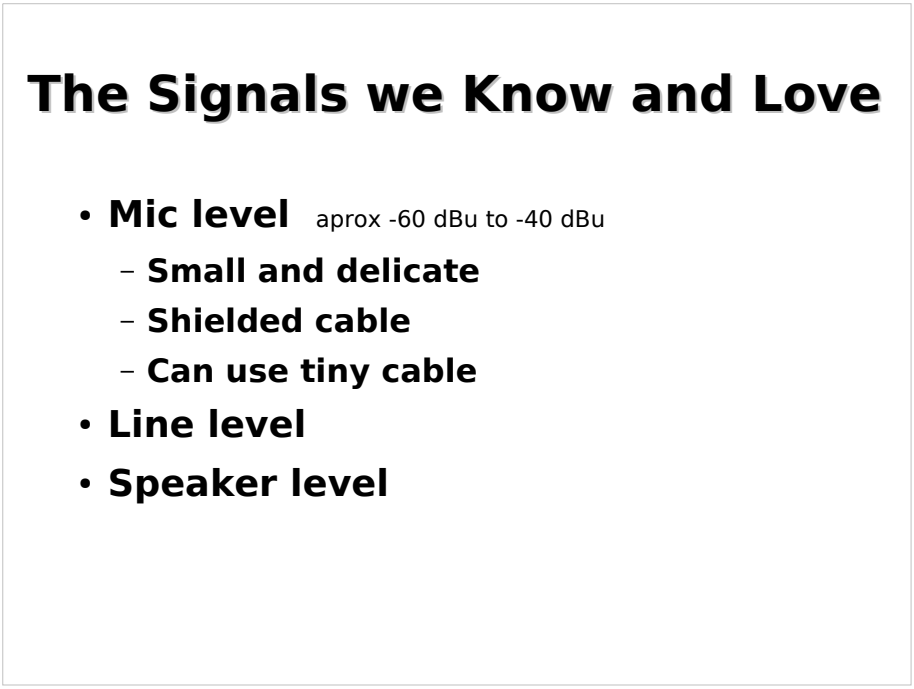
The Signals we Know and Love

- **Mic level**
- **Line level**
- **Speaker level**

Audio signals can be grouped into three main categories. The difference between them is the voltage, or level.

While the only difference electrically is the voltage, how we handle the signals and the cables we use does vary.



"Mic level" is the type of signal a microphone outputs.

Mic level has the least voltage. Therefore it is the most susceptible to interference. That's why shielded, twisted pair cable is used.

Also, because the voltage is so low, the current is also low, and so small wires work just fine.

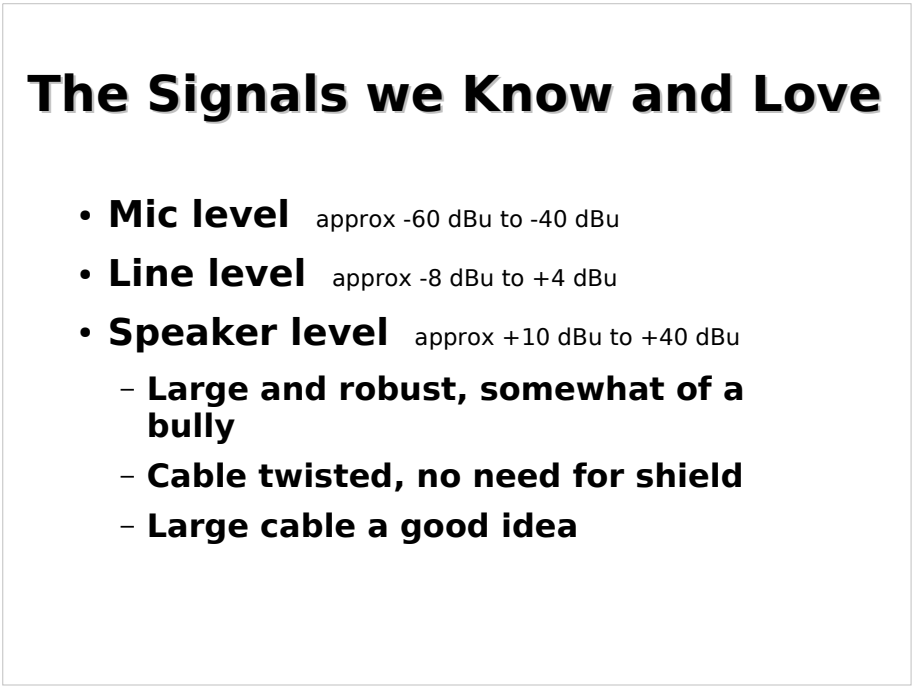
The Signals we Know and Love

- **Mic level** approx -60 dBu to -40 dBu
- **Line level** approx -8 dBu to +4 dBu
  - **Fairly sturdy**
  - **Shielded cable a very good idea**
  - **Can still use small cable**
- **Speaker level**

Line level is the level used to interconnect most equipment.

