

FORM DSP

PUSH

LOUDNESS & DENSITY SHAPING PROCESSOR



User Manual · Version 0.5.0

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1 What PUSH is

PUSH is a mix bus tool for one job: making a signal louder and denser without making it sound like an effect.

It belongs to the same family as Saturn, bx_saturator or Spectre, not to the family of creative destroyers. That decision runs through the whole design: everything PUSH does is meant to be judged at matched loudness, and what it says about its own output level comes from measurement.

Most of the time you will reach for it with a single thought in mind:

I need this louder and denser. Put PUSH on it.

That is the job. PUSH offers three different ways of doing it, but not three different jobs.

What it actually does

PUSH does not simply turn the signal up to make it louder. It shapes the dynamics so that the peaks come down while the body stays where it is, and the result is a signal whose average level can sit higher without its peaks going anywhere. The difference between peak and average is called the crest factor, and reducing it is what creates perceived loudness.

Because the peaks come down rather than the body going up, you gain headroom as well as loudness. Which of the two you take is up to you: leave the level where it is and the material is louder, or switch on MATCH and take the same amount as headroom instead.

A side effect of shaping a waveform is harmonic content. PUSH treats that as something you choose rather than something you tolerate, which is what CHARACTER and SHAPE are for.

What it is not

PUSH is deliberately not a saturation toolbox. It is not an exciter, not a transient designer, not a vintage emulation, and not a general distortion unit. Where a feature would answer a different question than "how do I get this louder and denser", it belongs in a different plug-in.

It also contains no internal limiter. TP SAFE is a protective stage, off by default, and section 5.9 sets out what it does and where its limit sits.

One thing to know before you start

PUSH is level dependent. Its knee sits at a fixed point, so the input level decides how much of the curve your material actually reaches. On quiet material PUSH is mostly an amplifier, and there is not much to gain. This is a property of the design, not a fault, and section 10 gives the measured numbers.

2 Quick start

Six steps. Two minutes. The reasoning behind each one is in section 4.

1. **Put PUSH on the bus or track you want denser.** It works on single tracks, but it was built for the mix bus and the master.
2. **Check the input meter.** The left pair of numbers is short-term loudness in LUFS and true peak in dBTP. PUSH has a fixed threshold, and it is a *peak* threshold, so watch the dBTP number rather than the LUFS number. If the peaks are not reaching roughly -6 dBTP, bring them up with INPUT TRIM before you do anything else.
3. **Leave CHARACTER on CLEAN** for now. It is the reference mode: the least audible colour for a given amount of effect.
4. **Turn PUSH up** until CREST REDUCTION reads somewhere between 1 and 3 dB. Watch the transfer curve while you do: the bright band shows how far into the curve your material is actually running.
5. **Switch MATCH on and off.** With MATCH on, the output is as loud as the input, so what you hear is the difference PUSH made and not the fact that it got louder. This lets you judge the processing without the loudness difference in the way.
6. **Now try COLOR and EDGE** at the same setting. They cost different things and give different things; section 5.2 says which.



The whole window. PUSH at 62 %, CLEAN, with programme material running: +2.4 LU louder and 2.0 dB less crest.

3 How it works

3.1 The signal chain

Everything happens at four times the project sample rate by default, and the order of the stages is deliberate. Reading it once makes the rest of the manual shorter.

-
- | | | |
|---|------------|--|
| 1 | INPUT TRIM | Sits before everything, including the dry copy. It is the input of the plug-in, not a wet gain, so it moves the working point of the whole unit. |
|---|------------|--|
-
- | | | |
|---|------------|---|
| 2 | Band split | Optional, off by default. A linear phase crossover at 120 Hz that keeps the low end out of the shaping. |
|---|------------|---|
-
- | | | |
|---|-----------|---|
| 3 | The curve | One of three families, chosen by CHARACTER, with SHAPE adjusting its form. This is where loudness and density are made. In CLEAN only, 2 dB is taken out below 150 Hz in front of the curve and put back exactly behind it (section 3.3). |
|---|-----------|---|
-
- | | | |
|---|----------------|---|
| 4 | Output ceiling | A soft ceiling on the wet sum, after the rate conversion. It has to sit there: converting back down is what creates the overshoot in the first place. |
|---|----------------|---|
-
- | | | |
|---|-----|--|
| 5 | MIX | The dry path is delayed by the exact total latency, so the blend is sample accurate. |
|---|-----|--|
-
- | | | |
|---|-------------|---|
| 6 | OUTPUT TRIM | After the ceiling and after the blend. A real fader that does what you set. |
|---|-------------|---|
-
- | | | |
|---|-------|---|
| 7 | MATCH | Optional, off by default. Takes the loudness gain back out so you can judge the sound instead of the level. |
|---|-------|---|
-
- | | | |
|---|---------|---|
| 8 | TP SAFE | Optional, off by default. Look-ahead true peak reduction, last in the chain because a promise about the plug-in output can only hold there. |
|---|---------|---|
-

Two things hold at every setting. With PUSH at 0, MIX at 0 and both trims at 0, the chain nulls exactly against its input. And without TP SAFE, processing keeps the *sample* peak below 0 dBFS, not the true peak. Section 5.9 explains the difference and why it matters.

3.2 Why shaping dynamics makes things louder

A limiter makes something louder by removing the peaks that stop you turning it up. It works, and past a certain amount it starts to pump, dull the transients and flatten the front edge of everything.

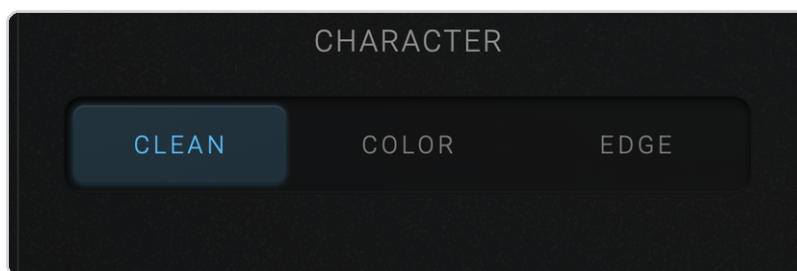
PUSH takes a different route. Instead of reacting to the signal over time, it applies a fixed curve to it: every sample is mapped through the same shape, regardless of what came before. Loud samples are pushed down more than quiet ones, which lowers the peak without touching the average by anything like as much. Nothing releases, nothing recovers, and there is no time constant to get wrong.

The price is harmonic content. Bending a waveform adds harmonics that were not there, and how much you get, and of which order, is exactly what separates the three characters.

This is also why PUSH behaves differently on different material. A fixed curve means the input level decides how far into the shape the signal runs. The effect depends more on the crest factor of your material than on its level, and there is no single correct input level to aim for.

