Your License

Your license key is in the order email: one long line beginning DMA1-. Click that strip, paste the key in and press **Activate**. The first activation on a machine takes one quick internet check, which registers this computer against your key; from then on the plug-in runs fully offline, apart from its once-a-day update check. There is no account and no dongle. One key covers every format — Audio Unit, VST3 and AAX — and is kept in
~/Library/Desert Moon Audio/PushPull/ on macOS.

1.4 Seats and Moving Machines

One key activates **up to four computers you personally own** — a studio desktop, a laptop and a couple of spares. To move to a new machine, open the preset bar's menu on the old one and choose **Deactivate This Machine...**; that hands the seat back at once and returns that copy to trial mode. If the old machine is gone — sold, wiped or dead — write to **info@desertmoonaudio.com** with your order number and the seat is released by hand.

1.5 Updates and Support

Updates are free for as long as you own the plug-in. Push Pull checks once a day for a newer version and shows a small notice on the panel when one exists; download the current installer and run it over the top — nothing needs to be uninstalled and your presets stay where they are. Questions, problems or a lost key:
info@desertmoonaudio.com.



- 1 **Preset bar** — step, pick, save, revert, A/B, undo, redo
- 2 **LOW BOOST** — shelf lift at the CPS frequency, 0–10
- 3 **LOW ATTN** — shelf cut, beginning higher than the boost
- 4 **HIGH BOOST** — peak at the KCS frequency, 0–10
- 5 **HIGH ATTN** — shelf cut at the ATTEN SEL frequency
- 6 **ATTEN SEL** — 5, 10 or 20 kc for the high attenuate
- 7 **IN** — EQ network in or out; the amplifier stays in
- 8 **LOW FREQUENCY** — 20, 30, 60 or 100 cps
- 9 **BANDWIDTH** — width of the high boost, SHARP to BROAD

- 10 **HIGH FREQUENCY** — 3, 4, 5, 8, 10, 12 or 16 kc
- 11 **OFF / ON** — power; the host's bypass, with the pilot lamp
- 12 **Lower-panel button** — folds the lower panel away
- 13 **RESPONSE** — the live curve of the network
- 14 **IRON** — level into the tube stage, -12 to +24 dB
- 15 **OUTPUT** — trim after the amplifier, ±24 dB
- 16 **MIX** — parallel blend, phase-aligned
- 17 **OVERSAMPLING** — 1×, 2×, 4× or 8×

4.1 How the Signal Runs

Input transformer, passive equalizer network, push-pull tube amplifier, output transformer. Nothing in the network amplifies: it can only lose signal, about 20 dB of it at rest, and the amplifier puts that back. Every curve the panel draws is a consequence of resistors, capacitors and an inductor sharing that loss unequally.

4.2 The Passive Network

Push Pull does not approximate the curves with digital filters. The network is entered as a circuit — the boost and attenuate potentiometers, the switched capacitors, the tapped inductor of the high boost and its bandwidth resistor — and solved by nodal analysis every time a control moves. The component values are those of a real passive network, and the solution is discretised with the resonance pre-warped so the high peak lands exactly where the circuit puts it. What you get for free is every interaction a real passive network has: the low boost and cut overlapping into the low-end trick, the high boost and cut fighting for the same node, the bandwidth control changing the peak's height along with its width.

4.3 The Push-Pull Amplifier

Two triodes in push-pull make up the network's loss. Push-pull cancels most of the even-order distortion, so at line level the stage is very clean — a whisper of second harmonic from the imperfect balance, third above it, both far below audibility. That is the calibrated operating point, IRON at zero. Turn IRON up and the stage runs toward its knee, the harmonics rise, and the sound thickens the way a tube line amplifier does when the input is hot.

4.4 The Iron

The output transformer's core saturates on flux, and flux is the integral of voltage: for the same level, a low note pushes the core far harder than a high one. So the transformer distorts in the bass and stays clean on top, and a big LOW BOOST drives it harder still. Push Pull models the core as a soft-saturating flux path with both odd and even terms, with the roll-off of the primary inductance at the very bottom. This is the weight in a passive equalizer's bottom end, and it is why the bass sounds bigger through Push Pull than the curve alone explains.



Boost and attenuate for both bands. On the low band, run both at once for the trick; on the high band, boost a lower frequency while attenuating a higher one.

LOW FREQUENCY

20 · 30 · 60 · 100 CPS

Selects the capacitors for both low controls. The number is the nominal shelf; the boost's turnover sits well above it and the attenuate's higher still, which is what makes them interact.

LOW BOOST

0 – 10 · to +16 dB

A broad shelf rising toward the selected frequency. Audio-taper: the first few numbers are subtle, the last few are not.

