MONOMONO

Comp 76

Two FET compressors for Ableton
Live & Push 3 Standalone

v1.0

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The 1176

In the mid-sixties Bill Putnam ran a small family of companies in Hollywood: United Recording, Universal Audio and Studio Electronics, all sharing one newsletter. Universal Audio already built limiters, the 175 and the 176, and in March 1967 Studio Electronics bought the rights to the Teletronix LA-2A, which let it call itself “the nation’s leading manufacturer of peak limiting devices.” Every one of those limiters ran on valves.

Bill Putnam wanted one that didn’t. Working at a lab near his home in Tarzana, he spent 1966 with the field-effect transistor, then a new part, until he found a way to make it the element that turns the signal down. His son Bill Putnam Jr. later named what had to be solved: a circuit that behaved the same whatever the spread of its parts, the noise the transistor made as it worked, and doing both in a way that sounded good. The prototype went to engineer Bones Howe, who ran its test sessions; he remembers “just a plain metal face with no numbers or anything on it,” and remembers it on the Mamas & the Papas’ vocals.

Studio Electronics first showed the 1176 at the AES Convention in 1967, and the company newsletter called it “a true peak limiter with the added distinction of being completely transistorized.” It caught a peak in under 20 microseconds, the fastest attack of any peak limiter, the factory claimed. Production began that June, and by December the company had become UREI, though the panels kept the Universal Audio name.

The factory had gentle work in mind: its manual advised no more than 3 to 4 dB of limiting “except where the program material contains extremely large peaks”, but audio engineers had other plans. Pushed hard, the 1176 doesn’t just hold level, it changes the sound: vocals step forward, drums and room mics turn explosive. Somewhere along the way they found that all four ratio buttons would stay in if pressed just right, a setting the factory never offered. Chris Lord-Alge, who keeps six of them, puts it simply: “Nothing adds attitude more than 1176s.”

Meanwhile the factory never stopped working on it. Each change got a letter after the serial number, and the log runs from A in 1967 to K in the eighties. The early letters carried on with the problems Bill Putnam had started on, stability, noise and distortion in a circuit built around a young part, and when one fix proved hard to build, the next letter moved it onto the board. Later ones followed the studios, with more output drive and an input that took any source. The next pages follow the line from the first drawing to the reissue.

OPERATION MANUAL

Revision History
Class A era

For its first six years the 1176 kept one skeleton: an input transformer, a field-effect transistor that turns the signal down, a preamp, and a single transistor driving the output transformer in class A.

What the factory kept reworking were the two amplifiers around the gain cell, and every change there moved the sound. Comp 76 is modeled on two points of this stretch, one from each end.



1967 — 1970 — 1973

ORIGINAL

Bill Putnam's first drawing. Field-effect transistors at the input of both amplifiers, the gain cell's control fed from the input itself, and a fastest attack with nothing to round its edge.

A

The same design, revised within five months: new values in the preamp for better stability and a little less noise. The attack gained a capacitor that softens its first edge.

B

The preamp's field-effect transistor gave way to two bipolar transistors, and the gain cell now took its control from the preamp's feedback instead of the input. The attack network took the form every later revision kept.

C

The panel turned black and the name became 1176LN, for low noise. Brad Plunkett, UREI's new director of engineering, added a small module to the B board, sealed in epoxy to keep it secret: it keeps the gain cell's transistor on a smaller swing, so it distorts less and the signal can run hotter above the noise. UREI's advertisement that May put it in one line: "Now 6 dB lower noise — and a new look!"

D

The epoxy module proved hard to build, so the low-noise circuit moved onto the main board. The gain cell became a transistor UREI selected and numbered itself, the power cord gained a ground pin, and lamps lit the meter.

E

A resistor across the ratio switch to stop it popping, and a power transformer with a 115/230 V switch for export. The last 1176 with the class A output stage.

SONIC DIFFERENCES

Cleaner than you might expect: in limiting it measures as clean as the black-face E. Its edge is in the attack, which grabs a transient harder than any revision after it.

The bluestripe sound: a strong second harmonic at everyday levels, the thickness that pulls a voice forward, and an attack a touch slower than the units that came after it.

Still a bluestripe: nearly A's second harmonic, with more third on top for a harder edge.

Cleaner and quieter, and less eager: the same Input setting now limits less, so the knob sits further up for the same work.

As C: electrically C, D and E are one amplifier.

The black-face sound, and the one Bill Putnam's sons chose to reissue in 2000: clean and even at normal levels, its harmonics low and close together until it is pushed hard.

Push-Pull and Bridging

In 1973 UREI rebuilt the output end of the 1176, and six years later the input end. Each step gave it more headroom and an easier fit in a modern studio. Each also moved it further from the class A circuit Comp 76 is modeled on. Most 1176s ever built come from these years; Comp 76 stops just before them, at E.

1973 — F

A new output amplifier, borrowed from UREI's 1109 preamp: two transistors in push-pull instead of one in class A, for more output drive. A new output transformer, the one in the LA-3A, and an op-amp that made the meter simpler to calibrate. The input transformer stayed.

1979 — G

The input transformer gave way to an electronic bridging input, so the 1176 would take any source, balanced or not. The threshold dropped six decibels, an IC regulated the supply, and jumpers set the output for European lines.

1980 — H

A new look: a silver panel, a backlit meter and an IEC power socket.

J AND K

Through the 1980s: another output transformer and meter chip in J, and the factory's value corrections in K, the last revision.

1983 — HARMAN

Bill Putnam agreed to sell UREI's parent company to Harman, the owner of JBL. The 1176 outlived the sale: its factory test procedure is dated December 1990, and serial numbers ran past 11,000.

2000 — REISSUE

In 1999 Bill Putnam's sons won the name back from Harman and relaunched Universal Audio. The 1176LN they shipped in 2000 was based on D and E, the black-face revisions.

SONIC DIFFERENCES

Much more level before it clips; in limiting it measures the same as E. Barry Rudolph found the F had "a lot more output level and a 'hotter' sound than the rev D models."

With no iron at the input, a hot source at full Input no longer thickens the low end. UREI also notes less noise with Input below three quarters.

As G; the change is on the outside.

As G, with the most headroom of the line.

Comp 76

Comp 76 is a pair of compressors for Live, modeled on two revisions of Universal Audio's 1176 limiting amplifier.

Comp 76 A follows one of the earliest production circuits, the bluestripe unit of 1967; Comp 76 E follows the black-face low-noise version of the early seventies. They share one panel: Input and Output, Attack and Release, four ratio buttons, and a threshold that never moves, so you set how hard it works by how hard you drive it. Around them sit a few things the hardware never had: Blend for parallel compression and a filter on what the compressor listens to.

What sets the two apart sits around the gain cell, in the amplifiers before and after it. That's where each revision's sound lives, so this manual takes them side by side first, then each on its own.



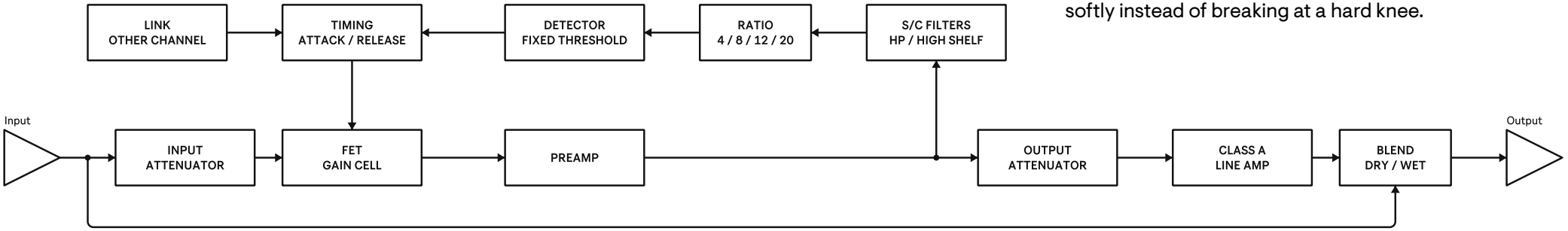


Signal Path

Comp 76 is modeled on the original circuit part for part. The audio runs through Input, a field-effect transistor that turns the signal down, a preamp that brings it back up, Output, and a class A line amp.

The sidechain listens after the preamp, to a signal already turned down. Its filters shape what it hears, the ratio buttons set how strongly it responds, and Attack and Release smooth the detector's output into the voltage that drives the transistor.

That makes Comp 76 a feedback compressor: it measures the result, not the incoming signal. Every bit of reduction lowers what the detector hears, so the curve bends over softly instead of breaking at a hard knee.



How the Fixed Threshold Works

Most modern compressors have a Threshold control: you pull the threshold down until the loud parts cross it. Comp 76, like the original, has no such knob. Its threshold is a fixed point inside the detector, and Input decides how far your signal is driven above it.

Input therefore does two jobs at once: more Input means more compression and more level. Output comes after the tap and takes the level back without touching the compression. Ratio, Attack and Release work as on any compressor, with one twist: a higher ratio button also starts later.

In practice: pick a ratio, turn Input up until the meter shows the reduction you want, then turn Output down until the track sits at its old level. The defaults start you level-matched, with a loud signal already well into compression.

Because the threshold never moves, set Input by the meter, not by the numbers on the dial: a quiet track needs more of it than a loud one. When you switch from 4 to 20, add a little Input to keep the same amount. Page 12 shows it on a chart.

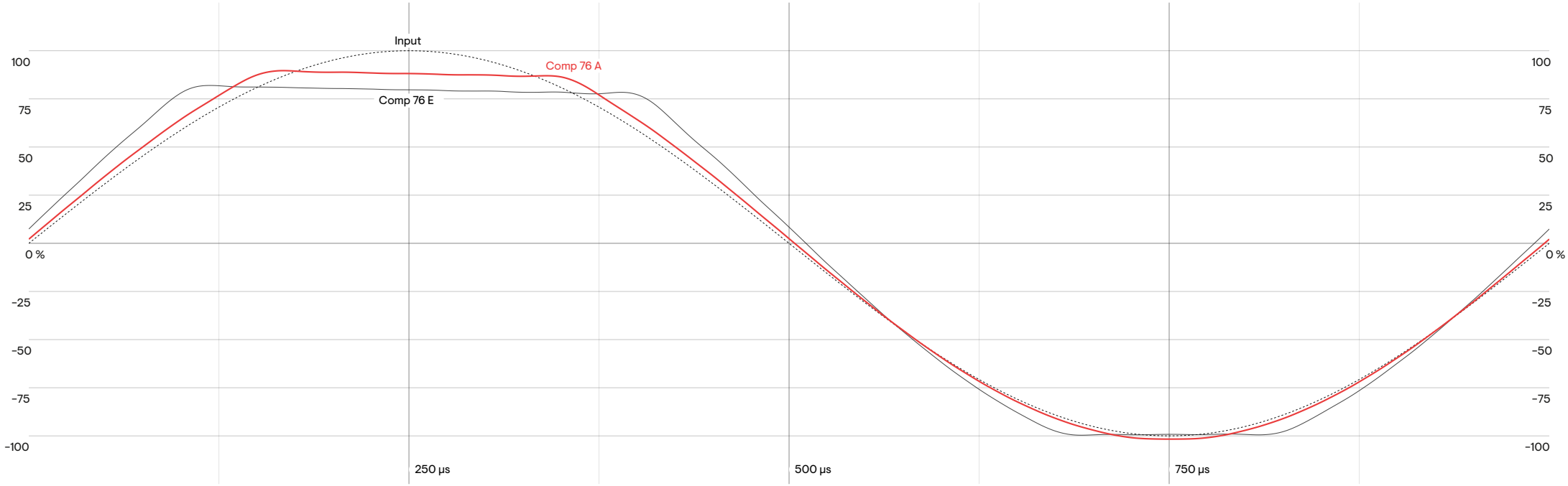
Two Colors

Comp 76 A and Comp 76 E share one panel, but not one sound. The difference sits in the amplifiers around the gain control, and you hear it at everyday settings, long before either is pushed.

Comp 76 A runs hotter: the same Input setting drives it noticeably further into compression, and at everyday levels it adds a clear second harmonic that E keeps out: it thickens a voice and pulls it forward. Its fastest attack lets a little more of a transient's front through, and its buttons bite a little steeper.

