MONOMONO

Console 40

Large-format console
suite for Ableton Live

v1.2

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Foreword

Over the years spent with the craft of audio engineering and its tools, one thing has become increasingly clear to me: modern manufacturers share very little about how their products work. Old user and service manuals are full of fascinating details about the electrical and audio engineering behind the gear. Modern ones mostly leave artists in the dark, which I find a real shame.

I believe a manual is a great way to communicate and build trust with artists and engineers: it can explain sound well and give artists confidence. This manual also aims to give you, as a customer, what you need to make an informed decision before you invest your time and money in Console 40. So even if this one gets dense and dry at times, with charts and plots, I want to give you as much as I can about how and why these tools work the way they do. I hope you find it as interesting as I do.

Thanks for checking it out. I hope Console 40 earns a place on your tracks the way the console did on so many records.

— Nikita

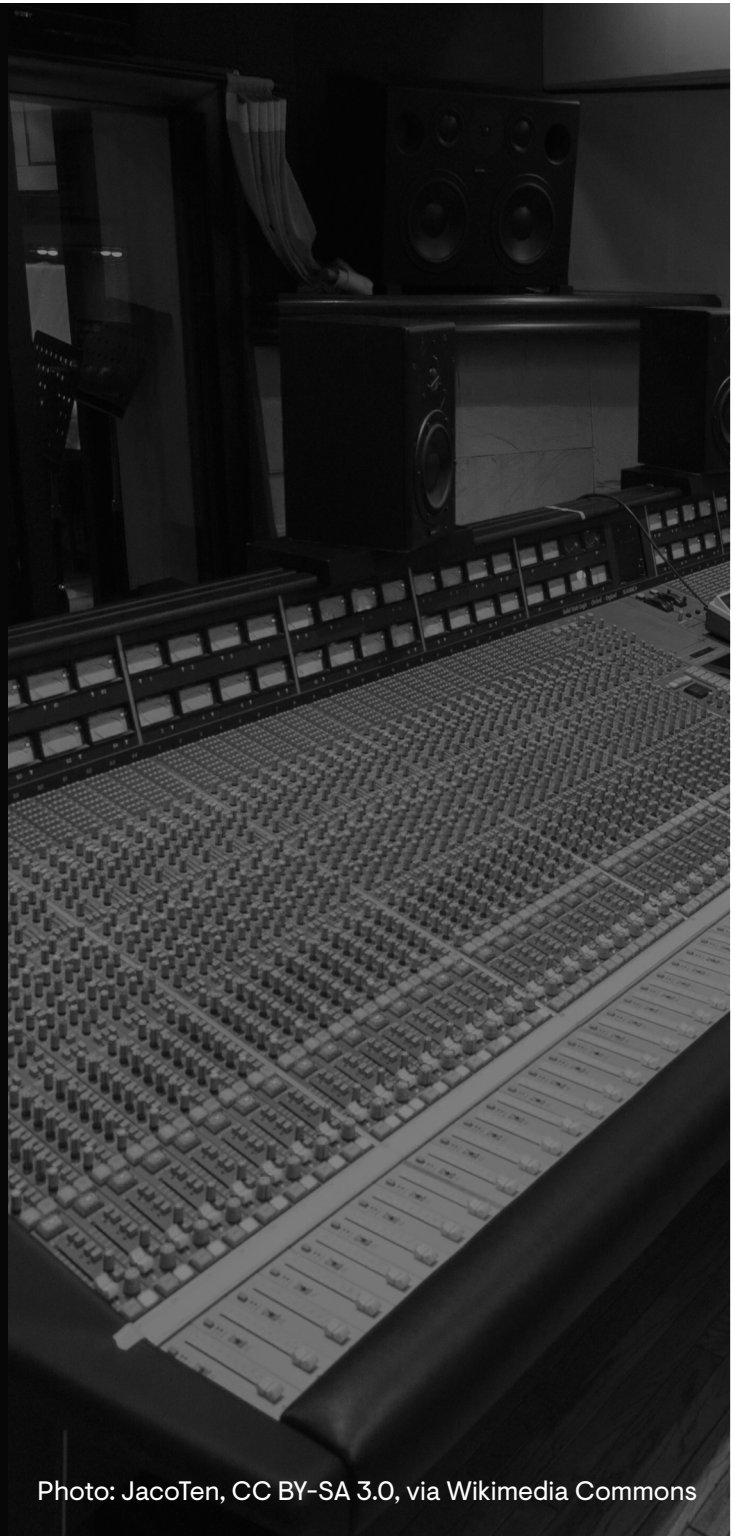


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Lineage

In August 1977, a small company from Oxfordshire sold the first of a new range of consoles, built the year before. Its founder, Colin Sanders, had started out building switching systems for pipe organs, and he designed the desk for his own studio because nothing on the market did what he wanted. The Solid State Logic SL 4000 put in-line channels, dynamics on every channel, automation and tape machine control into a single frame.

With a compressor and gate on every channel and another compressor across the mix bus, engineers stopped asking the assistant to patch things in: you pressed a button and it was there. On one of these early desks in London, a 4000 B, the gated drum sound of the eighties was found by accident. Two years later the E series added recall, so a mix could be rebuilt days later.

The G series arrived in 1987 with a redesigned EQ, known today as the Pink, and tighter, more refined compression. In 1996, Billboard reported that 83% of that year's number-one singles had been made on the company's consoles.

Production ended in 2002, but the workflow never left.

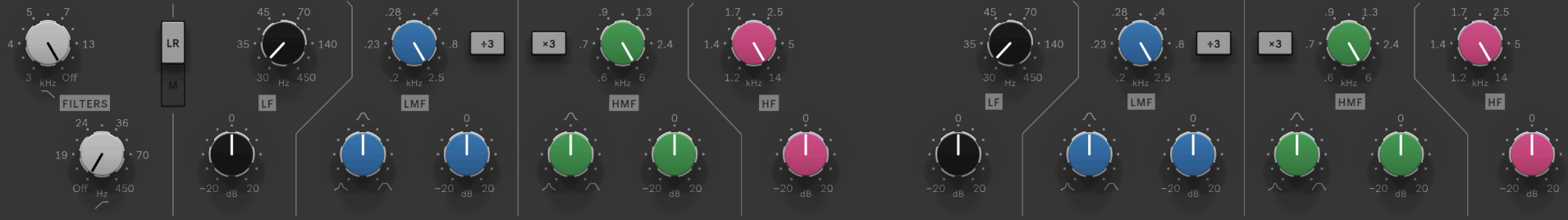
EQ Topologies

Console 40 offers three generations of the console's channel EQ, each modeled on the original circuitry. Any of them can handle the full range of material, but each brings something of its own to the table. The Pink comes as EQ 422 and its streamlined sibling EQ 420, the Black as EQ 424 and the Orange as EQ 426.

They come with a few additions of our own, such as M/S on the 422, 424 and 426, and a resonance trim on the Black's and Orange's high-pass.

Before we dive into each of them, let's highlight the differences between them.

EQ 422 & 420
Pink



EQ 424
Black



EQ 426
Orange



What 422 is Great at

The broad-brush.

Its bells widen as you back off and tighten as you push, so gentle moves stay smooth and natural while big ones become focused on their own. Engineers reach for it to shape tone: overall EQ on groups and buses, subtle corrections on vocals and instruments, and bells that the ×3 and ÷3 switches can place anywhere from the deep lows to the air.

Gentle, natural tone shaping and subtle fixes on vocals and instruments

Wide, musical curves for buses, groups and the whole mix

Warm, weighty lows from the bump built into the low shelf

Placing vocal and keys bells deep in the lows or high in the air with ×3 / ÷3

What 424 is Great at

Precise, punchy EQ.

Its bells keep the width you set at any gain, so you decide how focused a move is and it stays that way. That makes it the choice for detail work: tight drums, a low end with real weight, and narrow fixes at low gain. Many studios had both on one desk, so engineers could pick one per channel.

Punchy drums, with a low end that holds solid when you boost hard

Clear, open vocals and acoustic instruments

Precise lifts and clean scoops, focused even at low gain

What 426 is Great at

Narrow peaks, big shelves.

Its Q works like a Pultec's bandwidth control: narrow, a bell reaches high and stays tight; wide, the same move turns broad and gentle. Its shelves reach further than the panel suggests — the low one past the printed range, the high one down into the mids — so one move can tilt a whole sound.

Weighty lows from a shelf that lifts further than its panel says

Narrow boosts that pick out a single note or the ring of a drum

Broad, gentle tilts with the high shelf set low

Wide bells that stay musical, however far you turn them

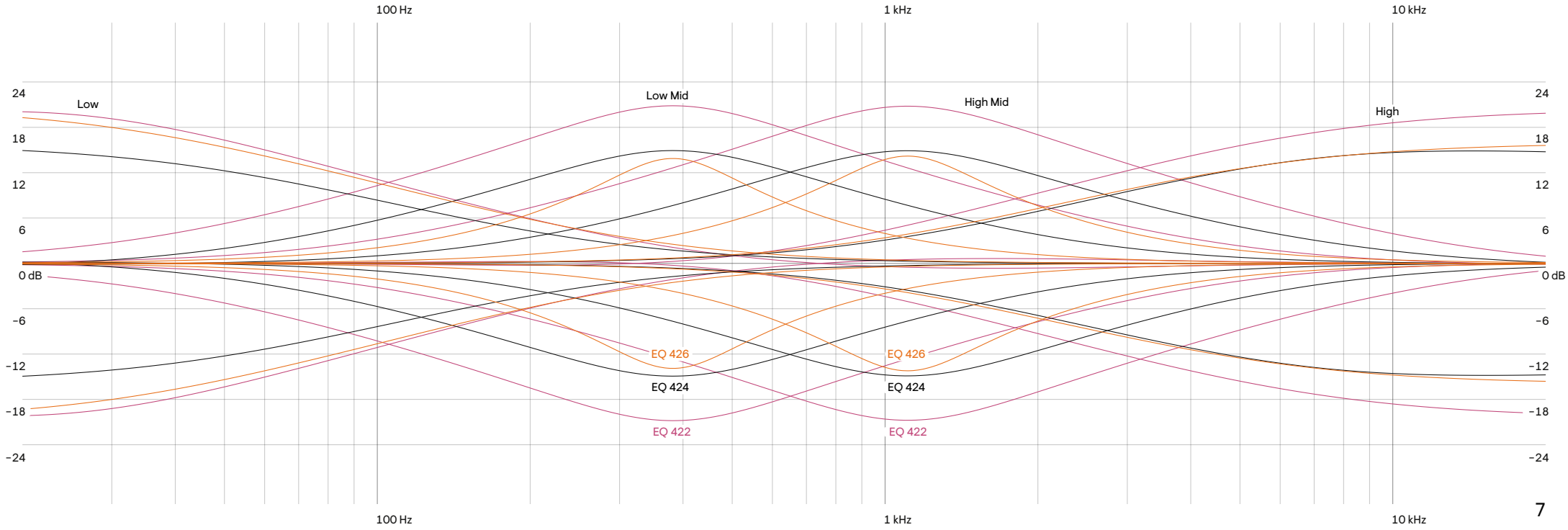
Console 40 includes all three. Learning them all is definitely worth it — it lets you build channel strips for specific material on purpose — but mastering just one will push your mixes further into greatness.

Pink, Black and Orange

Every channel of the console had its own four-band parametric EQ with high- and low-pass filters. Over the desk's lifetime that EQ was redesigned several times. Until 1987, the color of a channel's low-frequency knob caps told you which EQ it had.

The first E series desks shipped with the Brown EQ. Its bells kept a constant width and its shelves were gentle. A rare Orange option followed. Built on the Brown's circuit, it was marketed as following the curves of a Pultec valve equalizer: its bells are narrow, and as on a Pultec's bandwidth control, setting them narrower lets them reach higher. Very few were sold. Next came the Black, which grew out of discussions with working engineers. It brought tighter control of the low end and a steeper high-pass, and by the mid-eighties it had replaced the Brown as standard.

Production styles were changing, and some engineers found the desk's narrow mid boosts harsh. The G series, launched in 1987, answered with a redesigned signal path, EQ included. Its designer, Paul Frindle, set out to encourage subtler EQ: the bells are wide at small moves and narrow as they are pushed, the shelves dip slightly before they lift, and ×3 and ÷3 switches let the mid bands reach into the low and high ranges. It became standard on new desks, and it was built to fit the channels of older ones. The color code was dropped at the same time.



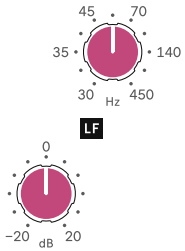
Band Overview

Low Frequency Band

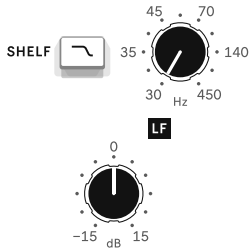
Tuned so their shelves act at the same frequency, the three low bands keep nearly the same shape; what differs is how far they lift. The Pink and the Orange go a long way, the Orange well past its printed ±15 dB, while the Black stays more restrained. Only the Pink dips slightly above its shelf.

The panels don't agree on where that frequency is: the Pink and the Orange read 50 Hz, while the Black sits at the bottom of its dial, at 30 Hz.

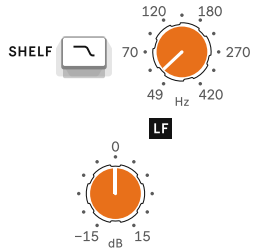
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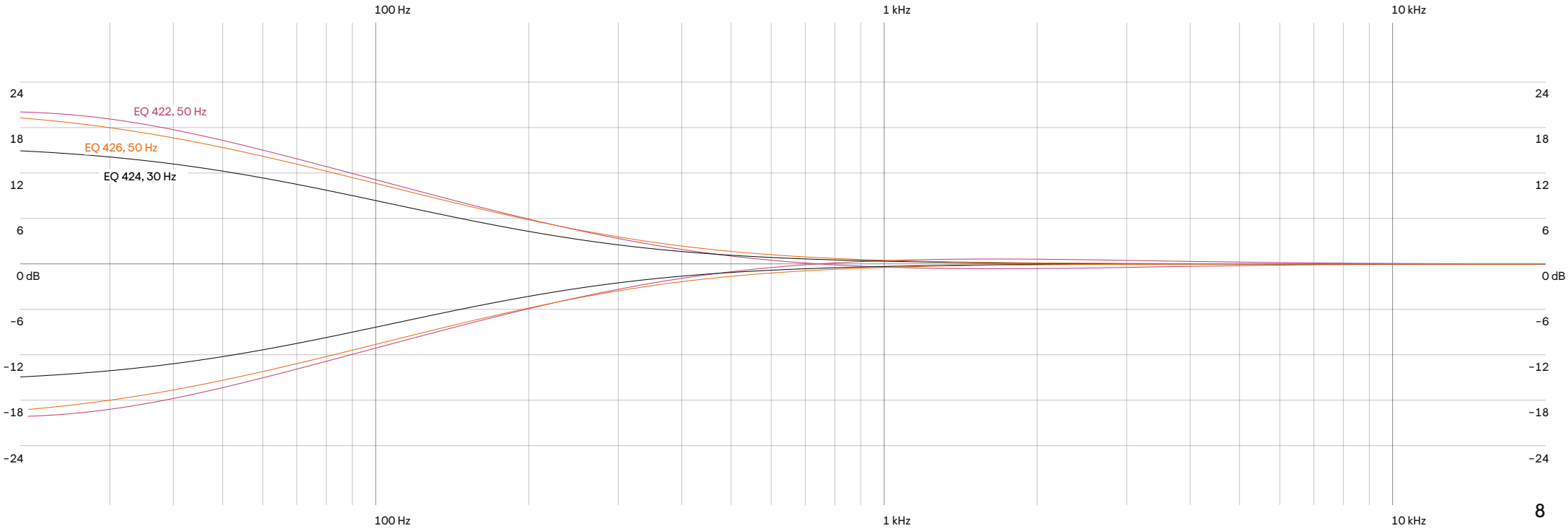


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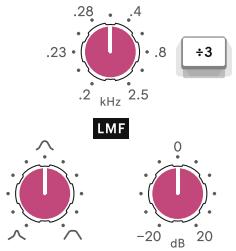


Low Mid Band

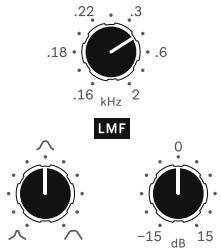
Centered on the same frequency, the Orange's bell is little more than half as wide as the other two, made for picking out a single note rather than shaping a range. The Pink reaches furthest and narrows as you push it. The Black keeps the width you set at any gain.

The Pink's ÷3 switch moves its whole range down, taking the bell deep into the lows.

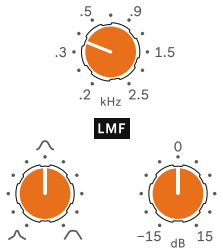
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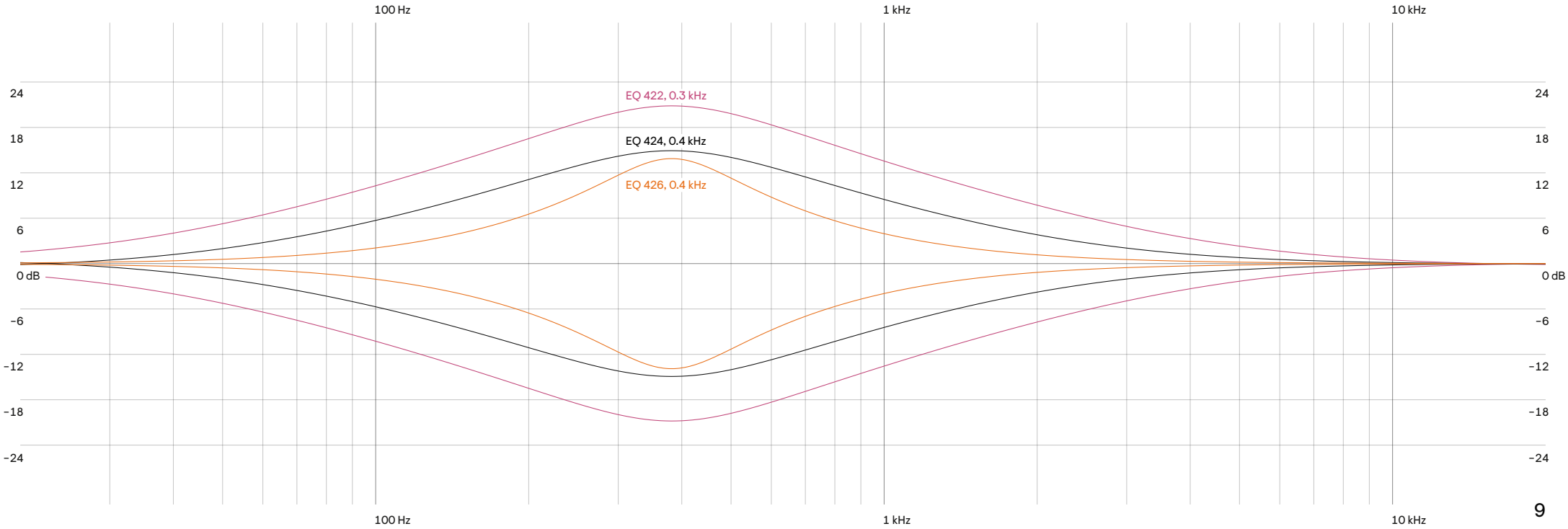


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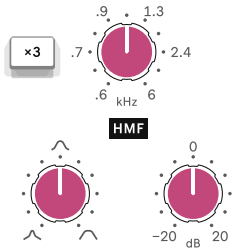


High Mid Band

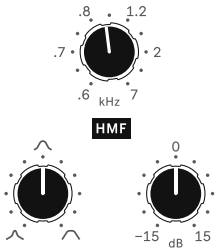
The same holds higher up: the Orange's narrow bell is the tool for a single harsh ring or the click of a kick drum. The Pink reaches furthest, and its skirts spread wider than the Black's, even though the Black's bell is a touch broader near its peak.

The Pink's ×3 switch moves its whole range up, lifting the bell into presence and air.

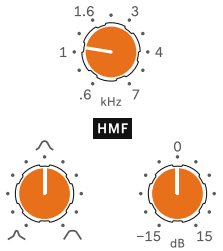
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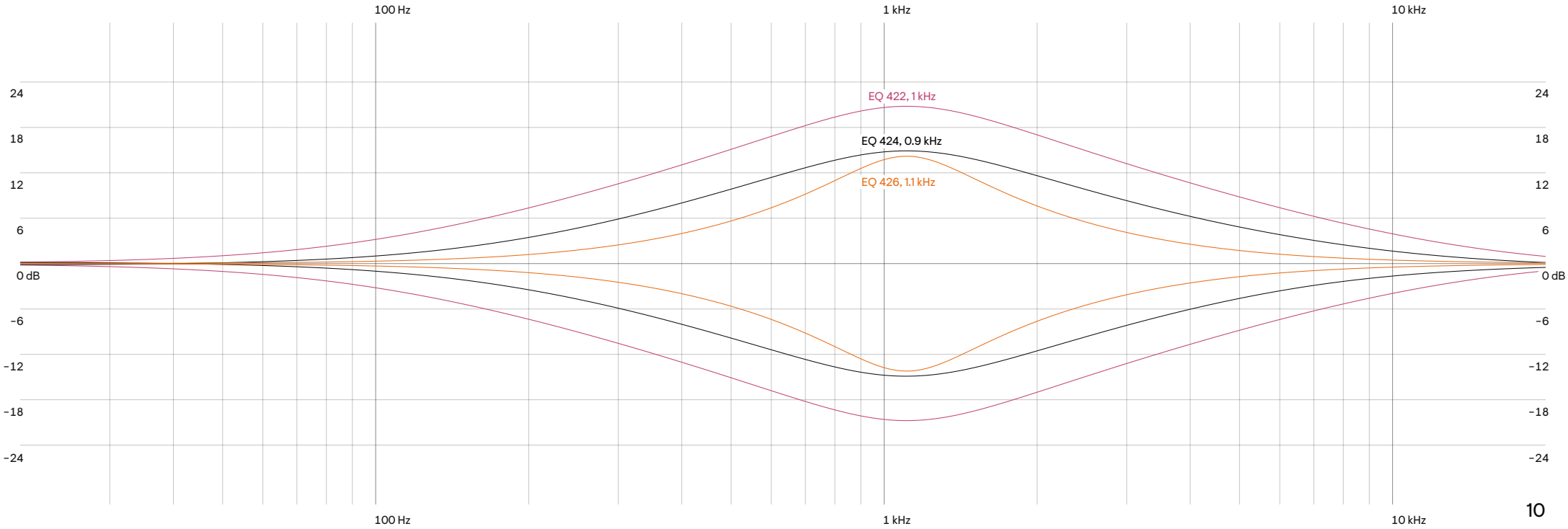


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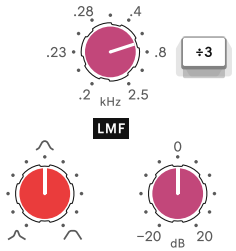


Low Mid Q

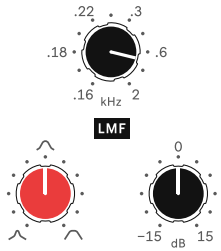
The Q dial sets how wide the bell is, and here the three cards part ways. Turned fully narrow, the Black and the Orange close to almost the same sharp point, tight enough to pick out a single note, and both lift harder there than their scales promise. The Pink never gets that narrow, but it keeps the same lift at every width.

Opened up, the Black spreads furthest, until its bell becomes a broad lift across the whole low mids. The Orange stays the most focused through the middle of its travel and gives up height as it widens, so its widest bell is also its gentlest.

