Live Sound Mixing

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Advanced Mixed Music Composition

Decibels

Sound signal level is expressed using various dB units of measurement including:

- dBu or dBv: decibels referenced to 0.775 volt (dBu is more commonly used)
- dBV: decibels referenced to 1 volt
- dBFS: decibels referenced to loudest sound level that is to be digitized
- dBSPL: decibels referenced 20uPa (sound pressure at threshold of hearing)

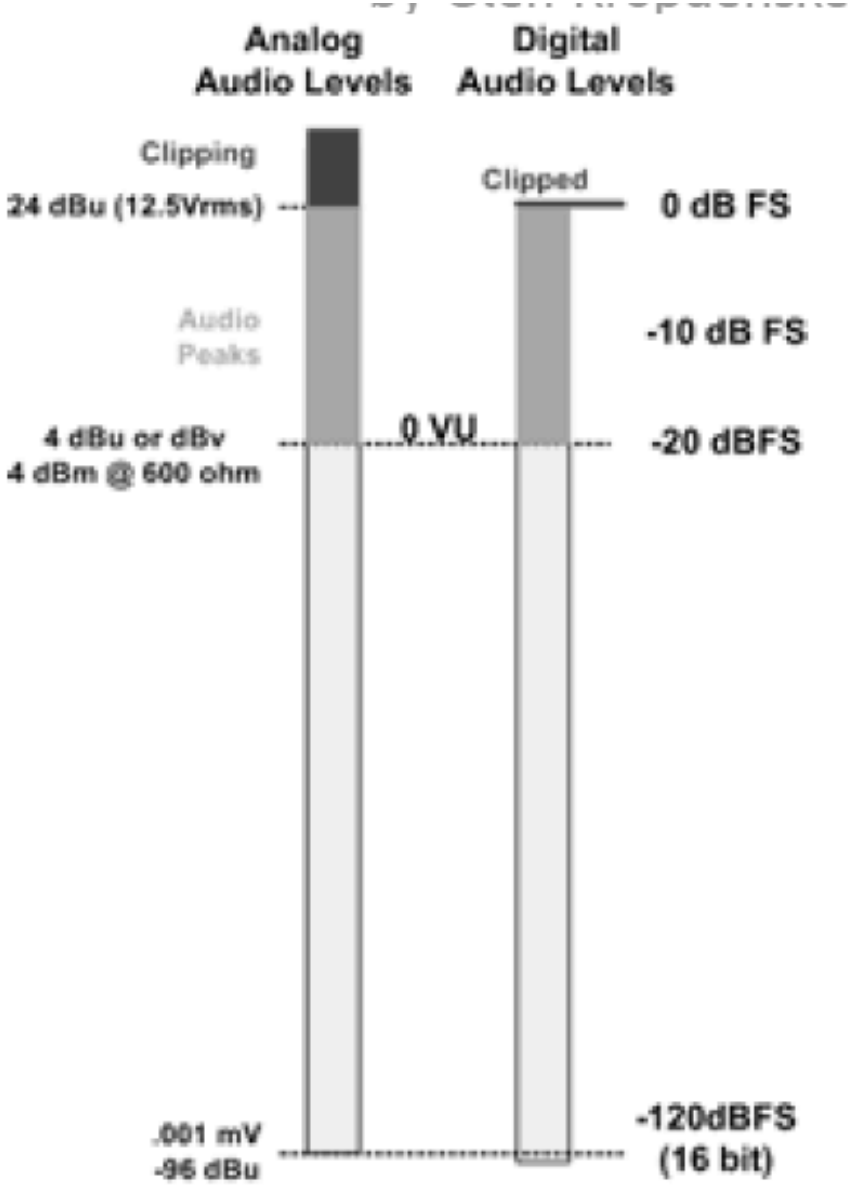
These dB measurements all provide a dB value that indicates the level of the audio signal. The suffix letter indicates the reference used to determine the dB value.

Decibels comparison

RMS Volts	Peak Volts	dBu (dBu=dBv)	dBV
20	28.4	28.27	26
15	21.21	25.7	23.5
10	14.14	22.2	20
5	7.07	16.2	13.98
2	2.83	8.24	6
1.23	1.74	4	1.8
1	1.414	2.22	0
.775	1	0	-2.2
.548	.774	-3.8	-5.2
.1	.14	-17.2	-20
.01	.014	-37.8	-40
.001	.0014	-57.8	-60
.0001	.00014	-77.8	-80
.00001	.000014	-97.8	-100

Audio levels comparison chart showing how RMS levels relate to dBm, dBu, dBV values

Decibels comparison



Digital audio levels in comparison to analog levels

Line Level

Line level refers to the level or strength of an audio signal - there are two main types of line level.

- Consumer line level is usually -10dBV (0.316 volts) and is what you will find in products like a CD player or hi-fi amplifier.
- Professional line level reference is +4 dBu (1.23 volts or higher) and is found on a mixing desk, wireless system and signal-processing equipment.