3.3 The three characters

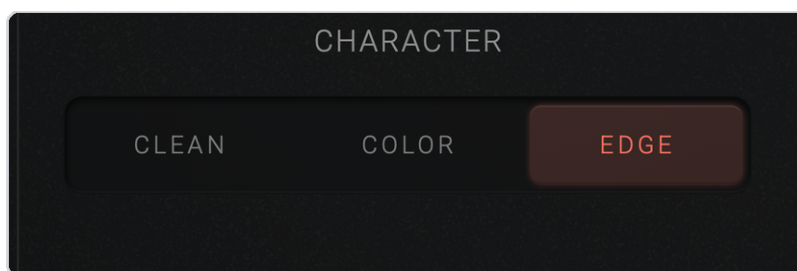
All three answer the same question. They differ in what they charge for the answer.



CLEAN is the reference: preserve, then shape. It stays restrained at lower amplitudes and concentrates its work on the peaks, which is why it reads as density rather than as colour. It produces odd harmonics only, at every setting. If you are not sure which to use, this is the one.

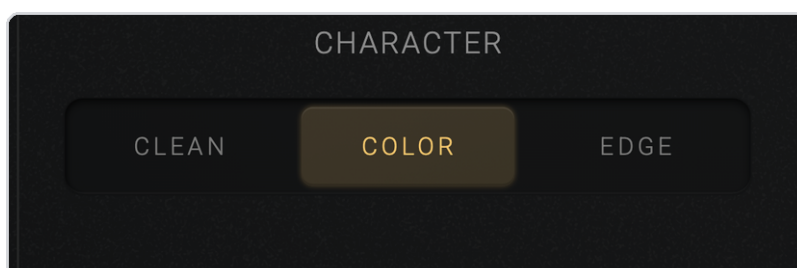
It is not the strongest of the three. At full travel CLEAN gives about +2.9 LU on percussive material where EDGE gives +4.8 and COLOR +4.2. That is deliberate: pushing CLEAN to match a more aggressive mode would mean driving it far enough to lose the very property it exists for.

A quiet low end is part of CLEAN, and only CLEAN. Before the curve, 2 dB is taken out below 150 Hz and put back exactly afterwards. The frequency response is unchanged, but the curve sees less bass, so bass-driven intermodulation drops. COLOR does not get this: there the same move costs 0.93 dB *more* intermodulation.



EDGE pushes into the boundary. It is exactly linear below its knee and firmly shaped above it, so quiet passages pass untouched and the distortion sits entirely on the peaks, which is how a soft clipper in front of a limiter behaves. Above the knee a residual slope remains, so peaks that went in at different levels still come out at different levels. It is the strongest of the three: at full travel it reaches about +4.8 LU where CLEAN reaches +2.9.

EDGE answers two different questions two different ways. Set it to match CLEAN's *crest reduction* and it produces more distortion. Set it to match CLEAN's *loudness* and it produces less, and up to about +3 dB of gain it is the cleanest of the three. Both statements describe the same curve at different working points, which is the whole point: the distortion is not in the amount, it is in how it is spread across the control's travel. Appendix A gives the figures and says what was measured.



COLOR saturates with character. It uses an algebraic curve that produces *even* harmonics, which is what makes it read as weight or warmth rather than as drive, and it colours where CLEAN is still holding back. SHAPE changes the kind of colour without touching the odd orders.

Across the PUSH control's travel the picture shifts: the even series stays put while the odd series climbs, and the two cross right at the top of the range. For the first 96 % of the travel COLOR is the even-harmonic character it is meant to be; at the very end it is not.

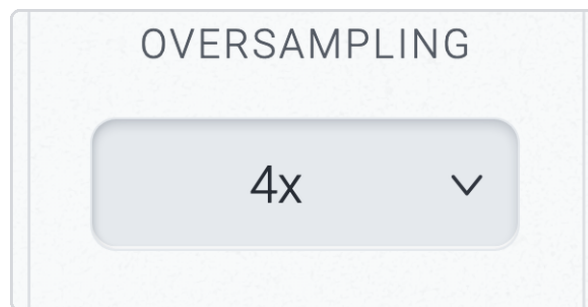
It also means that in COLOR, PUSH is mostly a compression control. Across its travel the total distortion moves by only about 2 dB, while crest reduction goes from 0.7 to 4.6 dB. The colour is there from the start; what you turn up is the density.

The knee position is not a separate control. It is the mechanism that makes the three characters distinguishable: early and soft for CLEAN, late and then steep for EDGE. Putting a knee control next to PUSH would give you two axes to trade off against each other, which is exactly what a tool that should be hard to misuse ought to avoid.

3.4 Oversampling and aliasing

Any non-linearity creates harmonics above the frequency it was fed. When those harmonics land above half the sample rate, they do not fade out as they would in an analogue circuit. They fold back into the audible range at full energy, and they arrive having lost any harmonic relationship to the note that produced them. That is aliasing, and it is what makes badly built distortion sound brittle and metallic.

PUSH runs its curve at a multiple of the project rate so that the harmonics it generates have somewhere to go. The filters are polyphase IIR, chosen because they cost very little latency compared to a linear phase design of the same steepness.



4x is the default and the right answer almost always. The reason to go higher is a specific one: high drive on bright material, where the curve generates harmonics far above the fundamental. The reason to go lower is a live situation where latency matters more than the last fraction of a decibel.

Higher oversampling does *not* reduce the true peak overshoot at the output. That overshoot is created by the rate conversion itself, which is why the output ceiling sits after it and why TP SAFE exists as a separate stage.

4 A way of working

Section 2 gave you the six steps. This section says why each one is in that order, which is what lets you leave the order when you have a reason to.

Set the input before you set anything else

PUSH has a fixed threshold. Where your material sits relative to that threshold decides how much of the curve it reaches, and therefore how much happens at a given setting of the PUSH control. Change the input level later and you will be re-doing every decision you made before it.

Use INPUT TRIM and watch the left pair of numbers. There is no single correct value: material with a high crest factor reaches further into the curve than dense material at the same loudness. What you are looking for is the point where the bright band on the transfer curve covers a useful part of the shape rather than huddling around the origin.

Choose the character before you choose the amount

The three characters do not share a scale. The same position of the PUSH control means different amounts of crest reduction in CLEAN, EDGE and COLOR, and at full travel EDGE is noticeably stronger than CLEAN. Pick the sound first, then find the amount inside it.

Turn it up until the number moves, not until it sounds good

This is the part that takes discipline. Louder always sounds better, so while the level is changing you cannot hear what the shaping is doing. Turn PUSH up watching CREST REDUCTION, and treat 1 to 3 dB as the range where a mix bus usually wants to live.

Then switch MATCH on and judge

With MATCH on, the output loudness equals the input loudness. The level difference is gone, and what is left is the actual difference PUSH made. This is where you find out whether you like it.