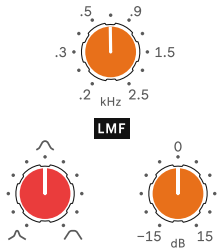
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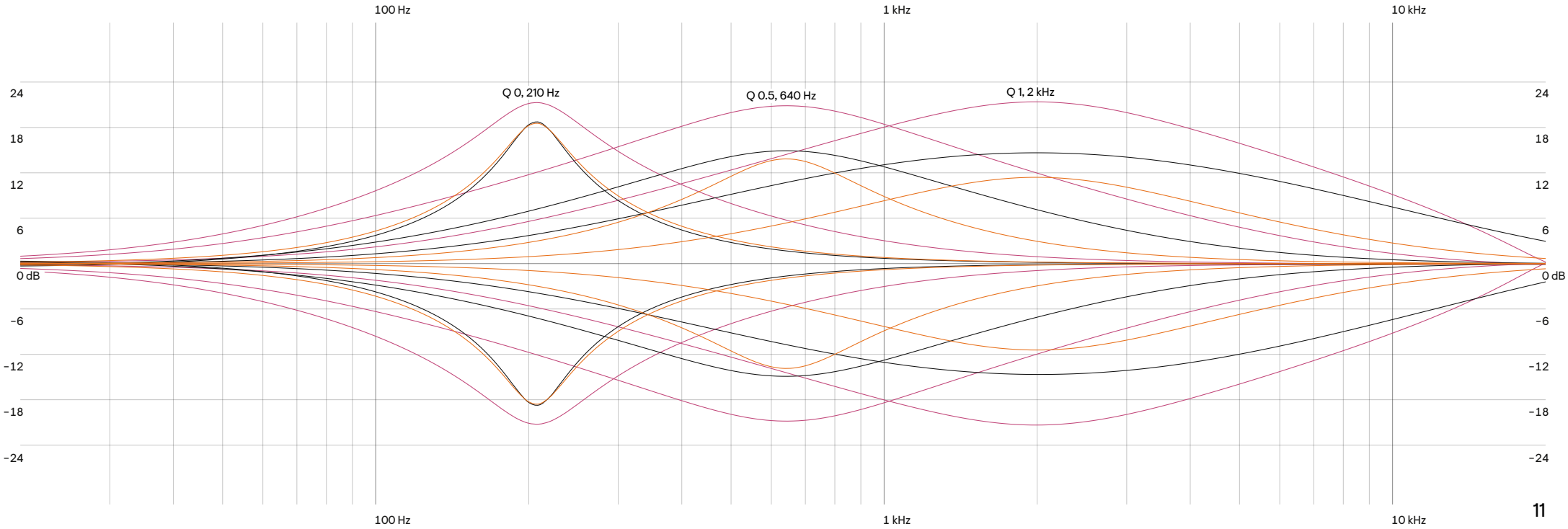


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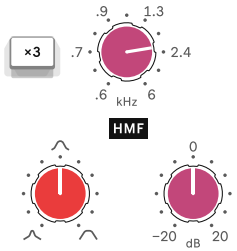


High Mid Q

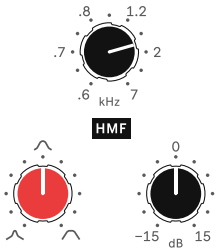
The high mids follow the same pattern. At the narrow end the Black and the Orange are surgical: a thin notch for a whistling resonance or a ringing snare, a thin lift for the attack of a pick. The Pink's narrowest bell stays broader, closer to a tone control than a scalpel.

Turned wide, the Black opens into a gentle rise over presence and air, the Pink keeps all of its lift, and the Orange softens as it opens, so a wide Orange boost stays smooth.

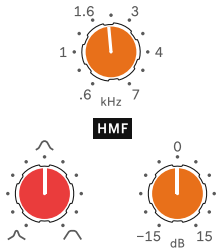
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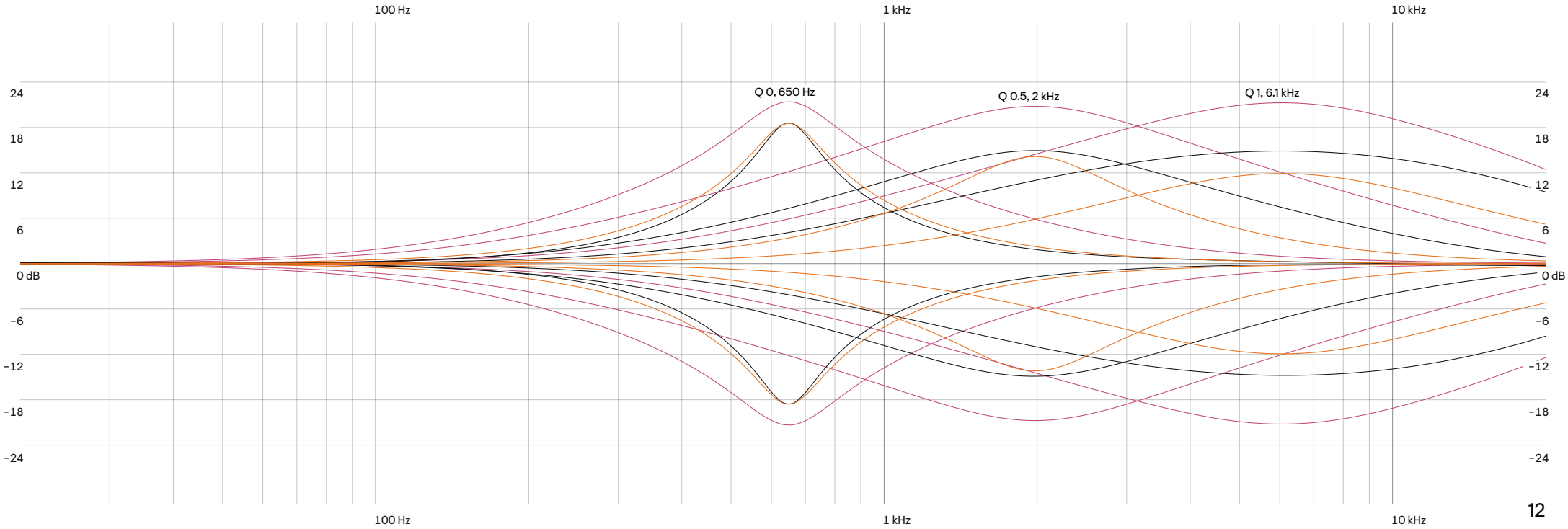


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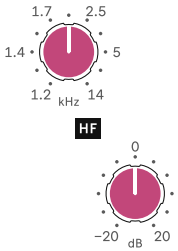


High Frequency Band

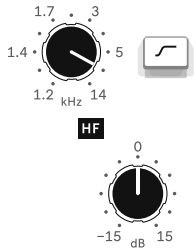
Matched at the same frequency, the three high shelves rise almost alike, and the Pink lifts well beyond the other two. Their panels read very differently, though: to match the Pink at 2 kHz, the Black and the Orange are set to 7 kHz, because their shelves act well below the frequency they print.

The Black and the Orange can also switch the band to a bell.

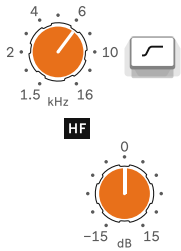
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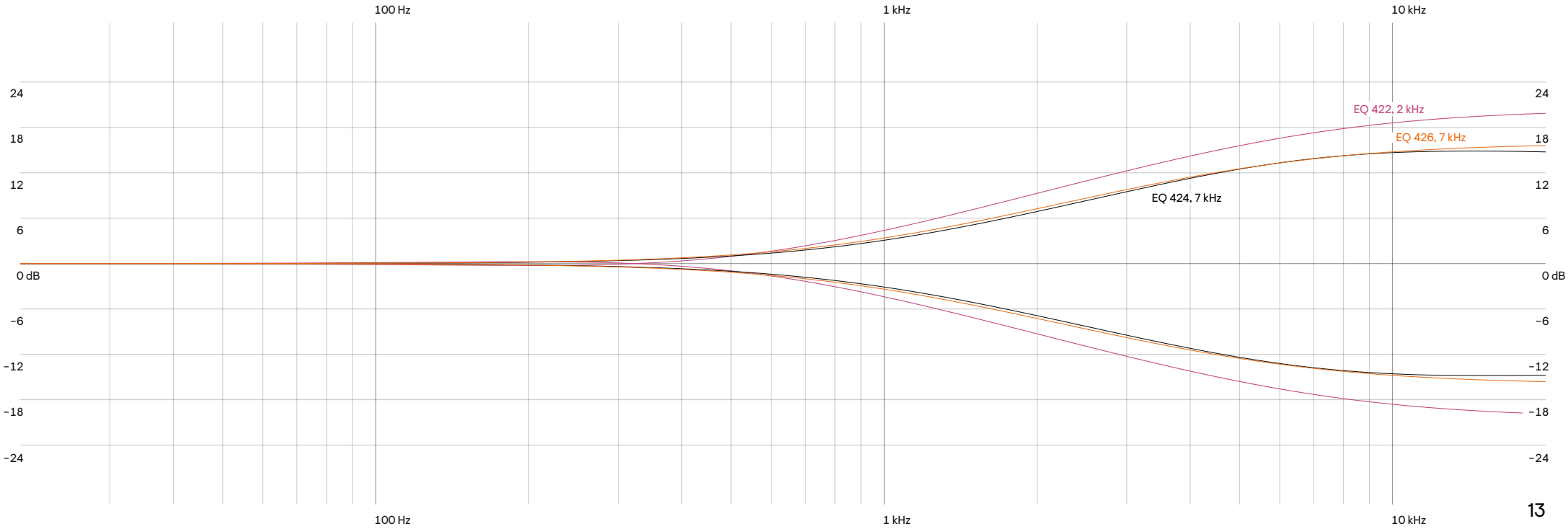


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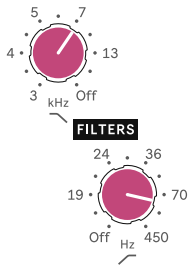


Filters

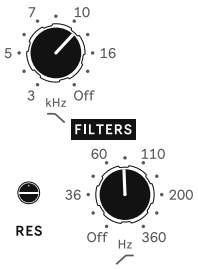
Each EQ closes its channel with a high-pass and a low-pass, and each switches out entirely at the end of its travel. With their corners matched, the three high-passes cut at about the same rate; what differs is the knee. The Orange's is the firmest, so the low end stays full right up to the corner, and the Black's is the softest, easing in earlier. The Black and the Orange add a resonance trim of our own that can lift the corner just before the cut.

The low-passes differ in their corner. The Pink's and the Orange's roll off smoothly and alike; the Black's rises to a resonant lift just below its corner before it falls, as its

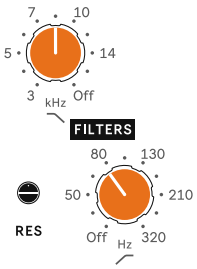
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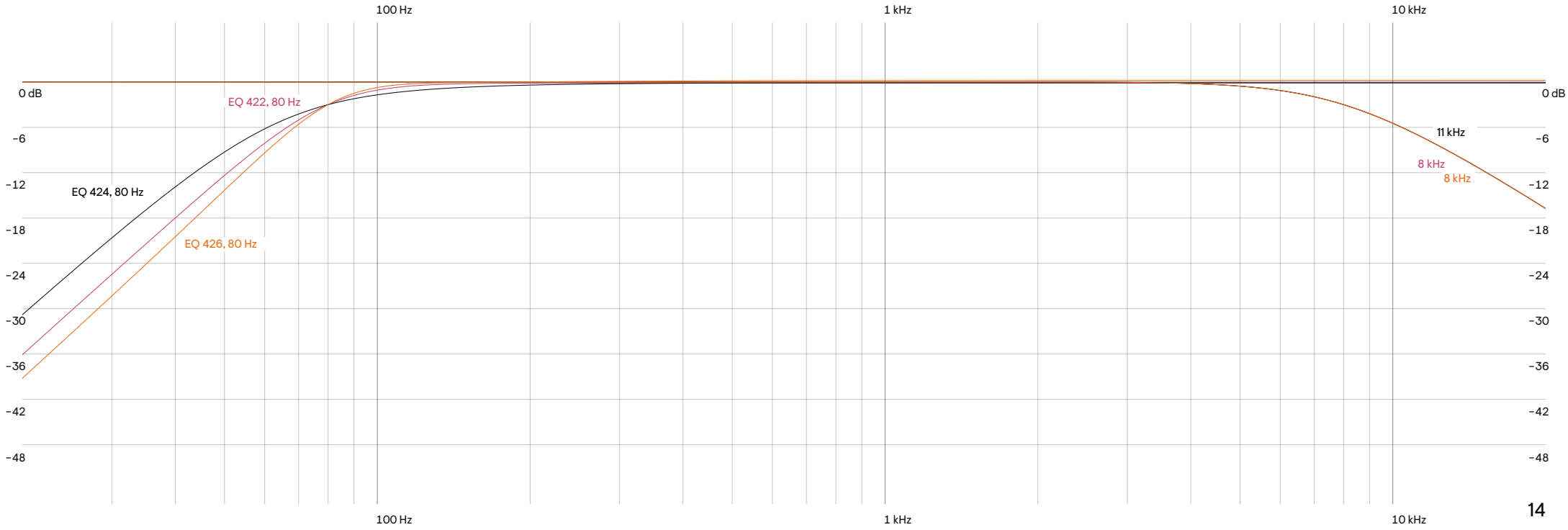


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EQ 422 & 420


Pink
M
S
45
70
35
140
30
Hz
450
LF
0
-20
dB
20
FILTERS
24
36
70
Off
Hz
450
13
Off

The 292

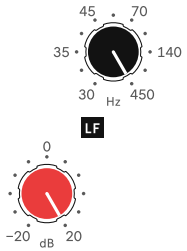
The 292 was first drawn on 16 June 1987, and its first title says what it was meant to be: a "611E/V Wide Range Equaliser", an upgrade for the channels of E series desks already in studios. It was renamed for the G series that October, the year the G was shown at the AES convention in New York. Paul Frindle, who developed it with the rest of the G channel electronics, remembers the new input stages, EQ and dynamics as "originally conceived as retrofit and/or customer optional modules destined for the E Series consoles". The old front panel had to fit, so the Bell switches went, "a reluctant compromise", and their places became the ×3 and ÷3 range switches.

What he changed was the feel. Engineers had started to call the desk harsh, which he put down to "the narrow bandwidth mid range boosts that had typified earlier production styles". On the 292 the width follows the gain: a small move is broad and a big one narrows itself, "to make delicate approaches to EQ more audible and thus encourage the user to employ somewhat less dramatic and more subtle EQ styles". Quieter electronics let the boost go further, and the shelves gained extra poles for "an increased warmth (response overshoot bump) in the LF region".

It had a price, and Frindle names it himself: losing narrow cuts at low gain "was a disadvantage when trying to tame resonances (especially percussion)", so some engineers were disappointed. Studios answered by mixing equalizers on one desk, and some new G desks were even built with the older Black on request.

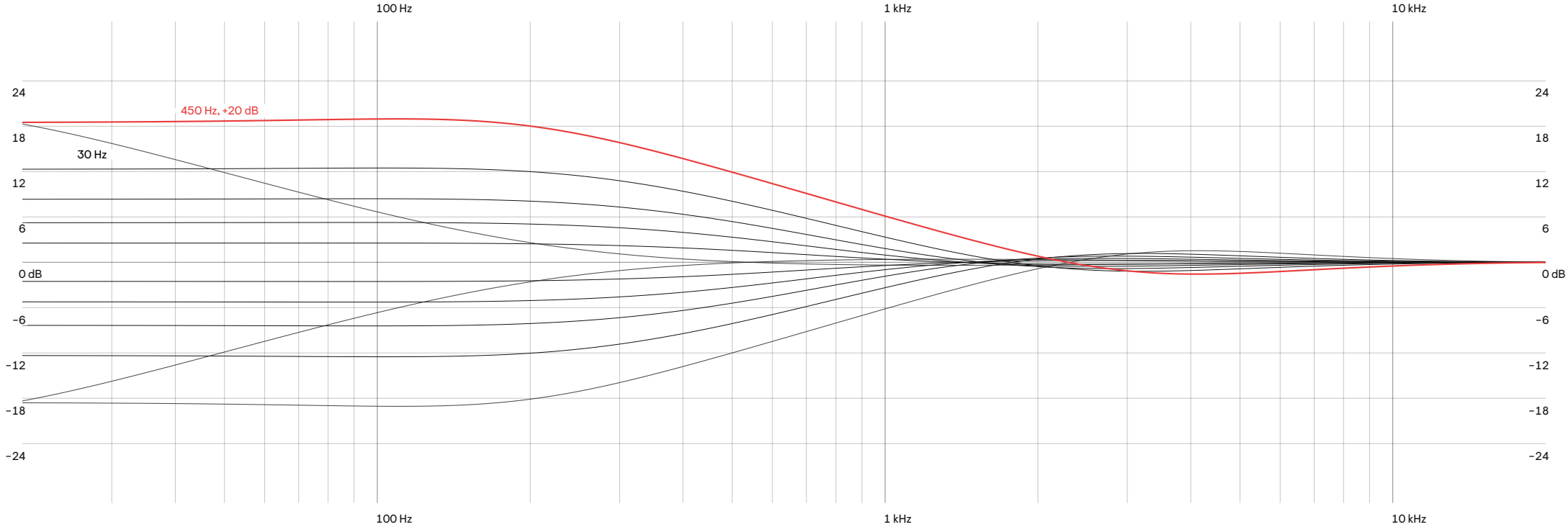
EQ 422 follows the 292 from its March 1990 issue, with M/S as our addition; EQ 420 is the same four bands on their own.

Low Frequency Band

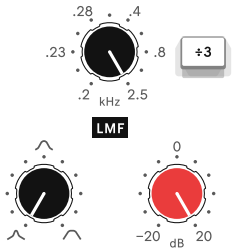


The low shelf is where a track finds its weight. Set low, it leans on the sub and lowest bass: a few dB of boost fills out a thin kick or bass without clouding the low mids. Turned up to its top mark, the shelf reaches well above the number on the dial, into the body of guitars, piano and vocals, where a gentle cut clears mud and a boost warms a thin source.

The range of boost and cut is generous, though most useful moves live in the first few dB. Because the shelf is broad and smooth, moves blend in rather than stand out, so it suits a whole bass line, a drum bus or a full mix. On kick and bass, pair a boost with the high-pass for weight without rumble. Pushed hard, the curve also sags a little around 4 kHz, so a big low lift leans the upper mids back slightly as well.

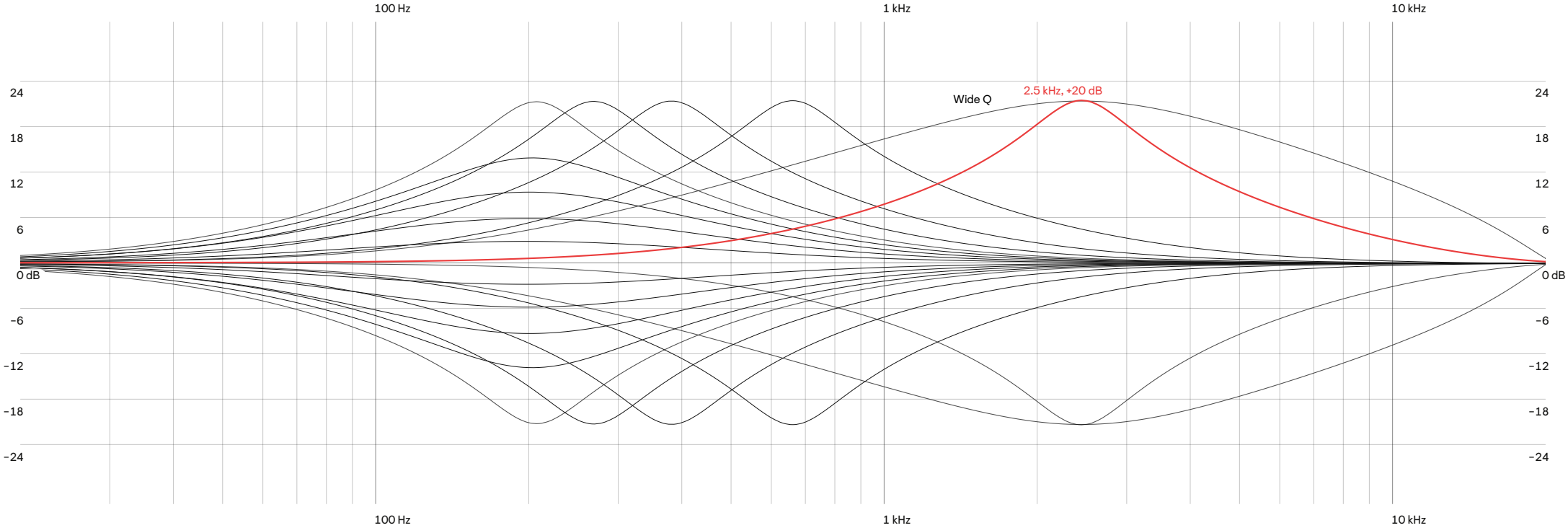


Low Mid Band

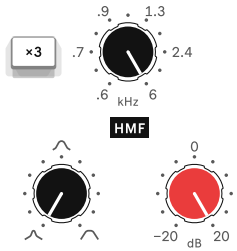


The low mid band is where a sound keeps its body and warmth, and where mud and boxiness build up when there is too much of it. Like every band on the 422, it is a clean op-amp circuit: it reshapes the balance and adds no saturation of its own.

The range runs from about 200 Hz to 2.5 kHz, across the body of vocals, guitars, piano and snare: a gentle cut clears it up, a lift adds warmth or brings out the tone of an instrument. Press ÷3 and the range moves down to 50–600 Hz, where a bell can lift the punch of a kick or the note of a bass, working on a chosen band rather than everything below it as a shelf would. The Q dial runs from a tight bell to a broad curve, and the bell narrows as you push it, so gentle moves stay smooth while bold ones stay precise and controlled.

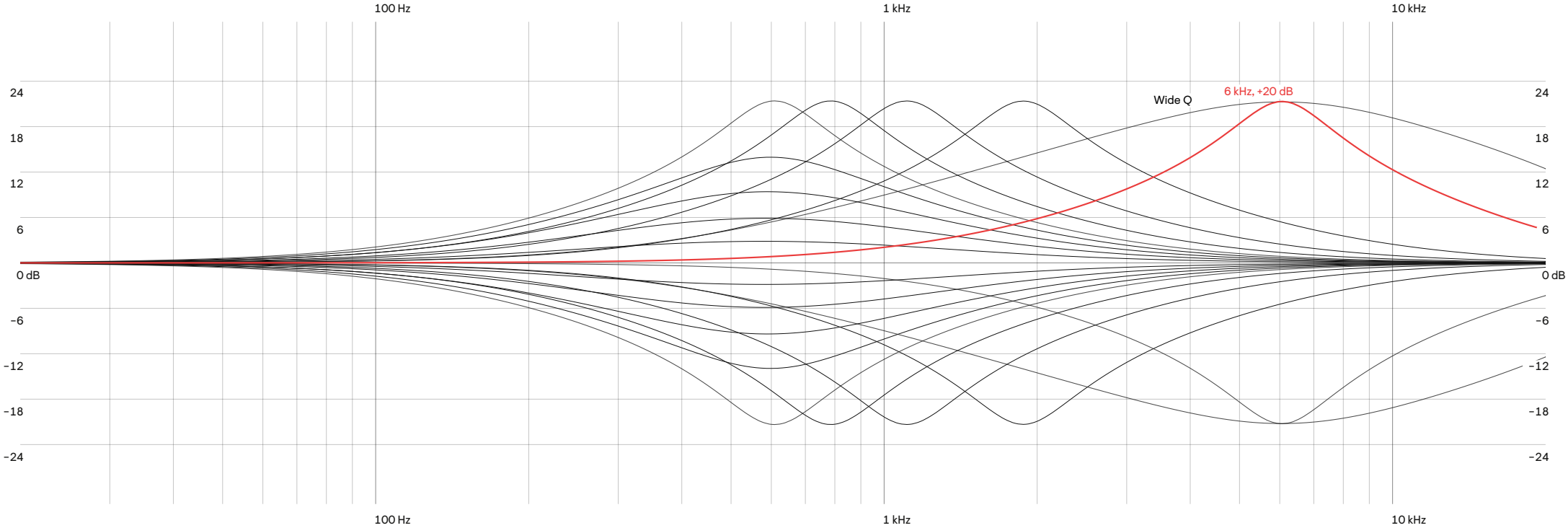


High Mid Band

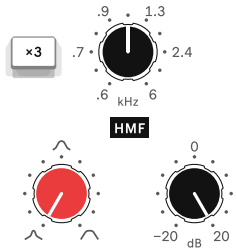


The high mid band is where a sound gets its edge. Between 600 Hz and 6 kHz lie the presence of a vocal, the bite of an electric guitar and the crack of a snare, along with the harshness that tires the ear when there is too much of it. A small lift in the upper part of the range brings a part to the front of a mix; a narrow cut tames a piercing resonance without dulling the whole sound. Press ×3 and the range moves up to 1.8–17 kHz, where a bell can add sparkle to cymbals and hi-hats or open up the air above a vocal, working on a chosen band rather than everything above it as a shelf would.

