



21. EQ & HEADROOM 101



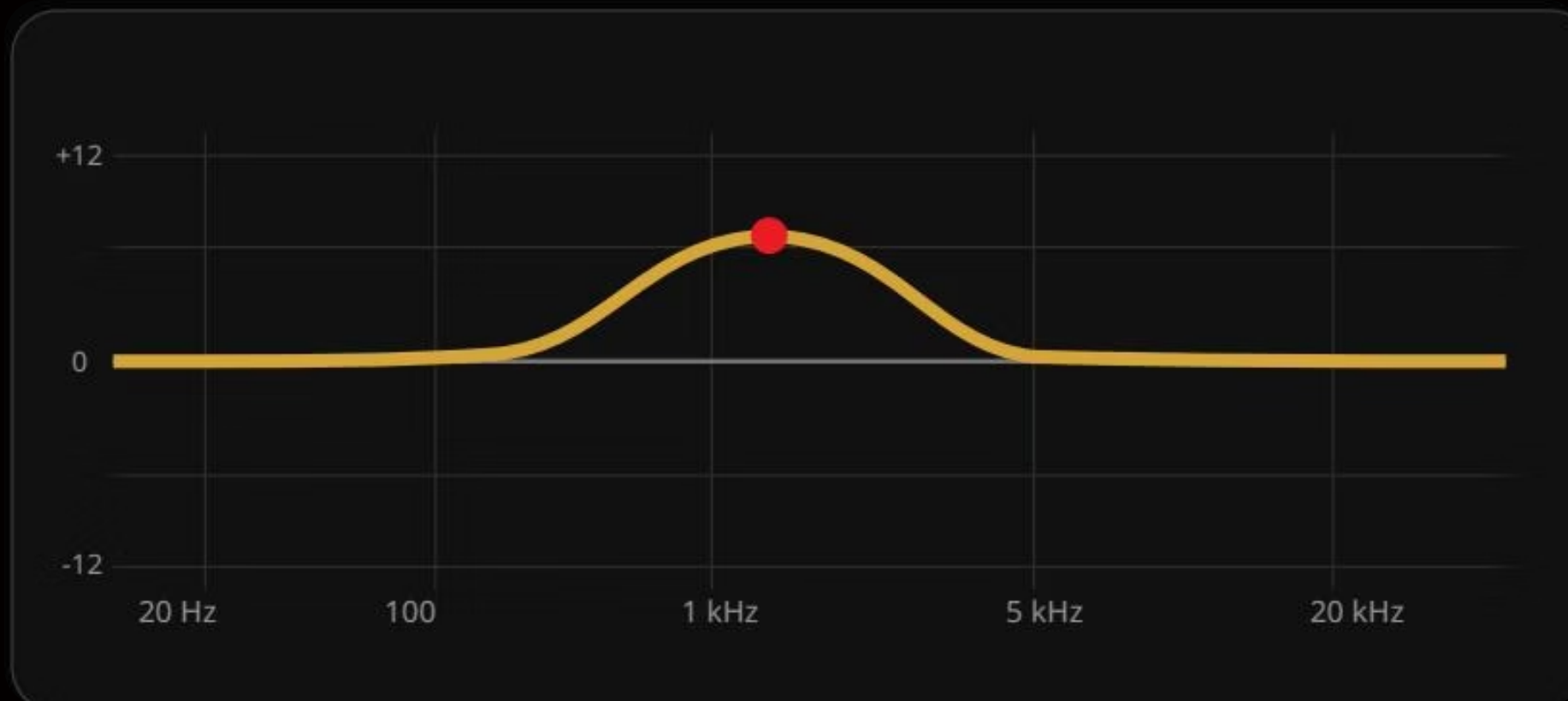
EQ 101

What EQ Is, How to Use It Right & Why Headroom Matters

- ❑ **Core Idea:** Do not EQ because a tutorial says every kick needs 60 Hz or every vocal needs 3 kHz. EQ because you can *describe* what needs to change.

EQ Is Volume by Frequency

A normal fader changes the whole sound. EQ changes selected parts of the sound. Instead of one volume knob for the entire signal, EQ gives you precise control over low, mid, and high frequency regions, think of it as having many small faders spread across the spectrum, each one governing a slice of the sonic picture. This is a powerful thing, and like any powerful tool, it can do real damage when applied without intention.