Two things become audible at this point that were hidden before. One is the colour of the character you chose. The other is what you gave up: with the loudness taken back out, a loss of attack or a dulled top end has nowhere to hide.

While MATCH is on, look at the two true peak numbers rather than the two loudness numbers. They are equally loud now by definition; the difference between the dBTP readings is the headroom you won.

It is the figure you would otherwise have to produce by hand, by pulling the output fader until the LUFS numbers matched.

Switch MATCH off again before you commit

MATCH is a judging aid, not a sound. Leave it on and you have a plug-in that shapes dynamics and then gives the loudness back, which is a valid thing to want but rarely what you reached for it to do. Decide with it on, print with it off, unless headroom was the point.

Reach for the rest only when something asks for it

SPLIT when the low end is being shaped more than you want. MIX when you want the original to stay and density to sit underneath. TP SAFE when the output is going somewhere that cares about inter-sample peaks. OVERSAMPLING higher when the material is bright and the drive is high. None of these are part of the normal path.

5 The controls

5.1 PUSH

Range	0 to 100 %
Default	0 %
Labelled	AMOUNT

The main control, and on most days the only one you will touch. It sets how hard the material is driven into the curve that CHARACTER selected.

At 0 the plug-in nulls exactly against its input, provided MIX and both trims are also at 0. There is no residue, no rounding, and nothing at all happens to the signal.

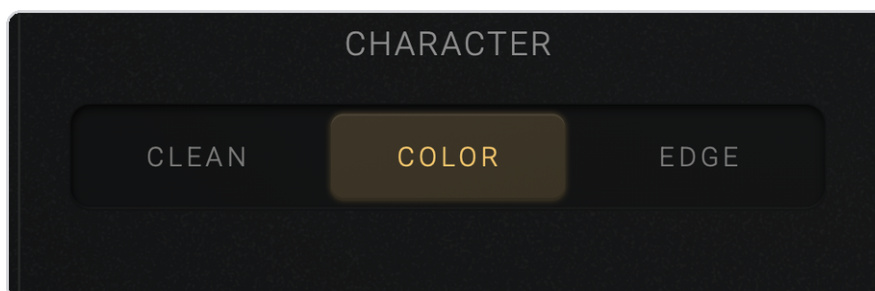


The travel ends earlier than it used to. What used to sit at 90 % is now the full stop, because the top of the old range was a state almost nobody wanted: it cost about 5 dB of intermodulation and 5 dB of aliasing to buy 0.2 dB of extra effect.

The ring around the knob shows the position. The number above it can be typed into: double-click and enter a value.

5.2 CHARACTER

Options	CLEAN, COLOR, EDGE
Default	CLEAN



Chooses which family of curves does the work. Section 3.3 describes what each one sounds like and what it costs; this is the short version.

MODE	USE IT WHEN	AVOID IT WHEN
CLEAN	You want density without a colour of its own. The default and the reference: the least colour per decibel of effect.	You wanted to hear that something happened.
COLOR	You want weight and warmth. Even harmonics, which read as body rather than as drive.	The material is already thick, or you need the effect to stay invisible.
EDGE	You want the peaks handled and the quiet parts left alone. Exactly linear below the knee, so low-level detail passes untouched.	You are pushing hard for density: at matched crest reduction it is the most distorted of the three.

The whole interface takes its accent colour from this choice: blue for CLEAN, gold for COLOR, red for EDGE. It is a reminder of which curve you are on, visible from across the room.

Changing CHARACTER changes what SHAPE does, and its labels change with it. It does not change what PUSH does, but the same position of the PUSH control will not give you the same amount of crest reduction in a different mode.

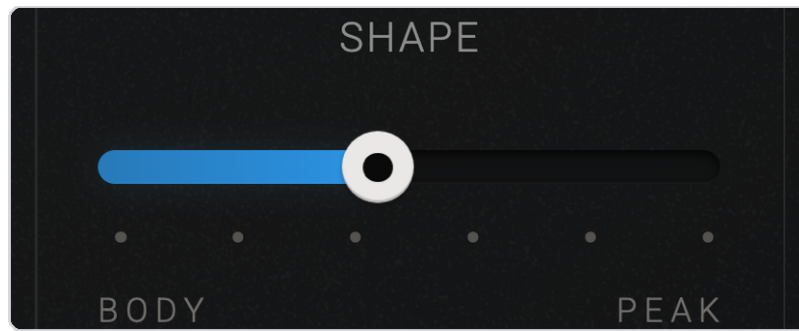
5.3 SHAPE

Range	0 to 100 %, with five detents
Default	0 %
Labels	change with CHARACTER

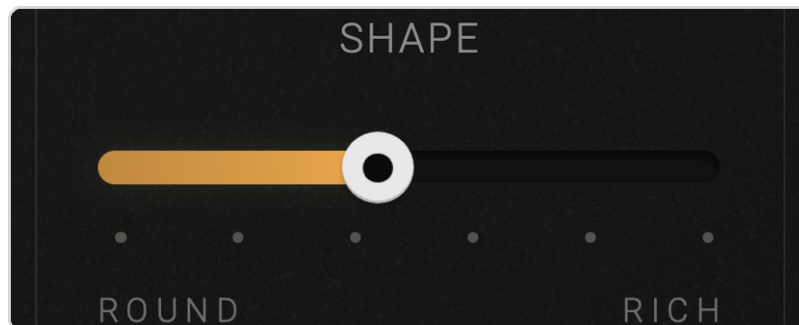
SHAPE changes how it sounds, not how much it does.

That is the intent, and in COLOR it holds to a figure: across the full travel of SHAPE, crest reduction moves by at most 0.08 dB while the tonal balance moves by several decibels. You set the amount with PUSH and then shape the sound without the amount drifting underneath you.

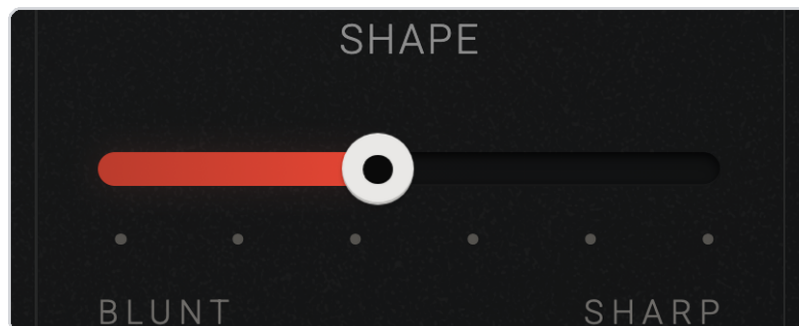
CLEAN and EDGE are documented exceptions, and for the same reason: in both, SHAPE moves a knee, and a knee is a mechanism of effect rather than of tone. Both are stated as measured figures below rather than as a promise the control does not keep.