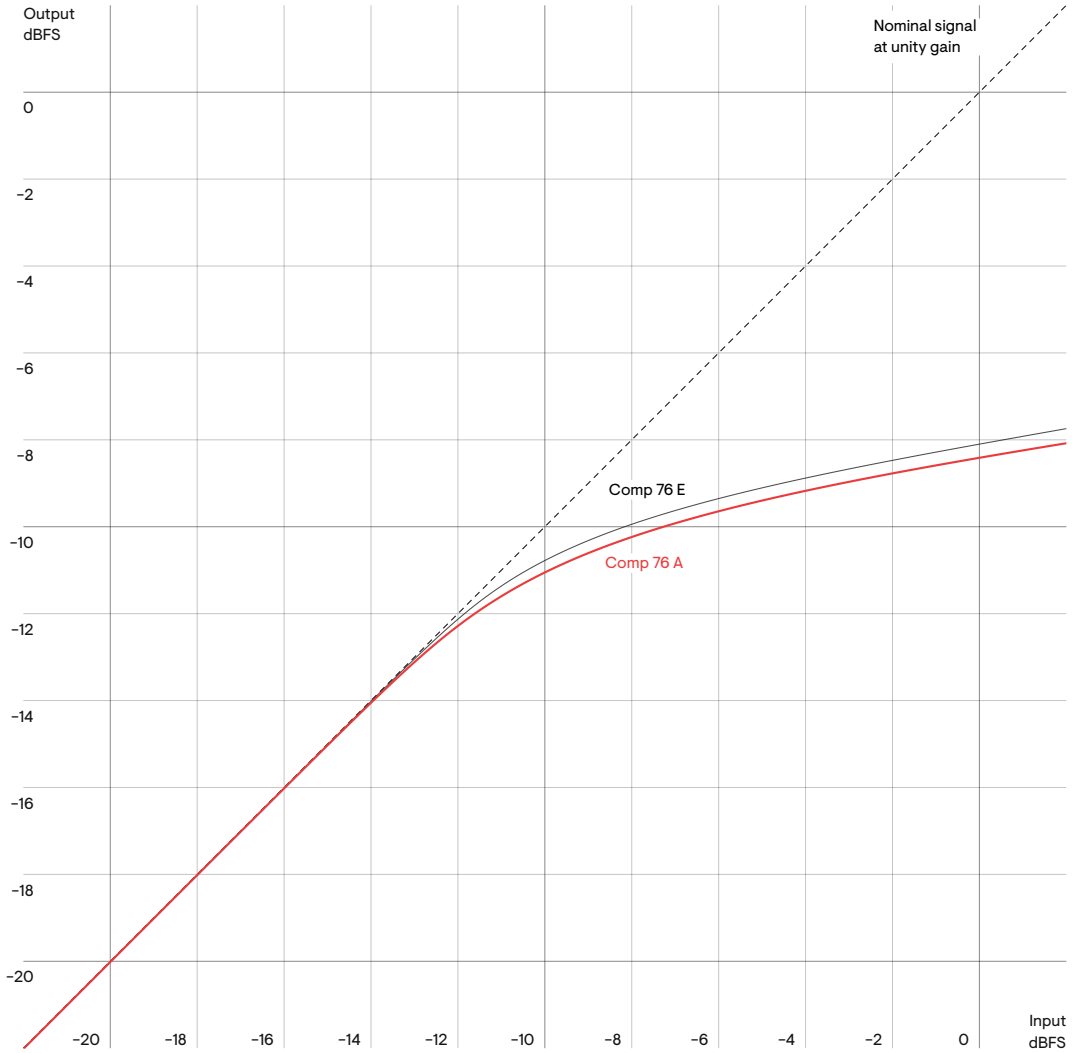
Comp 76 E is the cleaner of the two until you lean on it. Drive both into the red and E clips first, and harder.

Neither is the better one. They do different jobs, and the next two pages show where each one fits.



Two Ways to Compress

Load both devices at their defaults and they meet on level ground.



Each opens with its Input and Output set so a signal leaves at the level it came in, A's Input a few steps lower, because the same setting drives A harder. Both start on the same 4 button, the same Attack and Release, and the same moderate reduction on a loud tone. Run one tone through both and the curves lie almost on top of each other: the same knee, the same amount held back.

So the difference isn't in how much they compress, it's in how they move: how the timing of the compression follows the music.

On Comp 76 A the gain comes back sooner. At every Release setting it recovers a little faster than E, and its attack is a shade slower, so the tail and the room rise back sooner behind each hit. The result is a busier, more forward sound, compression you hear at work. Comp 76 E holds on a little longer and closes a little sooner, so the level stays steadier and the compression sits further back.

Neither curve tells you which to use; your ears will. Load both at their defaults on the same track and switch between them. The level stays put, and what changes is how the music breathes.

Comp 76 includes both A and E. Learning the operations is simple; then experiment with both on different sources in your mix to find the best approaches.

What Comp 76 A is Great at

Forward and alive.

More gain, a clear second harmonic and steeper buttons: A colors as it compresses, and it does so at moderate settings, not only when pushed.

Lead vocals that need to step in front of the track

Electric guitars and room mics where a little grit is welcome

Drums at a fast attack, with the first edge of each hit let through

Parallel crush with Blend, its color tucked under the dry signal

What Comp 76 E is Great at

Clean until pushed.

Less second harmonic and a slightly faster grab: E holds level without adding much of its own, until you drive it into clipping, where it turns hard and dense.

Bass, held steady without thickening the low end

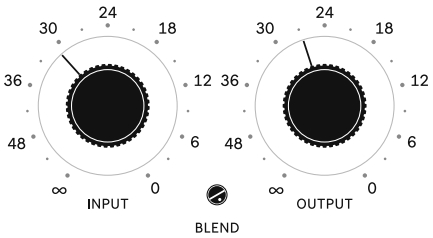
Vocals that should stay natural under heavy gain reduction

Fast peak control on drums and percussion

Deliberate overdrive: Input up, into the red, for hard, dense clipping

The Panel

Both devices share one panel. It reads left to right: what the compressor listens to, the two level knobs, the timing, the ratio buttons and the meter.

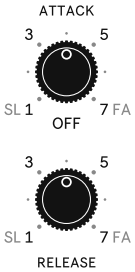


INPUT, BLEND AND OUTPUT

Input sets how much it compresses. Output sets how loud it comes out, after the compressor. Blend mixes the plain input back in, for parallel compression.

The numbers are the original panel's legends, evenly spaced positions rather than decibels: use them to recall a setting or to follow settings quoted for the hardware, and set the amount by the meter.

As we touched on with the signal path, there is no threshold knob. The threshold is fixed, and Input drives the signal into it.

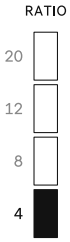


ATTACK AND RELEASE

1 is the slowest, 7 the fastest.

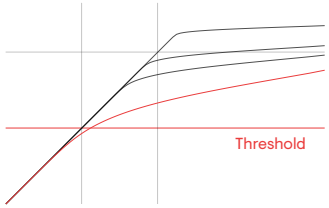
Attack: a few milliseconds at 1, a fraction of a millisecond at 7.
At 0 it clicks to Off: no compression.

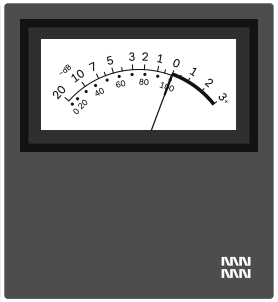
Release: over a second at 1, a fraction of a second at 7. The last few decibels always come back more slowly.



RATIO

4, 8, 12 and 20: 4 compresses, 20 limits. A higher button also starts later, by several decibels from 4 to 20. Press several at once (page 13). At different ratio settings, the knee shape also changes: 4 has the softest knee while 20 has the hardest.



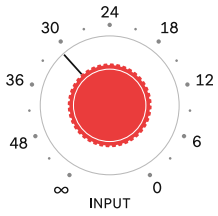


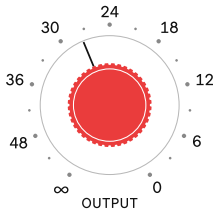
METER

Gain reduction: 0 at rest, –10 for 10 dB. A VU needle averages, so fast hits show less than they get. The logo turns the device around to its serial numbers (page 35).

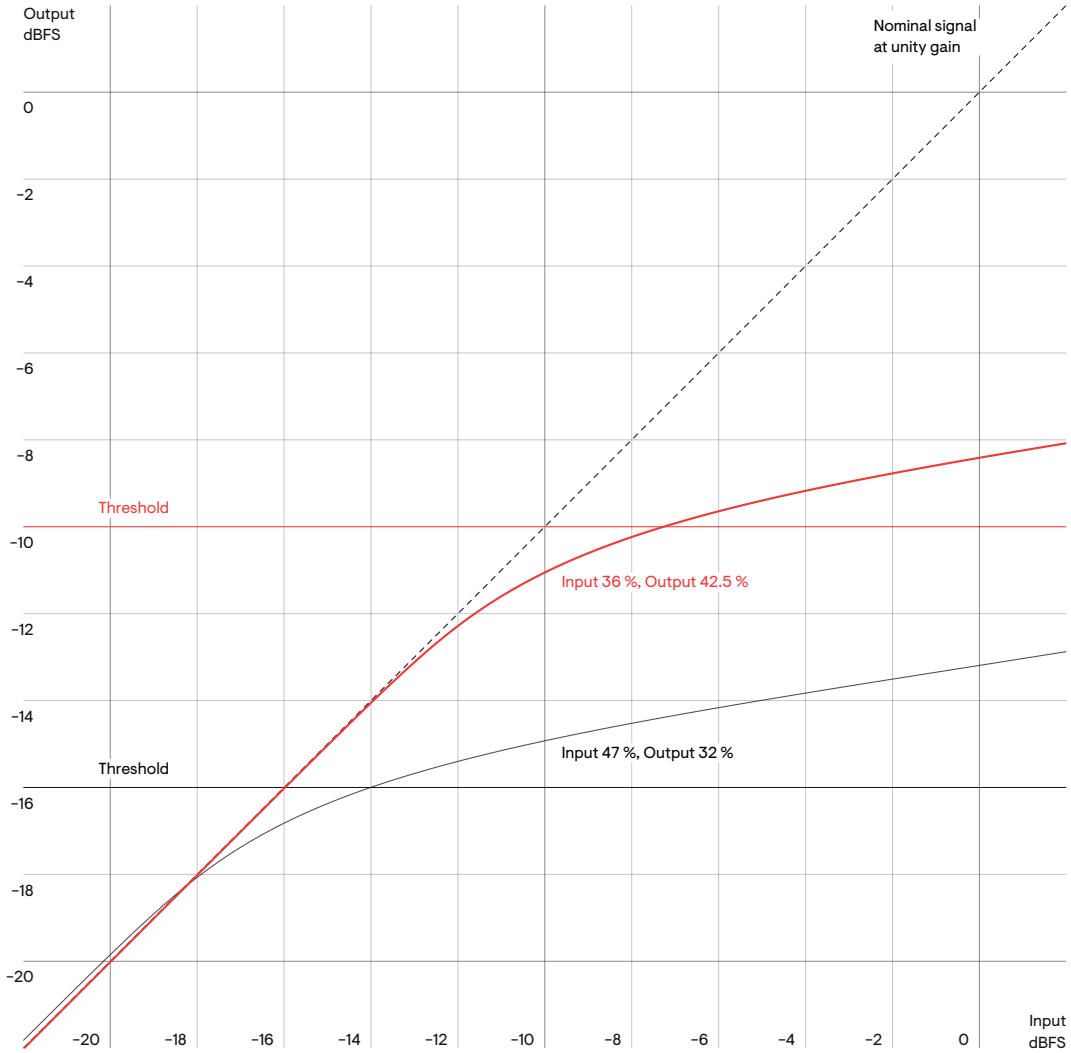
With two or more buttons in, the needle sits against the right-hand stop at rest and through light gain reduction, and comes off it once the reduction gets deeper. That is the circuit, not a fault: more than one button moves the point the meter is zeroed to.

Input and Output





Let's start with what's missing: there is no Threshold. The point where compression begins is fixed inside the unit, and Input decides how far over it your signal goes. Output comes after the point the compressor listens to, so it sets the level without touching the compression.



Here is what that means, on Comp 76 A; E works the same way. Red is the default: a signal passes at the level it came in until it reaches the threshold, then bends over, and a loud tone comes out well held.

The black curve is Input turned up a few steps, with Output pulled down just as far to match. Below the knee the two curves lie on top of each other, so a quiet passage comes out at the same level. But the knee has moved down by as much as Input went up, and the same loud tone now loses much more. The threshold hasn't moved; Input simply drives the signal further into it.

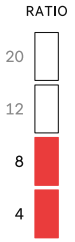
That is the routine from page 7 on a chart: turn Input up until the meter shows the reduction you want, then bring Output down until the track sits at its old level. Turn Input down and it works the other way, less compression, with Output bringing the level back up.

One thing to unlearn: the numbers around both dials are the original panel's legends, evenly spaced positions rather than decibels. Use them to recall a setting or to follow settings quoted for the hardware; set Input by the meter and your ears.

More Than One Button

The ratio buttons don't lock each other out: press two, three or all four and Comp 76 takes the combination, a set of ratios the panel never labels. All buttons in is the famous one, but every pair has a shape of its own.

All pairs share three things. Below the knee they play a little louder than a single button. The needle rests at the right-hand end of the scale instead of on zero, so read the reduction from there. And three or four buttons act as their outermost pair: 4, 8 and 12 together are 4 + 12, and every set with 4 and 20 in it is all buttons in. That leaves the six below; each device chapter puts its own curves on them.



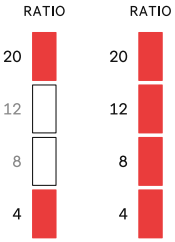
4 + 8

The gentlest pair: the knee where 4 has it, a little firmer above it. It recovers like a single button.



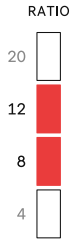
4 + 12

A firmer hold, still with 4's knee, and a quicker recovery.



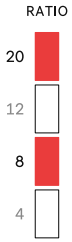
4 + 20 = ALL IN

All buttons in: an early knee, a hold close to a limiter's, and a fast let-go.



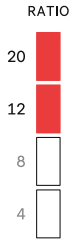
8 + 12

Between 8 and 12 in firmness, with a knee just above 4's. It recovers like a single button.



8 + 20

Nearly as steep as 20 alone, but starting earlier, and quick to let go.



12 + 20

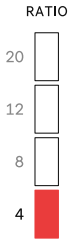
The steepest pair, with the latest knee of the six and a quick recovery.

All these descriptions, like the charts later on, mean little until you start listening to what the combinations do on different material and at different levels. The important thing is to know that Comp 76's compression has these nuances; it's up to you to master them and use them to your advantage.

