

Audio Terminology

By Dennis Bohn

Live Sound presents a brief guide to audio terminology, starting with something that every audio engineer probably thinks he knows, but may need to review: the definition of a decibel.

decibel Abbr. **dB** Equal to one-tenth of a bel. [After Alexander Graham Bell.] 1. A measuring system first used in telephony (Martin, W.H., "Decibel – the new name for the transmission unit. *Bell System Tech. J.* January, 1929), where signal loss is a *logarithmic* function of the cable length. 2. The preferred method and term for representing the *ratio* of different audio levels. It is a mathematical shorthand that uses *logarithms* (a shortcut using the powers of 10 to represent the actual number) to reduce the size of the number. For example, instead of saying the dynamic range is 32,000 to 1, we say it is 90 dB [*the answer in dB equals 20 log x/y, where x and y are the different signal levels*]. Being a ratio, *decibels have no units*. Everything is relative. Since it is relative, then it must be relative to some *0 dB reference point*. To distinguish between reference points a suffix letter is added as follows [*The officially correct way per AES-R2, IEC 60027-3 & IEC 60268-2 documents is to enclose the reference value in parenthesis separated by a space from "dB"; however this never caught on, probably for brevity reasons if no other.*]

0 dBu Preferred informal abbreviation for the official dB (0.775 V); a voltage reference point equal to 0.775 Vrms. [This reference originally was labeled dBv (lower-case) but was too often confused with dBV (upper-case), so it was changed to dBu (for unterminated).]

Decibel breakdown

+4 dBu Standard pro audio voltage reference level equal to 1.23 Vrms.

0 dBV Preferred informal abbreviation for the official dB (1.0 V); a voltage reference point equal to 1.0 Vrms.

-10 dBV Standard voltage reference level for consumer and some pro audio use (e.g. TASCAM), equal to 0.316 Vrms. (Tip: RCA connectors are a good indicator of units operating at -10 dBV levels.)

0 dBm Preferred informal abbreviation of the official dB (mW); a *power* reference point equal to 1 milliwatt. To convert into an equivalent voltage level, *the impedance must be specified*. For example, 0 dBm into 600 ohms gives an equivalent voltage level of 0.775 V, or 0 dBu (see above); however, 0 dBm into 50 ohms, for instance, yields an equivalent voltage of 0.224 V – something quite different. Since modern audio engineering is concerned with voltage levels, as opposed to power levels of yore, the convention of using a reference level of 0 dBm is obsolete. The reference levels of +4 dBu, or -10 dBV are the preferred units.

0 dBr An arbitrary reference level (*r = re; or reference*) that must be specified. For example, a signal-to-noise graph may be calibrated in dB_r, where 0 dB_r is specified to be equal to 1.23 Vrms (+4 dBu); commonly stated as "dB re +4," that is, "0 dB_r is defined to be equal to +4 dBu."

0 dBFS A digital audio reference level equal to "Full Scale." Used in specifying A/D and D/A audio data converters. Full scale refers to the maximum *peak* voltage level possible before "digital clipping," or digital overload (see overs) of the data converter. The

Full Scale value is fixed by the internal data converter design, and varies from model to model. [*According to standards people, there's supposed to be a space between "dB" and "FS" – yeah, right, like that's gonna happen.*]

0 dBf Preferred informal abbreviation of the official dB (fW); a *power* reference point equal to 1 femtowatt, i.e., 10⁻¹⁵ watts.

0 dB-SPL The reference point for the threshold of hearing, equal to 20 microPA (micro Pascals rms). [*Note: dB-SPL is defined differently for gases and everything else. Per ANSI S1.1-1994, for gases, the reference level is 20 microPA, but for sound in media other than gases, unless otherwise specified, the reference is 1 microPA.*]

Since 1 PA = 1 newton/m² = .000145 PSI (pounds per square inch).

Then 0 dB-SPL = 2.9 nano PSI (rms) – *an unbelievably small value.*

This means that since 1 atm = 14.7 PSI, it is equivalent to a loudness level of 194 dB-SPL! [*Thanks to Bob Pease for pointing out these enlightening facts!*] And higher positive pressures are called shock waves, not sound. [*Thanks to "Someone" for this distinction.*]

dB_A Unofficial but popular way of stating loudness measurements made using an A-weighting curve.

dB_C Unofficial but popular way of stating loudness measurements made using a C-weighting curve. ■

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