Boost

Raises a selected region. Useful when something genuinely needs more weight, presence, attack, brightness, or air. Boost with intention.

Cut

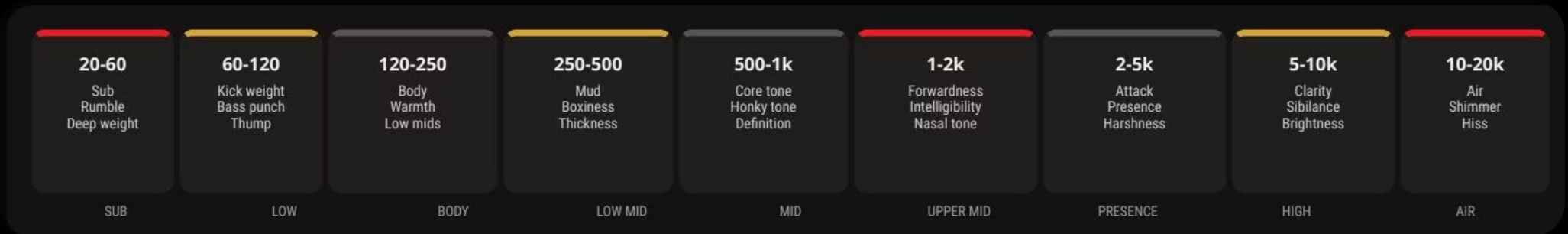
Lowers a selected region. Useful for rumble, mud, harshness, masking, resonances, or making room for another sound. Cuts can feel like magic, they're not.

EQ ≠ Repair

If the sample is wrong, the arrangement is overcrowded, or the source was recorded badly, EQ may reduce the symptom without solving the real problem.

Learn the Frequency Map

Frequency is measured in Hertz. Low numbers are low tones. High numbers are high tones. The map below gives you a search grid, a vocabulary for what you're hearing. Memorize the regions loosely, then train your ears to confirm them before you touch the analyzer. A frequency chart is a starting point, not a prescription.



Frequencies Are Not Instruments

A snare can have information at 150 Hz and 10 kHz. A bass can have harmonics above 5 kHz. The labels describe common *perceptions*, not ownership. Treating the chart as gospel will have you making cuts that hurt sounds just because a label said "mud" lives there.

Context Changes Everything

300 Hz may be useful body in one source and ugly mud in another. 3 kHz may create clarity in one vocal and painful harshness in another. The same frequency region behaves differently depending on the source, the arrangement, and what else is playing alongside it.

Ear Training: The Frequency Sweep

Put a bell EQ on one sound. Boost 8–12 dB with a medium Q and slowly sweep from 50 Hz to 12 kHz. Say out loud what changes: weight, boxy, nasal, bite, hiss, air. Then remove the boost. Do this every day for a week. This is **training**, not a mixing technique, don't leave that boost in your session.

❏ The point of a frequency chart is to help you search faster. Eventually you want to hear "too much 2–4 kHz" *before* you touch the analyzer.

The Three Controls: Frequency, Gain & Q

Most EQ decisions become simple once you understand these three controls. Every EQ band you'll ever use, regardless of plugin brand or interface, is built on this foundation. Get these internalized and the plugin stops feeling like a mystery box.

Frequency, *Where* the move happens

80 Hz is low. 800 Hz is midrange. 8 kHz is high. Move the frequency until you are affecting the part you actually want to change, not just the part the analyzer is yelling about.

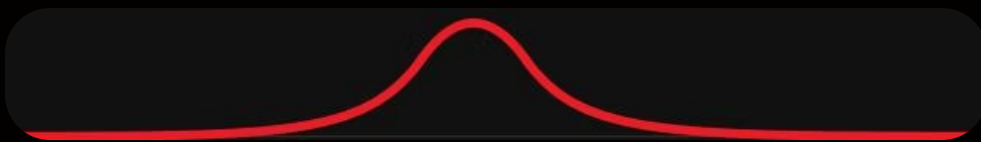
Gain, *How much* you boost or cut

+3 dB is a moderate lift. -3 dB is a moderate reduction. Extreme moves can be completely correct, but they should be intentional. Don't be afraid of +9 dB on a dull sample, but understand the headroom consequences.