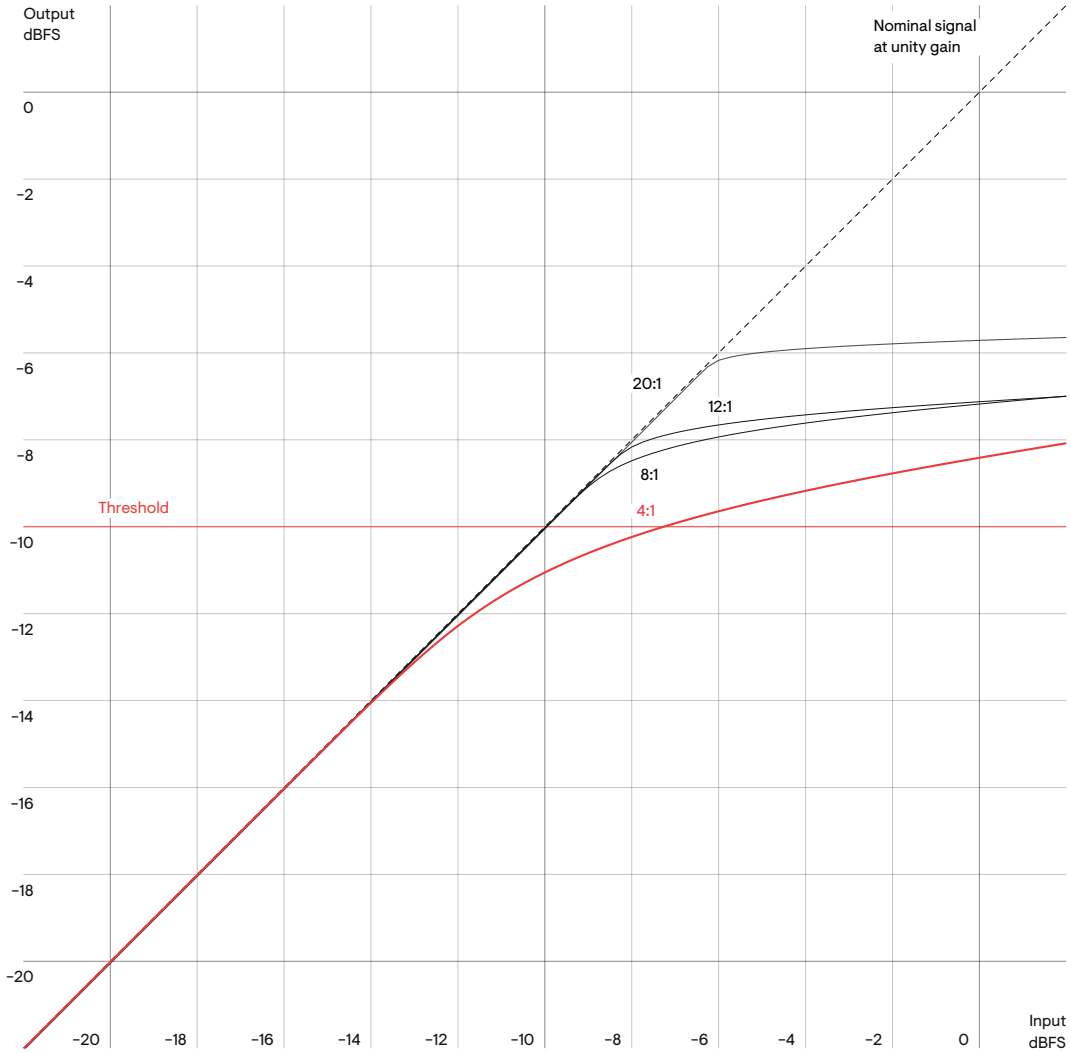
Comp 76 A


Comp 76 A
Sidechain
Stereo
HP Freq
79.5 Hz
High Shelf
0.0 dB
M/S
INPUT
BLEND
OUTPUT

Ratio



Now the four buttons, with Input at its default. On most compressors a ratio is a slope. Here each button also moves the point where compression begins, and that changes how you use them.



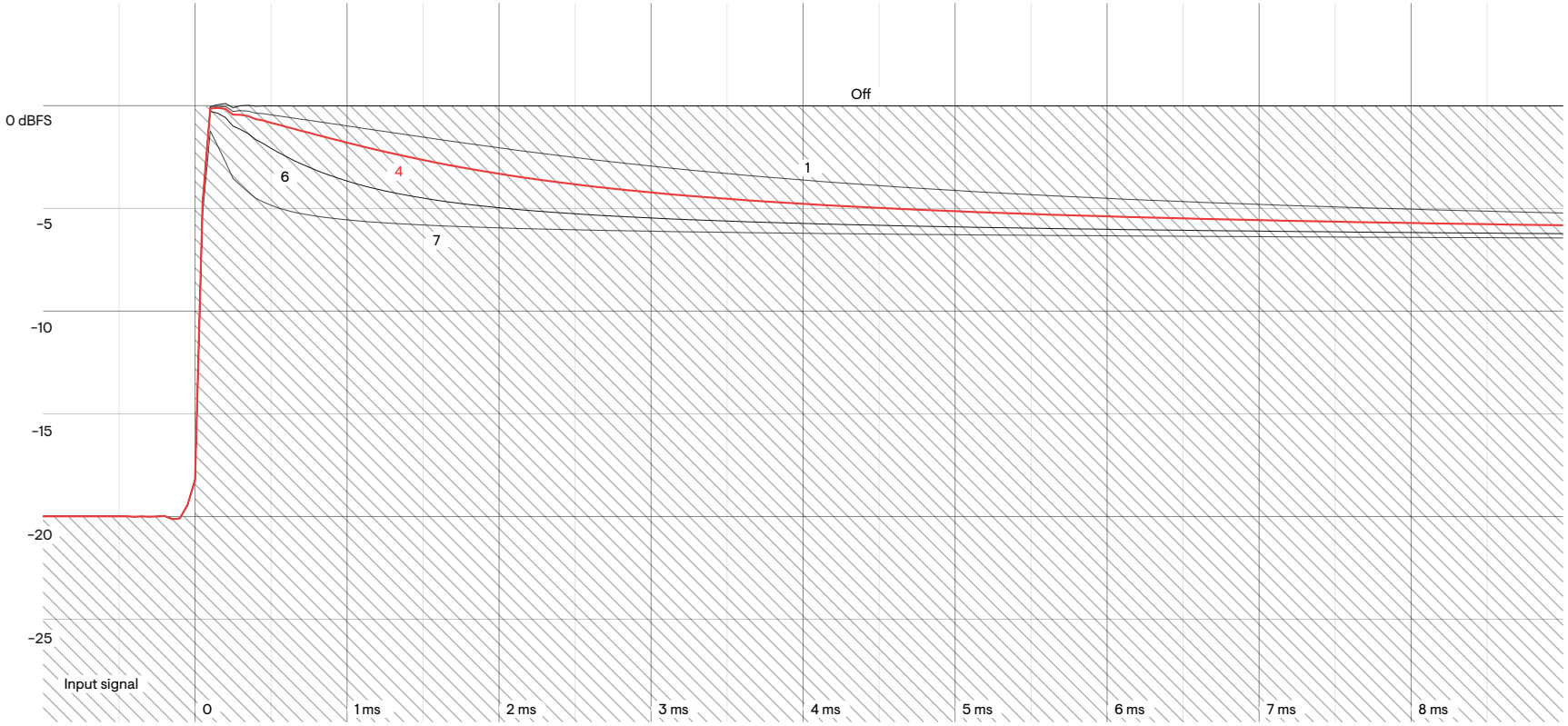
Red is 4:1, the button for everyday work. Press 8 or 12 and the knee moves up, 20 further still, so at everyday levels a higher button takes less off, not more. What the higher buttons change is the shape above the knee: each one holds harder, and all of them come out steeper than their legends. 8 and 12 start together and run almost on top of each other, so on A they are close to one setting. 20 is close to a flat ceiling: the body of a note passes up to its knee and almost nothing gets past it. In use: 4 is the button for vocals and bass, a compressor that holds the level and lets the performance move. 8 and 12 hold tighter, for a part that has to sit still. 20 is a limiter. If a higher button doesn't take off enough, turn Input up rather than looking for a lower threshold; there isn't one.

Attack



Speed is what this compressor was built for, and Attack sets how much of it you use. A tone jumps well over the knee, and the chart follows the first few milliseconds.

At every setting the step is caught within milliseconds. What the dial really chooses is how much of the front of a sound gets through before the gain comes down: the edge of a hit, or none of it.



At Attack 4, the default, most of the reduction is in place within a few milliseconds, and the rest settles in over the next few dozen. A hit keeps its edge and the body is held.

Attack 1 takes nearly twice as long and lets more of the front through, for a kit that should stay punchy under heavy compression. At 6 it is already quick.

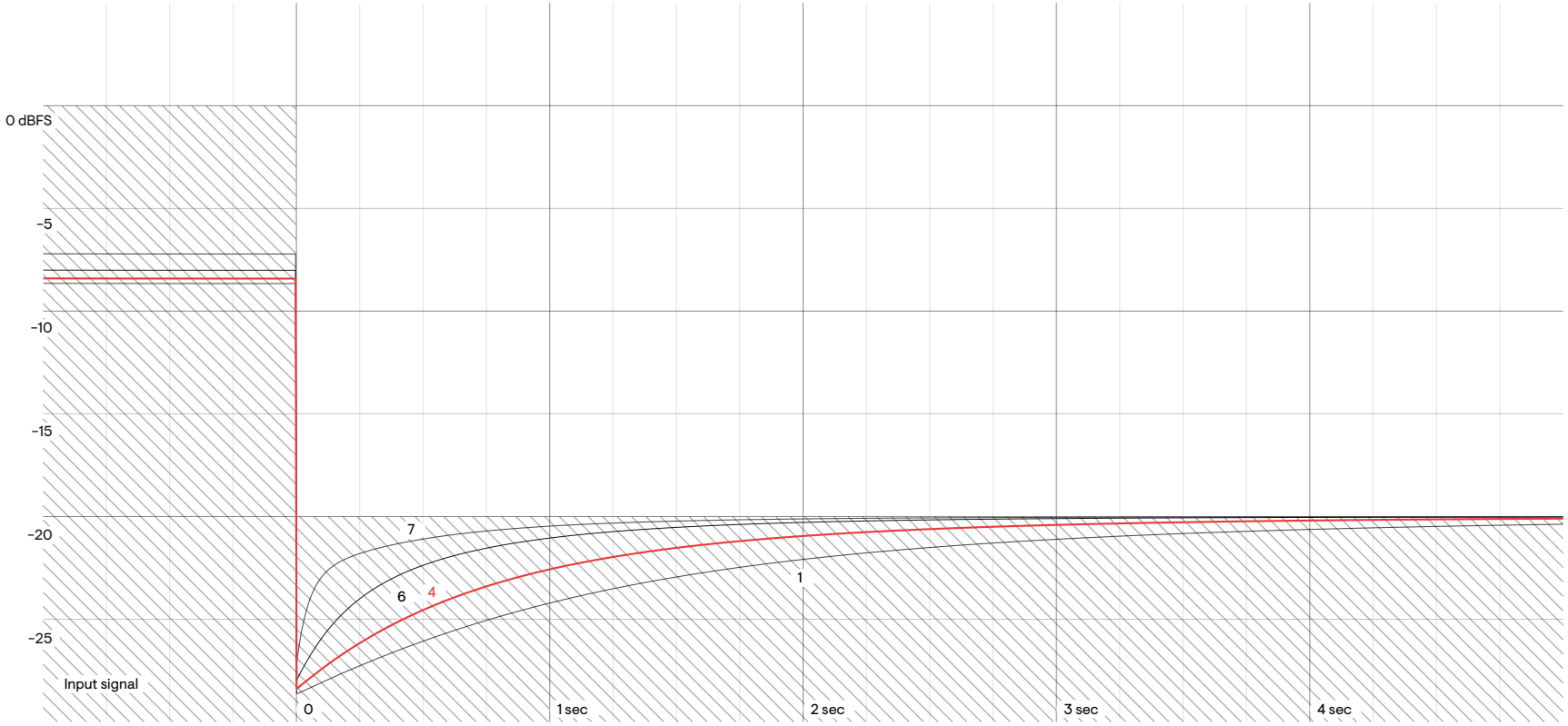
At 7, the fastest, it clamps within a fraction of a millisecond, yet even at 7 a transient keeps a sliver of its front. Below 1 the dial clicks to Off: the tone goes straight through, no reduction at all.

Release



Release decides how the compressor breathes, and it is the control that turns a level rider into an effect. A loud tone, well into reduction, drops under the knee, and the chart follows the gain as it comes back.

The release works in two stages: most of the reduction lets go at the dial's rate, the last few decibels more slowly, so even the fastest setting leaves a tail.