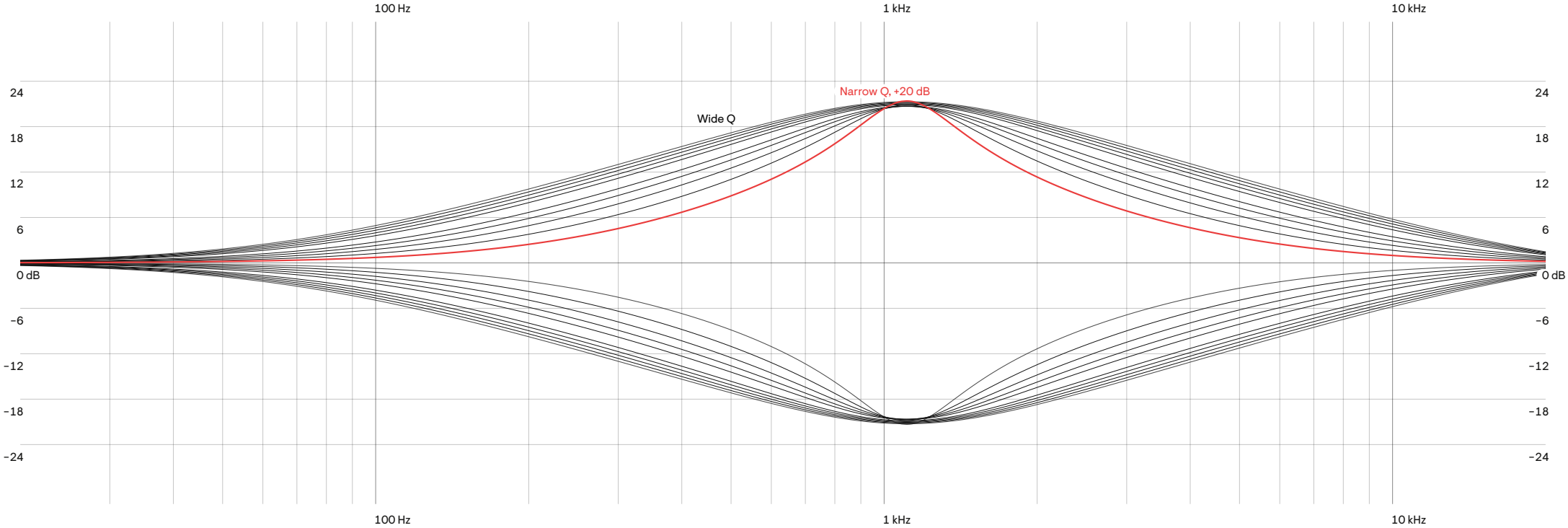
As on the low mids, the Q dial runs from a tight bell to a broad curve, and the bell narrows as you push it, so gentle moves stay smooth while bold ones stay precise and controlled.



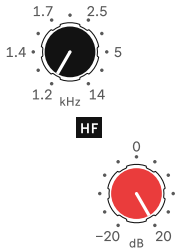
Q Control



The Q dial sets how much of the spectrum the bell takes with it; a full boost reaches the same height at either end. The Pink also ties the width to the gain: a gentle move stays broad whatever the Q, and the bell draws in to the width the dial asks for only as you push it, so bold moves stay precise.

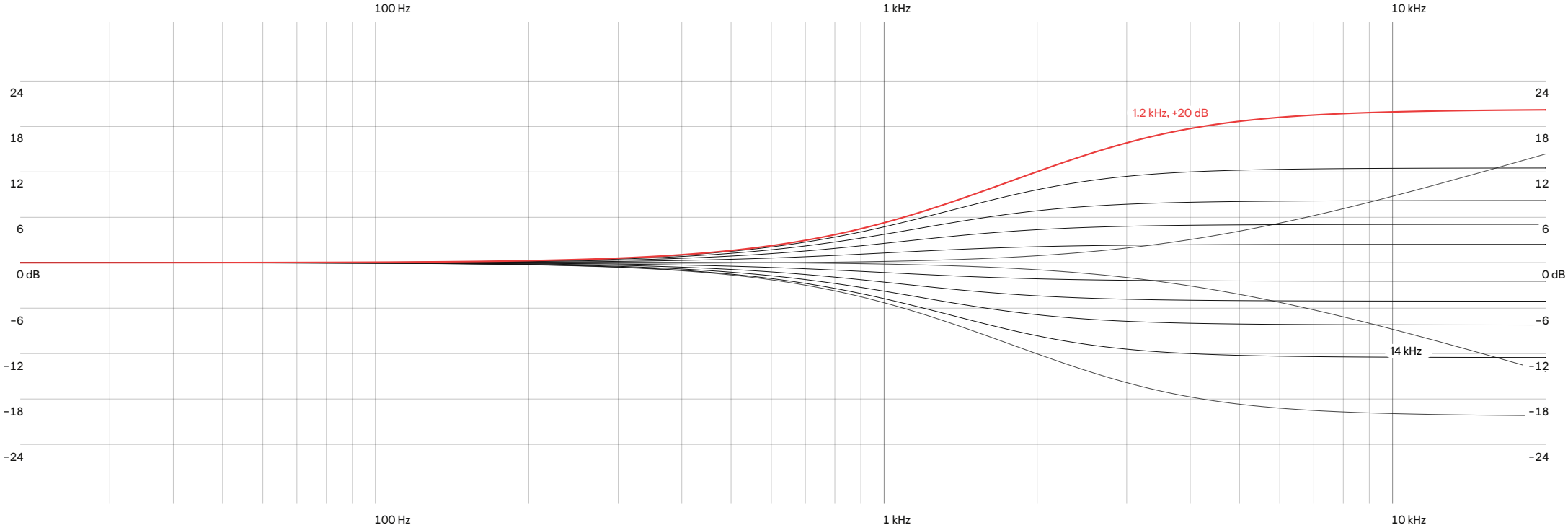


High Frequency Band

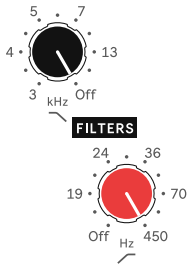


The high shelf is where a track finds its air and clarity. Set low, it starts in the upper mids and lifts everything above: a couple of dB brightens a dull vocal, piano or acoustic guitar as a whole, while a cut takes the glare off a harsh cymbal or an edgy synth. Turned up to the top of its range, it works mostly on the very top octave, adding sheen and air while leaving presence largely alone. There is plenty of boost and cut, though a few dB usually does the job.

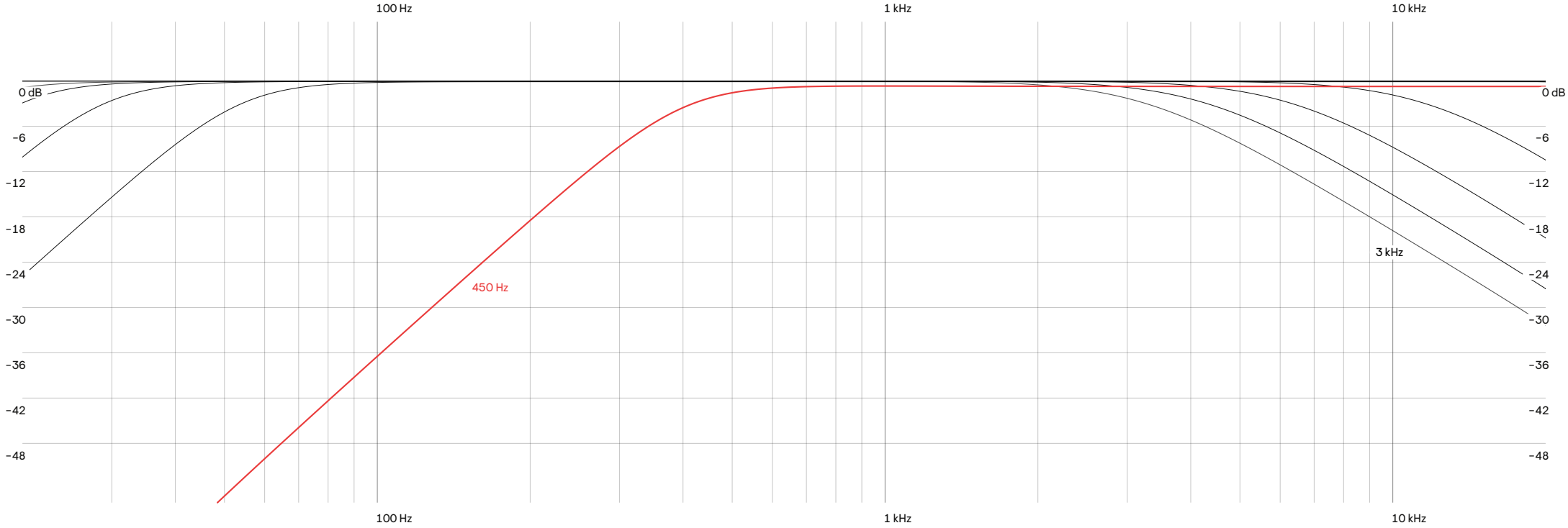
Because the shelf is broad and smooth, it suits overheads, a vocal bus or a full mix, and a gentle cut here pairs with the low-pass to soften hiss and brittle sources.



Filters



The filters clean up the edges of a sound before the bands shape what's left. They are on the EQ 422 only; the EQ 420 has the four bands without them. The high-pass rolls off at a steep 18 dB/oct with a sharp knee, and most of its travel sits below 70 Hz, so trimming rumble, handling noise or sub build-up is a fine, precise move; the last part of the throw reaches up to about 420 Hz for thinning pads, guitars or backing vocals out of the way. The low-pass falls at a gentler 12 dB/oct from 3 kHz upwards, softening hiss, fizz and brittle top end without a hard edge. With the high-pass fully left and the low-pass fully right, both switch out completely.



EQ 424 Black



The 242

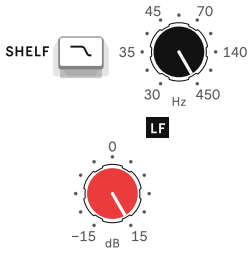
The console's first equalizer had a habit that engineers kept complaining about: switching the EQ in brought its filters in too, rolling off the top above 22 kHz and the bottom below 30 Hz "whether you wanted them to or not", as Keith, a former field engineer for the company, put it. The 242 fixed that. Its high-pass and low-pass pots gained end-stop switches that take each filter out at the end of its travel, and once the filter could leave the circuit, the high-pass could be made steeper, 18 dB per octave instead of 12. The bells kept the earlier design's constant width, the factory's choice for drums, where "relatively high Q is available at low gain settings".

The company tells a grander origin: that the 242 was developed with George Martin for the first of its consoles installed at AIR, with wider boost and cut and "a different control law for tighter control of low frequencies". Its own two accounts date it 1983 and "the mid-eighties". The drawing gives the working dates: a prototype, redrawn in March 1985, its filter values changed the next month, and small amendments into June 1986.

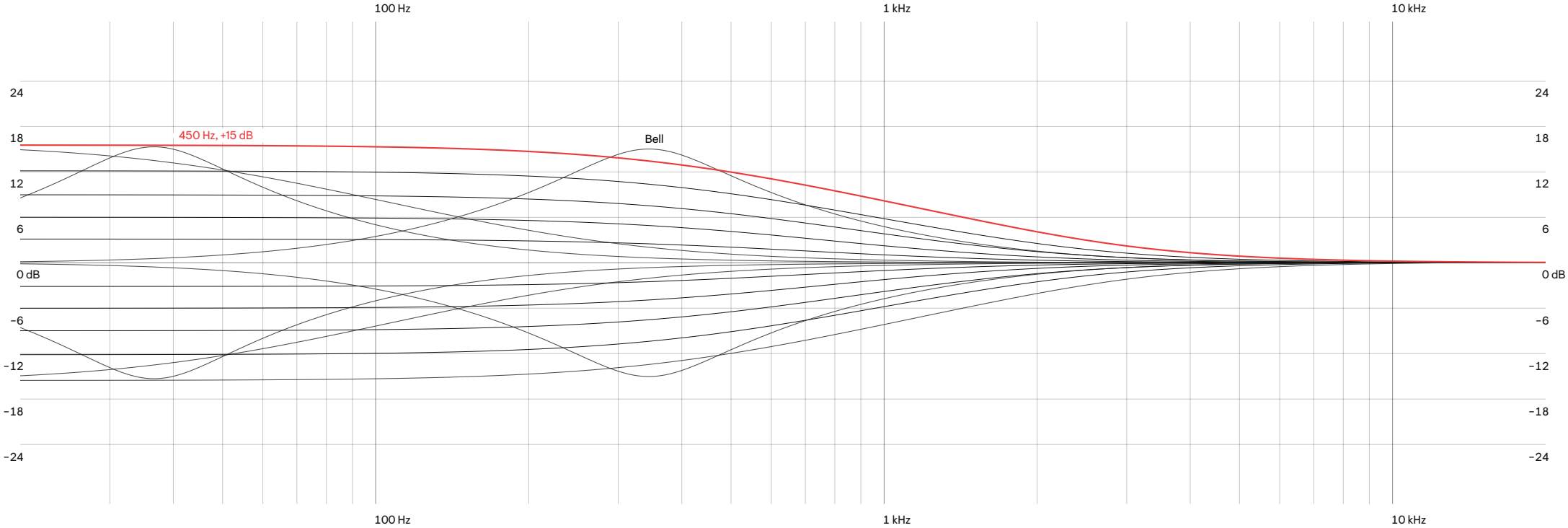
By the mid-eighties it had replaced the original as standard, and it outlived the change of series: some G desks were built with it on request, and the company still fits it today as its "E Series" equalizer.

EQ 424 follows the 242 from that drawing, with two additions of ours: a resonance trim on the high-pass and M/S.

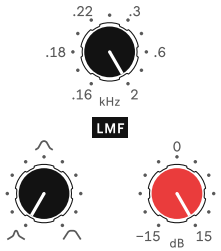
Low Frequency Band



The low band works as a shelf or, with Bell pressed, as a peak. As a shelf, everything below the frequency moves together, at both ends of the range and at any amount of boost or cut, and the lift reaches well above the number on the dial. As a bell it centers near the frequency and leaves the deepest lows alone, so you can lift the punch of a kick or the body of a bass without pumping up the sub, or dip a boomy note without thinning the whole bottom end.

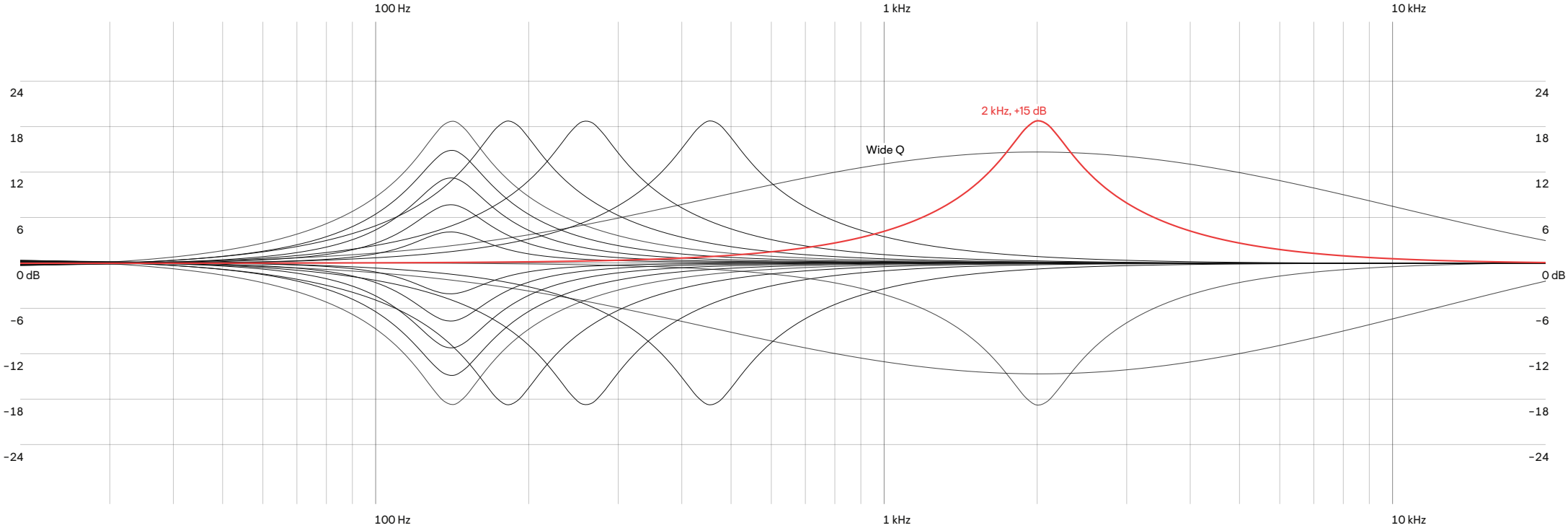


Low Mid Band

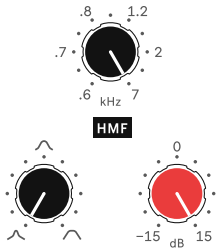


The low mid band stays narrow at any gain: as you boost or cut, the bell grows taller and opens only a little, the opposite of the Pink, which narrows as you push it. That makes small, focused moves possible: a narrow 3 dB dip on a boxy snare or a ringing tom stays narrow, and a gentle lift stays close to the width you set.

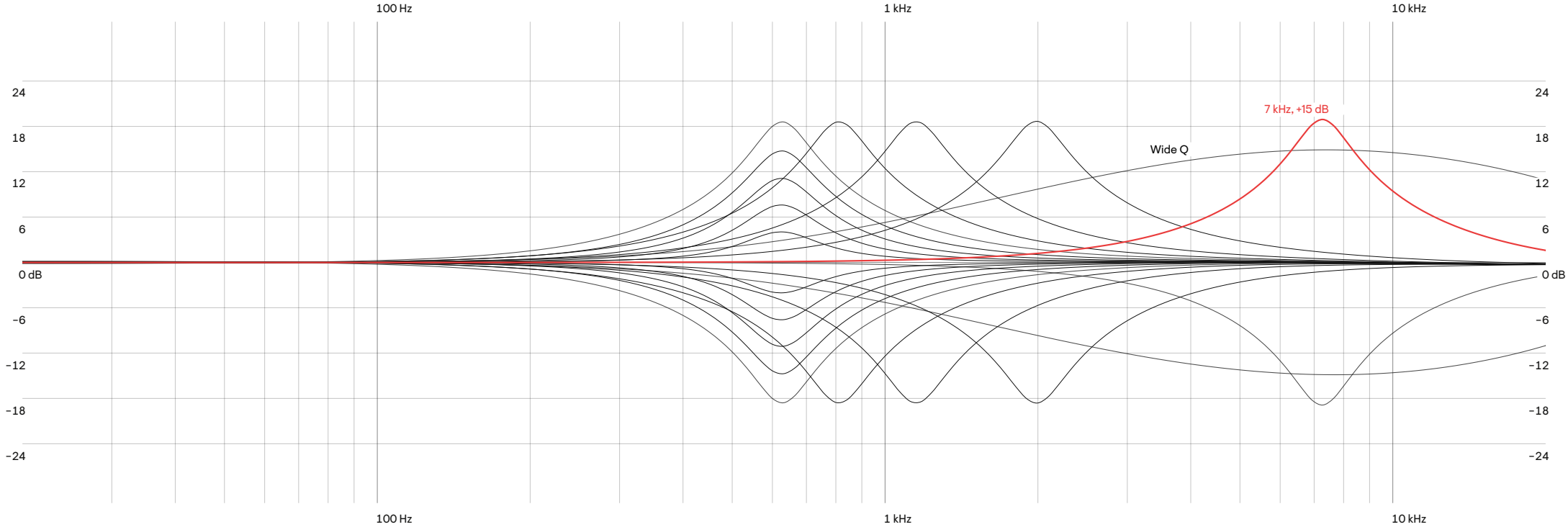
The range runs from about 140 Hz to 2 kHz, and the Q dial from a tight peak to a broad curve. At its tightest, a full boost rises past the 15 dB printed on the dial.



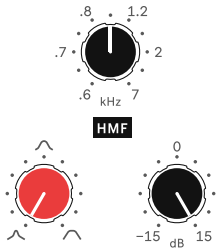
High Mid Band



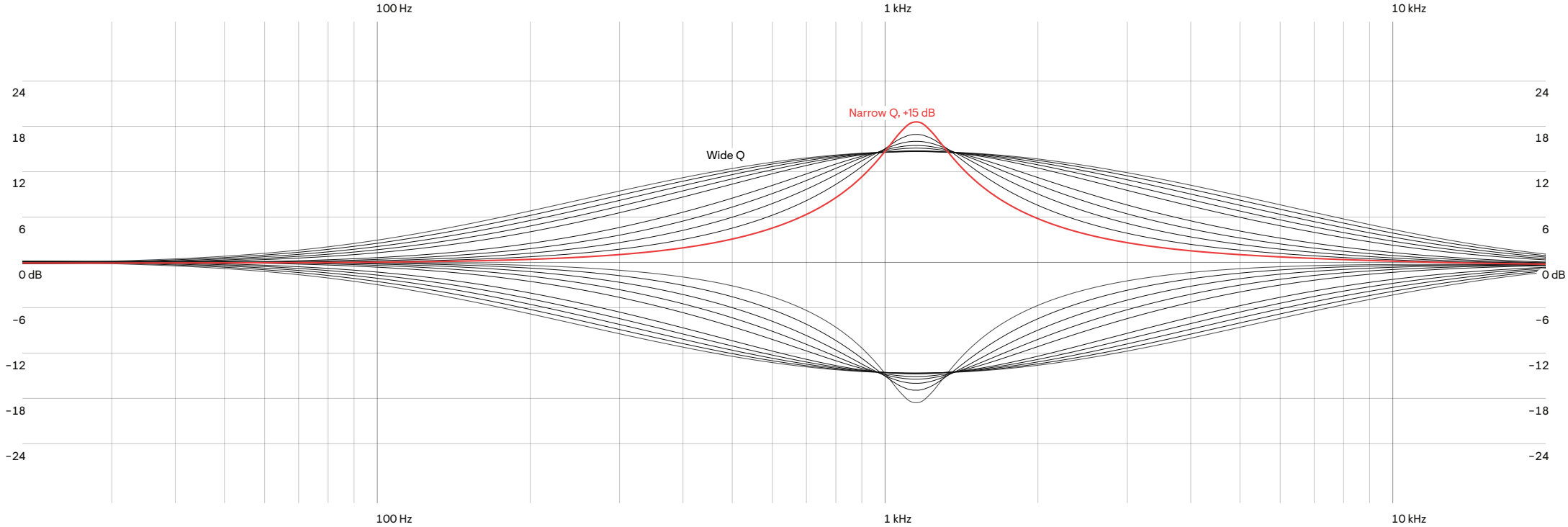
Like the low mids, the high mid band stays narrow at any gain, which makes it the tool for precise work between about 630 Hz and 7.4 kHz: pulling a single harsh frequency out of a guitar or vocal, or placing a narrow lift on the crack of a snare. A small lift is already as focused as a big one, and a full boost opens only slightly.