Q / Bandwidth, *How wide* the move is

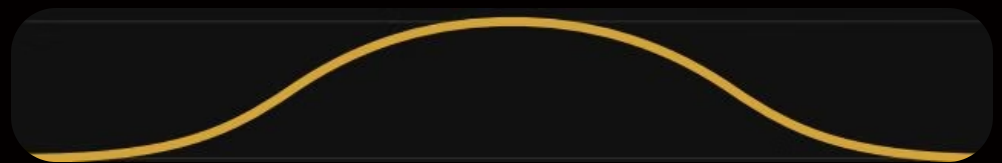
High Q = narrow and surgical. Low Q = broad and tonal. Q controls how much neighboring frequency content comes along for the ride. Use narrower Q for a specific ringing resonance. Use broader Q when you want the source to feel generally darker, brighter, warmer, or fuller.

High Q = Narrow



Surgical. Precise. Targets a specific resonance without disturbing much around it.

Low Q = Broad



Tonal. Natural. Makes the whole character of a source warmer, brighter, fuller, or thinner.

Know the Main Filter Types

Different shapes solve different problems. Don't use a bell for everything, that's like using a butter knife to do surgery. Each filter type has a distinct personality and a job it does better than any other shape. Knowing which one to reach for is half the battle.



High-Pass Filter

Removes frequencies **below** the cutoff. Useful for unwanted rumble, sub energy, mic handling noise, or sources that don't need deep low end. Don't use it automatically, filter actual unwanted energy.



Bell / Peak

Boosts or cuts around a center frequency. The everyday workhorse for resonance control, tone shaping, presence, body, and carving. Use it with intention and a clear Q decision.



High Shelf

Raises or lowers everything above a chosen frequency gradually. Useful for broad brightness, air, or darkening a source in a natural, musical way.



Low-Pass Filter

Removes frequencies **above** the cutoff. Useful for hiss, excessive brightness, darkening layers, or keeping background parts out of the top end. Also great as a creative texture tool.



Low Shelf

Raises or lowers everything below a chosen frequency gradually. Great for changing overall low-end weight without carving a narrow notch into the signal.



Notch

An extremely narrow cut. Useful for a very specific whistle, electrical tone, ringing resonance, or problem frequency that should simply disappear from the signal entirely.

Filter Test: On the same loop, remove 6 dB around 300 Hz using a bell, then try a low shelf. Notice how the same number changes the sound very differently, because the *shape* changes what else gets affected alongside your target.

The Right EQ Workflow

Hear the problem first. Touch the plugin second. This is the single most important sentence in this entire guide. Most EQ errors happen because producers open the plugin before they've finished listening. The workflow below gives you a repeatable decision chain that keeps your hands off the mouse until your ears have done their job.



1 Mix in Context

Solo is useful for finding a noise or resonance. Final decisions should usually be made with the track playing because the job is to fit the arrangement, not win a solo competition. A source that sounds ugly alone can be perfect in the track.

3 Level Match

A louder signal usually feels better, this is psychoacoustics, not tone. After boosts or cuts, compensate output gain enough to compare fairly. Don't confuse extra level with better tone. This is one of the most common EQ mistakes in the game.

2 Bypass Often

Your ears adapt quickly. Toggle the EQ off and on frequently. Ask whether the processed version is actually better, not simply different. Louder is not better. Different is not better. *Better* is better.

4 Stop When It Works

More bands do not mean a more professional mix. One correct move is better than seven moves that create a new problem. If you cannot finish the sentence "I am EQing this because..." you probably do not need to touch the EQ yet.

Subtractive vs. Additive EQ

Subtractive: Remove What Blocks

Cutting is useful when unwanted energy is masking something more important. The wrong approach: high-pass every channel, scoop 300 Hz because "mud lives there," notch every peak on the analyzer, keep cutting until every track sounds thin and separated in solo.

The better approach: identify a specific conflict. Remove only enough energy to solve it. Preserve the body and character that make the source feel real and alive.