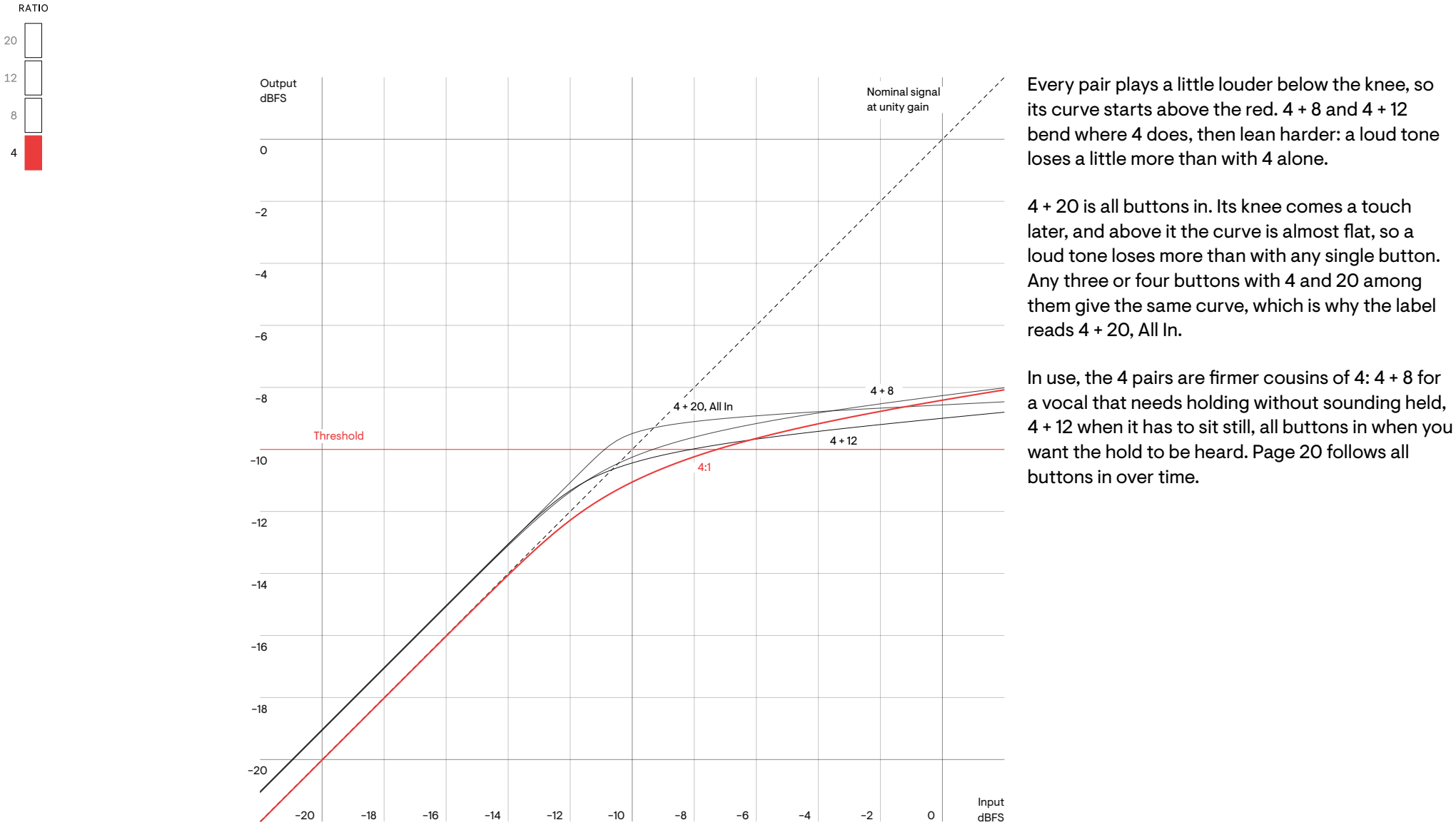
At Release 4, the default, half the reduction is gone in about half a second and the rest takes a couple of seconds: slow enough to ride a vocal or a bass without the gain audibly moving.

Release 1 takes longer still, a slow, even hold. At 6 the first half is back in a quarter of a second.

At 7 half is back almost at once, yet the last decibel still takes about half a second. That split is what makes the fast settings pump: the gain leaps back after each hit, so the decay and the room swell up between hits, and the tail rounds the swell off. Push Input with Release at 7 and a drum loop starts to breathe with the tempo.

Combined Ratios

The pairs with the 4 button, against 4 alone in red. Each keeps 4's gentle start and adds the steeper button's hold above the knee.



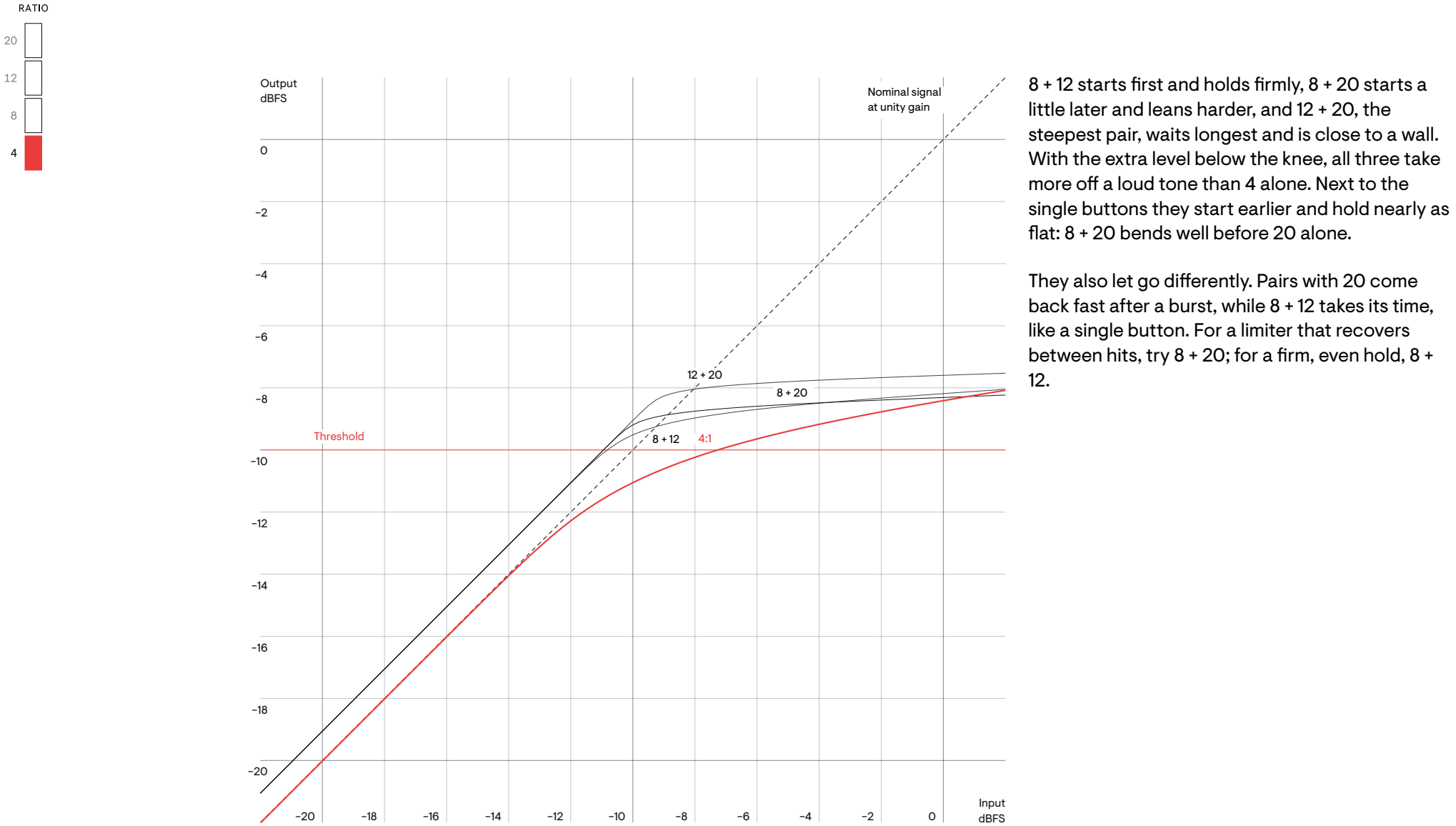
Every pair plays a little louder below the knee, so its curve starts above the red. 4 + 8 and 4 + 12 bend where 4 does, then lean harder: a loud tone loses a little more than with 4 alone.

4 + 20 is all buttons in. Its knee comes a touch later, and above it the curve is almost flat, so a loud tone loses more than with any single button. Any three or four buttons with 4 and 20 among them give the same curve, which is why the label reads 4 + 20, All In.

In use, the 4 pairs are firmer cousins of 4: 4 + 8 for a vocal that needs holding without sounding held, 4 + 12 when it has to sit still, all buttons in when you want the hold to be heard. Page 20 follows all buttons in over time.

Other Combinations

The pairs without the 4 button, against 4 alone in red. With 8, 12 and 20 the knee moves up and the hold gets harder, as it does with single buttons.

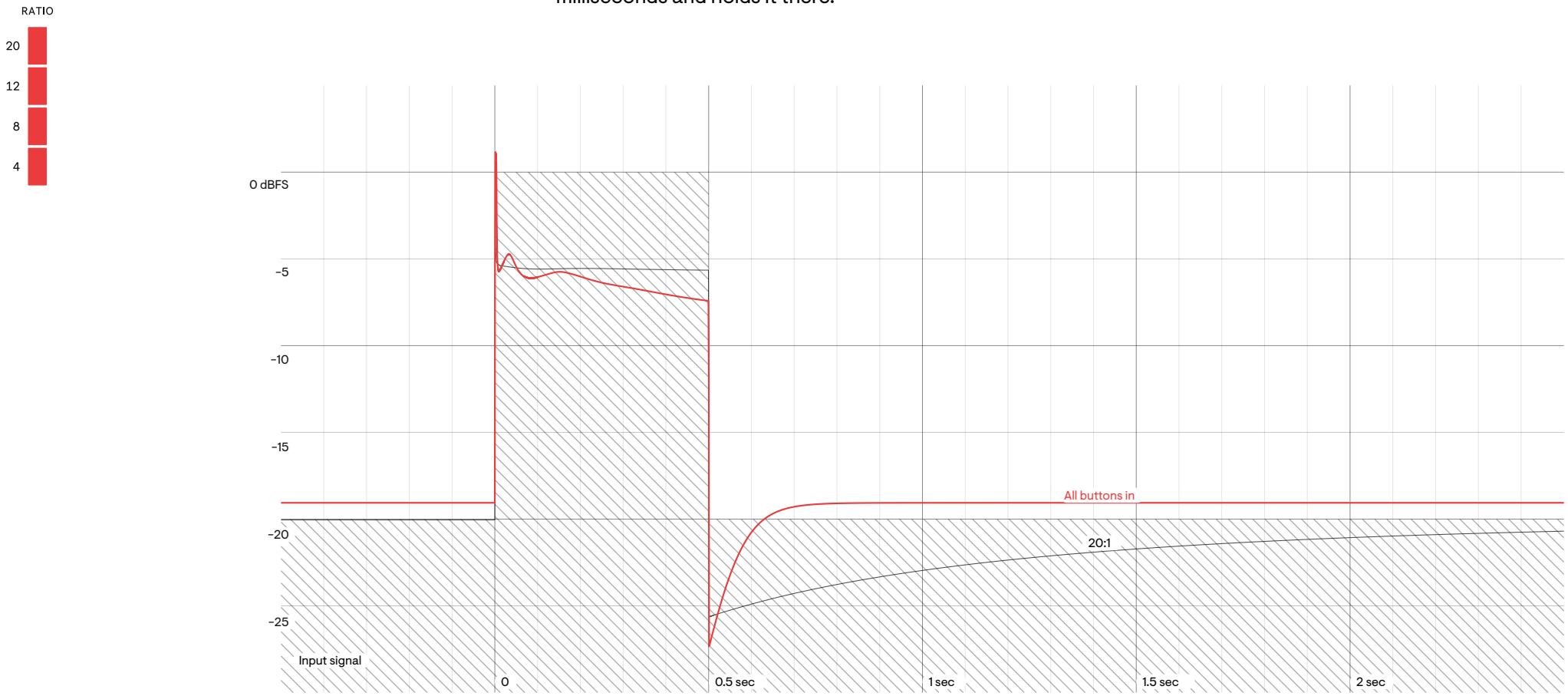


8 + 12 starts first and holds firmly, 8 + 20 starts a little later and leans harder, and 12 + 20, the steepest pair, waits longest and is close to a wall. With the extra level below the knee, all three take more off a loud tone than 4 alone. Next to the single buttons they start earlier and hold nearly as flat: 8 + 20 bends well before 20 alone.

They also let go differently. Pairs with 20 come back fast after a burst, while 8 + 12 takes its time, like a single button. For a limiter that recovers between hits, try 8 + 20; for a firm, even hold, 8 + 12.

All Buttons In over Time

This is where the sound is. A tone steps up into heavy compression for half a second and back, with 20:1 in black beside it. 20:1 catches the step within a few milliseconds and holds it there.



All buttons in lets the first few milliseconds through untouched, then clamps and keeps digging in through the note.

When the tone drops it lets go fast, back to its resting level in a fraction of a second, while 20:1 is still well down half a second on.

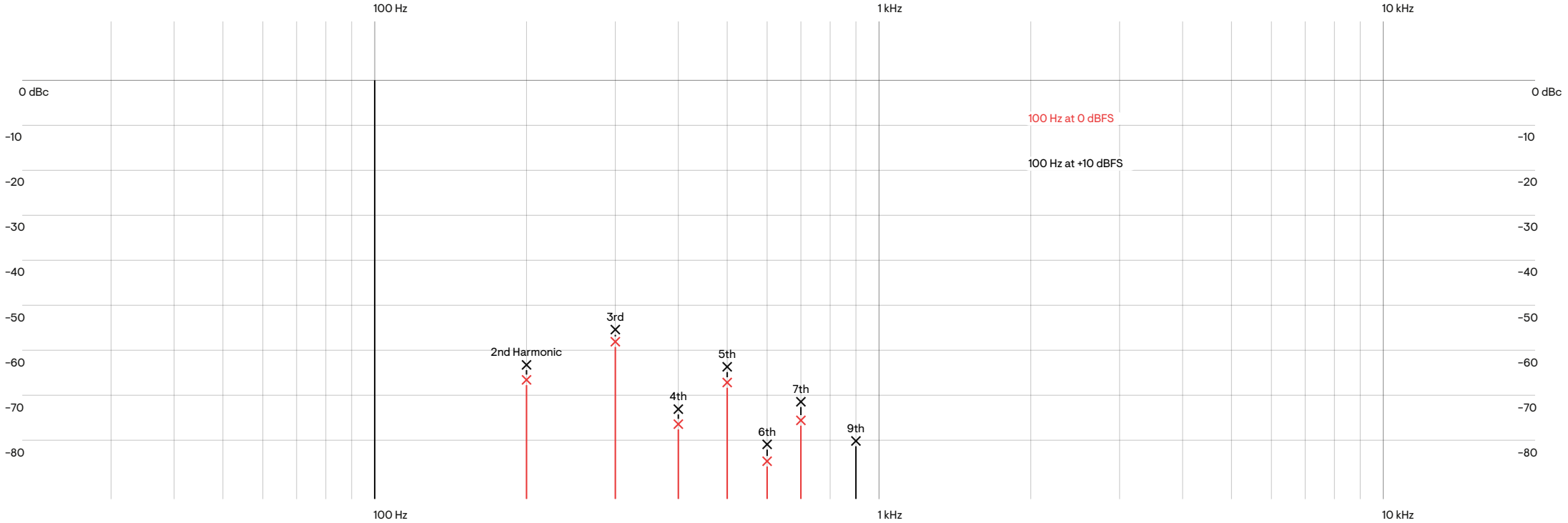
Put together, the front of every hit passes, the body is crushed and the room rushes back up between hits: the explosive, pumping sound of a drum room mic or a parallel drum bus. Bring Blend down to tuck it under the dry kit.