CLEAN: BODY to PEAK. Moves the knee, not the amount of harmonics. At BODY the curve bends everywhere and there is no threshold; at PEAK it is exactly straight below the knee and shapes only above it. Both ends are odd only, so CLEAN never produces even harmonics at any setting.



COLOR: ROUND to RICH. Changes the kind of colour rather than the amount. Towards RICH the higher even orders come up by 5 to 7 dB while the second harmonic stays put: from a single octave to a graded series.



EDGE: BLUNT to SHARP. Sets how sharp the knee is.

What the two exceptions cost, measured. In **EDGE**, SHAPE moves crest reduction by up to 0.51 dB across the full travel, measured across five pieces of material and three working points; on the two masters in that set it was 0.28 and 0.43 dB. In **CLEAN** it is 0.58 to 0.69 dB across three pieces of material, and on one of them the sign reverses along the travel. The display carries it either way: turn SHAPE and CREST REDUCTION moves with it, so you can correct with PUSH.

At PEAK, CLEAN enters hard. With the knee at its latest position the curve is exactly straight below it, so the transition is a step rather than a fade: distortion rises by about 116 dB within a single decibel of input. A smoother entry was built and measured better, but it sounded less transparent at exactly the point CLEAN exists for, so it was not kept.

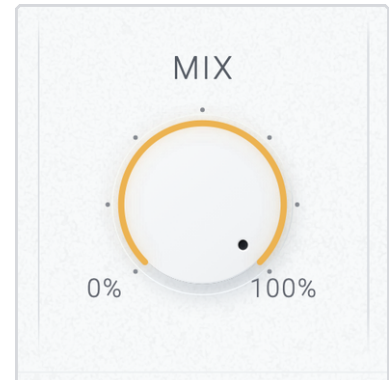
5.4 MIX

Range 0 to 100 %

Default 100 %

Blends the shaped signal with the original. The dry path is delayed by the exact total latency of the chain, so the blend stays sample accurate and nothing smears.

At 100 % you hear only the processed signal. At 0 % you hear only the dry path. With INPUT TRIM at 0 dB that dry path is the plug-in input, and the chain nulls against it exactly; with INPUT TRIM set, the dry path carries that gain too, because the trim sits before the dry copy is taken.



The interesting use is parallel. Take EDGE near the top of its travel, where it is barely a loudness tool any more and shapes hard, then bring MIX down to around 20 %. The original stays intact and density sits underneath it rather than replacing it. The SPICE factory preset does exactly this, at 76 % drive and 21 % mix.

This is why the top of the PUSH control's travel was kept even though it gives little in series. It has a different purpose, and that purpose needs the position.

5.5 INPUT TRIM and OUTPUT TRIM

Range -12 to +12 dB, both

Default 0 dB, both



Built the same, doing different jobs: one sets the working point, the other sets the output level.

These are gain staging, not a second drive control. PUSH changes the *shape* of the curve; the trims change the *working point* on it.

INPUT TRIM sits before the dry copy, which makes it the input of the plug-in rather than a wet gain. It moves the whole unit, including the dry path, and it is the control that decides how far into the curve your material runs. This is the one that matters.

OUTPUT TRIM sits after the ceiling and after the blend. It is a real fader: it does what you set, and it does not feed back into the shaping. It stays a real fader even with MATCH on, where output loudness equals input loudness plus whatever you set here.

At exactly 0 dB, and with no ramp running, the trims do not multiply at all. A multiplication by 1.0 would contribute its own rounding, and the null test at PUSH 0 would no longer be exact.

The mark on the input trim. A separate true peak detector sits *before* INPUT TRIM and places a mark on the control showing how much headroom the incoming material has. It has to sit there: computed from the post-trim signal it would be a distance from the current knob position and would move as you turned the knob back.

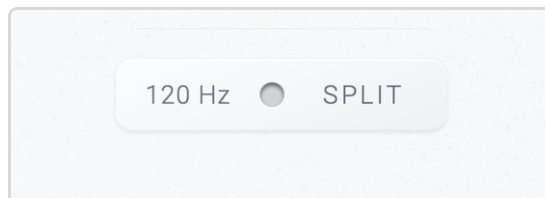
5.6 SPLIT

Crossover 120 Hz

Default Off

Keeps the low end out of the shaping. With SPLIT on, everything below 120 Hz bypasses the curve and is added back afterwards.

The crossover is a linear phase perfect reconstruction bank implemented as an FFT convolution. It morphs without clicks, and at every intermediate position the sum is exactly the delayed input signal rather than an approximation of it.



When to use it: full mixes with strong low end, where the bass is doing most of the driving and is getting most of the shaping as a result. Kick and bass reach further into the curve than anything else in a mix, and without a split they set the working point for everything.

When not to: on a single track that has no low end to protect, and on material where the weight *is* the point. Three of the six factory presets use it, three do not.

5.7 OVERSAMPLING

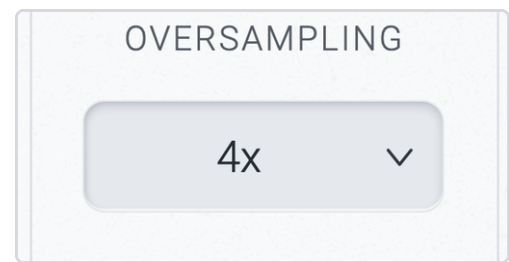
Options Off, 2x, 4x, 8x

Default

4x

Sets how far above the project sample rate the curve runs. Section 3.4 explains why that matters; this is when to change it.

Leave it at 4x unless you have a reason. It is the point where the aliasing products are far enough down that the material covers them.



Go higher for high drive on bright material, particularly EDGE near the top of its travel, where the knee generates harmonics well above the fundamental.

Go lower when CPU matters, not when latency matters. The oversampling filters contribute 6 samples of the roughly 1250 that PUSH reports, so turning them down saves almost nothing in delay and costs a great deal in aliasing. What it does save is processing load, and that is the only good reason to reach for it.

5.8 MATCH

Default

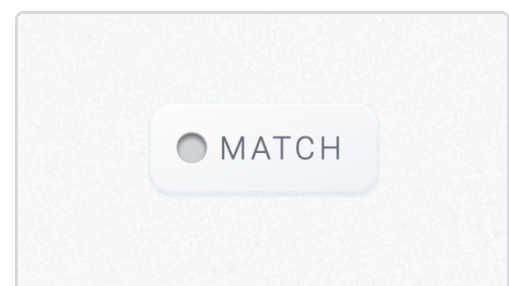
Off

Measures over

3 s window

Takes the loudness PUSH added back out. What comes out is as loud as what went in.

It answers the question you actually have while comparing: louder always sounds better, and as long as a level difference is audible you cannot say anything about the sound.