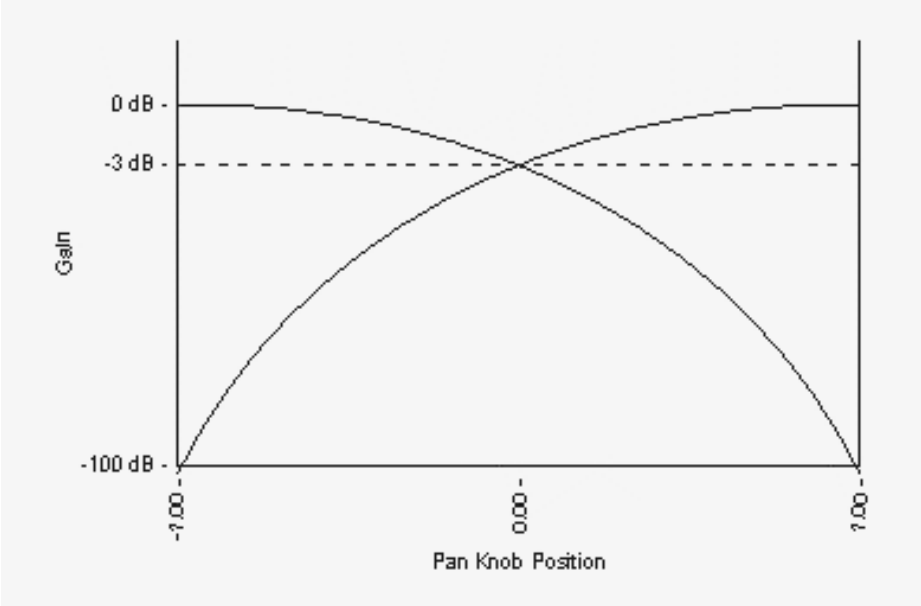
Level	Level in dB	Voltage (RMS)
International studio level - USA	+4 dBu	1.228 V
European studio level - ARD broadcast level	+6 dBu	1.55 V
Domestic recording (Consumer units)	-10 dBV	0.3162 V = -7.78 dBu

Chart 2. Worldwide reference for 0 VU.

A few numbers to remember concerning dBs:

- A doubling of the reference unit = 6dB increase

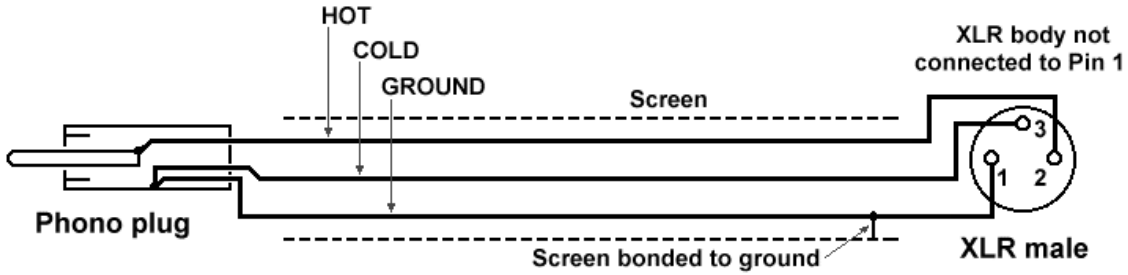
- Doubling two distinct sources (i.e., loudspeakers) ~ 3dB, depending on the listening space
    - This dictates the choice of pan law



Balanced Audio Connections

- Greatly reduce noise and interference, especially over long distances
  (see Max Patch for demo)

- Uses cables with 2 connectors (plus ground): either TRS or XLR



Gain Structure

Gain structure is the organization of the various gain adjustments found on the complete audio system: preamp, input faders, output faders, amplifiers levels, etc.

Gain structure takes two notions into consideration:

• **Dynamic range**: ratio in dB between the loudest undistorted signal and the quietist audible audible signal (i.e., the noise floor).

• **Headroom**: ratio of the largest possible undistorted signal to the average level. (**Headroom** is sometimes understood as the difference between clipping and your maximum peak signal level. This tells you how much safety factor exists between your peaks and hard clipping. Whereas, **peakroom** is the difference between clipping and your average signal level. This tells you how much room you have for your peaks.)

General rule: the higher the signal level is at its input, the better the dynamic range ratio at the output

Establishing Good Gain Structure

For the inputs:

1- Turn off all TRIMS (gains), turn off EQ, etc.

2- Raise all strip faders to U (keep master outs down)

3- Press solo (pre-fader listen) button

4- Get performer to play a passage with both loud and soft moments, raise the TRIM until 0VU is reached, with some peaks going above. Make sure clip light never (or very rarely) turns on. Listen in headphones to make sure there is no distortion.

For the outputs:

1- Turn TRIMS to U on strips with computer input

2- Raise strip faders to U

3- Press solo button for these strips

4- Play similar type of music from computer (with representative dynamic range), make sure the level is around 0 VU with some peaks above.

5- Raise master (or bus) faders to U

6- Raise speakers inputs until you reach to desired listening level. If you start to hear clipping you have reached the maximum output level, back off the input.