Harmonics at 100 Hz

A 100 Hz tone at 0 dBFS in, +10 dBFS in black. Each cross marks a harmonic's level under the tone: −20 dBc is a tenth of it, −40 dBc a hundredth.

Start low. On a 100 Hz tone at the defaults the third harmonic leads, with a train of higher harmonics behind it, well above what the same settings add higher up (next page). The reason is the compression itself: a low note's cycle is long enough for the gain to move within it, and that movement bends the wave. With Attack at Off the extra harmonics are gone and the low note looks like a 1 kHz one.

The black crosses are pushed harder, and the whole train comes up a little. On a hard-driven bass that is grit you can hear. If a bass line gets too rough, ease Input back a little or bring Blend down.

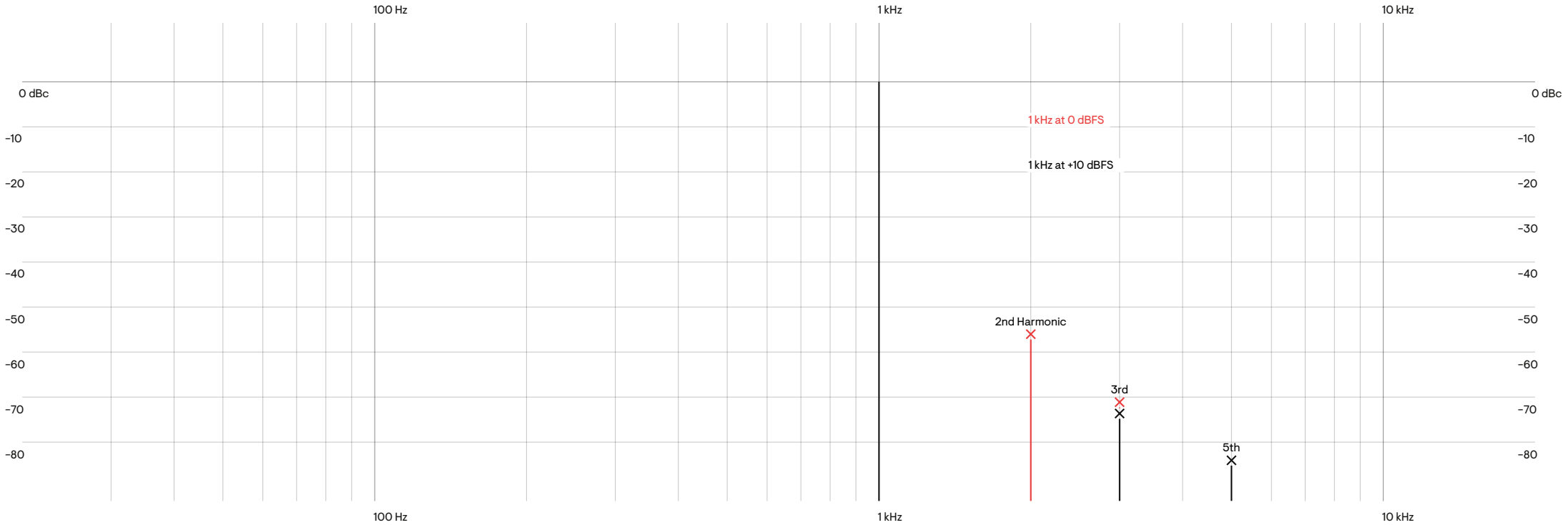


Harmonics at 1 kHz

A 1 kHz tone at 0 dBFS in, +10 dBFS in black. Each cross marks a harmonic's level under the tone: −20 dBc is a tenth of it, −40 dBc a hundredth.

Higher up, here is A's color. The red crosses are a 1 kHz tone at the defaults, well into reduction: a clear second harmonic stands out, the third well under it. That second harmonic is the thickening from page 8, and it is already there at a setting you would use every day.

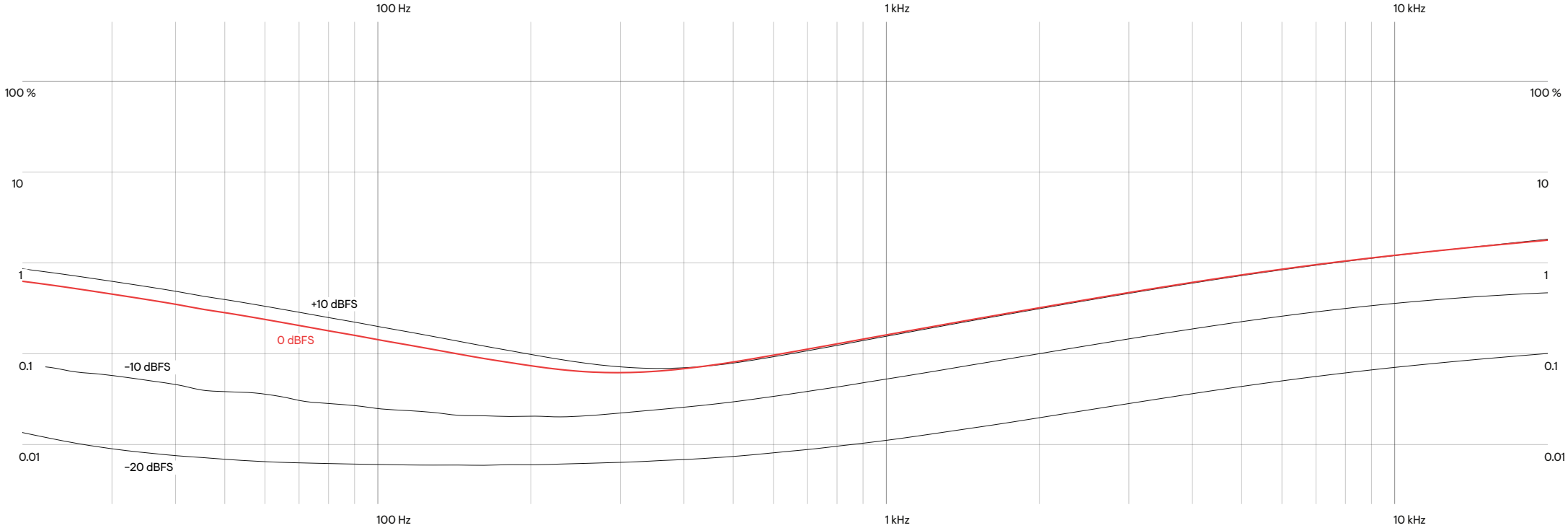
The black crosses are the same tone pushed harder, twice the reduction, and almost nothing changes: the second stays where it was, the third falls back a little, a faint fifth appears. A's color doesn't wait for you to lean on it and doesn't grow when you do; it is there as soon as the unit is working. That makes it easy to use in parallel: set the compression, then bring Blend down until the color sits where you want it.



Distortion

A sine at 0 dBFS in, −20, −10 and +10 dBFS in black. Higher means more distortion: at 1 % the added harmonics sit 40 dB under the tone, at 0.01 % 80 dB under.

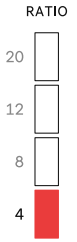
Here is the same story across the band, and it is told in the top half. A sine sweeps from the lowest bass to the top of the band at four input levels, the defaults throughout. Red is the compressor at its everyday depth. The bass rises a little, but the lowest point is in the low mids, and from there the curve climbs with every octave. So A adds most in the upper mids and the top: the bite of a guitar, the consonants of a voice, the crack of a snare. The black curves show how little the input level changes that shape. Under the knee the same climb is there, far lower. Driven harder, the curve lies on top of the red from the mids up: more drive doesn't add more. The color is the unit's own, at a constant strength once it compresses; set how much you want with Blend.



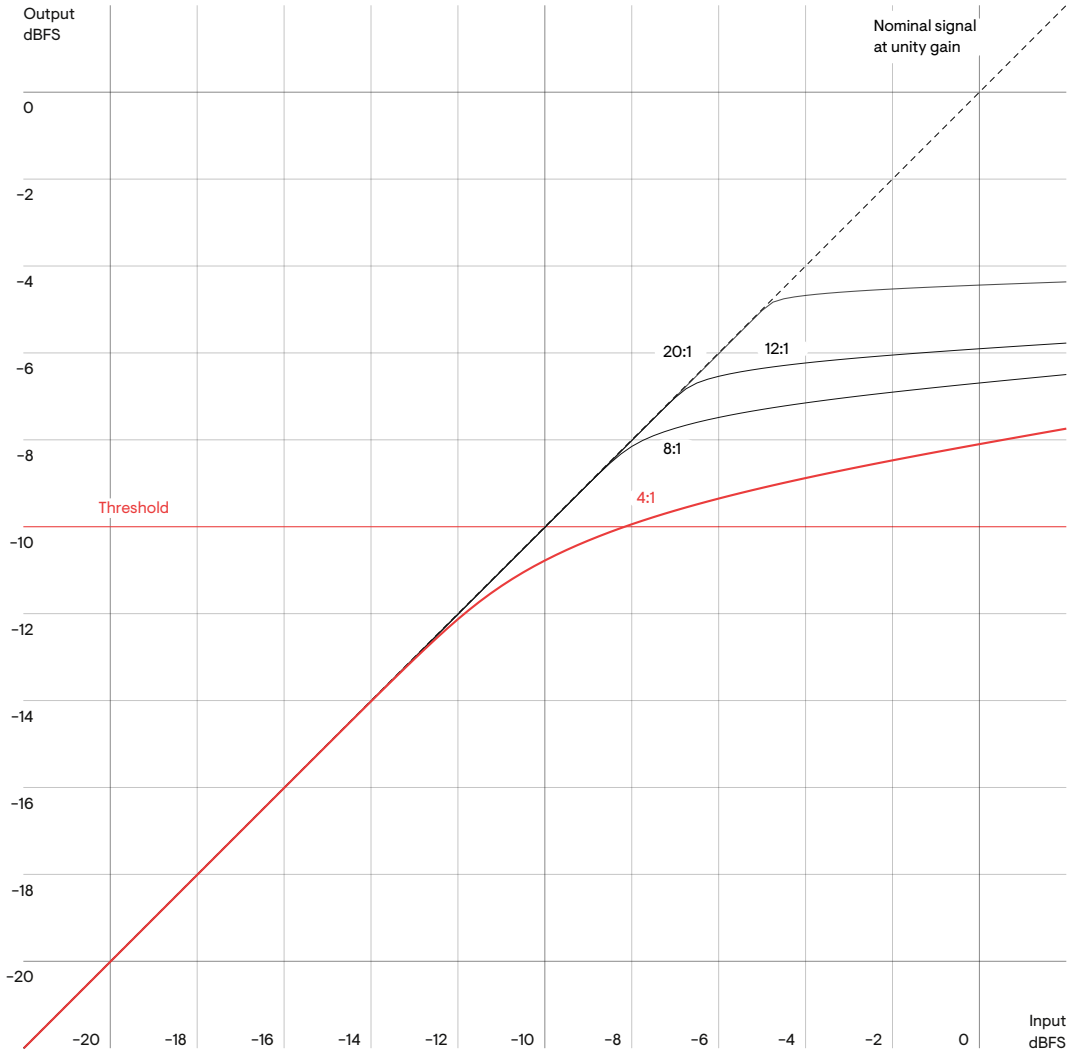
Comp 76 E



Ratio



The buttons work on E as on A: a higher one starts later and leans harder above its knee, so at everyday levels it takes less off, not more. E's own part is how hard they lean.



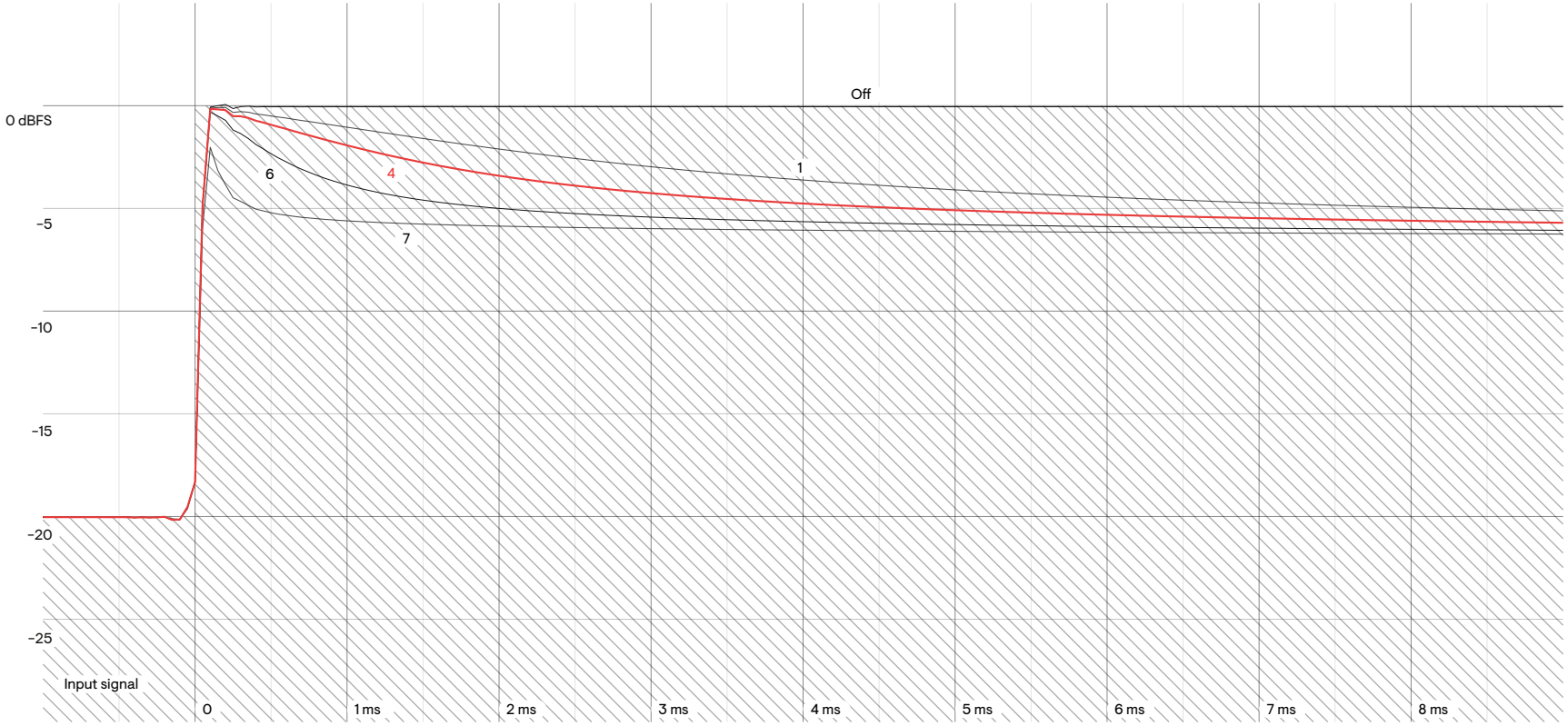
Red is 4:1, close to A at its default. Above the knee every button is gentler here than on A, though all still come out steeper than their legends. The knees sit a little higher than A's, and 8 and 12 part: 12 starts later and takes a little less off, a step A doesn't have. 20 is still a limiter, nearly flat above its knee. As on A, if a higher button doesn't take off enough, the answer is more Input.