It answers the question you actually have while comparing. Louder always sounds better, and as long as a level difference is audible you cannot say anything about the sound. MATCH removes the illusion, and what remains is the real return: **same loudness, smaller true peak**.

With MATCH on, PUSH has a second job that is really the same job. Instead of making the material louder, it hands you the loudness gain back as headroom.

Three conditions, all of which matter.

How much headroom you get depends on the input level. Measured across four pieces of material at 90 % drive:

Input	CLEAN	EDGE	COLOR
-24 LUFS	-0.06 dB	-0.34 dB	-0.54 dB
-18 LUFS	+0.64 dB	+1.49 dB	+0.30 dB
-12 LUFS	+2.87 dB	+5.09 dB	+3.70 dB
-9 LUFS	+4.68 dB	+6.32 dB	+5.42 dB

On quiet material there is nothing left over, and at -24 LUFS the figure is slightly negative. That is the level dependence from section 1 showing itself: down there PUSH is mostly an amplifier, and what was only amplified gives nothing back when you take the amplification away.

It does not apply for the first three seconds. MATCH measures over a three second window, and before that window is full there is no three second figure to use. The stage passes through unchanged until it fills. This is the same rule that makes the numbers show a dash during that time.

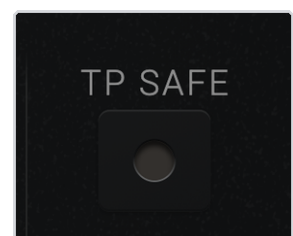
OUTPUT TRIM still shifts it, deliberately. Output loudness equals input loudness plus OUTPUT TRIM. Leave the trim at 0 and you can read the promise straight off the panel: the two LUFS numbers stand equal.

5.9 TP SAFE

Default	Off
Look-ahead	2 ms

Actively pulls down inter-sample peaks at the plug-in output instead of only showing them. It sits last in the chain, after OUTPUT TRIM and after MATCH, because a statement about the plug-in output can only hold at the output.

A digital signal only defines the sample values. The analogue waveform a converter reconstructs between them can go higher, and that is an inter-sample or true peak. Encoders see it too, which is why MP3 and AAC conversion can clip material that looked legal.



It is a reliable guard, not an absolute guarantee. On all three reference materials it holds the output below 0 dBTP, including with the output trim raised. A single event very close to Nyquist is still read

about 0.22 dB too low, and established reference products behave the same way on comparable signals. If you need hard 0 dBTP compliance for broadcast or streaming, verify at the output yourself.

On a lot of material it does nothing, and that is correct. Inter-sample overshoot comes from energy near Nyquist. Band-limited material, such as resampled loops or anything from a sample pack with capped bandwidth, barely produces it: measured overshoot there is +0.0001 dB, while sharp transients at an *identical sample peak* reach +4.42 dB. If you switch TP SAFE on and hear no difference, you are looking at a correctly working switch, not a broken plug-in.

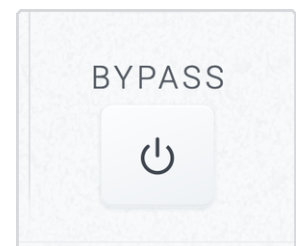
Switching it on is audible. The gain factor jumps by around 4.9 dB in a single sample, and that cannot be ramped without losing the promise in the first sample. Switching off fades out smoothly. At 96 kHz with very small buffers, switching costs a dropout: set TP SAFE before you play, not during.

The reported latency includes the look-ahead **always**, even with the switch off — a plain delay runs there instead. Switching TP SAFE therefore never changes the plug-in's latency and never makes your host re-align anything.

5.10 BYPASS

Passes the input through, delayed by the full reported latency so that the comparison is time aligned and the switch is click free.

Use your host's bypass if you want the plug-in taken out of the chain entirely. Use this one if you want to compare, because it keeps the timing intact.



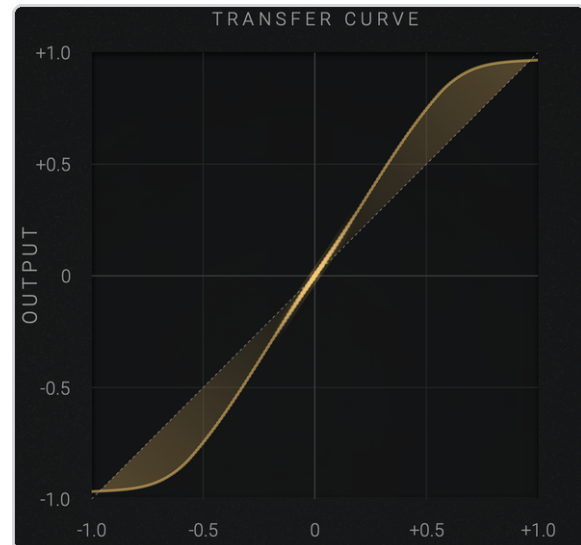
6 The displays

PUSH shows you what the curve does and how far your material runs into it. It does not tell you how far it ought to run. That decision stays yours.

6.1 The transfer curve

Input across, output up. The line is the curve that CHARACTER and SHAPE currently describe, and it moves as you turn them.

The bright band is the part of the curve your material is actually using, updated live. It is the single most useful thing on the panel: a band hugging the origin means the signal is not reaching the shape and you should bring the input up, while a band spread across the whole curve means it is working everywhere.



The hold mark is a short stroke across the curve showing how far the material ran in the last second and a half. It states a fact, not a judgement, and it uses the same device and the same colour as the peak marks on the meter bars.

The mark appears only once it is a little away from the running band. Closer than that it would sit inside the bright area and show you nothing you could not already see.

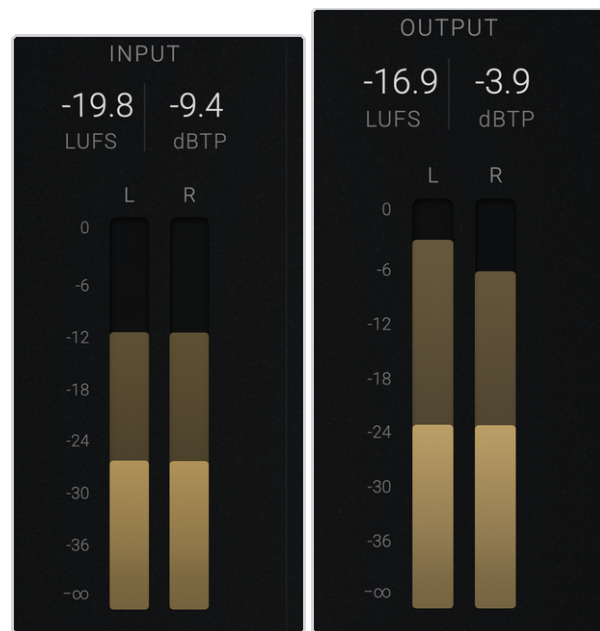
The curve is computed, not measured. With oversampling and a DC blocker in the path, the sample-by-sample transfer function is not directly accessible. What you see is the shape the current settings describe. The *band* on it, however, comes from the running signal.