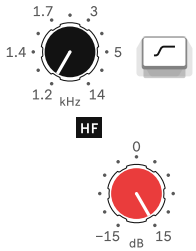
Q Control



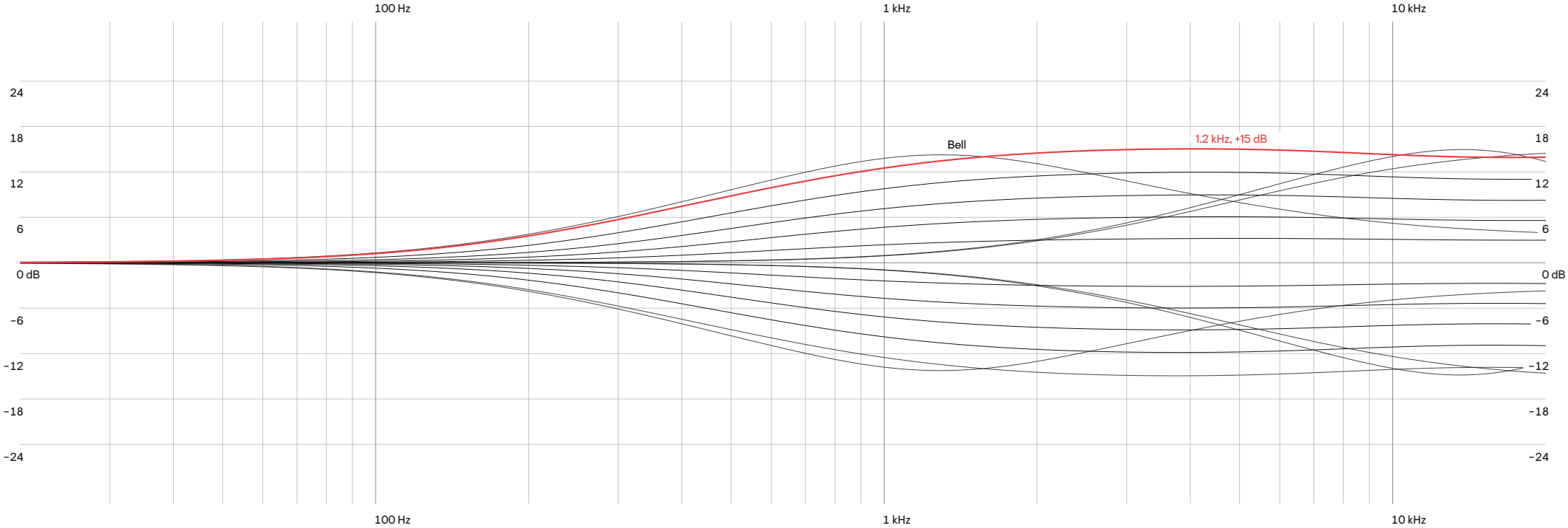
On the Black the Q dial alone decides the shape: a small boost and a full one at the same Q span nearly the same part of the spectrum, and the gain only decides how much. Turn it narrow to find and tame a single ringing note, wide to lift a whole region of the mids.



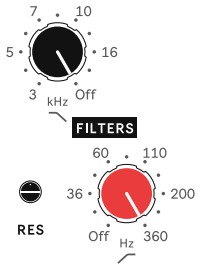
High Frequency Band



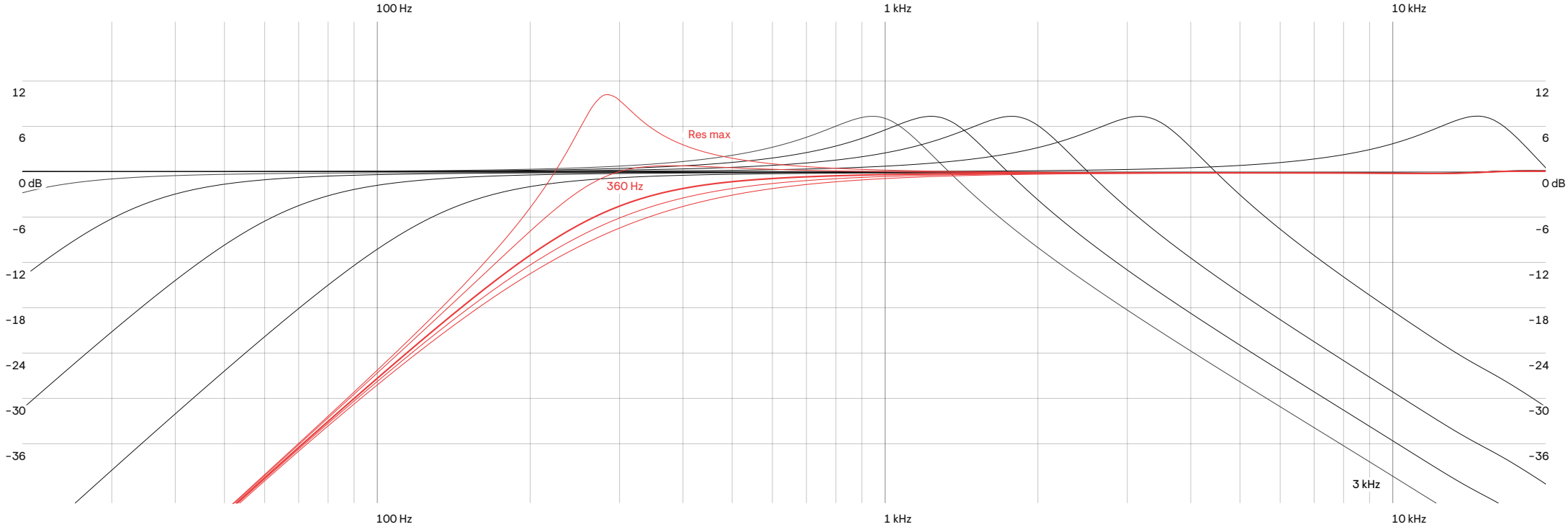
The high band is a shelf or, with Bell pressed, a peak. As a shelf it lifts or lowers everything above the frequency, and starts well below the number on the dial. As a bell it works on a range around the frequency, from about 1.3 to 14 kHz, and leaves the extreme top alone, adding presence to a vocal or bite to a snare without bringing up hiss or cymbal wash.



Filters



The high-pass sweeps evenly from 20 to 350 Hz, so every part of the dial is useful, from trimming sub rumble to thinning a pad. Its knee is softer, and the Res trim beside it, an addition of ours rather than part of the original circuit, adds a lift right at the corner: a little tightens and defines the bottom as it rolls away, a lot makes the corner sing. Below its center it rounds the knee off instead. The low-pass rises to a resonant lift just below its corner before it falls, as the original circuit is drawn. Both switch out completely at the end of their travel.



EQ 426 Orange



The 132

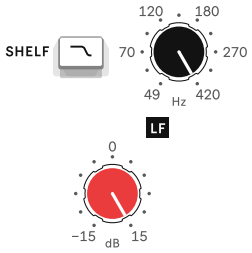
Next to the original equalizer, the factory offered an option that hardly anyone took: the 82E132, sold as the "EQ-P". It was marketed as "based on the curves of a Pultec", and Keith, a former field engineer for the company, remembers how that went: "Nobody liked it. They sold about twelve channels worldwide." The company now calls it the rare Orange, "celebrated for its broader and more musical response".

Inside, it’s neither a valve equalizer nor a passive one, whatever later descriptions say: the drawing shows thirteen 5534-class op-amps and no inductors, and every band has its own gain stage. Keith describes it as "heavily based on the topology of the brown 82E02", with "differing ranges for most of the controls in each band". Where it does echo the old valve units is in how width and height trade: on the factory’s own curve sheet, the mids at their narrowest Q rise to about 18.5 dB at full boost, at their widest to about 12.

Its dates are hard to pin down. A Total Recall wiring table dated October 1982 already has a line for it, and the drawing was redrawn in September 1984 and amended in July 1986. With so few channels built, almost nobody has heard the original hardware.

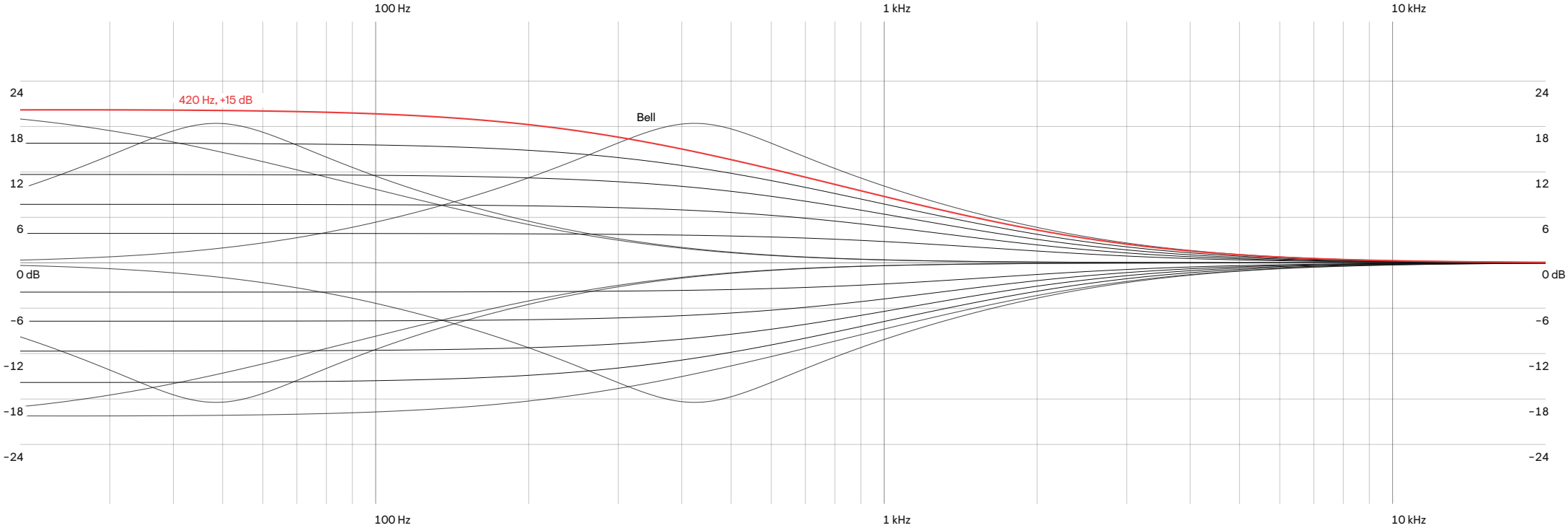
EQ 426 follows the 132 from those two issues of the drawing, trimmed against that curve sheet, with Black’s M/S and high-pass resonance as additions.

Low Frequency Band

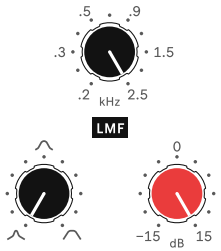


The low band is a shelf or, with Bell pressed, a peak, and it is the Orange's strongest move. As a shelf it lifts everything below the frequency in one smooth step with no dip above it, and at the top of the gain dial it reaches well past the 15 printed there. Set high, the lift reaches up toward 1 kHz and thickens the whole bottom half of a sound; set low, it adds weight under a kick or a bass and leaves the low mids alone.

As a bell it centers on the frequency, from about 50 to 420 Hz, and leaves the deepest lows untouched: lift the punch of a kick or the body of a bass without pumping up the sub, or dip a single boomy note.

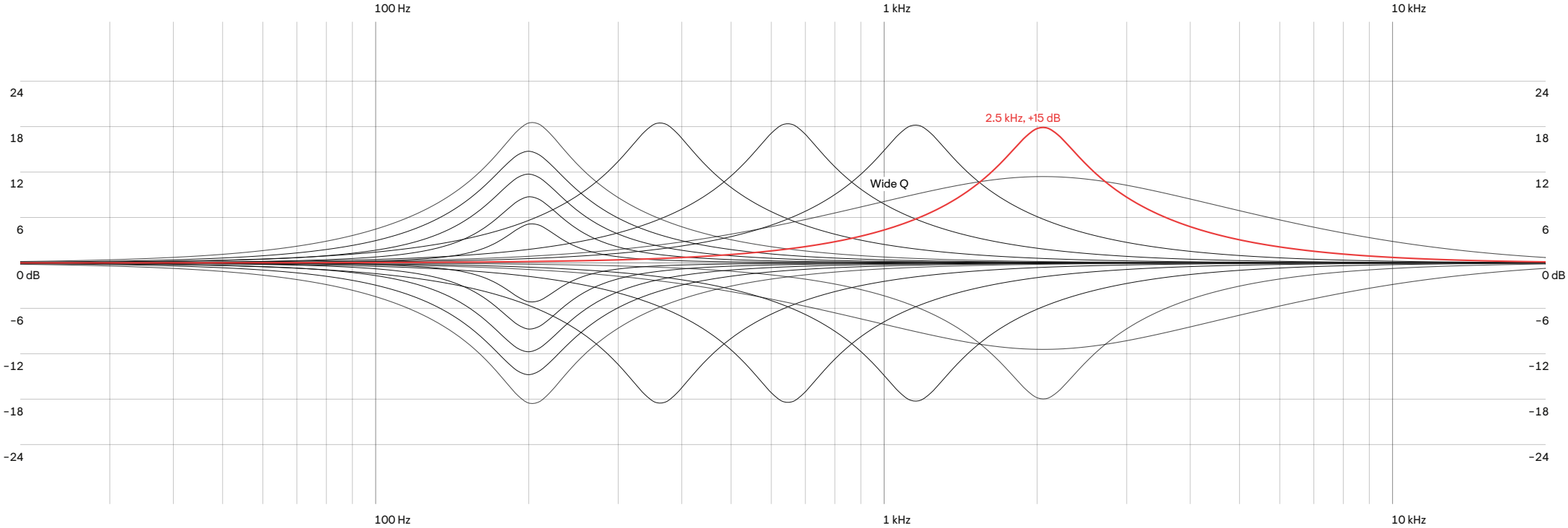


Low Mid Band

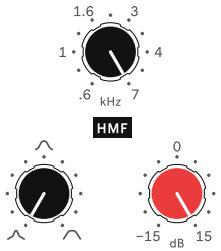


The low mid band runs from about 200 Hz to 2 kHz. Its Q dial trades width for reach: turned to narrow, a full boost rises past the 15 printed on the gain dial; turned to wide, the same boost stops lower and spreads over about two octaves, much like the bandwidth control of a Pultec, whose curves the Orange was marketed after.

The bell also widens as you push it, the opposite of the Pink, which narrows. A small boost at a narrow Q is a precise touch on the box of a snare or the ring of a tom; a big one turns into a broad, warm lift across the body of a vocal or a guitar.

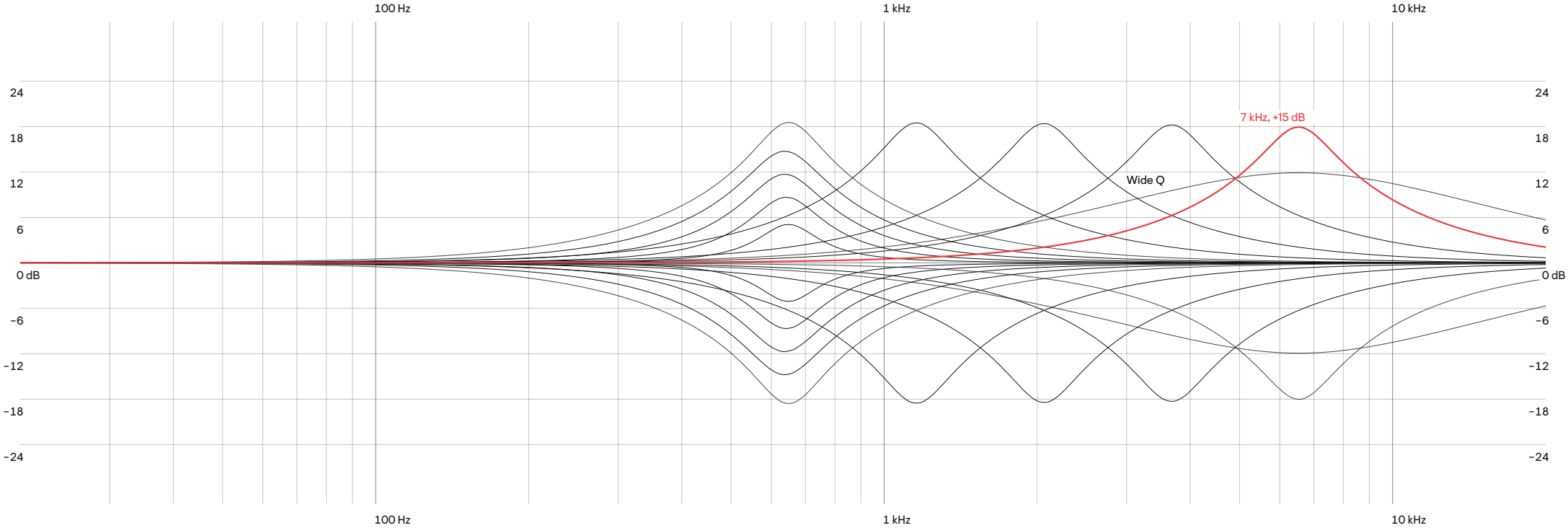


High Mid Band

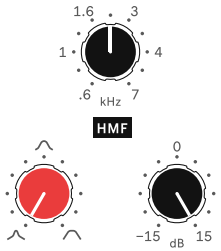


The high mid band is the low mid circuit scaled up, from about 650 Hz to 6.5 kHz, so it works the same way: narrow reaches higher, wide spreads further, and the bell opens as it grows.

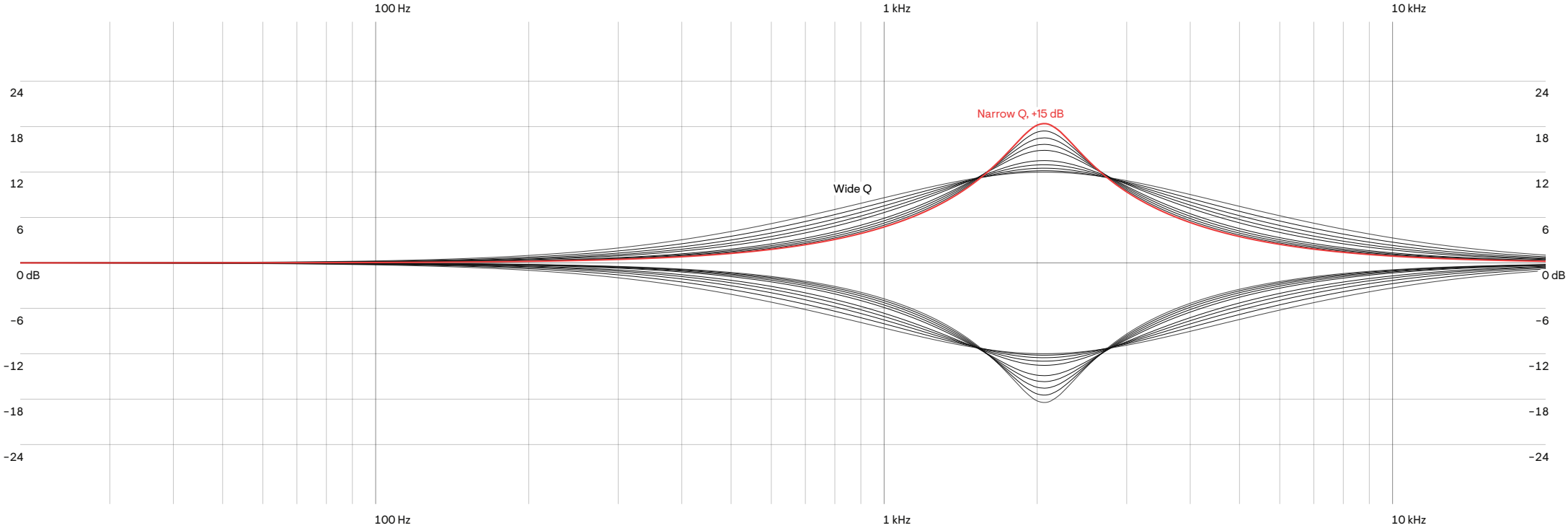
This is where a sound gets its presence and its edge. A narrow cut finds a single harsh frequency in a guitar or a vocal and takes it out without dulling the rest. A narrow lift places the crack of a snare or the pick of a bass. A wide boost brings a whole part forward in the mix, gently enough to stay musical.



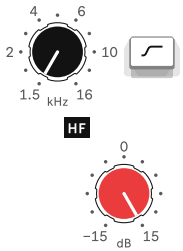
Q Control



On the Orange the Q dial trades width for reach. Turned to narrow, a full boost rises past the 15 printed on the gain dial; turned to wide, it stops lower and spreads across the mids, much like the bandwidth control of a Pultec. Push the gain and the bell opens rather than tightening, so big moves turn broad and musical.

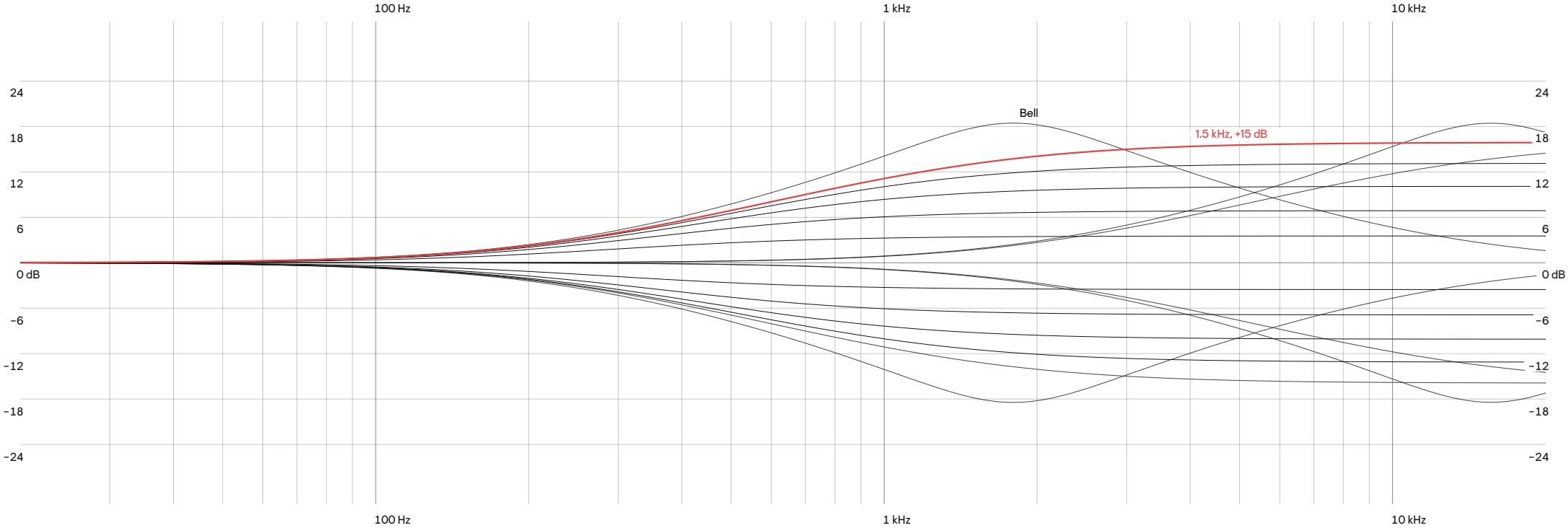


High Frequency Band

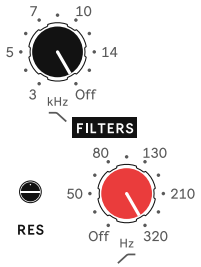


The high band is a shelf or, with Bell pressed, a peak. As a shelf it lifts or lowers everything above the frequency and starts well below the number on the dial, so even at 16 kHz the shelf is half-way up by about 5 kHz, and at the lowest setting it opens the whole top from the mids. Small amounts on a mix or a bus add air without edge.