- **Masking:** Two sounds dominate the same region. Decide which one owns that range, then reduce the competing part or change arrangement/level.
- **Resonance:** A narrow frequency rings unnaturally. Find it with a temporary boost, flip it into a cut, reduce only what's needed.
- **Unneeded Extremes:** Remove true rumble or hiss when it serves no musical role. Don't filter useful body just because it exists.

Additive: Boost With a Reason

Boosting is not bad. Random boosting is bad. Tonal shaping with a gentle wide boost can make a source feel warmer, brighter, fuller, or more open, and it usually sounds more natural with a lower Q. A focused boost can bring out a kick click, snare crack, vocal presence, or bass texture.

- **Broad Tone:** Wide, gentle boosts for overall tonal character. Shelves often work better than bells here.
- **Attack / Presence:** Find the useful characteristic instead of chasing a frequency chart.
- **Air / Weight:** Shelves work like tone controls, use them that way, not like surgery.

❏ Before adding 5 kHz to a snare, ask whether the snare actually needs more 5 kHz, or whether the hats and synths simply need less attention in that area.

Headroom Explained, and How EQ Changes It

Headroom is the distance between your current peak level and the digital ceiling. In a digital system, dBFS means decibels relative to full scale. 0 dBFS is the maximum representable sample level. Negative numbers are lower levels, -12 dBFS is quieter than -6 dBFS. Headroom is not the same as loudness: perceived loudness depends on average energy, dynamics, frequency balance, and time. A track can peak at -6 dBFS and still feel devastatingly loud.

-6 dBFS

Comfortable Peak

Roughly 6 dB of headroom before the digital ceiling. Plenty of room for transients to hit, buses to sum, and mastering to work.

-3 dBFS

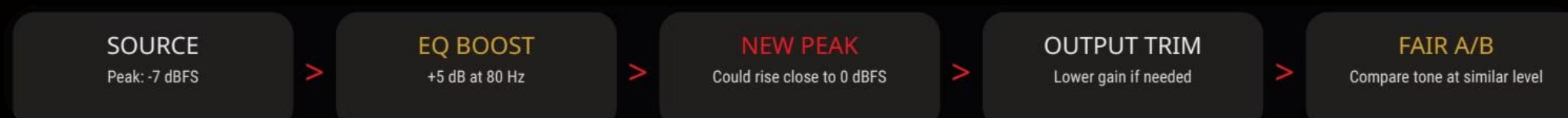
Getting Tight

Still clean, but less room for later boosts and summing. Watch what happens downstream on your group buses and master.

0 dBFS

The Ceiling

You are at the digital ceiling. Any additional level may clip at the output or downstream stage. This is not a loudness target.



Boosts Consume Space

Boosting a frequency region often increases the channel peak. If you make several boosts across many channels, the bus and master can climb quickly. A +5 dB boost at 80 Hz on a bass that's already peaking near -7 dBFS can push it uncomfortably close to 0 dBFS, especially once it hits compression and summing downstream.

Filters Change Peaks Too

Even a cut or high-pass filter can change waveform phase and transient shape. The tonal energy may decrease while the sample peak stays similar or occasionally rises. Use input/output trim to let the plugin work comfortably and make bypass comparisons fair. Don't rely only on the channel fader to fix every stage.

Headroom Exercise: Take a channel peaking near -8 dBFS. Add a broad +6 dB boost where the source has strong energy. Watch the new peak. Then reduce EQ output until bypass and processed levels are similar. Listen again. This shows exactly why gain staging and EQ cannot be separated.

Phase, Dynamic EQ , Useful Starting Areas

Filters Change More Than Frequency

EQ can affect phase, transients, ringing, and timing. You don't need to fear this , just understand it. Minimum-phase EQ is the normal mode in most EQs: it changes amplitude and phase around the filter, is usually low latency and musical, and is the default choice for most mixing work. Linear-phase EQ keeps frequency components more time-aligned but can add latency and pre-ringing , useful in specific mastering or parallel situations, not automatically "better."

Phase matters most with layered kicks or snares, multiple microphones on the same source, parallel processing, crossovers and split-band systems, and kick/sub relationships. The practical advice: listen in context, check mono, use gentler filters when they work, and don't solve invisible problems you cannot hear.