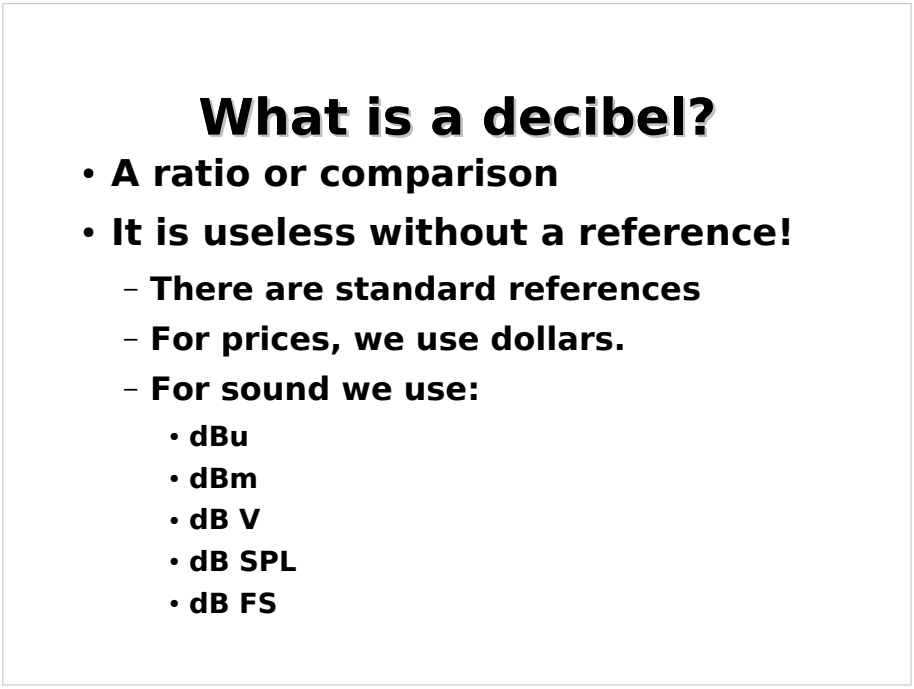
It is has a much higher voltage than mic level, but it is not immune to interference. Shielded twisted pair cable is still a good idea, but not as necessary as with mic level.

The voltage is still low enough that the current is low enough so that small wires are still usable.



"Speaker level" is the signal used to drive speakers.

Speaker level voltage is high enough that there is no need to protect it. Actually, it is high enough that mic level cables need to be protected **from** it! Twisted pair cable helps contain the magnetic field so it is less likely to cause interference.



There are standard references. These append a letter or two after the “dB” to indicate which one.

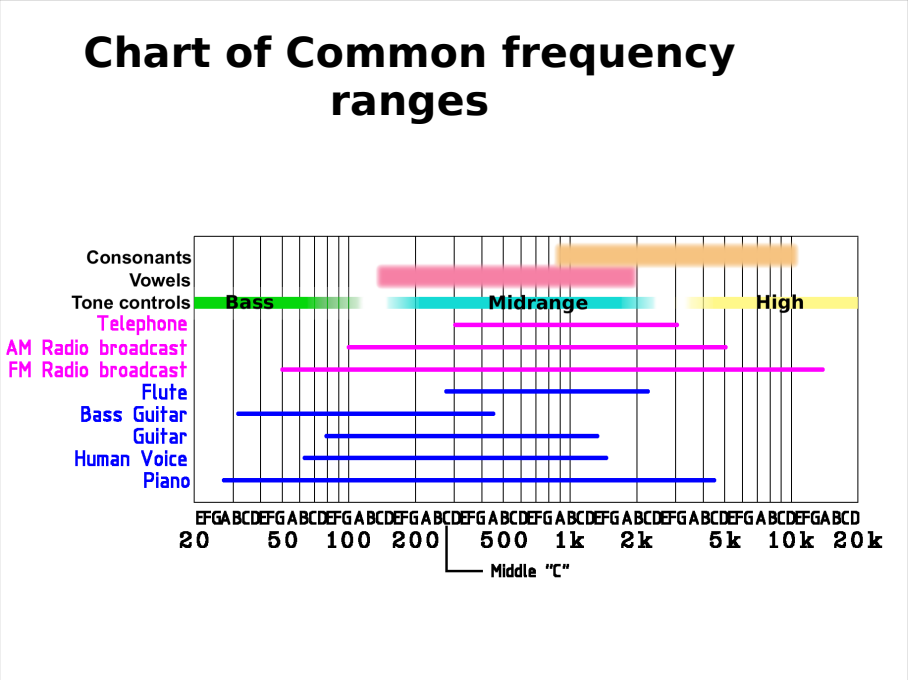
dBu - decibel unloaded. The most common in pro sound. Reference is 0.775 V RMS

dBm - **power** value, so impedance matters. Reference is 1 mW

dB V - reference is 1 V RMS

dB SPL - sound pressure level. Reference is 20 µPa (rms)