As a bell it works on a range around the frequency, from about 1.8 to 16 kHz, and leaves the very top alone: presence on a vocal or bite on a snare without bringing up hiss or cymbal wash.

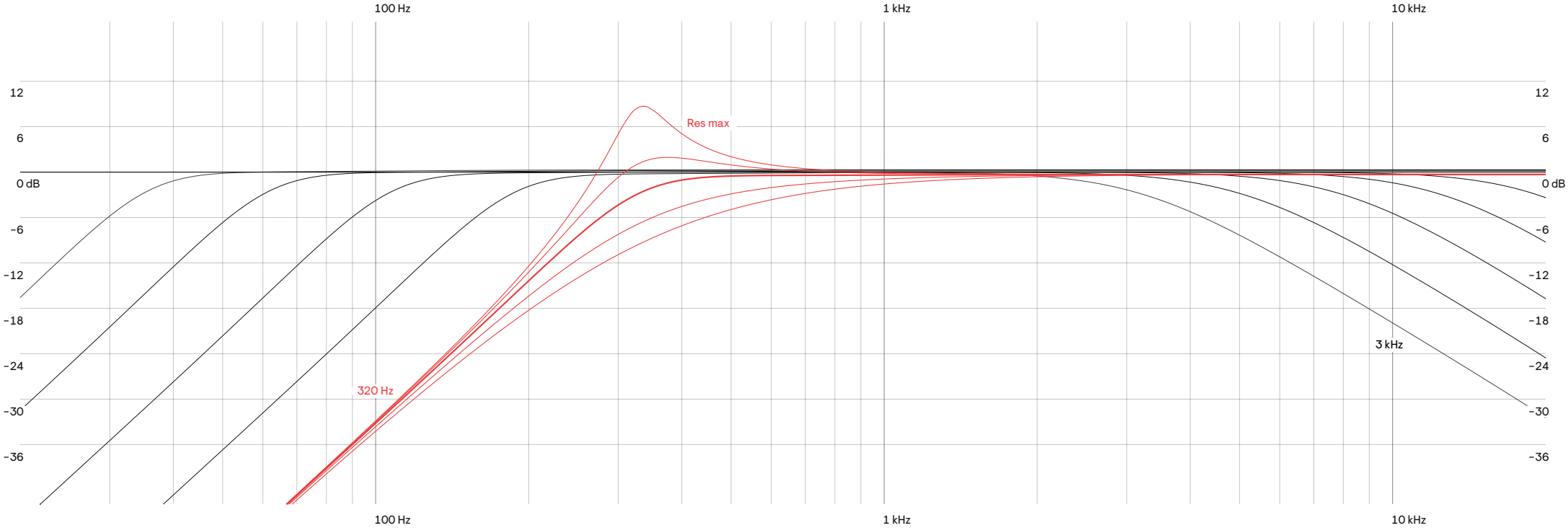


Filters



The high-pass sweeps evenly from 35 to 320 Hz and falls steeply, about 18 dB per octave, with the firmest knee of the three EQs: below its corner the low end goes, above it the sound stays as it was. The Res trim beside it is an addition of ours, not part of the original circuit. Above its center it adds a lift right at the corner that tightens and defines the bottom as it rolls away; below center it rounds the knee off.

The low-pass sweeps from about 3 to 20 kHz at a gentler 12 dB per octave, softening hiss and fizz without a hard edge. Both switch out completely at the end of their travel.



Dyn 432


7
S
8
S
18
24
30
36
42
48
60
TO EXP
SMZD
ATTACK
SLOW
15
30 -dB 0
THRESHOLD
COMP
11
16
20
7.2
24
1.6
2.4
3.2
.8
4
.1 Sec
RELEASE
1
∞
RATIO
THRESHOLD
RANGE
RELEASE

The 82E10

Dynamics on every channel were there from the beginning: the G manual's own history credits the nine B series desks with "Dynamics sections on every channel". Hugh Padgham, on one of the first of them at the Townhouse: "You pressed a button and there it was. It allowed us to be more immediate." "Suddenly, we had a 40-channel desk with 40 compressors and 40 noise gates."

The module that carried them through the E and G desks is the 82E10. Its drawing had already reached its twelfth revision when it was redrawn in October 1984, and when the G series came, the dynamics stayed: the sheet kept its title, "611E/V Dynamics Section", and the G service manual lists the 82E10 as the G channel's dynamics. On it, a single dbx 2151 VCA does the gain change for both the compressor and the expander, which can work at the same time, and an AD536 true-RMS converter does the listening. The company traces the line from the B's dbx 202 "black can" through an Aphex VCA, later replaced by dbx, and credits the E with program-dependent attack between 3 and 30 ms.

The drawing never really stopped moving: the attack and release switching was reworked through 1986, and amendments run on to May 1990. It was never meant to be polite. Andy Wallace, who mixed on these desks for decades: "the SSL compressors are pretty aggressive-sounding."

Dyn 432 follows the 82E10 from its 1990 issue, and adds Input Gain, the sidechain filters, M/S, Dry/Wet and GR Smooth.

Every channel of the console carried its own compressor and expander/gate, and it changed how records were made. Hugh Padgham, on one of the first of these desks: “this was the first console where you didn’t have to say to the assistant, ‘Can you plug in a compressor please or a noise gate?' You pressed a button and there it was.” Dyn 432 brings that channel section to Live: a small, fixed set of controls to drop after the EQ on any track.

The two halves share one gain stage and can work at the same time. The compressor handles level and adds the console's punch. Andy Wallace, who mixes on these desks, uses it "more for the sound", calling the compressors "pretty aggressive-sounding."

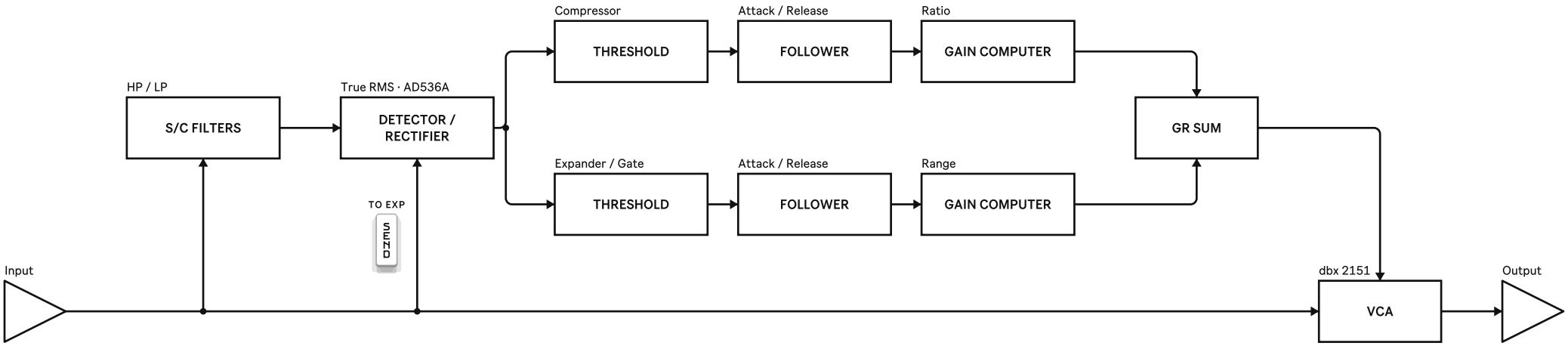
The expander/gate works on the quiet parts: gently turning down bleed and noise between phrases, or, as a gate, shutting hard between drum hits to tighten a kit. The sidechain filters decide what both halves listen to, so bass stops pumping the compressor and cymbals stop opening a drum gate. Blend brings the dry signal back in for parallel compression.



Signal Path

Dyn 432 follows the console's channel dynamics circuit part for part, and adds two things of its own: Input Gain and the sidechain filters. The audio runs straight through a single dbx 2151 VCA — the only thing in its path that changes level. Everything else happens on a side branch: the signal is tapped before the VCA, trimmed by Input Gain, shaped by the sidechain filters and measured by a true-RMS detector, which responds to how loud the signal is over time rather than to every individual peak.

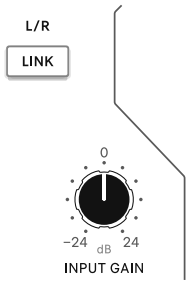
That one measurement feeds two chains side by side. Each compares it with its own threshold, smooths it with its attack and release, and turns it into an amount of gain reduction: the compressor through its ratio, the expander/gate through its range. Both results meet at a single control node, where the one asking for more reduction takes over, and drive the same VCA. That is why the two can work at once without fighting.

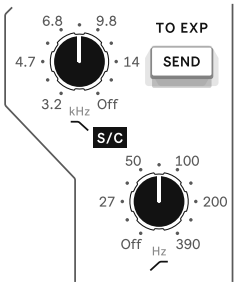


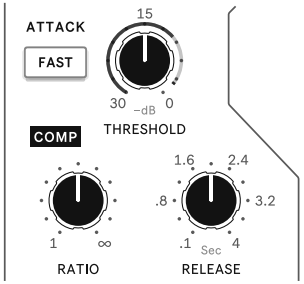
This is a feed-forward design: the detector listens to the signal before it is turned down, works out how much to take off, and applies it. A feedback compressor does the opposite. It listens to its own output and keeps correcting, which gives a softer, self-regulating response but can never quite reach true limiting. Feed-forward is what makes the channel compressor fast and predictable, lets the ratio run all the way to a limiter, and gives it the character Andy Wallace calls "pretty aggressive-sounding."

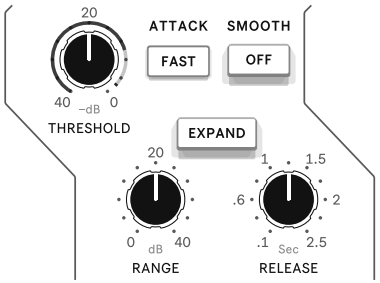
Section Overview

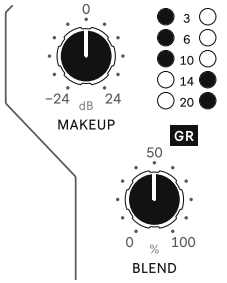
Dyn 432 reads left to right like the channel strip it comes from: set how hard the detector is driven, decide what it listens to, shape the loud parts with the compressor and the quiet parts with the expander, then finish with level and blend.











INPUT SECTION

Input Gain, an addition to the original circuit, sets how hard the detector is driven without changing the audio, so both sections react sooner or later at any threshold. Link holds a stereo image steady; M/S treats the center and the sides separately and switches Link off.

SIDECHAIN FILTERS

These filters, also an addition, shape what the dynamics listen to, not what you hear. Roll off the lows so a bass line stops pumping the compressor, or the highs so cymbals don't open a drum gate. Send, on by default, passes the filtering on to the expander too.

COMPRESSOR

Controls level and adds punch. On Slow attack the music sets the timing and transients get through before it clamps; Fast catches them within milliseconds for a harder, more upfront sound. Ratio runs from gentle control all the way to limiting.

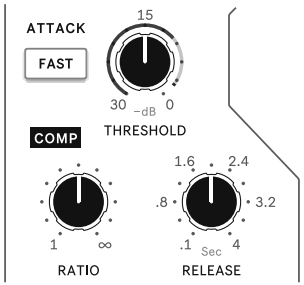
EXPANDER

Works on the quiet parts. As an expander it gently turns down bleed, hiss and noise between phrases; switch to Gate to shut hard between hits and tighten drums. Range sets how far it closes, Release how naturally sounds fade out.

OUTPUT SECTION

Makeup restores level after compression; Blend brings the dry signal back in, keeping the transients while adding density. The meter shows the compressor's reduction from the top and the expander's from the bottom. Output sets the final level; M/S Balance trades center against sides.

Compressor



Three jobs cover most of what the channel compressor does, though it isn't limited to them.

CONTROL
Keep a vocal, bass or guitar sitting in place. Moderate ratio, Slow attack, a medium release, and a few dB of gain reduction on the loudest phrases.

PUNCH
For drums and percussion. On Slow the front of each hit gets through before the compressor clamps, so the attack stays sharp while the body is pulled in; a shorter release lets it recover before the next hit. Fast with only a little gain reduction gives a harder, more aggressive snap. Avoid Fast on piano and other peaky sources, where it ducks the level on every transient.

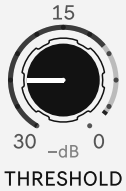
LEVELING
Low to mid ratio, long release, threshold just into the arc. The compressor rides the overall level gently, like a hand on the fader.

The compressor turns the loud parts down once they cross the threshold. Ratio sets how far, Attack how quickly it reacts, and Release how soon it lets go.



THRESHOLD

Sets the level, from –30 to 0 dB, above which compression starts. Lower it and more of the signal is compressed; the arc shows where the signal sits. Automatic make-up raises the output as you go, giving back part of the level the compression takes. Start at 0 and bring it down until you hear the result you want.



LEVEL INDICATOR ARC

To help set the threshold by eye, the Threshold dial shows the level the detector hears as an arc: solid for the average level, lighter up to the highest peak of the last three seconds. In this example the threshold sits about 15 dB below the average level; depending on the ratio, attack and release, that gives up to 13–15 dB of

Built around a true-RMS detector and a single VCA, it responds to how loud the signal is rather than to every individual peak, and its automatic make-up raises the output as you lower the threshold, giving back part of what the compression takes, so you judge the sound more than the volume.



RATIO

How hard the signal is pulled down once it crosses the threshold, from 1:1 (no compression) to a limiter at full right. Low settings smooth gently; higher ones hold the level firmly; fully right, it works as a limiter. The ring marks only 1 and ∞; the Ratio page has a cheat sheet for the



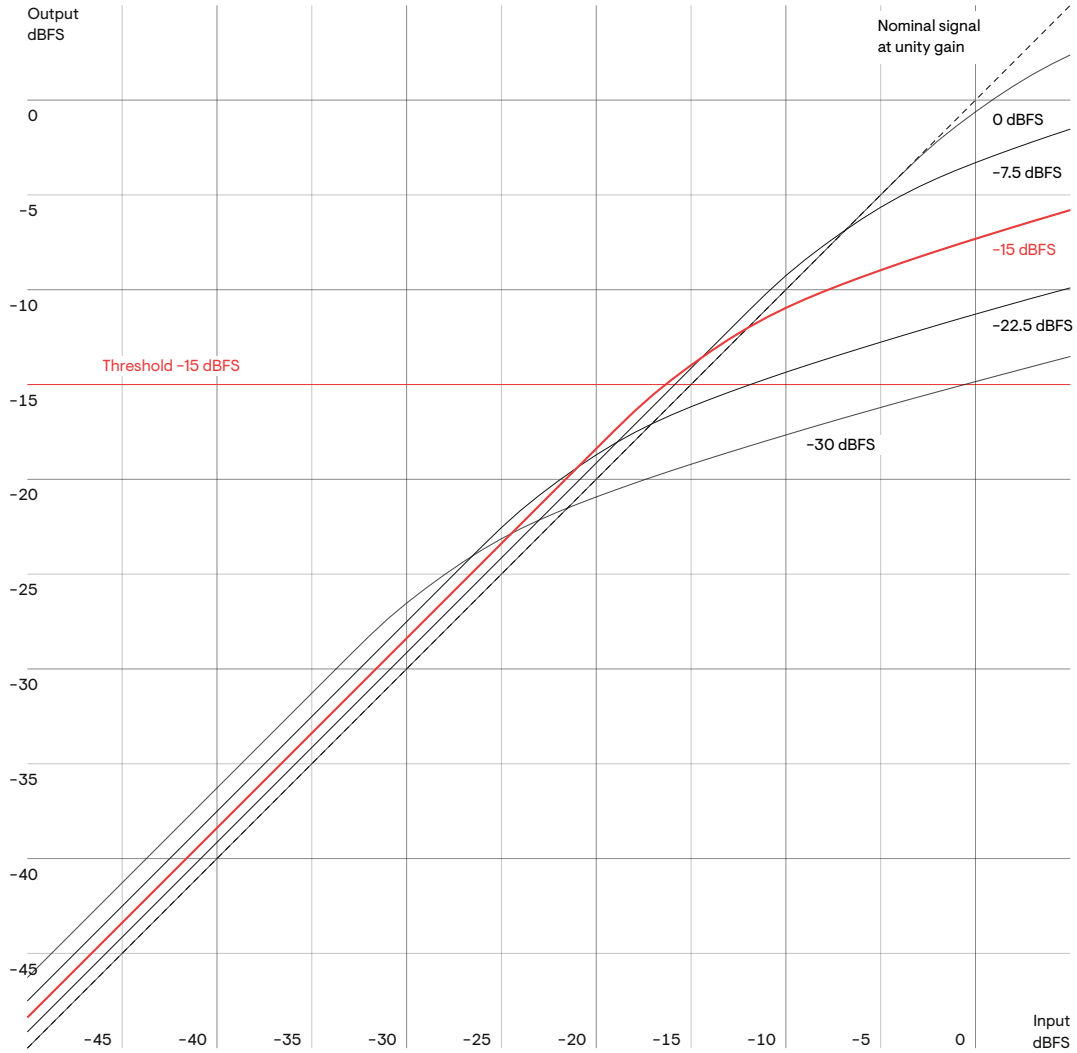
RELEASE

How quickly the compressor lets go once the signal falls back; the dial runs from 50 ms to 4 s. Short releases recover between hits and lift the tail and room of a drum for a livelier, more aggressive sound. Long releases ride the level smoothly. If you hear the level pumping, lengthen it; if the sound stays squashed, shorten it.

Threshold control

The knee is wide: set to −15 dBFS, the compressor takes only 1 dB at −13.7 dBFS in and keeps bending for another 20 dB, so a full-scale tone comes out at −7.3 dBFS.

Let's look at how Threshold affects your output signal. As an example, let's set Ratio to 4 on the dial (it measures closer to 3:1, more on the next page) and Attack to Slow. Release doesn't matter in this case, since we're capturing the output at a steady state (1 kHz sine).



With Threshold at −15 dBFS, the red curve shows what the compressor does to a steady tone at every level.

Below the knee the curve runs just above the dashed line: nothing is compressed, and the signal only comes up by the automatic make-up — +1.6 dB at this setting. From there the curve starts to bend, but it does not snap to its ratio at the threshold. The reduction builds gradually and keeps growing for another 20 dB, right up to full scale. On Fast the whole bend sits about 2 dB lower.

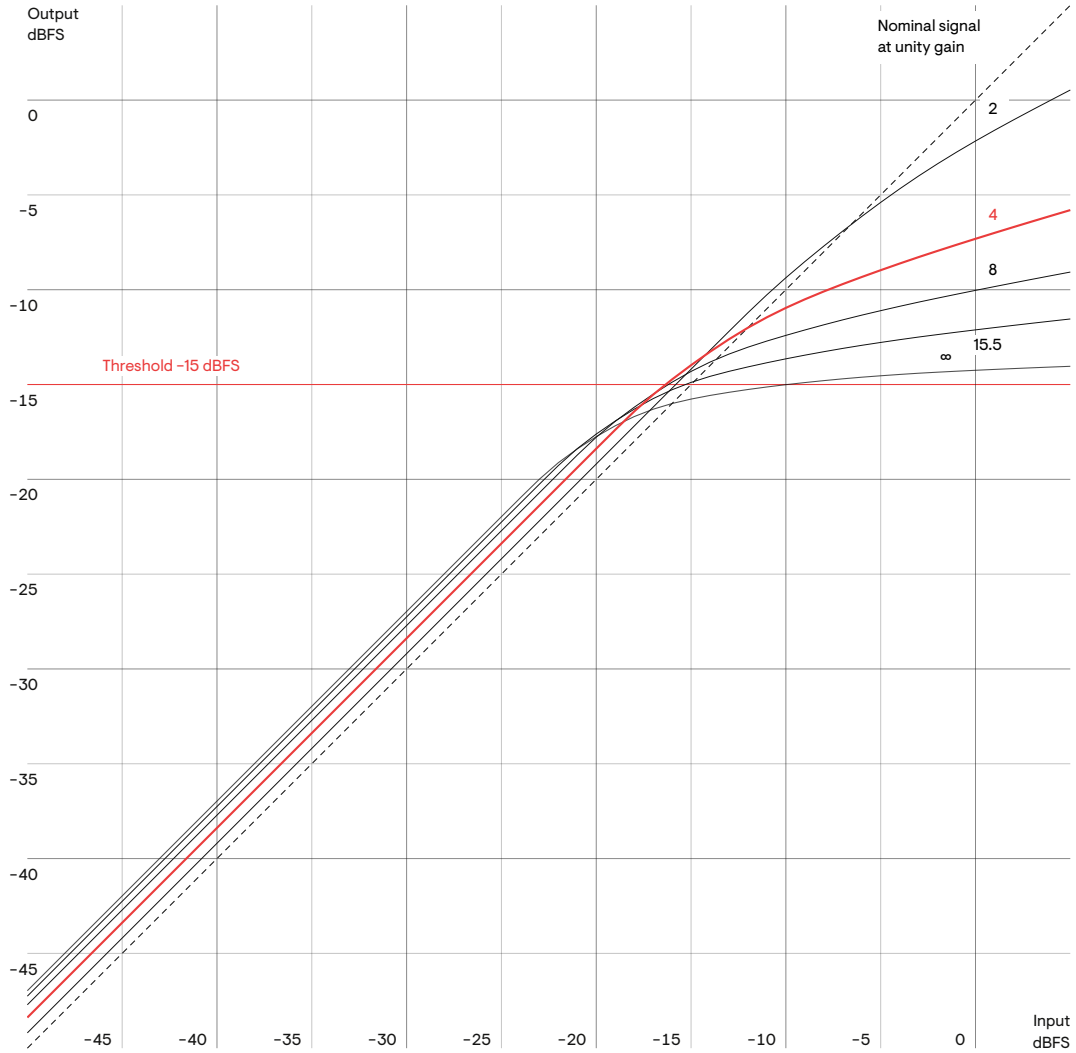
That wide, soft knee is a large part of why the channel compressor stays musical even when it works hard. Quieter material passes almost untouched and the reduction grows with level instead of switching in at one point, so there is no obvious moment where compression kicks in — louder notes are simply held back harder than soft ones.

The thin black curves show the other Threshold positions, from −30 to 0 dBFS: the same shape, bending earlier or later, with more make-up the lower the threshold sits — and, as the next page shows, the higher the ratio.

Ratio control

Set to 4 the compressor settles to about 3:1, at 12 o'clock to about 8:1, and only fully right does it reach 20:1. The higher the ratio, the earlier the knee and the more make-up.

Now let's look at how the Ratio control shapes the output. Threshold stays at −15 dBFS, and release doesn't matter here, since the curves are measured with a steady tone once everything has settled.



The chart shows the input-to-output relationship at different ratios, each labelled with the value Live shows for the dial, and a few things characteristic of the Dyn 432 stand out.