Static vs. Dynamic EQ

A static -4 dB cut at 3 kHz is active all the time , it solves harsh moments but also removes 3 kHz when the source was already balanced. A dynamic band stays near flat and reduces 3 kHz only when that range crosses a threshold. Use dynamic EQ for vocal harshness on aggressive words, bass resonances that jump out on specific notes, and kick/bass space via sidechain. Start with static EQ , it teaches frequency balance faster. Add dynamic EQ only when you can clearly say: "This frequency is fine most of the time, but becomes a problem in specific moments."

Useful Starting Areas , Not Recipes

Source	Areas	What You Hear
Kick	35–120 Hz / 2–5 kHz	Deep weight, thump, beater click
Snare	120–250 Hz / 1–5 kHz / 8k+	Body, crack, brightness/air
Bass	30–120 Hz / 150–500 Hz / 1k+	Sub, punch/body, texture
Vocal	100–300 Hz / 1–5 kHz / 5–10 kHz	Body, intelligibility, sibilance
Hats / Cymbals	3–12 kHz	Attack, metallic tone, shimmer
Synth / Lead	150 Hz–8 kHz+	Role-dependent , serve the track

❏ The range is a **search area**, not a target. If someone says "mud is 300 Hz," that doesn't mean every source needs a 300 Hz cut. Listen first , a frequency is only a problem when there's too much of it for that source in that arrangement.



PARTS 13,14 + PRACTICE

Mistakes, Routines & the 7-Day Bootcamp

Common EQ Mistakes

→ EQ by Sight

A visible analyzer peak is not automatically a bad frequency. Music is supposed to have peaks. Listen before correcting the graph.

→ Solo Forever

The final judge is the arrangement, not the solo button. A source can sound ugly alone and perfect in the track.

→ Over-High-Passing

Removing low end from everything can make the mix thin, weak, and disconnected. Filter actual unwanted energy, not imaginary problems.

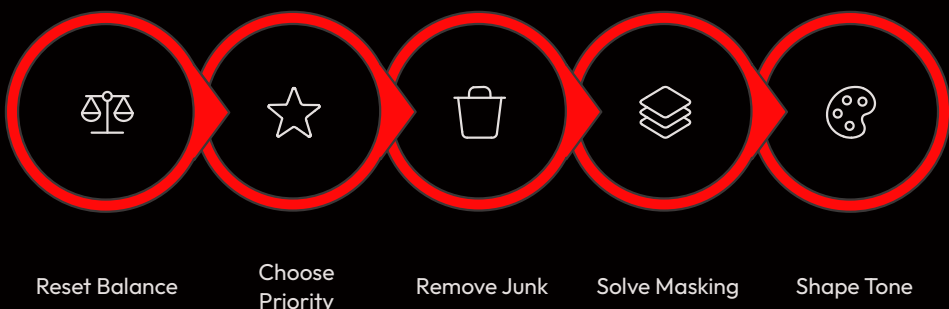
→ Louder = Better

Match output level before deciding any move improved the tone. Don't let extra level trick your ears into thinking the EQ worked.