dB FS - Common in digital. Reference is maximum value that can be expressed

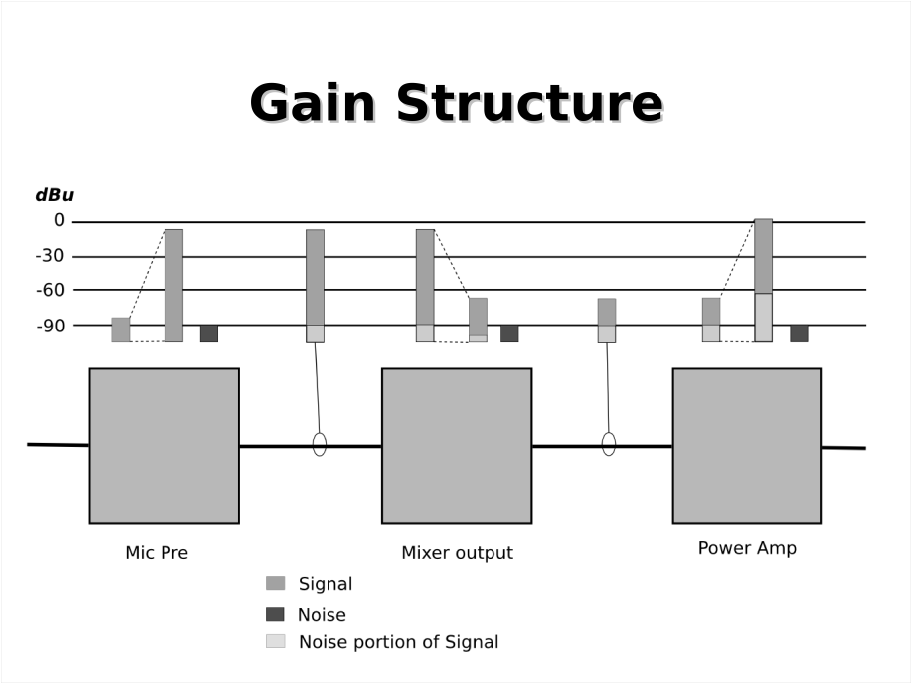


The bar on the chart for each of the musical instruments shows the **fundamental** only. The fundamental is what we think of as the note it's playing. But what makes a flute sound different than a trumpet is the harmonics. The harmonics are multiples of the fundamental and can continue up off the right side of this chart.

To help you get a grasp of the various frequencies, the chart has some “handles”.

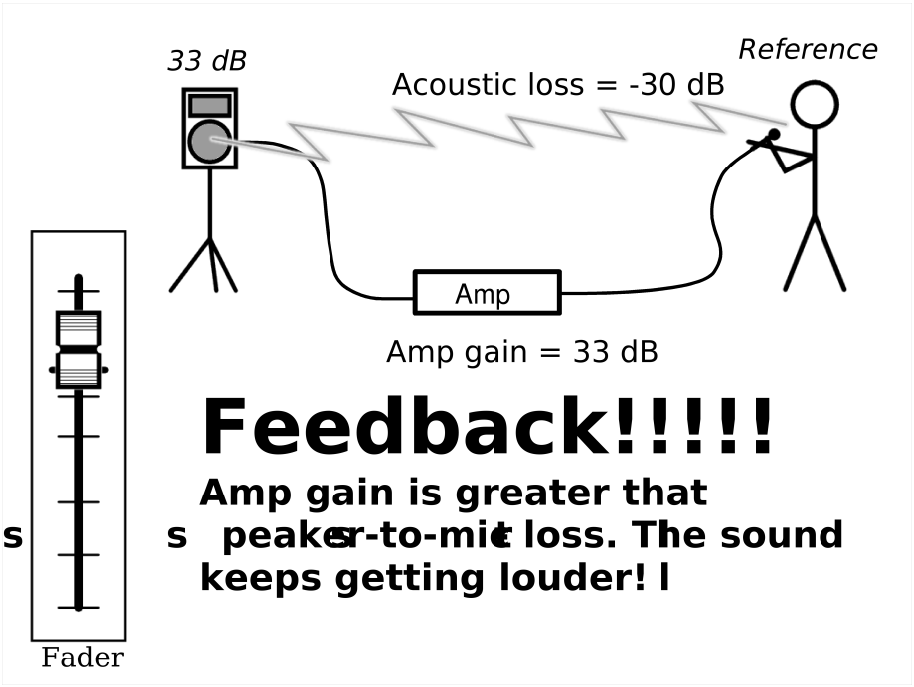
Watch for situations where it's loud enough, but not intelligible. Or it's missing the body and roundness of the vowels.

Also shown are common limited range systems. The sound of AM radio and telephone can help you figure out what needs adjusting.



In the power amp, the signal is again amplified. But the noise level of the incoming signal is already much more than the inherent noise of the power amp.

Therefore, the rule of thumb is - turn it up as much as possible as early as possible in the chain. If it is too loud, turn it down as late as possible in the chain.



But someone in the back said “I can't hear!”, so we turn it up just a bit more.

Now the amp chain adds 33 dB, but the acoustic path still only loses 30 dB. + 33 dB, -30 dB, +33 dB, -30 dB.

Every trip “around”, the net gain is 3 dB, so the howl/squeal keeps getting louder and louder.

This is feedback!

range

Chart of Common frequency ranges