Attack



The same test as on A. The dial runs the same way, and E is a step ahead of A at every setting.

The difference is small in milliseconds and it shows on drums: a little less of each hit's front gets through before the gain comes down, and the reduction settles sooner.



At Attack 4, the default, most of the reduction is in place a little sooner than on A, and the rest settles faster. A hit keeps its edge and the body is held.

Attack 1 is the slow end, as on A, and 6 is already quick.

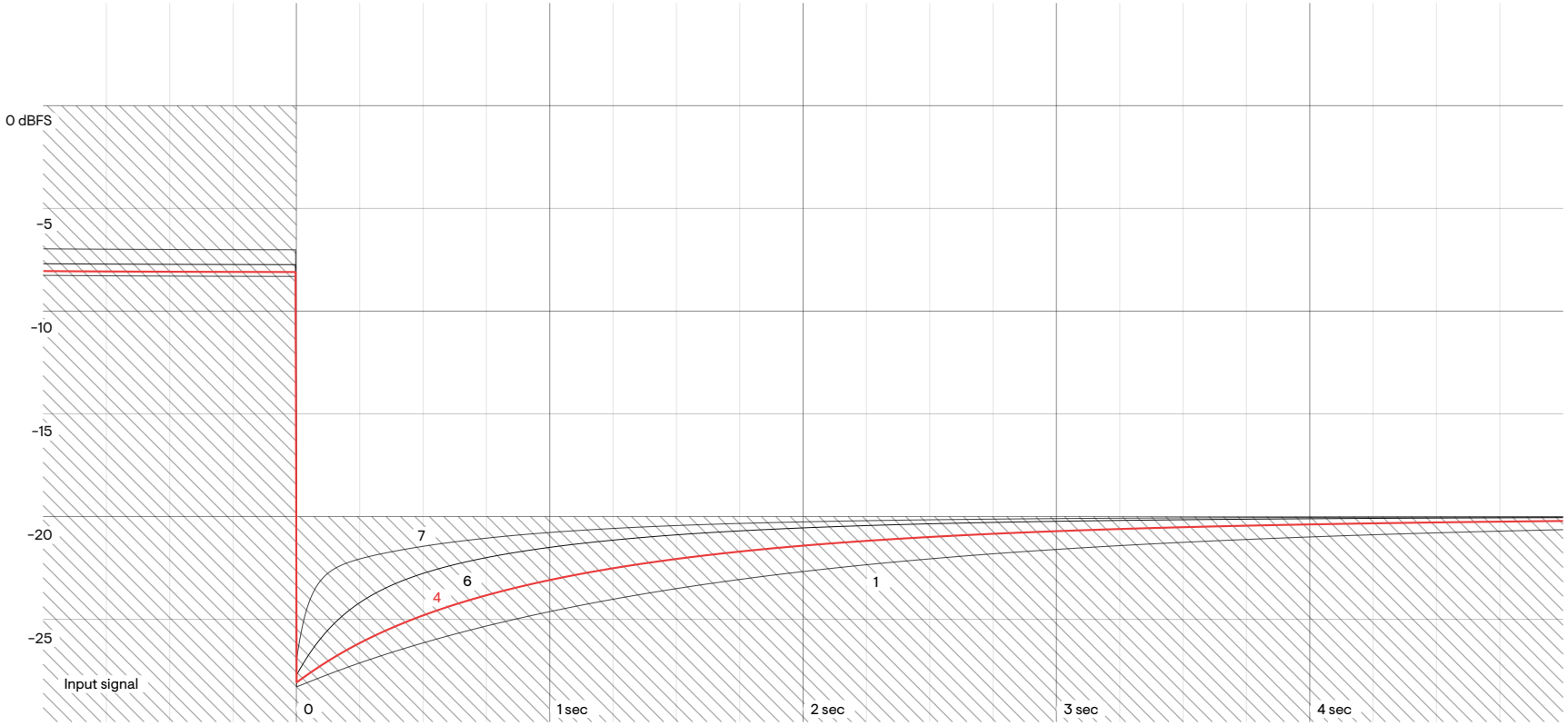
At 7, E's fastest, it clamps in a fraction of a millisecond, quicker than A, and the first cycles after the step are already held down harder: the position for catching peaks, and for a vocal pinned to the front of the mix. Off works as on A: no reduction at all.

Release



The same test as on A: a loud tone drops under the knee and the chart follows the gain back. The release has the same two stages, a main stage at the dial's rate and a slower last few decibels.

E holds on a little longer at every setting, and its slow last stage is longer: under the same settings the level stays steadier.



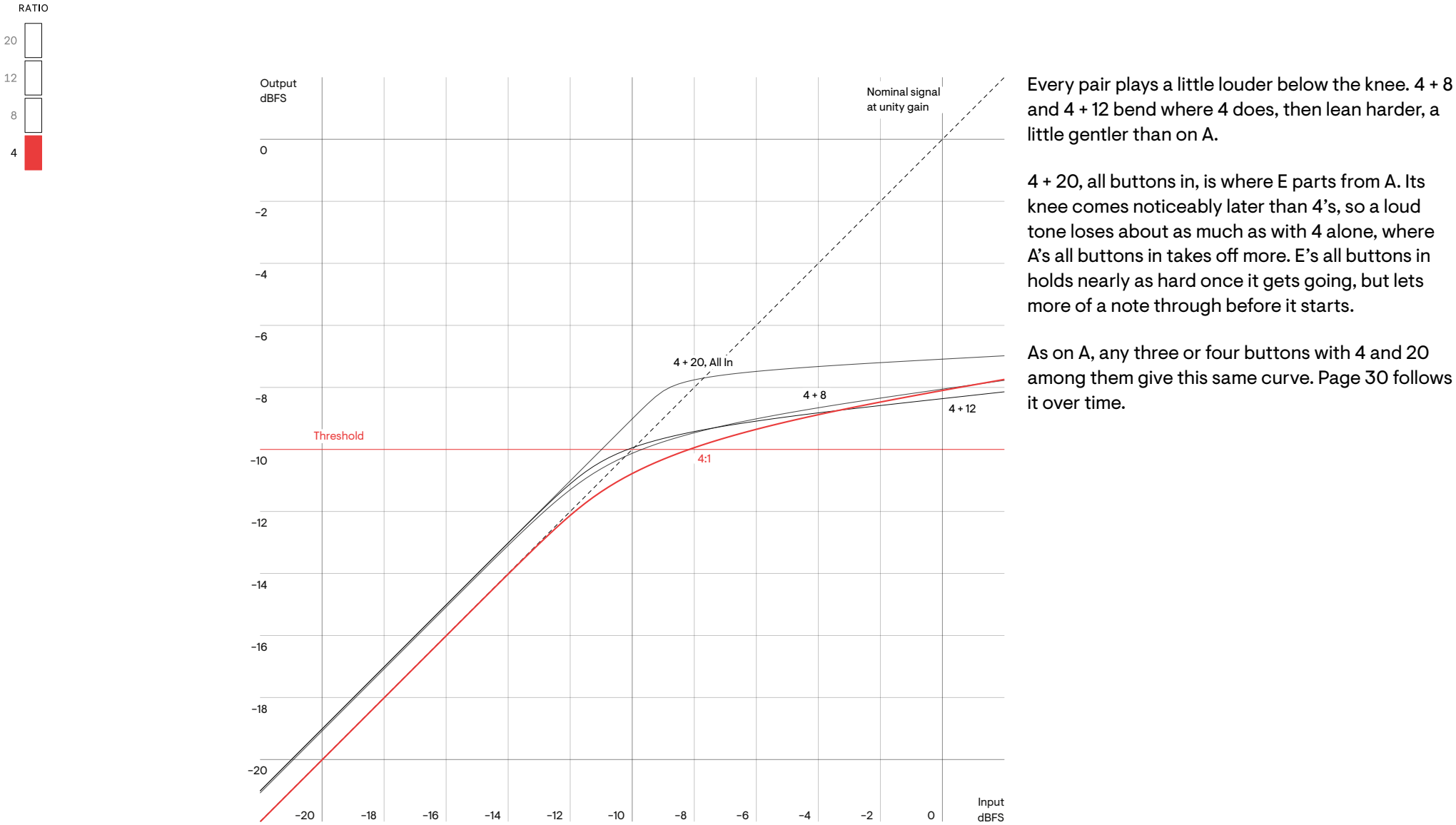
At Release 4, the default, half the reduction is gone in under a second, and the rest takes a little longer than on A.

Release 1 is a slow, even hold for a mix bus or long notes. At 6 the first half is back in about a third of a second.

At 7 half is back almost at once, yet the tail takes longer to settle than A's. The pump is a little slower and it settles later after each hit, so a hard-driven drum loop breathes a little slower on E than on A.

Combined Ratios

The pairs with the 4 button on E, against 4 alone in red. They work as on A (page 18): each keeps 4's start and adds the steeper button's hold.



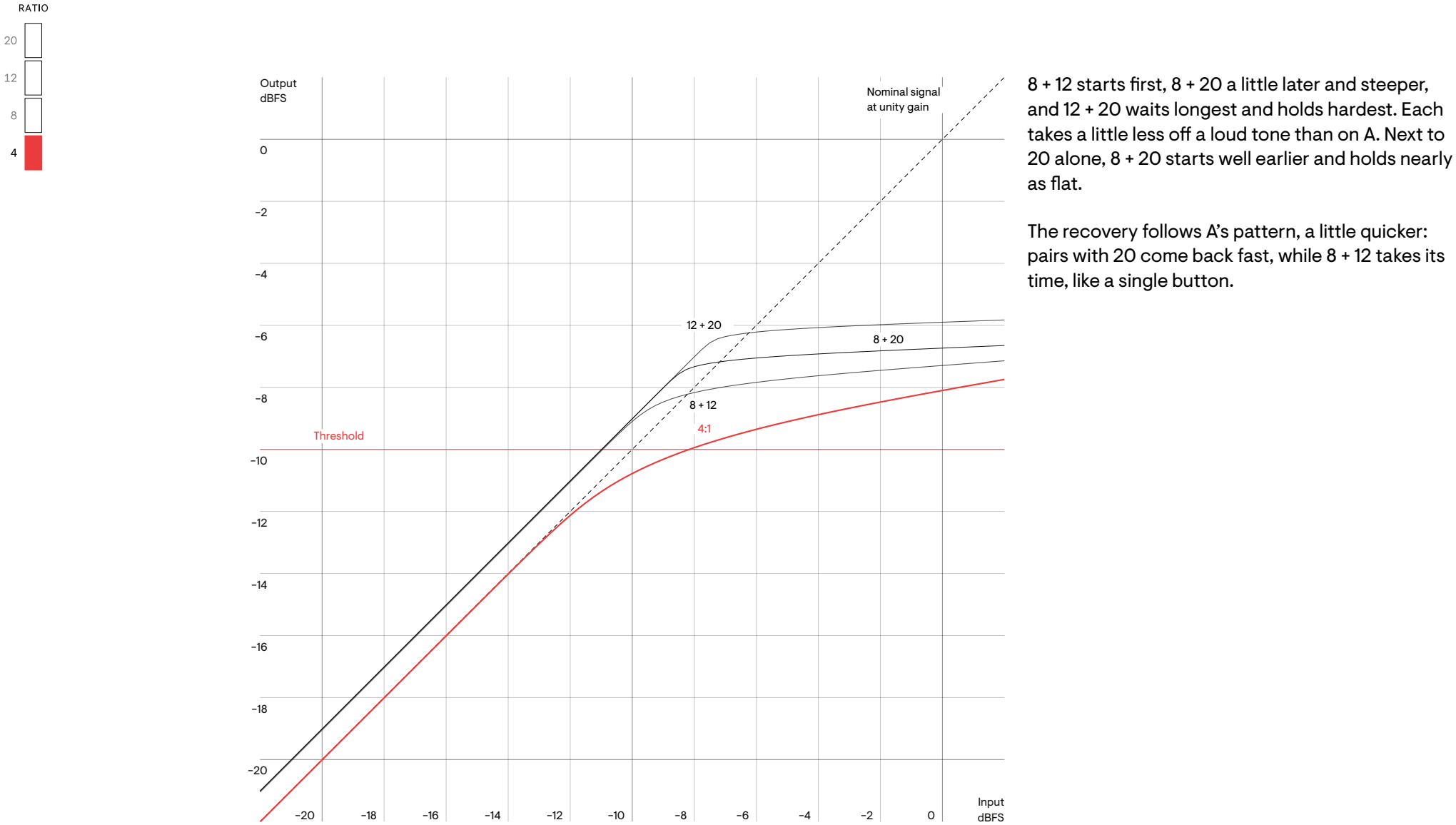
Every pair plays a little louder below the knee. 4 + 8 and 4 + 12 bend where 4 does, then lean harder, a little gentler than on A.