LOW ATTEN

0 – 10 · to –20 dB

A shelf cut whose corner is roughly twice the boost's. Alone it cleans the bottom; with the boost it makes the trick.

HIGH FREQUENCY

3 · 4 · 5 · 8 · 10 · 12 · 16 KCS

Selects the capacitor and inductor tap for the high boost. Each position has its own resonant character; 16 is the sharpest.

HIGH BOOST

0 – 10 · to +20 dB

A resonant peak at the selected frequency. Its shape depends on BANDWIDTH and, because they share a node, on HIGH ATTEN.

BANDWIDTH

SHARP – BROAD

The series resistance in the resonant branch. SHARP is a tall narrow peak of about 20 dB; BROAD lowers it to about 12 and widens it into a gentle lift. Most air moves are made toward BROAD.

ATTEN SEL

5 · 10 · 20 KCS

The corner of the high attenuate shelf. 5 reaches down into the presence region; 20 only touches the top octave.

HIGH ATTEN

0 – 10 · to –20 dB

A shelf cut above the selected frequency. Boost at 10 and attenuate at 20 is the classic "bright but not harsh" move.

IN

toggle

Engages the equalizer. Switched out, every boost and attenuate returns to zero but the tube amplifier and transformers stay in the path — the colour without the curve.

OFF / ON

power

The host's bypass, dressed as a power switch. OFF passes the input through untouched, delayed to the reported latency so nothing shifts, and the pilot lamp goes dark.



The bottom row: the CPS lever, BANDWIDTH, the KCS lever. The levers step; drag or click and drag to move them.



The additions live below the rack unit.

6.1 RESPONSE

The true curve of the circuit, and an editor as much as a display. Three handles sit on the line: low shelf, high peak, high shelf. Drag up or down for boost or attenuate, sideways for frequency. On the low handle, above the line is BOOST and below it ATTEN; shift moves both for the trick. On the peak, option-drag or scroll for BANDWIDTH. Double-click zeroes a handle. Behind the curve runs a spectrum analyser, input in grey and output in the curve's colour; in DUAL or M/S the other channel's curve is dashed.

6.2 IRON

Level into the tube stage, -12 to +24 dB, compensated so the knob changes texture rather than loudness. Zero is the calibrated operating point; up from there the push-pull stage and the iron lean in, bass first.

6.3 OUTPUT and MIX

OUTPUT trims ± 24 dB after everything. MIX blends against a delay-matched dry copy, so a parallel blend never comb-filters.

6.4 IRON

A moving-coil meter of the flux in the output transformer's core. Into the red the bass thickens; pinned, it folds.

6.5 OVERSAMPLING

1× to 8× around the whole circuit. 2× is the default and keeps the 16 kc peak exact at 44.1 and 48 kHz; 4× and 8× for mastering or heavy IRON; 1× is latency-free. A machine preference, not stored in presets.

6.6 STEPLESS

The frequency selectors stop being switches: the levers sweep continuously, and because the equalizer is solved from component values, every in-between setting is the real circuit with in-between parts, not a crossfade. Travel runs half a step past each end, about 16 cps to 18 kc. The frequency is written under each lever.

6.7 CHANNELS

STEREO: one set of controls for both channels. **DUAL:** left and right each have a complete set. **M/S:** the same for mid and side — air on the sides, weight in the middle. EDIT picks which channel the knobs and curve show; COPY sends it to the other. Both sets automate and save.

6.8 AUTO GAIN

Matches the processed loudness to the dry over about a second, up to 20 dB either way, so OFF and ON compare tone, not level. The correction shows under the key; OUTPUT still trims on top.

6.9 VINTAGE and NOISE

VINTAGE gives every capacitor, inductor and pot a few percent of tolerance, differently per channel and per instance, and unbalances the push-pull pair a touch.

NOISE adds tube hiss and a whisper of hum near -80 dBFS. Both default off.



The preset bar: previous, next, the readout, A/B, undo, redo, save, revert, menu.

The bar across the top carries the whole preset system. Arrows step through the list; the glowing readout names what is loaded, with a dot when you have edited it; click the readout for the full menu. The keys on the right: **A/B** flips between two scratch settings — tweak one, flip, and hear them against each other; they start as twins and diverge as you edit, and neither is saved anywhere. **Undo** and **redo** walk the edit history — a knob drag is a few steps, not hundreds, and a preset load is one. The disk saves under a name; the ring puts back the loaded preset, discarding edits; the stacked bars open the menu.

Your saved presets live in ~/Library/Application Support/Desert Moon Audio/PushPull/Presets as .pppreset files — plain XML, safe to share, visible from every session and every host. Power and oversampling are not part of a preset.