There is deliberately no guidance here. No percentage, no LOW/ACTIVE/HOT zones, no arrows suggesting more input. The reason is measured rather than stylistic: how far a signal runs into a curve does not map onto how much the dynamics are being changed, and the relationship breaks down completely between the three characters. A threshold curve like EDGE would permanently signal "more input" while it was already working at full strength.

6.2 The meters

Two meters, input and output, each with a bar per channel and two numbers above.

The input meter reads *after* INPUT TRIM, so it shows what the curve actually sees. The output meter reads at the very end, after the ceiling, after MATCH and after TP SAFE, so it shows what leaves the plug-in. Between them you can read the whole story.



Input left, output right — the same way round as in the window.

READING	WHAT IT IS
---------	------------

Left number	Short-term loudness in LUFS (BS.1770, 3 s window) — not an integrated reading over the whole programme
-------------	--

Right number	True peak in dBTP
--------------	-------------------

Bars	Level per channel, with a peak mark that falls back slowly
------	--

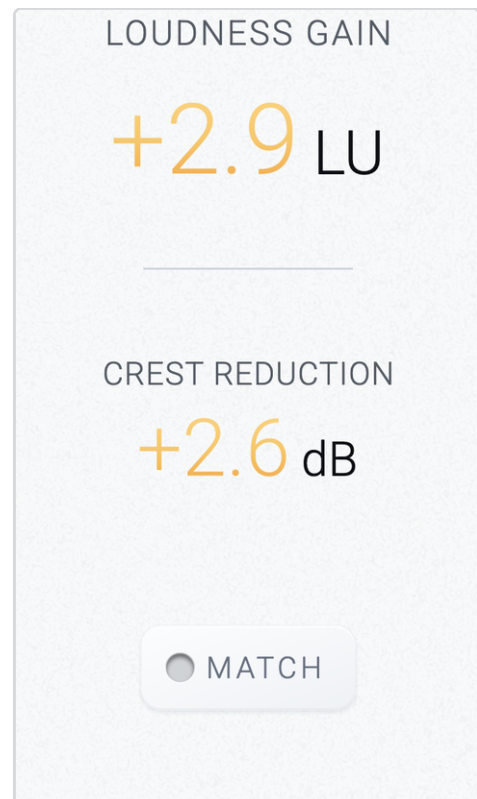
A dash instead of a number means the three second window is not full yet. It is not an error, and it resolves itself after three seconds of audio. The same rule is why MATCH does not apply during that time.

6.3 LOUDNESS GAIN and CREST REDUCTION

Two numbers between the display and the output meter, and they are the ones to work by.

LOUDNESS GAIN is how much louder the shaping made the material, in LU.

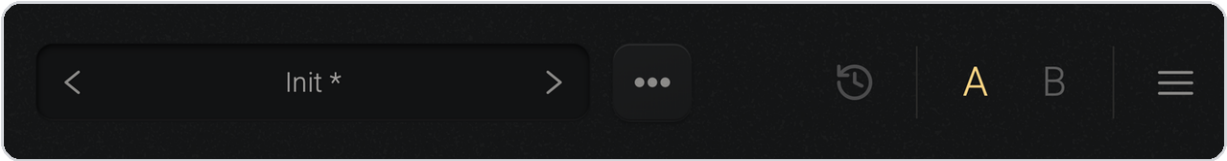
CREST REDUCTION is how much the difference between peak and average came down, in dB. This is the number that tells you how hard PUSH is working. On a mix bus, 1 to 3 dB is a useful range.



These two are measured before OUTPUT TRIM, and that is deliberate. They describe the *processing*, not the fader. If you set an output trim, LOUDNESS GAIN will not equal the difference between the two visible loudness numbers, and that is not an error: one tells you what the curve did, the other tells you what is leaving the plug-in. Input trim cancels out as a level but still acts through the working point, which is the whole point of the figure.

There is deliberately no third number for headroom. It would be the crest reduction with the sign reversed, and two numbers saying the same thing is worse than one. With MATCH on, the headroom you gained is the difference between the two dBTP readings, directly on the panel.

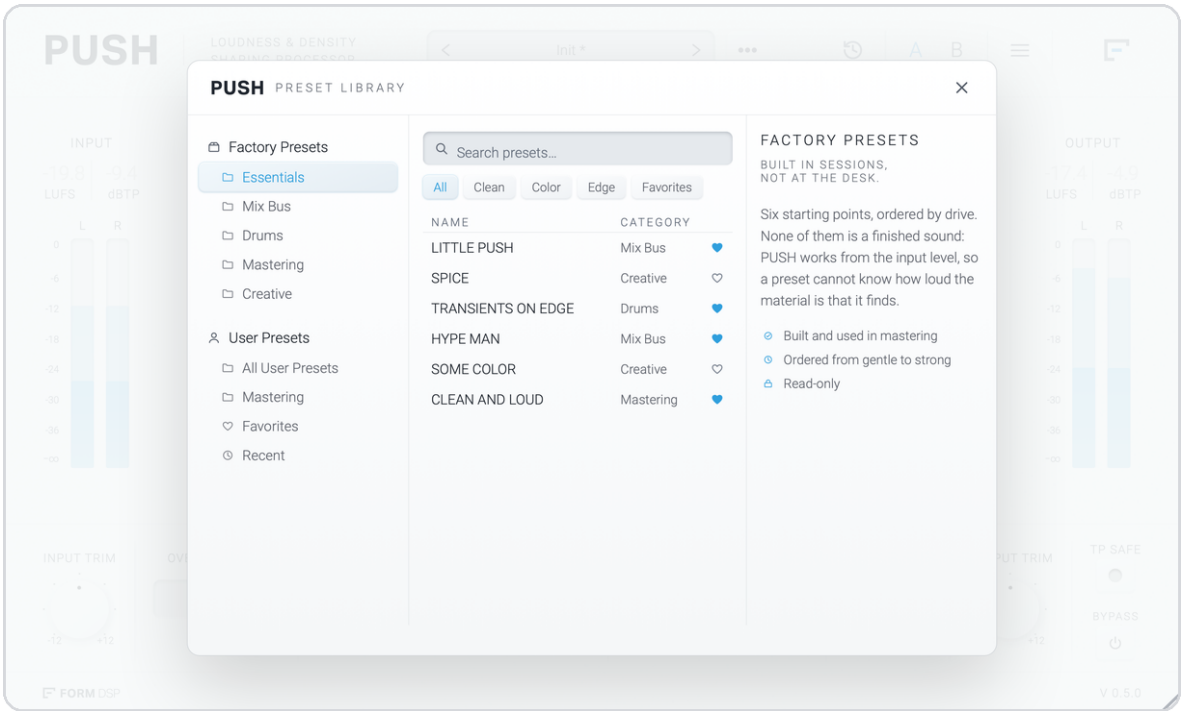
7 Presets, A/B and undo



The header: preset navigation, the preset menu, undo, A/B, and the main menu.