The slope is gentler than the readout suggests: the knee is so soft that the ratio keeps building well past the threshold, so read the numbers Live shows as positions rather than ratios. The cheat sheet below gives the real ones.

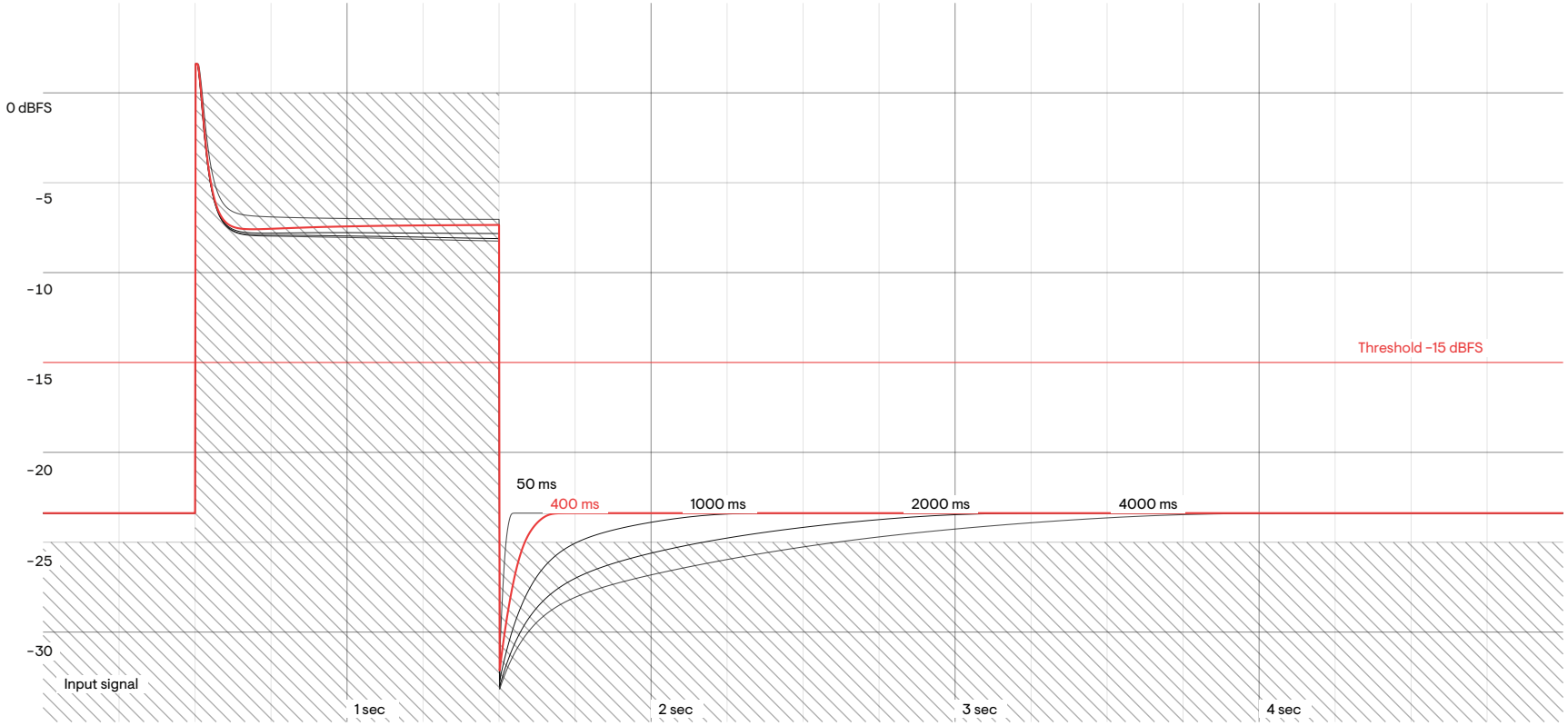
Ratio, just like Threshold, affects the automatic make-up: the higher the ratio, the more is added to the output — from under a dB at the gentlest setting shown to about +3 dB fully right.

3:1 6:1 12:1 20:1

Follower timings

Release decides how long the quiet part after a loud one stays ducked: at 400 ms the level is back within a dB 0.1 s after the drop, at 4000 ms it takes 1.4 s.

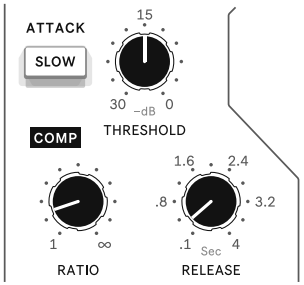
As the last aspect of the compressor, let's check out how the attack and release settings affect the compression. This time we look at the output over time. Ratio is at 4, Threshold at −15 dBFS and Attack on Slow, and a 1 kHz tone steps from −25 dBFS to full scale and back.



While the input amplitude doesn't cross the threshold, the signal is only slightly lifted by the automatic make-up.

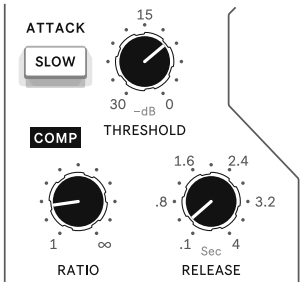
Past the threshold, the front of the step gets through: on Slow, used here, the output jumps past full scale and settles in 70 to 90 ms. Fast pulls it down in about 4 ms.

The release time sets how quickly the signal returns to the nominal level. Right after the drop the output dives under the input, as the reduction is still held: short settings snap back almost at once, long ones ease the level up. The dial values aren't recovery times: even 4000 ms is back within a dB in under 1.5 s.



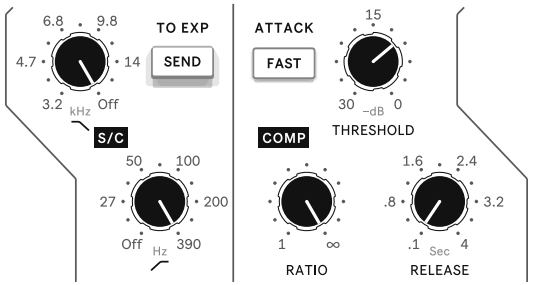
STACK

Backing vocals and doubles. A firmer ratio and a short release keep a stack of voices tight behind the lead; switch Link on as well and both sides follow the louder one, so the image holds still. Mark Endert compressed backing vocals with the channel compressors “set to a 5:1 ratio”; George Seara treated ad libs at 3:1 with fast release, linked.



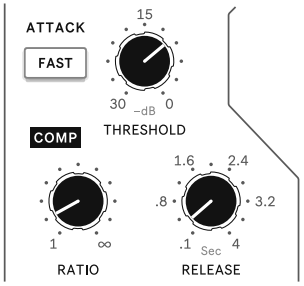
PUNCH

Drums and percussion. Slow attack, a higher ratio and a short release: the front of each hit stays sharp, the body is pulled in, and the compressor has let go before the next hit.



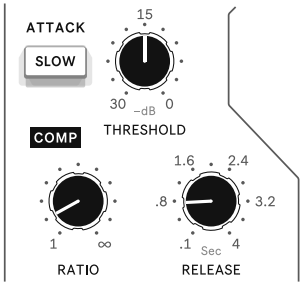
TAME

Full ratio, Fast attack, a very short release and the sidechain high-pass turned all the way up, so the low end can’t trigger it and only spikes in the upper range get caught. Keep Blend full, or the peaks come straight back through the dry path. Bob Clearmountain runs a similar patch on his SSL, “on fast attack and fast release” as “a fast high-frequency limiter” instead of a de-esser.



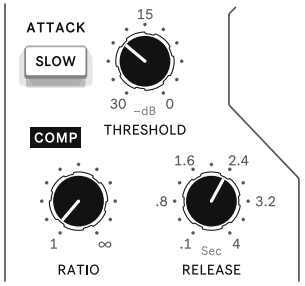
BITE

Fast attack, a moderate ratio and only a few dB of reduction. The compressor grabs the front of every note, which reads as attitude rather than control. Guitars, bass and rock vocals take it well; if it gets too hard, pull Blend back so the grabbed sound sits under the dry one.



CONTROL

Vocals, bass and guitars. A moderate ratio, Slow attack and a medium release, with the threshold set so only the loudest phrases get a few dB of gain reduction.

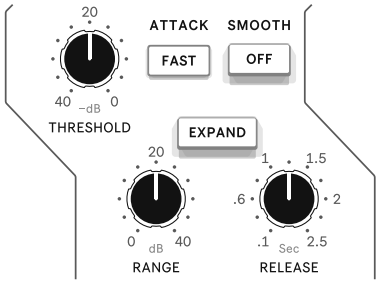


LEVELING

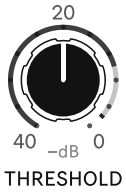
A low ratio, Slow attack, a long release and the threshold just into the arc. Keeps a performance even from verse to chorus.

Threshold settings depend on the level of your material, so treat the ones shown as starting points. Set Threshold to 0 dB, then turn it down until the compressor starts working where you want it.

Expander

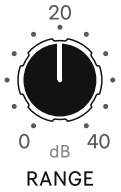


The expander works the other way around from the compressor: it turns the quiet parts down once they fall below the threshold. Range sets how far, Attack how quickly it opens again, and Release how soon it closes. It is the tool for everything a microphone picks up that you didn't ask for: room tone and bleed between drum hits, amp hiss between guitar phrases, a fan, a keyboard or a second voice on a podcast or stream. With its 2:1 slope it works gently, so the background fades instead of cutting off; Gate Mode shuts it hard for drums.



THRESHOLD

Sets the level, from −40 to 0 dB, below which the expander starts turning the signal down; the arc shows where the signal sits. The knee is soft, so the first few dB under the threshold are eased down rather than dropped. Start fully down and raise it until the pauses fall away while the playing stays untouched.



RANGE

How far the quiet parts are turned down, from nothing to about 45 dB fully up (the ring reads 40). Small settings, 6 to 10 dB, tidy a track without anyone noticing; large ones approach silence. With Range at zero the section is out of the way, whatever the threshold.



GATE MODE

Press Gate and the gentle 2:1 slope becomes a hard switch: below the threshold the signal drops straight to the depth set by Range, above it passes untouched. It closes 1.6 dB below where it opened, so a decaying hit doesn’t flutter. This is the drum tool: tight toms, a snare without the hi-hat, and the gated room sound of the eighties. In Gate mode the Release dial reads the gate’s own timing.



ATTACK

How quickly the expander opens once the signal comes back. The original manual gives Fast as 100 µs and Slow as 1.5 ms per 40 dB. Fast keeps the leading edge of a hit; Slow is enough to round off the click of a gate opening on a sustained source.



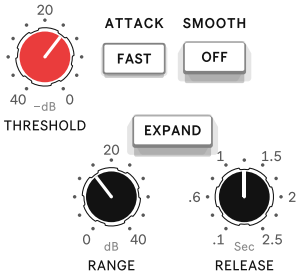


RELEASE

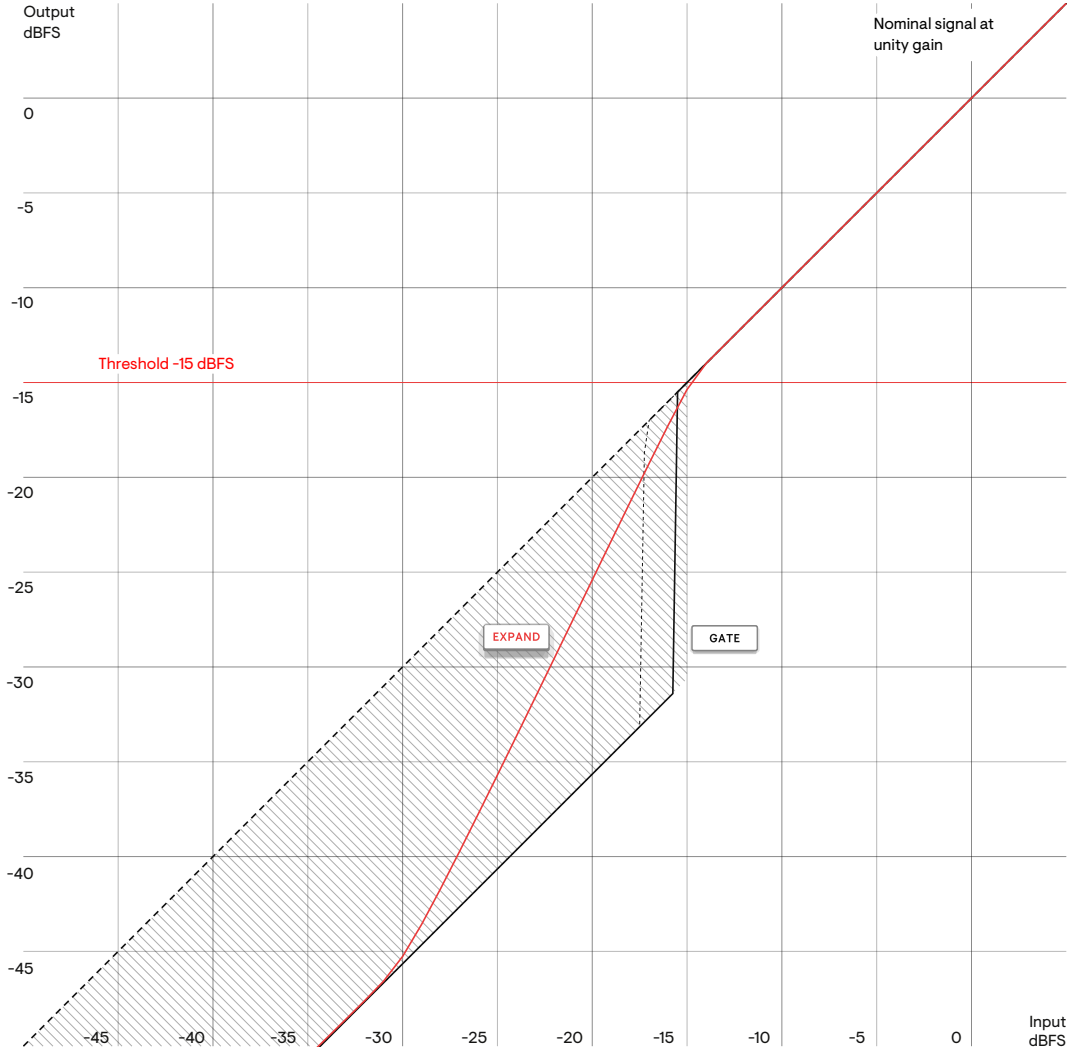
How long the expander or gate takes to close once the signal drops below the threshold, from 0.1 to 2.5 s on the dial. Short settings follow each hit and tighten a drum; long ones let a chord or a spoken sentence trail off before the background fades. The numbers are a guide, and in Gate mode the dial relabels itself to the gate’s own timing. If tails sound clipped, lengthen it; if noise hangs on between words, shorten it.

Threshold control

Let's look at how the expander's threshold shapes the output. As an example, Threshold is set to −15 dB and Range to 15 dB, and both modes are plotted at the same setting. Release doesn't matter here, since we're capturing the output at a steady state (100 Hz sine).



Threshold −15 dB, Range 15 dB, Attack Fast, Release at 12 o'clock.



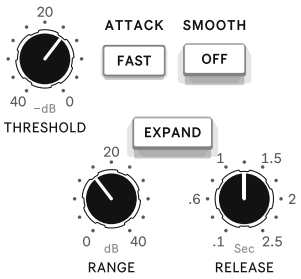
Below the threshold the expander turns the signal down by twice as much as it has dropped, until it reaches the depth set by Range and then simply follows the input from there. In practice this means a note that fades away fades faster, and room tone or bleed that sits 10 or 15 dB under the playing ends up 15 dB lower than it was, without ever switching off. Because the reduction grows gradually, there is no audible click or hole; the background just shrinks around the performance.

Press gate and the same section becomes a switch. Anything above the threshold passes untouched; the moment the signal drops below it, the output falls straight to the depth set by Range. It reopens only when the signal climbs back over the threshold, and it closes about 1.6 dB lower than it opened, so a decaying hit that hovers around the threshold does not chatter open and shut. In practice a drum comes through complete and everything between the hits is gone, which is what tightens toms, keeps hi-hat out of a snare mic, and cuts a reverb tail dead.

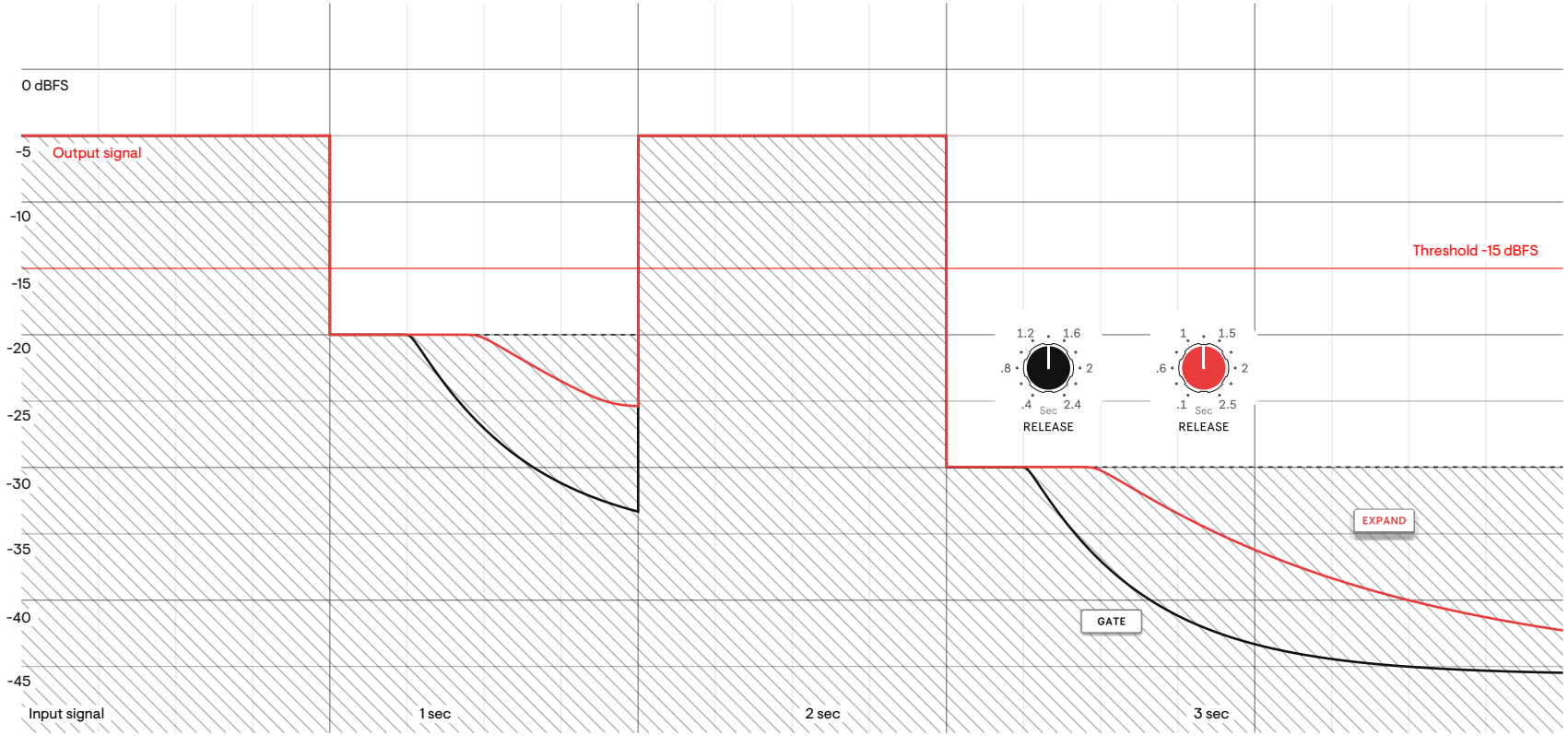
Range (area marked with stripes), the hatched band is how far below unity the signal can be pushed, read vertically to the dashed line, about 15 dB here. The only difference is how quickly each mode gets there. The gate drops the moment the input crosses the threshold, while the expander slides down at 2:1 and reaches the same floor about 15 dB later.

Follower timings

Same test, this time on the expander, with the levels on its side of the threshold. Threshold −15 dB, Range 15 dB, Release at 12 o'clock and Fast attack, and both modes on one chart: the signal sits at −5 dBFS, drops to 5 dB under the threshold, comes back, then drops to 15 dB under.



Red is the expander, black is the gate. Same Threshold, Range and Release, same Fast attack; only the mode differs.



The expander eases down about 5 dB and settles there, all its 2:1 slope asks for at this level. The gate keeps going towards the full Range, because a gate always goes all the way.

Both reopen at once. Fast opens in 0.1 ms, Slow in about 0.5 ms, a fraction of one cycle at 100 Hz, so on any chart in seconds the attack is a vertical line. You hear it only as a click or no click on the front of a hit.

In Gate mode the dial relabels itself to the gate's own timing, so 12 o'clock is a shorter release for the gate than for the expander. That is why the black curve gets to the floor first in the last segment.

Bus 442



The Quad Bus Mix Amp

Every mix on the console ends on the Quad Bus, four legs, left and right, front and back, and each leg has its own 82E26 in the centre section. Its title lists everything it does: "Quad Bus Mix Amps, Patch Returns, VCA, Compressor Side Chain". The mix amp at its head is careful work. The bus arrives against its own Mix Bus 0V, a reference that runs out to every channel and, in Jakob Erland's words, "acts for cancellation of incoming interference and noise", then meets a pair of matched transistors, LM394s and later MAT02s, ahead of a 5534. It's built to stay clean, and it does.

The colour sits a few parts further on. Right after the mix amp comes a dbx 202X VCA, the one the master fader, the autofade and the bus compressor all share, which is why the manual can say that switching the compressor in "introduces no additional audio circuitry". Compressor in or out, every mix went through it. Beside it on the drawing is a trim marked DISTORTION NULL. Set carefully, the VCA all but disappears; Erland, writing about his clone of this circuit, tells of a builder who trimmed the VCAs "a bit off-center - just to get a little more 'sound'", and found the result "almost exclusively second harmonic".

Bus 442 is the module the desk never had. It puts that trim on the front panel as Bias, on a THAT 2181 in place of the 202X, and adds a diode peak-stop and a peak meter of our own. With no drawing to trace, it's written by hand.

Bus 442 Overview

Bus 442 is the one device in the suite with no counterpart on the desk. It is Console 40's own way of putting some signature color into the mix, and of looking good while doing it.





While working on the console, we went through a lot of schematics trying to find any source of color, and inside the nominal signal range there is none to find. Not in the channels, not in the summing bus, not even in the preamps, which stay fully linear until they reach the supply rails. That is marvelous engineering, and it leaves the signal clean. I still wanted a way to put some color into the chain, and that is how Bus 442 came about.

The idea of summing through a VCA goes back to a Studer 904 console of mine, where, as I remember it, every channel ends in a fader-driven VCA. Bus 442 takes the THAT 2181 from the Bus Comp and gives you its symmetry trim on the front panel as Bias. Leaning the gain stage off its null adds even harmonics, mostly the second, and nothing else.

The other color is the console's own: the hard clip at the supply rails, tamed here into a diode peak-stop you switch in with Clip. A fast limiter ducks under each peak to keep the clipping soft, and a true-peak limiter holds the output at -0.3 dBTP.

Place 442 at the end of each track or bus, set Bias to taste, and switch Clip on where peaks are getting through a bit too hard. Together they give the summing stage the color the desk itself never had: Bias at every level, Clip only at the ceiling. The meter on top, a BBC Type IIa peak program meter, does nothing for the sound; it just looks nice, like the meter bridge on a hardware console, and moves like the real thing. And the whole device warms the heart in a great way.

