

Bit Depth — Cheat Sheet

The 6 dB-per-bit rule, dynamic range, dither, and which depth to use per task.

The one rule: ~6 dB per bit

Each added bit lowers the quantization noise floor ~6 dB, widening dynamic range.

$$\text{SNR} = 6.02 \times N + 1.76 \text{ dB}$$

(N = number of bits)

Dynamic range by depth

Depth	Range	What it means
16-bit	~ 96 dB	Enough for human hearing once dithered. Deliver here.
24-bit	~ 144 dB	Headroom for recording, not better delivery. Real DACs ~123 dB.
32-bit float	~ 1528 dB	Can't digitally clip; capture first, set level later.

Human hearing ~120 dB — threshold of hearing to threshold of pain

Dithered 16-bit reaches ~120 dB perceived range. More bits add no audible detail.

Dither — the final-reduction rule

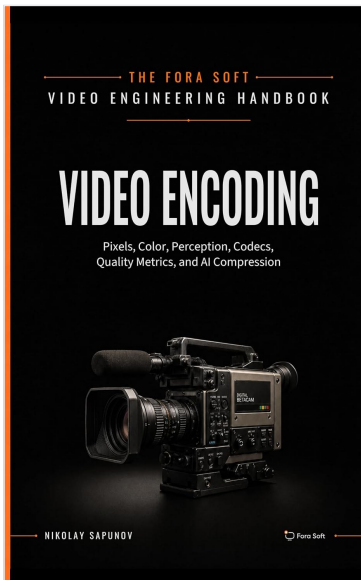
- Reducing to 16-bit? Add TPDF dither BEFORE the cut, never truncate (chop bits).
- Truncation = grainy distortion in quiet fades; dither = smooth, inaudible hiss.
- Dither once, on the final reduction only. 24-bit / 32-bit float need no dither.

Which depth by task

Your task	Use	Why
Capture you can't re-record (field, live)	32-bit float	Can't clip; no level-setting
Studio recording & mixing in a DAW	24-bit	Headroom in; 32-float to process
Delivery to listeners (stream, download)	16-bit	Enough for ears; half the size
Archival master of source	24-bit	Future-proof headroom
Real-time voice (WebRTC, conferencing)	16-bit	Opus is 16-bit; saves CPU
Telephony / legacy narrowband	8-bit	Set by codec (G.711)

Companion to: 'Bit Depth and Dynamic Range: 16-bit, 24-bit, 32-bit Float'

www.forasoft.com/learn/audio-for-video/articles-audio/bit-depth-dynamic-range-16-24-32-float



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This sheet gives the 6 dB-per-bit rule, dither and the right depth for each audio task. Volume 1 applies the same precision logic to the picture: pixels and color, 8-bit versus 10-bit sampling, H.264, HEVC and AV1 encoding, and quality metrics that show banding before viewers do.

WHAT YOU WILL FIND INSIDE

- Pixels, color and sample precision
- H.264, HEVC and AV1 encoding
- 8-bit vs 10-bit and banding
- Quality metrics for encoded video

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