Presets

The arrows step through the presets in order. The name in the middle opens the library; the button beside it opens the preset menu for saving, renaming and deleting. An asterisk after the name means you have changed something since loading it.



Six factory presets ship with PUSH, ordered by drive from restrained to firm. Each one carries a category and a sentence saying what it is for.

PRESET	FOR	WHAT IT DOES
LITTLE PUSH	Mix Bus	The most restrained of the six. EDGE at half travel with SPLIT on, so the low end stays out of the shaping.

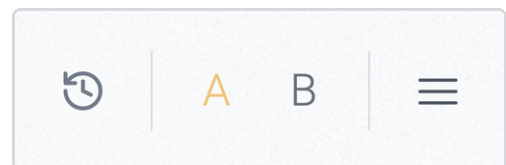
SPICE	Creative	Parallel: the dry signal stays, density sits underneath at 21 % mix. Heavy drive without touching the front edge.
TRANSIENTS ON EDGE	Drums	A hard knee with SPLIT on. Sharpens what hits first and leaves the low end where it was.
HYPE MAN	Mix Bus	Full-range EDGE, no split. The most forward of the six: everything gets the knee, bass included.
SOME COLOR	Creative	Even harmonics across the whole range, shaped wide. Reads as warmth rather than as drive.
CLEAN AND LOUD	Mas- tering	CLEAN at full travel: density without a colour of its own. The least audible of the six as an effect.

Init is not a preset, it is the starting state. It resets everything, including CHARACTER and both trims. Loading SOME COLOR and then Init leaves you genuinely neutral rather than quietly still in COLOR.

A/B

Two slots for comparing settings. Click A or B to switch; the inactive one fades rather than lighting up, because A and B are one state with two positions, not two buttons.

Right-click copies the current slot to the other one, which is how you start a comparison from where you already are.



Undo

The arrow on the left of the header takes back the last change. Right-click redoes it. It covers control movements and preset loads, so you can explore and get back.

8 Appearance and window size

PUSH ships in two colour schemes, and neither is a reduced version of the other. Both were drawn as a finished surface. The main menu switches between them and the choice persists across sessions.



Light. Made for bright rooms, for daylight, and for anyone working in a light host theme.



Dark. Made for dim rooms and long sessions, where a bright panel is the brightest thing in the room.

Nothing moves between the two. The same controls sit in the same places, the accent colour still follows CHARACTER, and every reading means the same thing. The illustrations in this manual use both.

Window size

Drag the handle in the bottom right corner. PUSH scales from 70 % to 160 % with a fixed aspect ratio, and the main menu offers the same sizes as fixed steps if you prefer to pick one.

The size is remembered by the host as part of your session, not by the preset. A preset changes the sound, not the furniture.

9 Where to use it

PUSH was built for the mix bus. Here is the fuller list.

- **Mix bus, gently.** One to two decibels of crest reduction with CLEAN, to pull a mix together before it goes to mastering. The most common use by a distance.
- **In front of a limiter.** EDGE handles the peaks so the limiter has less to do. A soft clipper in this position is standard practice in mastering, and EDGE is one.
- **Winning headroom instead of loudness.** Switch MATCH on and leave it on: same loudness out as in, smaller true peak. Useful when the loudness target is already set and what you need is room.
- **Drum bus.** EDGE with SPLIT on sharpens what hits first while the kick keeps its weight.
- **Parallel density.** High drive, MIX around 20 %. The original stays intact and body sits underneath it.
- **Warmth on a thin source.** COLOR at a modest amount, for even harmonics that read as weight rather than as distortion.
- **Checking someone else's master.** Put PUSH on with PUSH at 0 and read the input meter: loudness, true peak and the headroom mark, without changing anything.

10 Things worth knowing

Five behaviours that look like faults and are not. They are here because otherwise they get reported as bugs.

PUSH does very little on quiet material

The knee sits at a fixed point relative to full scale, so the peaks decide how much of the curve your material reaches. The measured headroom table in section 5.8 shows what that costs: at -24 LUFS the gain is essentially zero, at -9 LUFS it is between 4.7 and 6.3 dB.

Bring the level up with INPUT TRIM. That is what it is for.

It is a peak threshold, not a loudness threshold, and that is why there is no single LUFS value to aim for. Which loudness reading first reaches the knee depends entirely on the crest factor of your material:

Material	Crest	Knee reached at
Sine tone	3 dB	-9.1 LUFS
Dense master	8 dB	about -14 LUFS
Dynamic material	12 dB	about -18 LUFS

Dynamic material is therefore worked on at a much lower loudness reading than a finished master. Two pieces at the same LUFS value can behave quite differently, and neither is misbehaving.

TP SAFE does nothing on some material

Inter-sample overshoot comes from energy near Nyquist. Band-limited material cannot really produce it. At an identical sample peak, measured overshoot ranges from +0.0001 dB on band-limited material to +4.42 dB on sharp transients.

If you test TP SAFE on one piece of material and see no difference, you have shown nothing about the switch. You have found out something about your material.

The numbers show a dash for the first three seconds

Loudness is measured over a three second window. Before that window is full there is no figure, and PUSH shows a dash rather than a number it would have to invent. MATCH does not apply during that time either; it passes through until the window stands.

Switching TP SAFE on is audible

The gain factor jumps by around 4.9 dB in a single sample. It cannot be ramped without giving up the promise in the very first sample, so it is not ramped. Switching off fades out smoothly.

At 96 kHz with very small buffers the switch costs a dropout. Set it before you play.

Latency is constant, and it is not small

PUSH reports around 26 ms and reports it accurately, so your host compensates for it and the plug-in stays phase aligned in a mix. The figure barely moves with the oversampling setting and does not move at all with TP SAFE, because the look-ahead is always included.

This makes PUSH unsuitable for tracking while a performer listens through it. Everything else it does, it does at a fixed, compensated delay. Section 11 has the table.

11 Specifications

PROCESSING

Internal sample rate	project rate × oversampling factor, 4× by default
----------------------	---

Oversampling filters	polyphase IIR, minimum phase
----------------------	------------------------------

Band split	120 Hz, linear phase perfect reconstruction, FFT convolution
------------	--

Curve families	three (CLEAN, COLOR, EDGE), selected by CHARACTER
----------------	---

Loudness measurement	ITU-R BS.1770 K-weighting, short-term (3 s sliding window)
----------------------	--

True peak detection	oversampled, 256-tap detector
---------------------	-------------------------------

TP SAFE look-ahead	2 ms
--------------------	------

Internal precision	32-bit float
--------------------	--------------

	Oversampling	Latency (samples)	at 48 kHz
Off		1248	26.00 ms
2×		1252	26.08 ms
4× (default)		1254	26.12 ms

8x

1254

26.12 ms

Measured at the plug-in's own reported latency. The figures are identical with TP SAFE on and off, because the look-ahead is always included. Most of the total comes from the linear phase band split, which runs whether or not SPLIT is engaged.

