

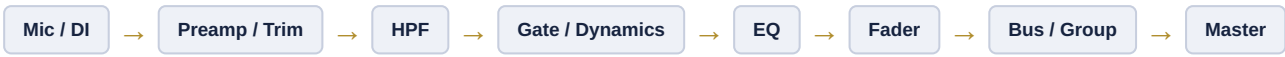
Live Sound Gain-Staging Cheat Sheet

A practical reference for setting clean gain structure on any live console, analog or digital.

THE GOAL

Gain staging means setting the level at **every stage** of the signal path so the signal is strong enough to stay clear of noise, but has enough headroom left that transients don't clip. Get it right at the input, and every stage downstream (EQ, dynamics, the fader, the bus) has room to work without you fighting noise or distortion later.

SIGNAL FLOW ORDER



Set trim first, with the fader at unity (0 dB) and the channel unmuted, **before** touching EQ or dynamics. If you're compensating for a bad trim by riding the fader, fix the trim.

MATCHING GEAR: OUTPUT SENSITIVITY TO THE NEXT INPUT

Gain staging doesn't start at the console. Every connection between two pieces of gear has a source pushing out a signal at some level and a destination expecting a signal within some range. If those don't line up, you're fighting noise or distortion before you ever touch a fader.

Pro audio gear and consumer/prosumer gear are built around two different nominal line-level standards: **+4 dBu** for professional equipment (consoles, outboard gear, most stage-rated devices) and **-10 dBV** for consumer and some prosumer gear. That's roughly an 11.8 dB gap. Feed a -10 dBV consumer source into a +4 dBu-expecting pro input and it runs quiet, picking up noise along the way. Feed a +4 dBu pro source into a -10 dBV consumer input and you can overload it.

The process:

- **Find the source's rated output level.** Check the outgoing gear's spec sheet or manual for "nominal output level" or "max output level," in dBu or dBV (or dBFS on digital gear).
- **Find the destination's rated input level.** Look for "input sensitivity," "nominal input level," or "max input level" on the receiving device.
- **Compare the two.** If the source runs hotter than the destination's max input, pad it down (an input pad, an output trim, or a dedicated level-matching DI). If the source is quieter than the destination expects, you likely need extra gain instead.
- **Set any available pad or trim at the connection itself,** not by riding a fader further downstream. Fixing the level where the two devices meet keeps everything after it working in its intended range.
- **Confirm on meters.** Watch the destination's input meter or clip LED while the source plays its loudest passage, and adjust until it sits in a healthy range: not pinned at the bottom, not flashing red.

Match at every hop: this isn't just mic-to-console. A wireless receiver's line output feeding a mixer channel, a mixer's output feeding a powered speaker, a DI's output feeding a snake: each connection has this same source-output-to-destination-input relationship, and each is worth checking the same way.

WORKED EXAMPLE: CONSOLE OUTPUT TO AMP OR POWERED SPEAKER

This is the connection most engineers run into gain-staging trouble on: a digital console's line output feeding a poweramp or powered speaker's input. Get it wrong and you either clip the amp's input stage or leave power on the table.

- **Check the console's output.** Most digital consoles send a fixed nominal line-level signal on their XLR/TRS outputs, but many also let you set an output trim (and sometimes a limiter) per output on the routing or patch page. Note what that output is already set to before you touch anything downstream.
- **Check the amp or speaker's input sensitivity.** This is the level needed to drive it to full rated output, and it's specific to that model, look it up on the spec sheet rather than assuming. Many powered speakers and poweramps also have a mic/line switch on a combo XLR input: confirm it's set to line. A console output hitting a mic-level input clips immediately.
- **Start the amp or speaker's input gain conservative,** not maxed out. Full clockwise doesn't mean "loudest and cleanest." It usually means the input stage has the least headroom left before it clips.
- **Play a normal, loud passage from the console** (not a full-scale digital test tone) and watch the amp or speaker's own clip or limiter indicator while you bring its input gain up.
- **Set the amp or speaker's gain, not the console's output,** so it reaches its intended level right around the loudest normal passages. That keeps the console's own metering and limiting, which you can see and control, as the first thing to reach its ceiling instead of an amp input stage you're not watching.

Why the console should clip first: a controlled limiter on the console, or a conservative output trim, is a known and predictable failure point. An amp or speaker input stage clipping unexpectedly is not, and it's harder on the gear. Set gain structure so headroom runs out at the console, not at the amp.

SETTING TRIM: WHAT TO LOOK FOR

SYSTEM TYPE	TARGET AVERAGE LEVEL	PEAKS SHOULD STAY UNDER
Digital console (dBFS)	-18 dBFS to -12 dBFS	-6 dBFS
Analog console (VU)	0 VU on average passages	+3 VU on transient peaks

These are starting points, not hard rules: a system with more physical headroom can run hotter, and a system feeding a limiter that's already working hard needs more margin. Trust your ears and your meters over any fixed number.

READING THE METERS

- **Green / lower LEDs:** normal working level.
- **Yellow:** loud passages, still has headroom. Fine.
- **Red / clip LED:** distortion risk. If it's lighting on normal playing, trim is too hot.
- A meter that **never** leaves the bottom few segments usually means the trim is too cold and you're mixing in the noise floor.

COMMON MISTAKES

- Setting trim by ear at soundcheck, then never re-checking once the room fills and the band plays for real.
- Compensating for a hot trim by pulling the fader down instead of fixing the trim.
- Skipping the high-pass filter on non-bass sources, wasting headroom on rumble.
- Adding gain at the bus or master to fix a channel that was under-gained from the start.

Quick check: with the fader at unity, a channel's meter during the loudest normal passage should sit comfortably in the upper-middle of its range, loud enough to be well clear of the noise floor, with enough headroom above it that an unexpected peak doesn't clip. If you have to ask "is this too hot or too cold," it's a good sign to re-trim.