4 + 20, all buttons in, is where E parts from A. Its knee comes noticeably later than 4's, so a loud tone loses about as much as with 4 alone, where A's all buttons in takes off more. E's all buttons in holds nearly as hard once it gets going, but lets more of a note through before it starts.

As on A, any three or four buttons with 4 and 20 among them give this same curve. Page 30 follows it over time.

Other Combinations

The pairs without the 4 button on E, against 4 alone in red. The order is the same as on A (page 19); each pair starts a little later and leans a little less.

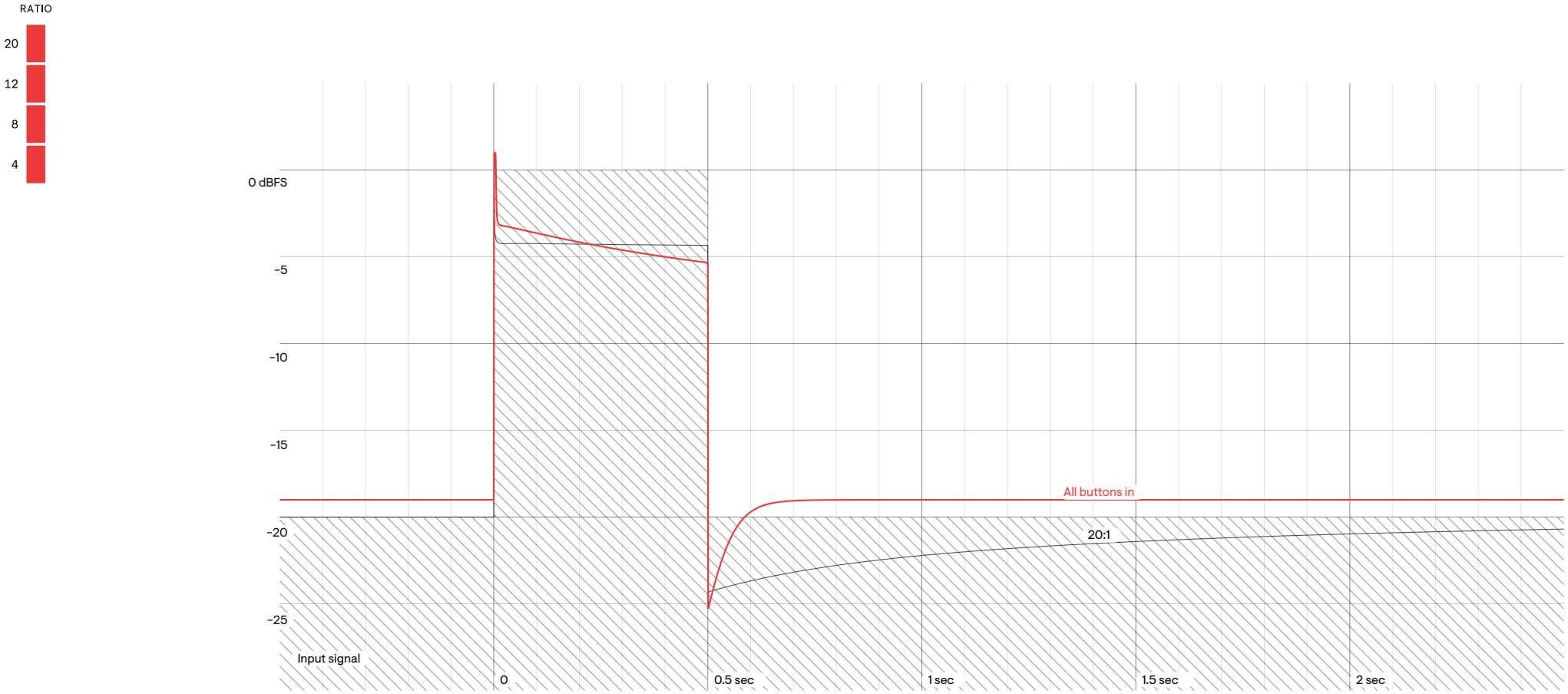


8 + 12 starts first, 8 + 20 a little later and steeper, and 12 + 20 waits longest and holds hardest. Each takes a little less off a loud tone than on A. Next to 20 alone, 8 + 20 starts well earlier and holds nearly as flat.

The recovery follows A's pattern, a little quicker: pairs with 20 come back fast, while 8 + 12 takes its time, like a single button.

All Buttons In over Time

On the same burst as on page 20, E lets the front of the note through a little longer than A, then comes back sooner.



The first few milliseconds pass untouched, a little longer than on A. Then E pulls the level down and keeps digging in through the note.

When the tone drops it comes back faster than A, almost at once, while 20:1 is still well down half a second on.

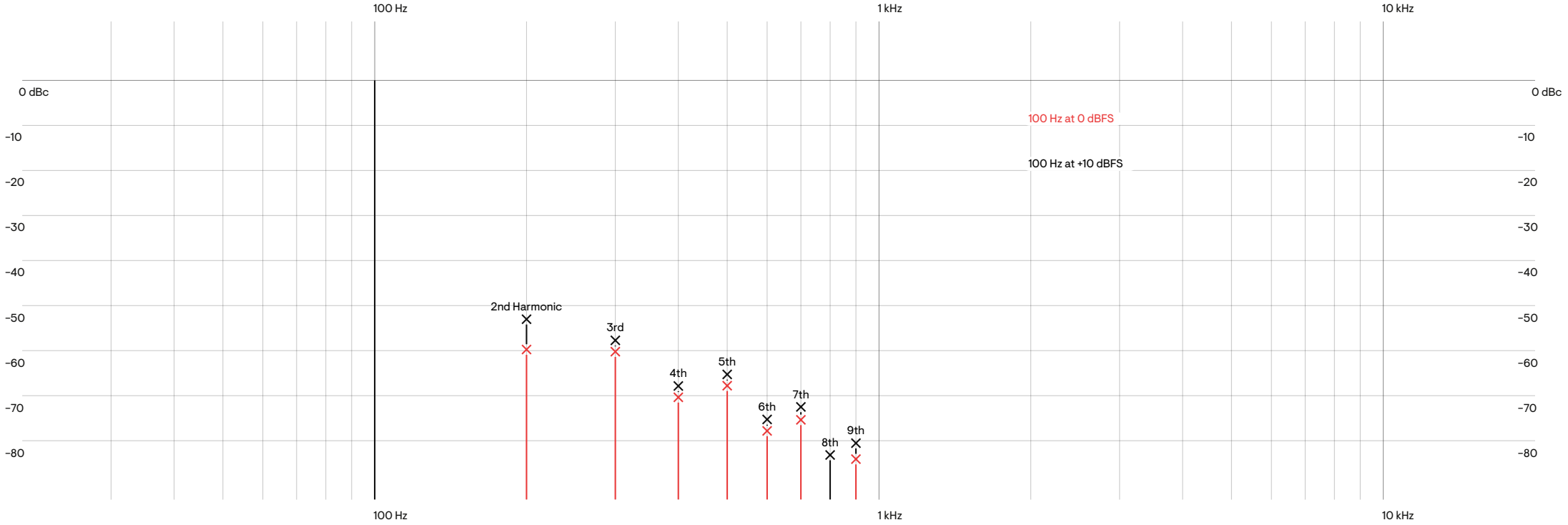
So E gives a longer crack on every hit and a quicker swell after it. On a room mic or a parallel drum bus, start with Blend well down and bring it up until the room is as big as you want.

Harmonics at 100 Hz

A 100 Hz tone at 0 dBFS in, +10 dBFS in black. Each cross marks a harmonic's level under the tone: −20 dBc is a tenth of it, −40 dBc a hundredth.

On a low note E carries more than its clean manner suggests. On a 100 Hz tone at the defaults the second and third harmonics stand side by side, with a train of higher ones behind them, well above the 1 kHz picture on the next page. As on A (page 21), the reason is the compression: a low note's cycle is long enough for the gain to move within it, and with Attack at Off the extra harmonics are gone.

Pushed harder, the second climbs further. So under heavy compression a bass gets weight and grit of its own, while the mids and the top stay clean. On a smooth bass line, keep the reduction moderate or bring Blend down.

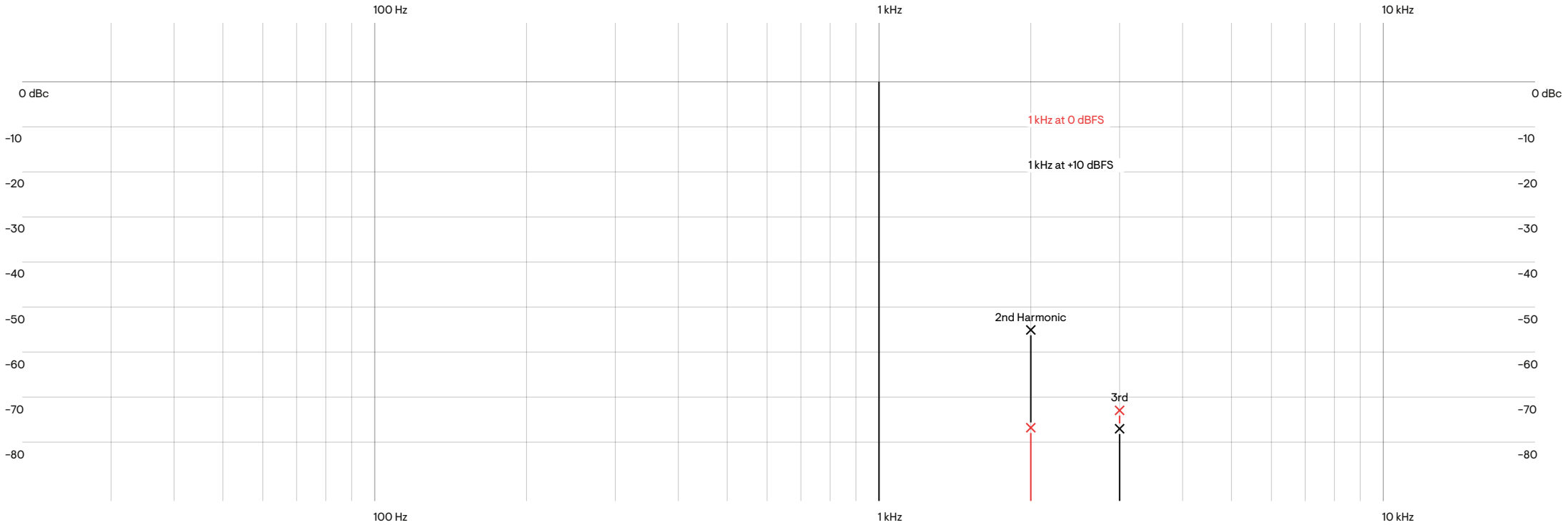


Harmonics at 1 kHz

A 1 kHz tone at 0 dBFS in, +10 dBFS in black. Each cross marks a harmonic's level under the tone: −20 dBc is a tenth of it, −40 dBc a hundredth.

Higher up, E parts company with A: what it adds to a sound comes with the work it does, and at a moderate setting that is very little. The red crosses are a 1 kHz tone at the defaults, well into reduction: the second and third harmonics sit low and close together, and nothing higher reaches the chart. You hear the level being held, not the unit; A at the same setting already carries a clear second harmonic.

The black crosses are the same tone pushed harder, twice the reduction. The second harmonic climbs a long way while the third falls back a little: a clean, even thickening that comes in with deep compression and not before. That is E's manner. Ride a bass or a natural vocal with a few decibels and it stays out of the way; drive the Input until the meter sits deep and the sound fills out.

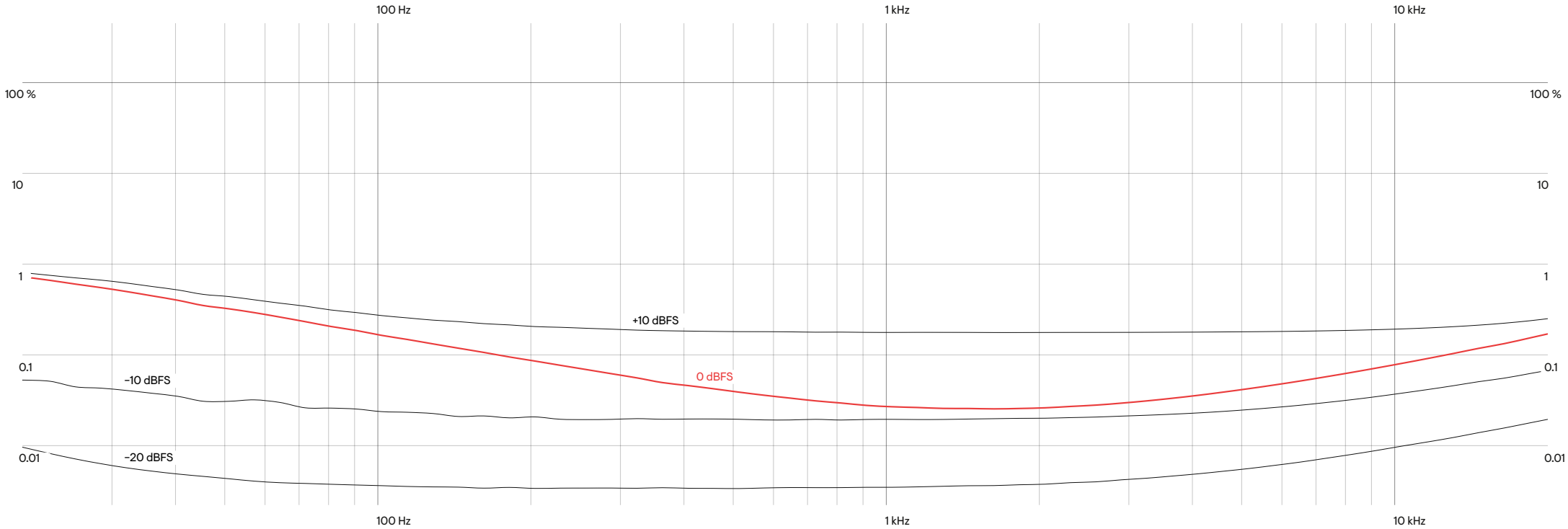


Distortion

A sine at 0 dBFS in, −20, −10 and +10 dBFS in black. Higher means more distortion: at 1 % the added harmonics sit 40 dB under the tone, at 0.01 % 80 dB under.