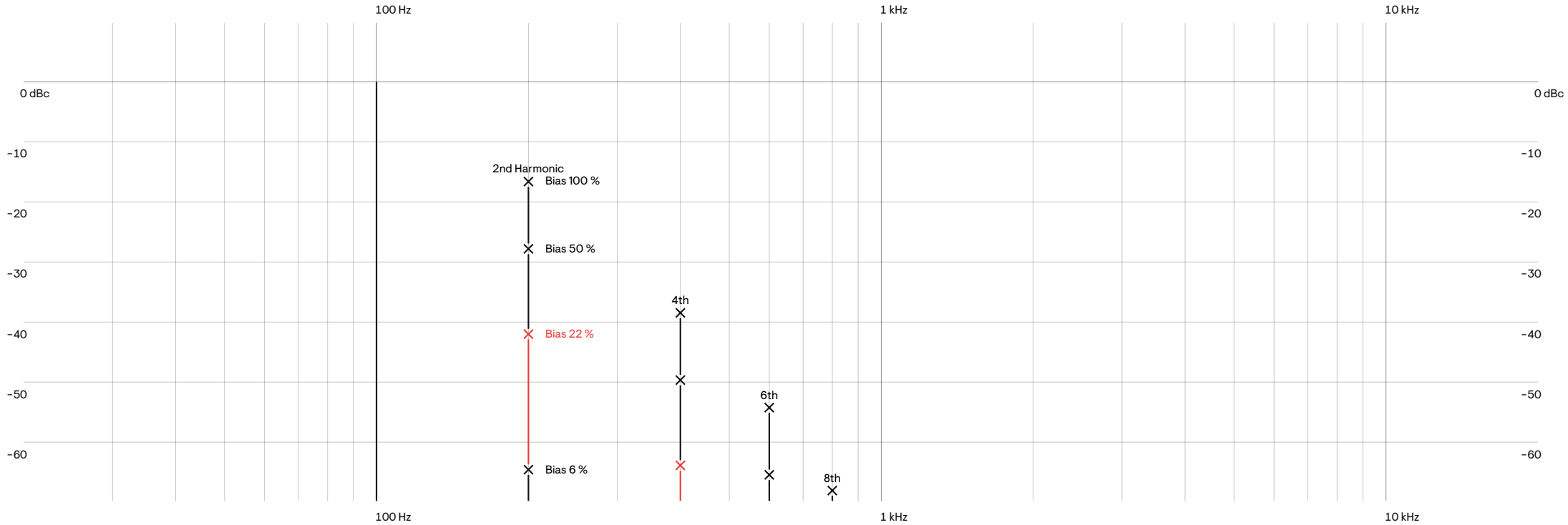
I hope you'll like this addition as much as I do; I fell in love with it while building it.

Harmonic Saturation

Bias adds only even harmonics, and turning it up raises them all together: at its starting 22 % the 2nd sits 42 dB under the tone, a trace of warmth; at 100 % it is 17 dB under.

Bus 442 adds two kinds of color, and they do different jobs. Bias adds even harmonics, the octave-related ones the ear folds back into the note. On a bass or a vocal that reads as body and warmth; on a whole mix it sounds like the material thickening a little without getting louder. It works at any level, a little less on quieter passages, so a small amount left in all the time is the natural way to use it. Turned all the way up, the tone itself comes down about a dB.

Clip adds odd harmonics, and only when peaks reach the ceiling. That is density and edge: drums get harder, a mix gets tighter at the top, and the transients that would have poked out are folded into the sound instead. Below the ceiling nothing changes, so how much of it you get is set by how hard you drive in. The chart shows Bias alone: a 100 Hz tone at full scale, Clip off.



Bus Comp 452


Bus Comp 452
Sidechain
Stereo
HP Freq
66.4 Hz
High Shelf
0.0 dB
Output
0.0 dB
Type
Modern
THRESHOLD
RATIO
MAKEUP
ATTACK
RELEASE
BLEND
LG

The Quad Bus Compressor

The bus compressor was never a box. From the first 4000 B in 1976, as the company tells it, it lived in the centre section. On the E and G desks it's spread over two modules: the four 82E26s carry the VCAs and the sidechain, and the 82E27 holds the time constants alongside the master Quad fader and the autofade. Engineers called it the Quad compressor. Spike Stent, on the stereo bus: "I really get that SSL Quad compressor pumping. I'm not shy with it."

Its trick is that it adds nothing to the audio. The main VCAs already carry the master fader and the autofade, and a second "dummy" VCA in the sidechain tracks them, so the one set of main VCAs can do "compression, fader, computer and autofader at the same time", as Jakob Erland describes it. Whatever the compressor sounds like, it's the sound of that VCA working.

When Erland cloned it in 2002 from his own 1985 SL 4044 E, he found the VCA, a dbx 202XT, was "ten paralleled 2150's" in one can, and that the "sound" didn't seem to be that different on a 202, a 2150 or a THAT 2181. DIY Recording Equipment later went further with their G Bus, choosing "to reconstruct the original console circuit part-by-part", and found "35 differences between the original and GSSL circuits".

Bus Comp 452 is modelled on the G Bus schematic, with our own additions: the sidechain high-pass and shelf, a continuous Link, Blend, Bias and Clip.

Bus Comp 452 is where a Console 40 mix comes together, just as it did on the large-format legend. Unlike Dyn 432, a feed-forward design whose ratio goes all the way to limiting, Bus Comp has a completely different topology, built around a feedback loop in its sidechain. It's not as immediate as Dyn, but that relaxed, laid-back response is its signature: it shapes the peaks, pulls tracks closer together and puts the final touches on the whole mix, just right.





There's nothing I can say about this piece of audio engineering that you haven't heard already. It's legendary for a reason: countless hit records passed through it, inside large-format consoles all over the world.

My personal approach on the 500-series unit I've used for years works just as well on the 452: switch it on about halfway into the mixing session, with a 4:1 ratio, slow attack and release in the middle. I ride it at 2–4 dB of compression on average and keep mixing into it. It gives the drums a nice, coherent feel and lets me drive my mix a bit hotter without it feeling overwhelming.

I also find its character well suited to any material that calls for a bit more consistency. It works great on a drum bus, on unruly synths whose level drops away as the resonance sweeps, and even on effect returns when I want them to sit a little closer in the mix.

I studied every bit of schematic I could find and followed the circuit part by part, tracing it from the G Bus, DIY Recording Equipment's published clone of the console's compressor, and checking it against Gyraf Audio's clone. The 452 is as close to that circuit as I could ever get. And while the wonderful Glue Compressor exists, the 452 earned its place in my mixes on its own while I was testing

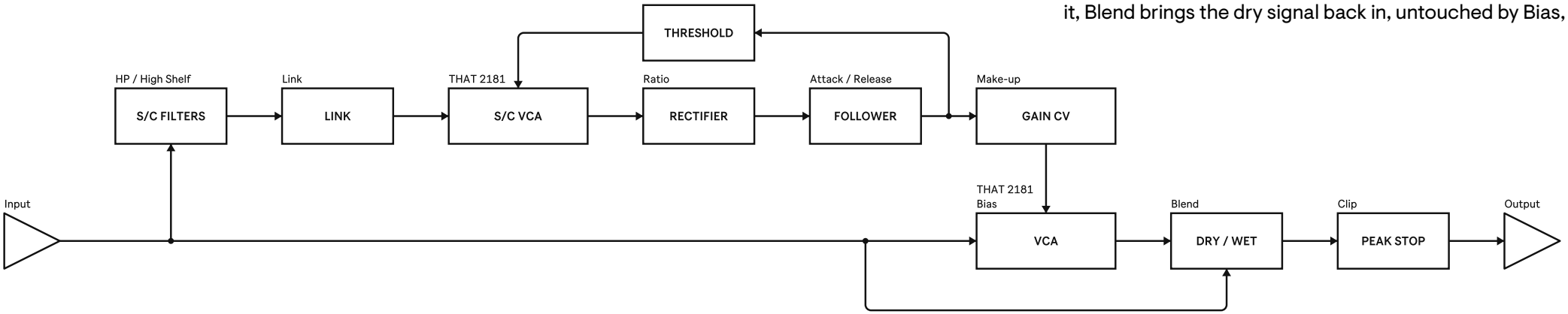
Signal Path

Bus Comp 452 follows the console's bus compressor circuit, with its fascinating mix of feedback and feed-forward signal processing.

Let's have a closer look at the signal path. The audio runs through a single THAT 2181 VCA, where all the compression happens. The sidechain is tapped at the input. Its filters shape what the compressor hears, and Link decides how much the two channels share.

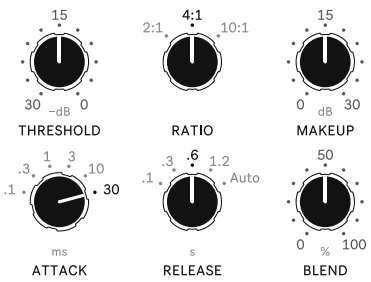
So far that looks like Dyn 432, but here the sidechain has a VCA of its own, a second 2181 that follows the one in the audio path. The rectifier measures the signal after that VCA, with the Ratio switch setting how strongly it responds. The follower then smooths it with Attack and Release.

The follower's output goes two ways. Through Makeup it drives the main VCA and turns the mix down. Through Threshold it goes back to the sidechain VCA and turns down what the rectifier hears, and Threshold sets where compression begins. Bias colors the main VCA itself. After it, Blend brings the dry signal back in, untouched by Bias,

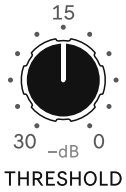


The loop is what gives the 452 its feel. Dyn 432 measures the signal once and applies the result. Here, every bit of gain reduction also changes what the detector hears, so the compressor keeps correcting itself and settles into the music instead of grabbing it. Because the audio itself never passes through the loop, it stays clean and stable. The knee is soft, the gain moves smoothly, and even 10:1 holds peaks firmly without the hard edge of a limiter. That's the relaxed, laid-back response from the overview, and it's why the 452 can sit across a whole mix for hours without drawing attention to itself.

Control Panel



Bus Comp 452 has only a handful of controls, and three of them click into fixed positions, just like the switches on the original hardware. That's part of the charm: fewer choices, and every one of them has been used on countless records.



THRESHOLD

Sets where compression begins; the dial is marked from −30 to 0 dB. As on the hardware, the threshold moves when you change the ratio: the lower the ratio, the earlier compression begins. On a mix, start at 0 and bring it down until the meter moves 2 to 4 dB on the loudest parts. If the needle never rests, you've gone too far.



RATIO

Three positions, as on the original. At 2:1 the compressor starts early and gently, almost invisibly. 4:1 is the classic setting for the whole mix: firm, but still breathing. At 10:1 it waits longest and then clamps hard, which is close to peak limiting. Save that for a drum bus or for catching stray peaks.



ATTACK

How quickly the compressor reacts, in six steps from 0.1 to 30 ms. Slow settings let the front of each hit through before the gain comes down, which keeps drums punchy. They also ease the overall reduction by a few dB, as on the hardware. 30 ms is the usual starting point on a mix. The fastest steps catch everything, which is useful for control but softens the attack of a kit.



RELEASE

How soon the gain comes back: four fixed times from 0.1 to 1.2 s, plus Auto. Short times make a mix pump and feel louder. Longer ones hold it steady. Watch the meter: it should fall back between beats, in time with the groove. Auto combines two speeds. Short peaks recover quickly, while longer stretches of compression settle back over several seconds. On a full mix it's the safest choice.

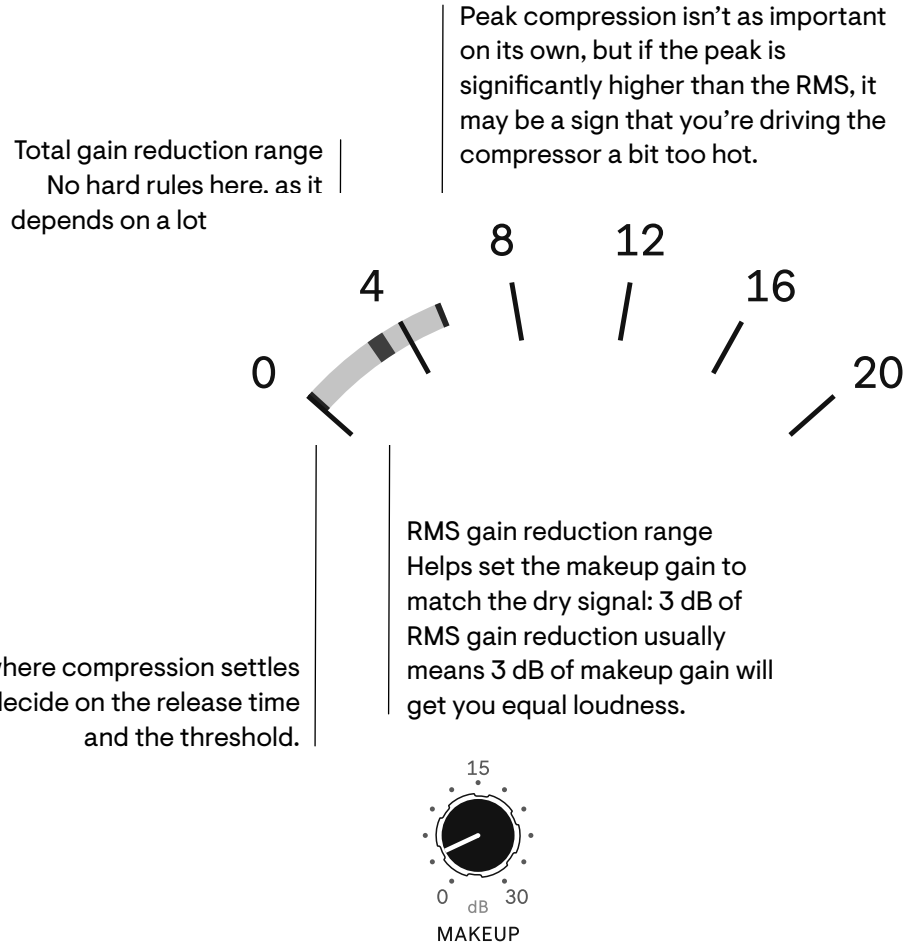


MAKEUP & BLEND

Makeup brings back the level the compression took away, up to about 28 dB. Match the compressed and bypassed loudness before judging, since louder always sounds better. With Clip on, Makeup also sets how hard you drive the clipper. Blend mixes the untouched input back in for parallel compression. Squeeze a drum bus hard, then bring Blend down until the hits come back.

Metering, gain reduction amounts & makeup gain

Metering on the 452 is a simple needle showing the gain reduction in dB. It's a plain readout that follows the original, with two arcs added: one shows the full range of the gain reduction over the last three seconds, the other the range of its one-second RMS average. They're very helpful when you need to diagnose why something doesn't sit right.



COMPRESSION AMOUNT

The needle shows the current amount of compression. How much is right depends on personal preference, the material and where the Bus Comp 452 sits in the session, so no single rule fits all.

As you learn the device, you'll build up expectations of how much gain reduction suits specific sources. As a general starting point, look for settings where the needle can settle back close to 0 dB of reduction. But keep in mind there's potential across the full compression range, and deep compression can open up interesting options in certain situations.

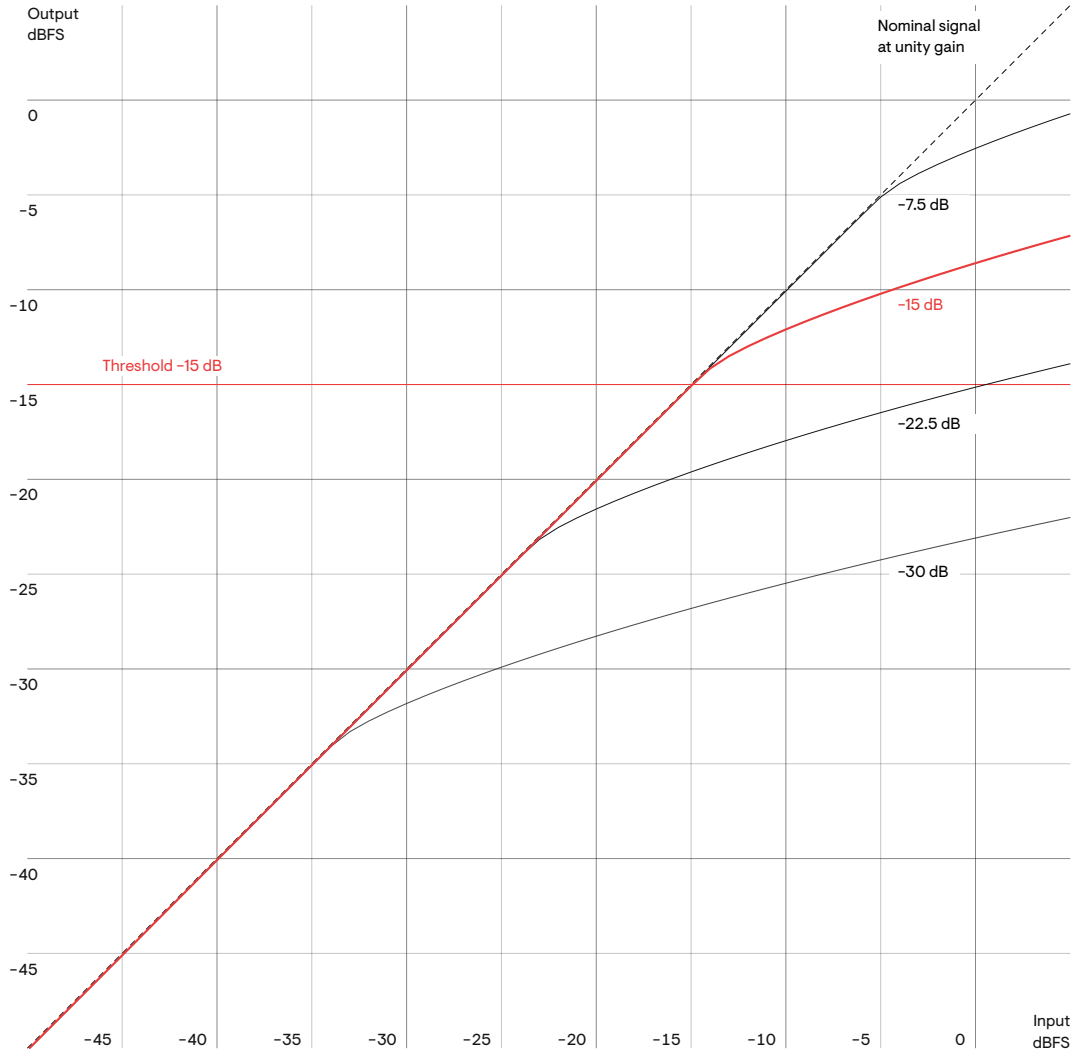
If you're generally happy with the sound but the range never settles, the threshold likely needs attention. If it sounds too sluggish, the material may call for a shorter release; if it's overly energetic, a longer one.

Remember, these are general directions, not even recommendations, just guiding signals. It's up to you to decide what is right for the material.

Threshold control

Threshold slides the whole bend along the dashed line: at −15 the curve leaves it at −14 dBFS, and a full-scale tone comes out at −8.6 dBFS.

Let's look at how Threshold shapes the output. As an example, we'll set the Ratio to 4:1 and the Attack to 30 ms, leave Release on Auto, and send in a steady 1 kHz sine at every level.



Below about −14 dBFS the curve sits right on the dashed line. Unlike Dyn 432, the Bus Comp adds no automatic make-up, so anything under the threshold passes at the level it came in. Past the threshold the curve bends and settles to about 3:1 within 10 to 15 dB. At 30 ms the attack lets a little of each cycle through, so the full 4:1 shows up with faster attack settings and louder signals.

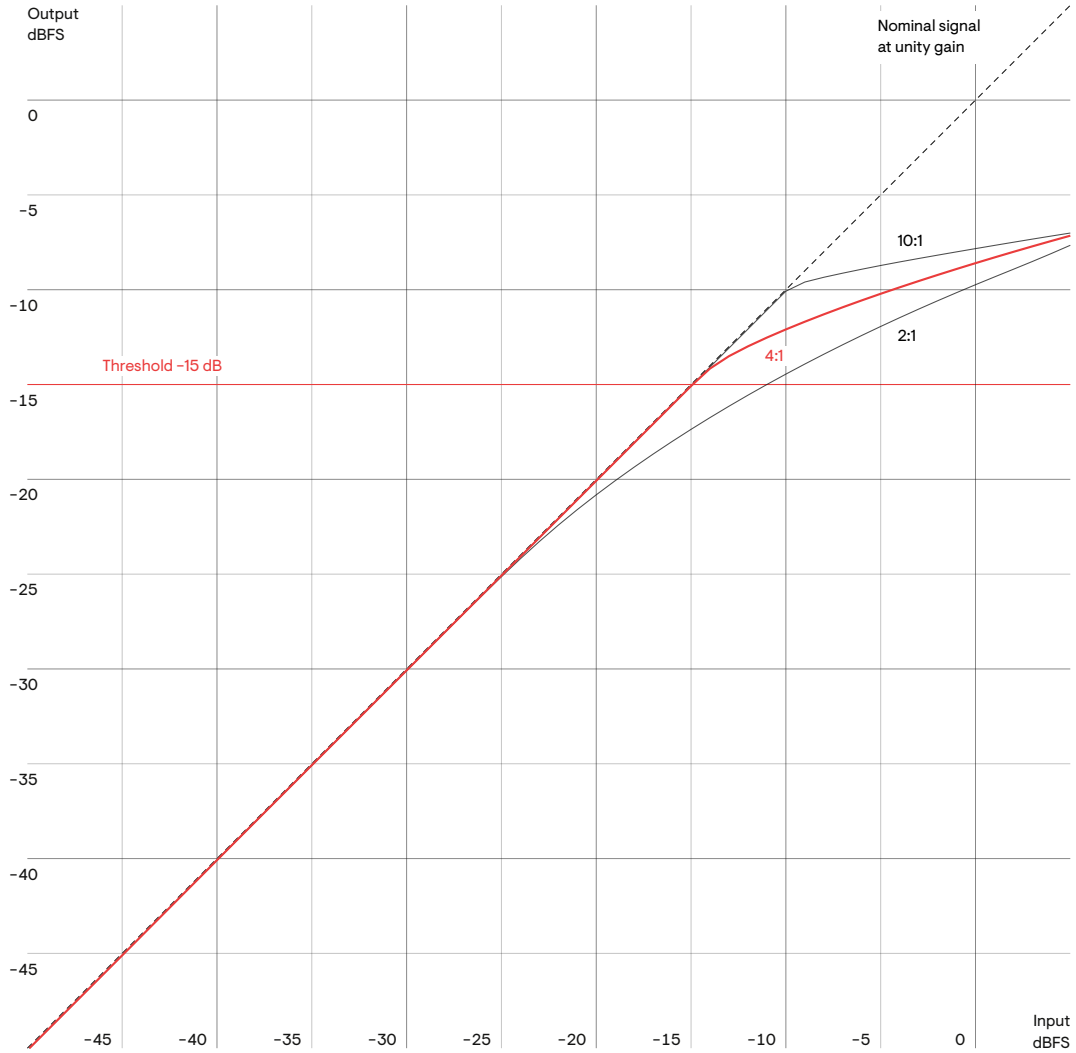
The thin black curves show the other Threshold positions. The dial numbers are a guide: at the −30 position compression starts about 3.5 dB early, at −22.5 close to the mark, and at −7.5 about 3 dB late. The top of the dial is inert at 4:1, so 0 is left off the chart.

In a real mix, how soft the knee feels also depends a lot on the attack time.

Ratio control

Ratio moves the knee as much as the slope: the lower the ratio, the earlier it bends, so a full-scale tone comes out within 2 dB on all three.

Now let's look at how the Ratio switch shapes the output. Threshold stays at −15 dBFS and Attack at 30 ms, and release doesn't matter here, since the curves are measured with a steady tone once everything has settled.