SYSTEM

Formats	VST3 (macOS, Windows), AU (macOS)
---------	-----------------------------------

macOS	10.13 or later, Intel and Apple Silicon
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Windows	10 or later, 64-bit
---------	---------------------

Sample rates	44.1 to 192 kHz
--------------	-----------------

Channels	stereo
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Window	resizable, 70 % to 160 %
--------	--------------------------

12 Installation and licence

Installing

Run the installer and restart your host. Plug-ins are placed in the standard locations:

macOS VST3 /Library/Audio/Plug-Ins/VST3/

macOS AU /Library/Audio/Plug-Ins/Components/

Windows VST3 C:\Program Files\Common Files\VST3\

On macOS, hosts differ in which format they prefer. Studio One loads the AU in preference to the VST3, so if an update does not seem to have arrived, check which format your host actually loaded.

Presets

macOS ~/Library/Audio/Presets/Form DSP/PUSH/

Windows %APPDATA%\Form DSP\PUSH\

Each preset you save is a single file in this folder, so you can back them up or copy them to another machine. The main menu has an entry that opens the folder for you.

Trying it first

PUSH runs unrestricted for **14 days**. Nothing is disabled during the trial: every character, every switch and every preset behaves exactly as it will after you buy it, so what you hear while trying it is what you get.

The trial needs a FORM DSP account and starts the same way a licence does, from the screen that appears the first time you open the plug-in.

When the trial ends, PUSH goes silent. Nothing else changes: your projects keep their settings, the plug-in still loads, and the panel still responds. Only the audio stops until a licence is entered. The output meter goes quiet along with the sound, so you can see that the plug-in is not broken, just not licensed.

Licence

The first time you open PUSH, the licence screen appears. There is no serial number to type in: the screen gives you an activation link, you confirm it in your browser with the account you bought PUSH with, and the plug-in picks the licence up from there.

The licence is personal rather than tied to one machine, and it covers **two computers at a time** — a studio machine and a laptop, for instance. The licence screen shows how many of the two are in use.

To move the licence to a third machine, release one of the two first: open the licence screen on the computer you are leaving and choose Deauthorize. The seat is free immediately, and you can activate PUSH on the new machine.

After that it stays out of the way. PUSH checks in once a day rather than continuously, and it keeps working for **30 days** without reaching the internet at all. Mastering often happens off the network, and a tool that stops after a week of silence is not a tool you can rely on.

For machines that are never online, the licence screen offers file activation: it writes a request file, you carry it to a connected machine, and you bring the answer back. No network connection is needed on the studio machine at any point.

A licence activated this way is permanent for that machine and cannot be released again. Use it for a machine that stays where it is, not for a laptop you might want to move the licence off later.

When a new version is available, PUSH tells you once. Dismiss it and that version will not ask again; a later one will.

Uninstalling

Delete the plug-in files from the paths above. Your presets stay where they are unless you delete that folder too.

Appendix A Measurements

Everything in this manual that reads like a promise has been measured on the built plug-in. This appendix shows a few of those measurements, because a claim you can check is worth more than one you cannot.

The three characters at the same setting



CLEAN, EDGE and COLOR at the same position of the PUSH control. CLEAN bends early and gently, EDGE stays straight and then turns, COLOR sits between the two with a different harmonic content behind the same visible shape.

What MATCH returns, by input level

Headroom gained at 90 % drive, in dB, across four pieces of material:

Input	CLEAN	EDGE	COLOR
-24 LUFS	-0.06	-0.34	-0.54
-18 LUFS	+0.64	+1.49	+0.30
-12 LUFS	+2.87	+5.09	+3.70
-9 LUFS	+4.68	+6.32	+5.42

The table is in the manual rather than in a brochure because it contains a negative number. A claim about headroom without the input level beside it would not be honest.

EDGE against CLEAN, at two different working points

Distortion products relative to CLEAN, as total harmonic distortion plus noise measured on the wet signal. The two rows are the same two curves, compared once at equal crest reduction and once at equal loudness:

Matched on	EDGE relative to CLEAN
Crest reduction	about +17 dB
Loudness, at +2 dB gain	about -48 dB

The two figures are not in conflict. Matched on crest reduction, EDGE has to be driven much harder than CLEAN to reach the same number, because it is linear below its knee and only the peaks are doing the work. Matched on loudness, it gets there with far less shaping. Which figure is relevant depends on which of the two you are holding constant, and in normal use that is loudness.

What SHAPE costs in effect

Mode	Change in crest reduction across full SHAPE travel
COLOR	0.08 dB
CLEAN	0.58 to 0.69 dB
EDGE	up to 0.51 dB

For COLOR, SHAPE changes the sound by several decibels of tonal balance while the effect stays put. For CLEAN and EDGE the figure is larger and stated as measured, because in both SHAPE moves a knee, and a knee is a mechanism of effect rather than of tone. Section 5.3 says the same thing at the control itself.

True peak overshoot depends on material, not on level

Material	Overshoot at identical sample peak
----------	------------------------------------

Band-limited (resampled loops)	+0.0001 dB
--------------------------------	------------

Sharp transients	+4.42 dB
------------------	----------

This is why "it stays below 0 dBTP on my material" proves nothing about the general case, in either direction.

Appendix B Troubleshooting

WHAT YOU SEE

WHAT IT IS

The numbers show a dash

The three second loudness window is not full. Wait three seconds of audio.

TP SAFE makes no audible difference

Your material has little energy near Nyquist and therefore little inter-sample overshoot. The switch is working. See section 10.

Turning PUSH up does almost nothing

The input is too quiet for the fixed knee. Raise INPUT TRIM.

LOUDNESS GAIN does not match the two loudness numbers

You have set an output trim. The figure measures the processing, not the fader. See section 6.3.

CREST REDUCTION moves when I turn SHAPE

You are in EDGE, where knee sharpness is the compression behaviour. Up to 0.51 dB. Correct with PUSH.

A click when switching TP SAFE

Expected. Set it before playback, particularly at 96 kHz with small buffers.

An update does not seem to have arrived

Check which format your host loaded. On macOS, some hosts prefer the AU over the VST3.

The low end is being shaped more than the rest

Normal: bass reaches furthest into the curve. Switch SPLIT on.

Still stuck

Write to support@formdsp.com with your host, your operating system, the plug-in format, and if you can, the preset or settings that show the problem.

PUSH is part of the FORM suite.

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