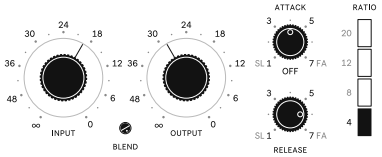
Across the band E tells a different story from A, and it is told in the bass. A sine sweeps across the band at four input levels, the defaults throughout. Red is the compressor at its everyday depth: very little through the mids, a gentle rise toward the top, and a steeper one in the bass. The bottom octave is where it shows first: on a bass held hard, a little added weight on the lowest notes. The black curves place it.

Under the knee, with nothing to compress, the unit is clean everywhere. Right at the knee it rises a step. Pushed harder, the bass hardly moves while the whole band above the low mids comes up: the thickening from page 32. So the low end comes in as the compressor starts working and levels off once it is deep in; what pushing harder adds is in the mids and the top.



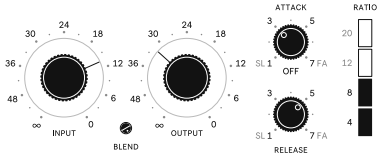
Setup Examples

The threshold is fixed, so Input sets the amount: turn it up until the meter moves where you want it, then bring Output back to match the level. Treat these as starting points; where an engineer is named, the setting in the quote is theirs and the rest is ours.



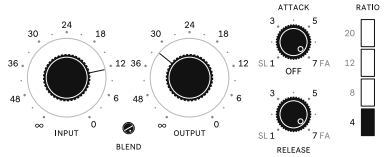
LEAD VOCAL, BLUE

Comp 76 A. The 4 button, Attack 4, Release 6. Input until the meter dips 4 to 6 on the louder phrases. Chris Lord-Alge's lead vocals on My Chemical Romance's The Black Parade "all got blue 1176 compression, 4:1, quick release." The bluestripe's second harmonic pushes the voice forward as it holds it.



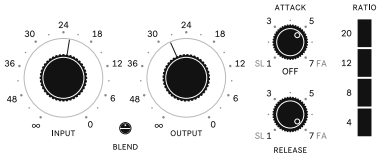
BASS

Comp 76 E. The 4 and 8 buttons in together, Attack 3, Release 5. Input until the meter sits around −7 on the notes. The two buttons are Tom Elmhirst's bass setting, with "attack and release ... at three or five"; Chris Lord-Alge put a black-face on bass at 4:1 and 7 dB of reduction. The notes even out and the low end stays clean.



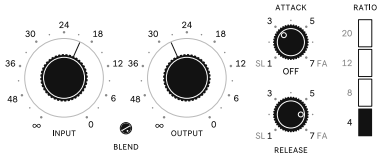
VOCAL IN YOUR FACE

Comp 76 E. The 4 button, Attack 7, Release 7. Input until the meter reads around −10. Tom Elmhirst's vocal chain on Amy Winehouse's "Rehab" ran through a black-face with a "very fast attack and a super-fast release, doing perhaps 10dB of compression." The voice jumps right to the front; breaths and room come up between the words.



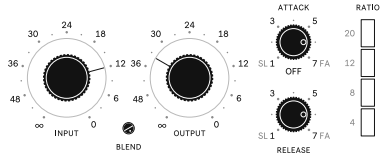
KICK, ALL BUTTONS IN

Comp 76 A. All four buttons in, Attack 5, Release 7, Blend about 50 %. Input until the needle stays well down. Johnny Simmen of Iguana Studios in Toronto put a microphone over the kick and slammed it with an 1176 in all-buttons mode. The kick thickens and distorts; Blend keeps its attack from the dry signal underneath.



PARALLEL MIX

Comp 76 A on a return track, Blend fully up, Link on Stereo. The 4 button, Attack 3, Release 6, Input until the meter dips 6 to 8. Send everything but the drums and bass, and bring the return up under the mix. That's how Andrew Scheps mixed Black Sabbath's 13: a pair of 1176s in parallel "through which I sent everything apart from drums and bass."



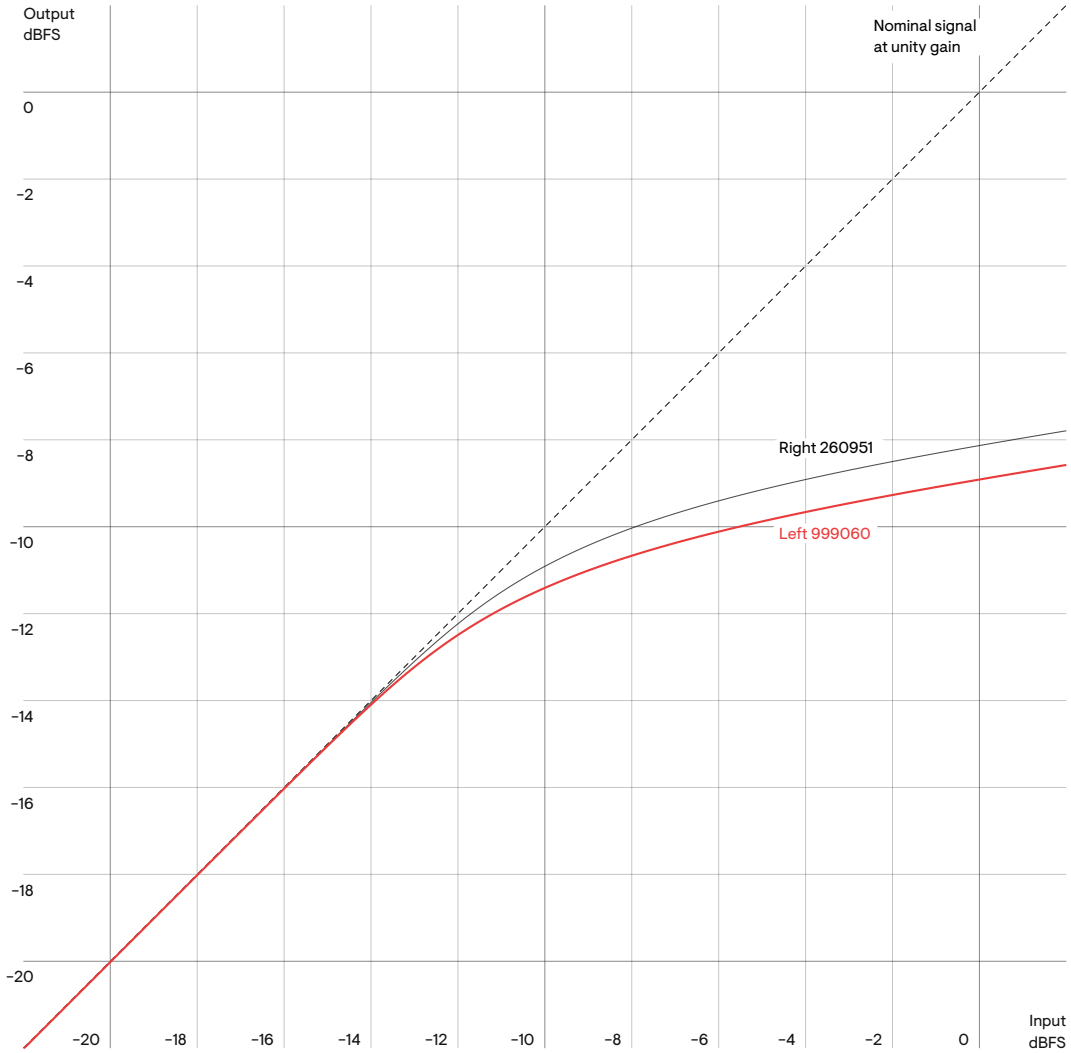
CRANKED GUITAR

Two Comp 76 A in series on a guitar recorded direct. The first with every ratio button out, Input high, Output down to bring the level back: it doesn't compress, it drives. The second on the 20 button, Attack 7, Release 7, Input up to taste. On Led Zeppelin's "Black Dog," Andy Johns ran the guitar direct through a couple of the limiters: "I just cranked the hell out of them." Watch the output level.

Serial Numbers

Every channel of Comp 76 is one unit, named by the six-digit serial number on its backplate. The number builds that unit from its own parts, so no two units compress quite alike.

Comp 76 A, Left 999060 in red and Right 260951 in black, Link on Dual Mono. Left reaches the knee a little earlier and holds back a little more on loud signals; one random pair in ten parts this far.



Click the logo under the meter to turn the device around and see the two numbers. Each one draws every part that shapes the compression from its own spread: the field-effect transistor that does the gain control, the attack and release parts, the input transformer, the resistors of the ratio switch and of the amplifier that drives the gain control, the output stage's idle current. Then it trims the unit's bias, so every channel idles where it should and the differences only show once it compresses.

Set Random gives the two channels unrelated numbers, and that is where the units part. The chart shows a typical such pair with Link on Dual Mono: one unit reaches the knee earlier and holds back more above it, the other starts later and lets more through. Most random pairs part only a little; one in ten parts as far as the chart shows. On a stereo source that is a touch of width, and two sides that lean in differently on the same hit.

Set Stereo gives a random pair of consecutive numbers, a matched pair from the same batch, and they stay very close. The defaults are such a pair: 303103 and 303104 on Comp 76 A, 482913 and 482914 on E.

Link on Stereo ties both channels to one control voltage, so even an unrelated pair stays close. Switch it to Dual Mono when you want to hear the two units.

Under The Hood

Two devices modeled on two versions of one limiting amplifier: the bluestripe and the black-face

Each revision built from its factory drawing into a complete circuit model, part by part. Both devices are checked against that model end to end

A serial number for each channel, each its own set of part tolerances, its bias trimmed as the factory did. Consecutive numbers make a matched pair

Inside, the circuit runs at twice the host rate, and the preamp clips at four times, to keep aliasing down when pushed

After a second of digital silence the circuit sleeps and costs a fraction of its load. The first sound wakes it in the same sample

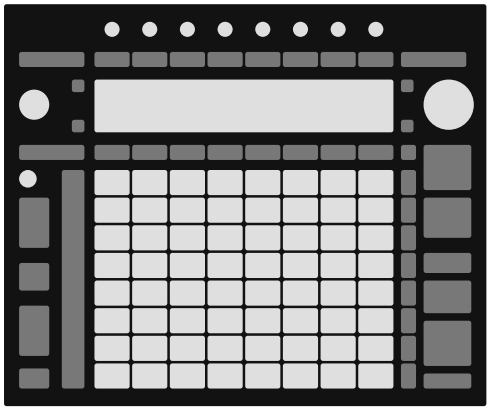
52 samples of latency, reported to Live: about 1.1 ms at 48 kHz. Blend's dry signal is delayed to match, so parallel compression never combs

Each meter a model of a VU movement, driven by the circuit's own meter amplifier and calibrated the factory's way

Added to the original circuit: Blend, a sidechain high-pass and high shelf. Link on Stereo joins the two channels as two units for stereo

About 5–6 % of a core per device in Live at 48 kHz; twice that at 96 kHz

Input and output transformers modeled, cores and all



PUSH BANKS: COMPRESSOR AND GLOBAL

COMP 76 REQUIRES LIVE WITH MAX FOR LIVE

A personal note

Thank you so much for checking out my work. I hope it helps you explore and learn these tools. I would never claim great expertise in audio engineering, but through my love for this craft I hope to shed a bit of light on it. I'm always happy to share what I know, and I'd especially love to hear your thoughts on the result. Please don't hesitate to reach out with questions, concerns, feedback or anything else.

You can reach me at info@monomono.audio, or send me a message on Instagram at @monomono.audio. I handle all my communication myself and will be happy to hear from you.

Oh, and while the research and proofreading were done with the help of various language models, every single em dash in this manual was put in by hand. Decades of print-design experience still leak through in my copy.

— Nikita

Including this one. It's ⌥+⇧+-. You're welcome.

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The people quoted or credited in this manual are quoted from the published sources below. Their words describe the original hardware, not Comp 76, and no endorsement by any of them is claimed or implied.

Bill Putnam: Universal Audio, 2-1176 manual, 2009; Mix, Barry Rudolph, June 2000.

Bones Howe: Music Connection, Harvey Kubernik, July 2022; Mix, Dan Daley, July 2004.

Brad Plunkett: United & Affiliates Newsletter, December 1969; Universal Audio, 2-1176 manual, 2009.

Bill Putnam Jr.: Universal Audio, 1176AE manual, 2008.

Chris Lord-Alge: Sound On Sound, Paul Tingen, May 2007; Mix, Maureen Droney, October 2001.

Tom Elmhirst: Sound On Sound, Paul Tingen, August 2007.

Andrew Scheps: Sound On Sound, Paul Tingen, August 2013.

Johnny Simmen: Mix, Regional Sessions: Canada, August 2016.

Andy Johns: MusicRadar, November 2023.

Barry Rudolph: Mix, 2000.

The history draws on factory documents of the period and photographs of original units. None of the authors above reviewed or endorsed Comp 76.

Release Notes

1.0 — November 23, 2026
Initial Release