→ No Headroom Plan

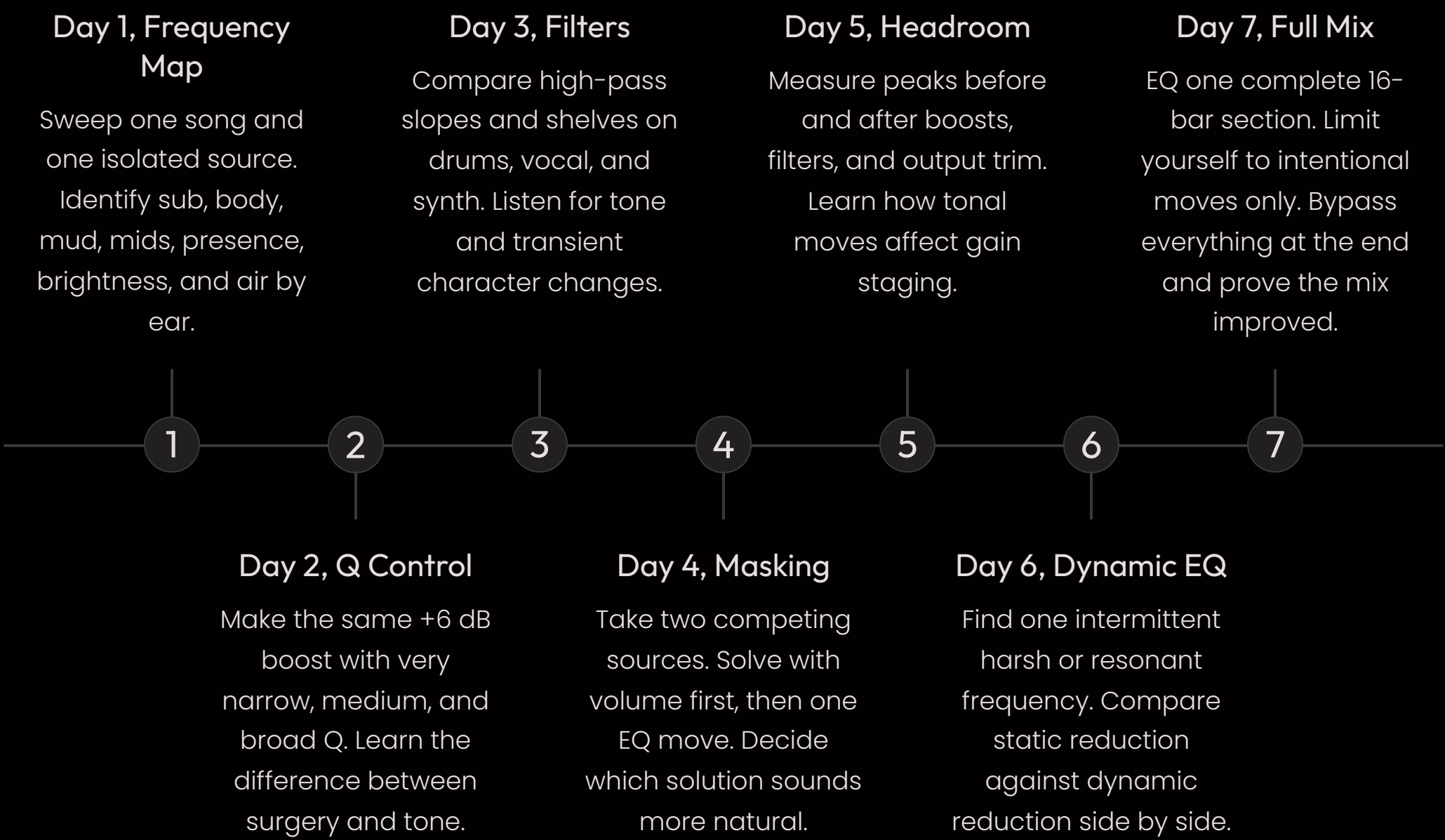
Several EQ boosts plus saturation and compression can push the chain into clipping. Watch levels before and after every stage.

A Repeatable EQ Routine



7-Day EQ Ear Training Bootcamp

Twenty minutes a day will teach more than another night of preset hunting. The goal is not to recognize 327 Hz on command, the goal is to hear a problem and know where to look.



EQ 101, Final Cheat Sheet

EQ = Volume by Frequency Know what part of the spectrum you're changing and why. No move without a description.	Context Over Solo Use solo to investigate. Make final choices in the mix. The arrangement is the judge.
Level First Many "EQ problems" disappear when the fader is correct. Always try the fader before opening EQ.	Watch Peaks After EQ Cuts, boosts, and filters can all change waveform peaks. Gain stage around every plugin in the chain.
Phase Is Part of Filtering Especially critical with layers, parallel chains, kick/sub relationships, and crossovers. Check mono.	Stop When It Works Fewer bands with clear reasons beats seven bands that create a new problem. The best EQ is the one you don't notice.

The Final Rule: There is no frequency chart that knows your song better than your ears. Use EQ to support the musical hierarchy, preserve character, and create enough space that the important elements can do their jobs.

Listen. Describe. Locate. Move. Level-match. Bypass. Stop when it works.