7.1 The Factory Bank

Front Panel Everything at rest. The amplifier and iron alone. FLAT · IN · IRON 0	Low End Trick The signature move: bigger bottom, mud stepped back. 60 CPS · BOOST 6 · ATTEN 4
Kick Weight Weight at 60 with the box cut, and a little snap at 5. 60 CPS · B 5 · A 3 · 5 KC B 3 · BW 4	Bass Bloom 30-cycle bloom under the fundamental, a touch of drive. 30 CPS · B 4 · A 2 · 3 KC B 2 BROAD · IRON +2
Vocal Air Broad lift at 12, glare taken off at 20, a little chest removed at 100. 100 CPS A 2 · 12 KC B 4 BROAD · 20 KC A 1	Mix Bus Sheen A whisper of 20 cps and a wide 16 kc lift. 20 CPS B 2 · 16 KC B 3 · BW 9
Snare Crack Sharp 5 kc peak, driven, a hair of body at 100. 100 CPS B 2 · 5 KC B 6 SHARP · IRON +3	Acoustic Guitar Boom out at 100, presence in at 10, wide. 100 CPS A 3 · 10 KC B 4 · BW 6
De-Mud Five of attenuate at 100 and a small 8 kc lift: the honest cleaner. 100 CPS A 5 · 8 KC B 2 · OUTPUT +1	Tube Only EQ switched out; the amplifier and transformers pushed 8 dB. IN OUT · IRON +8 · OUTPUT -8
Mastering Air M/S, stepless: a wide sliver of air on the mid, more on the sides, auto gain on. M/S · STEPLESS · AUTO GAIN	Wide Sides Weight in the middle, the sides cleaned and opened. M/S · MID B 3 A 2 · SIDE A 6 · 12 KC B 5
Old Iron Vintage tolerances, hiss and hum, the amplifier working. VINTAGE · NOISE · 60 CPS B 4 A 2 · 8 KC B 3 · IRON +5	Parallel Thump Slammed low boost and drive at 40 % mix, for under a drum bus. 60 CPS B 8 A 5 · 5 KC A 6 · IRON +6 · MIX 40

8.1 The Low-End Trick, Properly

Pick the CPS position nearest the instrument's fundamental — 60 for most kicks and basses, 30 for an 808, 100 for a boxy guitar. Bring BOOST up until the bottom is where you want it, then bring ATTEN up until the mud above it gets out of the way. Because the two shelves overlap differently, ATTEN can go surprisingly high before it eats the boost. Level-match with OUTPUT before judging.

8.2 Air on a Vocal or a Mix

HIGH FREQUENCY at 10, 12 or 16, BANDWIDTH toward BROAD, BOOST to taste. Then ATTEN SEL at 20 and a little HIGH ATTEN: the lift stays, the fizz goes. This is the "bright but never harsh" setting, and it is a genuine interaction of the two networks, not two filters in series.

8.3 Presence Without Peaking

For snare and electric guitar, HIGH FREQUENCY at 3, 4 or 5 with BANDWIDTH mid-way gives a wide presence lift; sharper settings ring, which is sometimes the point.

8.4 Just the Tubes

Switch IN out, raise IRON, and pull OUTPUT back. With no curve at all the push-pull stage and the iron thicken the bass first and leave the top alone. Load **Tube Only** and blend with MIX.

9 Specifications

ITEM	DETAIL
Formats	Audio Unit, VST3 and AAX on macOS (universal binary, Apple Silicon and Intel); VST3 and AAX on Windows
Buses	Mono or stereo; independent circuits per channel
Equalizer	Nodal-analysis circuit model of the passive network, re-solved on every control change
Low band	Shelf boost to +16 dB and attenuate to -20 dB at 20, 30, 60, 100 cps
High band	Peak boost to +20 dB at 3, 4, 5, 8, 10, 12, 16 kc with continuous bandwidth; shelf attenuate to -20 dB at 5, 10, 20 kc
Amplifier	Push-pull triode model with a clean calibrated line-level operating point; IRON -12 to +24 dB
Transformer	Flux-domain core saturation, odd and even, 2.5 Hz primary roll-off; IRON flux meter
Frequencies	Switched, or STEPLESS: continuous component interpolation, ~16 cps – 18 kc
Channels	Stereo, dual mono, or mid/side, each with its own complete control set
Display	Editable circuit response with three handles; 4096-point spectrum analyser, input and output
Extras	Auto gain (± 20 dB loudness match), VINTAGE tolerances, tube hiss and hum
Oversampling	1 $\times$, 2 $\times$ (default), 4 $\times$, 8 $\times$; polyphase IIR
Latency	0 / 4 / 6 / 6 samples, reported; dry path and bypass aligned
Bandwidth	Flat to 40 kHz at 96 kHz and above
Automation	Every control; click-free bypass; smoothed parameters

Desert Moon Audio

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Desert Moon Audio · Los Angeles, California · info@desertmoonaudio.com

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