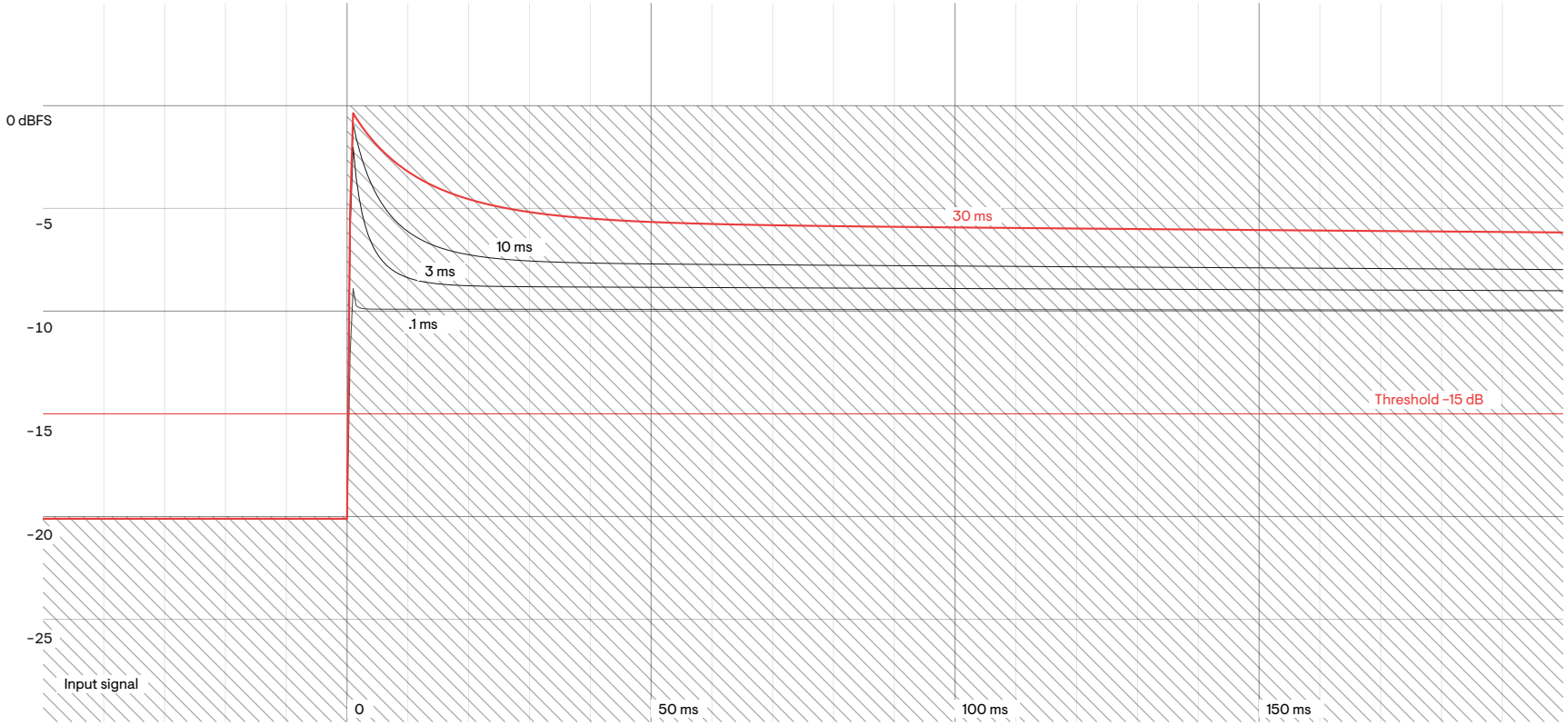
As you can see, ratio moves the threshold. This is deliberate, and characteristic of the bus compressor. The lower the ratio, the earlier compression begins: 2:1 starts around 10 dB before 4:1, and 10:1 around 4 dB after it. A gentle ratio leans on the mix early and softly, while a steep one waits for the peaks. Because the threshold shifts with the switch, the three ratios close up again as the signal approaches full scale.

The labels are generous. The knee is so soft that 10:1 behaves more like 5:1 in normal use, and 4:1 reaches about 3:1. A few dB above full scale the curves cross, and 10:1 finally clamps harder than the others.

Attack timings

Next, let's check out how the attack and release settings affect the compression, starting with attack. This time we look at the time-dependent behavior: what the output does over time, as a tone steps from just under the threshold to full scale. Ratio is 4:1, Threshold -15 dBFS and Release on Auto.

At 30 ms the front of a hit gets through almost whole: the gain takes 10 ms to come halfway down. At .1 ms nothing gets through, and the faster the attack, the deeper it holds: 10 dB against 6 dB at 30 ms.



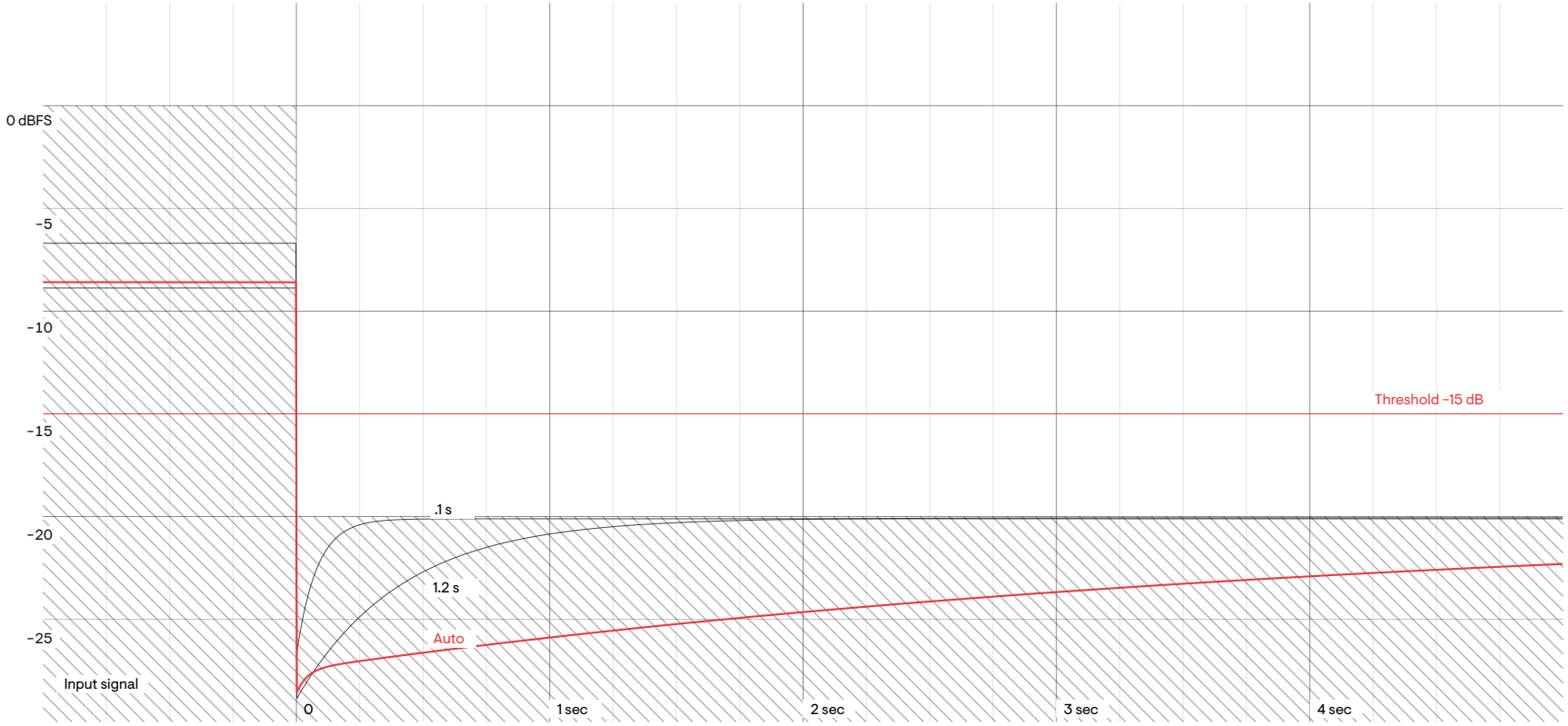
The attack time sets how fast the gain comes down once the signal crosses the threshold. At 30 ms the front of the step gets through almost whole and the gain eases down over the next few tens of milliseconds, so the front of a hit keeps its edge while what follows is pulled in.

At .1 ms the reduction is in place within a cycle, and nothing of the transient gets through. The fast settings also hold deeper: a slow attack reads each cycle a little quieter, so it compresses a little less.

Release timings

Now let's look at the release. A steady tone at full scale is held for several seconds, then drops to −20 dBFS, just under the threshold. What the compressor does at that moment is decided by the Release switch alone. Ratio stays at 4:1, Threshold at −15 dBFS and Attack at 30 ms.

The fixed positions are back within a second. After a long loud stretch Auto gives back only 1.2 dB at once and takes 2.3 s to recover half, so the music comes up slowly instead of pumping.



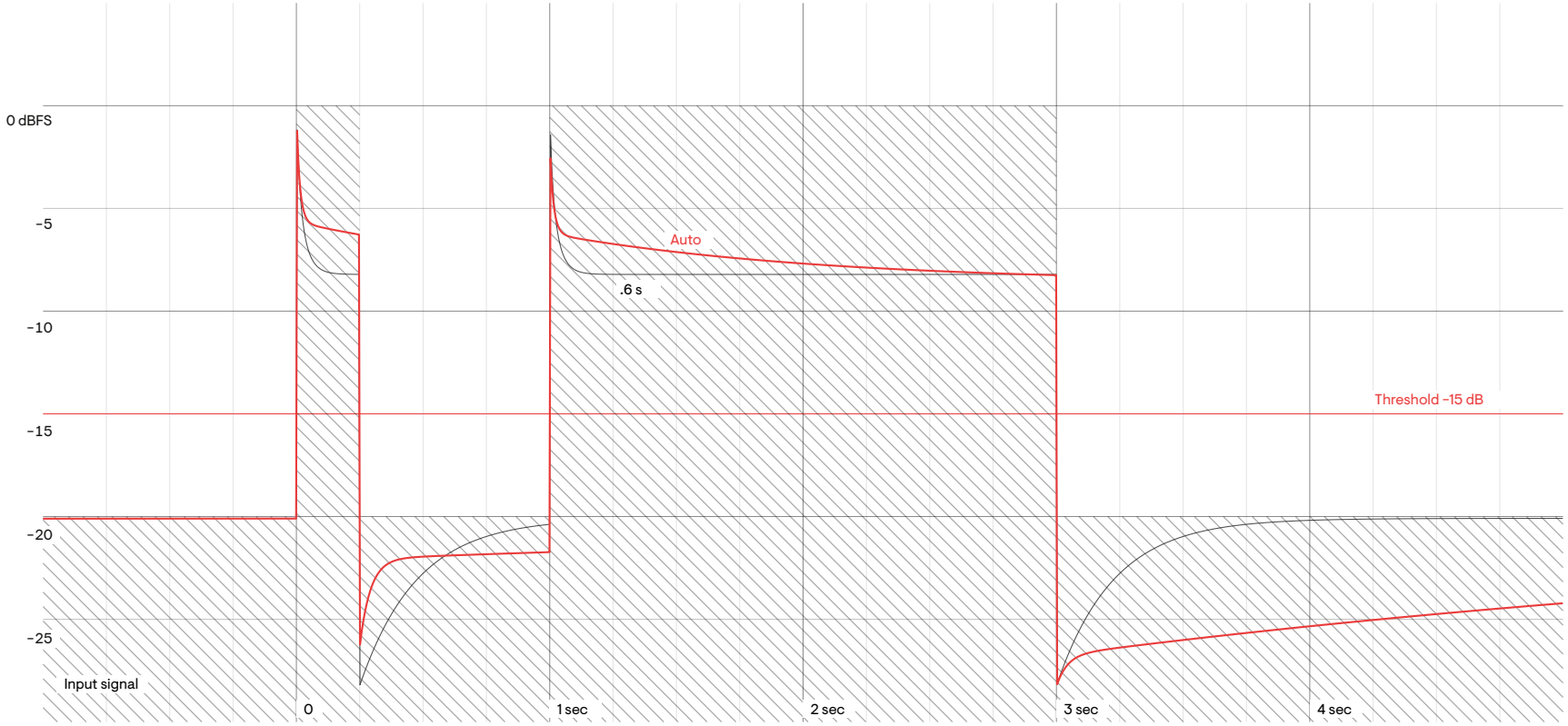
During the loud part the gain sits about 9 dB down. The .1 s position rests a little higher, because it starts letting go in the gaps between the waveform's cycles.

At the drop the compressor is still holding what it took from the loud section, so the quiet passage comes out too low until the gain has climbed back.

Auto-release timings

Auto release is the position voiced for whole mixes: the release time follows the duration of the peak that caused the reduction. It is the usual starting point for a full mix or a drum bus, where short hits and long swells arrive together. A short burst at full scale, then a long loud section, both against a quieter background at −20 dBFS, just under the threshold, show what that means in practice. Ratio, Threshold and Attack stay at 4:1, −15 dBFS and 30 ms.

Auto times itself to the music: after a short hit half the gain is back in 58 ms, faster than .6 s, but after two loud seconds it still holds 4 dB two seconds later. The longer the loud part, the slower it lets go.



Auto works at two speeds at once. On a short hit the fast half takes less off than the .6 s position and gives it back sooner, while the slow half keeps a dB or two of reduction, so the passage after the hit does not jump up.

During a long loud section the slow half charges up. The reduction grows through the section until it matches the .6 s position, but it now has a long memory of how loud

After the section ends, that memory holds the level down: two seconds after the drop, half the reduction is still there. The .6 s position recovers in about half a second both times, whatever came before. Auto is the setting for material that mixes short hits with sustained loud passages: it lets go of the hits fast and lets the whole mix breathe slowly.

Closing Notes

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.

Under The Hood

Seven devices from one console: four EQs in three voices, the channel dynamics, a color box and the bus compressor

Circuit models traced part by part from published schematics, and each device built from its model. Bus 442, with no original to trace, is written by hand

Real component tolerances built into every device. Each serial number is its own set of parts, so no two channels are ever identical

The smallest details of the hardware captured with the circuit models

Three EQ voices: Black's bells stay precise at any gain, Pink's narrow as you push them, Orange's peak higher the narrower you set them. Run them side by side

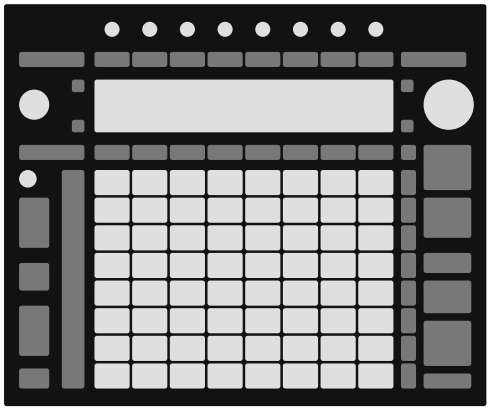
Dyn 432: the console's firm, punchy compressor and its expander/gate sharing one gain element, both at once, with sidechain filters, stereo link and mid/side

Bus 442 is the module the console never had: its gain stage and output amp as a color box, with a diode clipper and a true-peak limiter waiting behind it

Bus Comp 452, the glue itself: Auto release, an adjustable sidechain link, a detector high-pass and shelf, and the Bias and Clip section for a mix that needs no limiter after it

Mid/side on EQ 422, 424, 426 and Dyn 432, Dry/Wet on both compressors, a live response curve with spectrum on every EQ.

True-peak limiting and tasteful clipping for separate tracks or the whole mix.



FULL SUPPORT FOR PUSH 3 STANDALONE AS WELL AS PUSH 2

CONSOLE 40 SUITE REQUIRES LIVE 11+ SUITE

Device Data

	EQ 420	EQ 422	EQ 424	EQ 426
Latency 44.1 kHz 48 kHz 96 kHz	19 samples 0.43 ms 0.40 ms 0.20 ms	19 samples 0.43 ms 0.40 ms 0.20 ms	19 samples 0.43 ms 0.40 ms 0.20 ms	19 samples 0.43 ms 0.40 ms 0.20 ms
Oversampling	2×, high and high mid bands	4× low-pass, 2× high and high mid bands	4× filters, 2× all four bands	4× high and high mid bands and filters, 2× low and low mid bands
Sample rates	44.1–192 kHz	44.1–192 kHz	44.1–192 kHz	44.1–192 kHz
0 dBFS	unity at 1 kHz [VERIFY]	unity at 1 kHz [VERIFY]	unity at 1 kHz	unity at 1 kHz
Controls	Output ±24 dB	Output ±24 dB	Output ±24 dB	Output ±24 dB
Parameters	17 automatable	22 automatable	23 automatable	23 automatable

Sub-title

	DYN 432	BUS 442	BUS COMP 452
Latency 44.1 kHz 48 kHz 96 kHz	0 samples none none none	107 samples 2.43 ms 2.23 ms 1.61 ms	107 samples 2.43 ms 2.23 ms 1.61 ms
Oversampling	none (1×)	2× clip stage, true peak at 4×	1× compressor, 2× clip stage, true peak at 4×
Sample rates	44.1–192 kHz	44.1–192 kHz	44.1–192 kHz
0 dBFS	about +17 dBu [VERIFY]	+18 dBu	+20 dBu at the input
Controls	Input Gain ±24 dB, Makeup ±24 dB, Output ±24 dB, Dry/Wet 0–100 %	Clip holds the output at −0.3 dBTP	Makeup 0 to +28 dB, Dry/Wet 0–100 %, Clip at −0.3 dBTP
Parameters	28 automatable	4 automatable	14 automatable

Bus 442 and Bus Comp 452 hold their lookahead in time, so they report 155 samples at 88.2 / 96 kHz and 251 at 176.4 / 192 kHz.

Disclaimer

Solid State Logic, SSL, SL 4000, Total Recall and the series and module names used in this manual (the B, E and G series, SL 4044 E, 82E10, 82E26, 82E27, 132, 242 and 292) are trademarks or product names of Solid State Logic, used here only to identify the products studied during development. Ableton, Live, Push, Max for Live and Glue Compressor are trademarks or product names of Ableton AG; Max is a trademark of Cycling '74. dbx, THAT, Aphex, AIR Studios, Studer, Pultec, BBC and Instagram are trademarks of their respective owners. Gyraf Audio (GSSL) and DIY Recording Equipment (G Bus) are named as the authors of the published circuits Bus Comp 452 was traced from and checked against. Monomono is not affiliated with, endorsed by or sponsored by any of them. Console 40 is an independent product, modeled on published circuit documentation; it is not a reproduction of any Solid State Logic product, and all historical information is drawn from published sources.

Bus Comp 452's compressor circuit is traced from "G Bus VCA Compressor", schematic Rev 1.0, October 2022, by DIY Recording Equipment (drawn by JG & PG), diyrecordingequipment.com/products/g-bus-compressor-kit, licensed under Creative Commons Attribution-ShareAlike 4.0 (creativecommons.org/licenses/by-sa/4.0). Changes: the schematic was turned into a circuit model and the device's engine. Cross-checked against "SSL Mixbus Compressor Clone", Rev 9, June 2013, by Jakob Erland, Gyraf Audio.

The people quoted or credited in this manual are quoted from the published sources below. Their words describe their own work on the company's consoles and on the original hardware, not on Console 40, and no endorsement of Console 40 by any of them is claimed or implied.

Hugh Padgham, on the desks with dynamics on every channel: Mix, Classic Tracks: Phil Collins "In the Air Tonight", by Robyn Flans, May 2005; MusicTech, Hugh Padgham on how he created the gated-reverb effect, by Jim Ottewill, June 2019.

Andy Wallace, on the channel compressors being used "more for the sound" and "pretty aggressive-sounding": Mix, Andy Wallace, by Michael Barbiero, October 2005.

Bob Clearmountain, on the channel compressor "on fast attack and fast release" as "a fast high-frequency limiter": Sound On Sound, Secrets of the Mix Engineers: Bob Clearmountain, by Paul Tingen, February 2009.

Mark Endert, on backing vocals with the channel compressors "set to a 5:1 ratio": Sound On Sound, Secrets of the Mix Engineers: Mark Endert, by Paul Tingen, September 2007.

George Seara, on ad libs at 3:1 with fast release, linked: Sound On Sound, Inside Track: Shawn Mendes "Treat You Better", by Paul Tingen, December 2016.

Sources

People quoted or credited in the manual, with every source the copy rests on:

Hugh Padgham. Mix, Classic Tracks: Phil Collins “In the Air Tonight”, by Robyn Flans, May 2005 (the Townhouse desk, “You pressed a button and there it was”). MusicTech, Hugh Padgham on how he created the gated-reverb effect and evolving technology, by Jim Ottewill, 28 June 2019 (“40 compressors and 40 noise gates”).

Andy Wallace. Mix, Andy Wallace, by Michael Barbiero, October 2005 (the channel compressors on a G series desk).

Bob Clearmountain. Sound On Sound, Secrets of the Mix Engineers: Bob Clearmountain, by Paul Tingen, February 2009 (the keyed channel-compressor patch in place of a de-esser).

Mark Endert. Sound On Sound, Secrets of the Mix Engineers: Mark Endert, by Paul Tingen, September 2007 (backing vocals through the channel compressors).

George Seara. Sound On Sound, Inside Track: Shawn Mendes “Treat You Better”, by Paul Tingen, December 2016 (ad libs through linked desk compression).

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Paul Frindle, who developed the G series channel electronics. ProSoundWeb R/E/P forum, “SSL EQ Black, brown, orange???”, 24–25 November 2005, Internet Archive copy (the 292 as a retrofit, the lost Bell switches, the gain-dependent width, the low-frequency “overshoot bump”, the loss of narrow cuts).

Keith (“ssltech”), former field engineer for the company. Same ProSoundWeb thread, 25 November 2005 (the 242’s end-stop filter switches, the steeper high-pass; the 132 as “EQ-P”, its Brown-based topology); GroupDIY, “E Series EQ”, 8 August 2006 (the 132’s Pultec marketing and “about twelve channels worldwide”).

Jakob Erland, Gyraf Audio. GroupDIY, “SSL 4000 summing question”, 18 April 2024 (the mix bus 0V). Gyraf Audio, The SSL Mixbus Compressor Clone, project text (the clone from his 1985 SL 4044 E, the “dummy” sidechain VCA, the 202XT, the off-center VCA trim); “SSL Mixbus Compressor Clone” schematic, Rev 9, June 2013.

DIY Recording Equipment (G Bus, designed by Peterson Goodwyn). G Bus compressor kit page, diyrecordingequipment.com (the part-by-part reconstruction, “35 differences”); “G Bus VCA Compressor” schematic, Rev 1.0, October 2022, CC BY-SA 4.0.

Release Notes

1.0 — SEPTEMBER 24, 2026

Initial Release

1.01 — OCTOBER 4, 2026

Bus Comp 452: Makeup no longer zippers as you turn it, Makeup and Bias moves no longer thump, and Blend and Link are smoothed.

1.1 — OCTOBER 22, 2026

EQ 426 Orange joins the suite.
Bus 442's meter is now a BBC Type IIa peak program meter.
Manual revised.
Updated user interface.
Oversampling added to EQ 422, EQ 424.
Push mappings revised.

1.2 — NOVEMBER 11, 2026

Every device loads faster.
Push and automation show the frequency each EQ and sidechain filter dial actually sets.
Bus Comp 452: SC Link now works, and moves smoothly from independent channels to fully linked.
Dyn 432: the sidechain filter scales read the real filter frequencies, and the low-pass keeps its frequency at high sample rates.
Bus 442's meter no longer sticks at full scale at 44.1 kHz.