

Microphone, Line and Instrument Level

- Different types of signal have differences in **impedance ('Z')**
 - **Lo-Z** inputs are usually used with **microphones**
 - **Hi-Z** inputs are usually used with **instruments** like electric and bass guitar
- Microphone and Instrument levels are a lot lower than line level
 - Both of these signals need a boost from a pre-amp in order for them to get to a usable line level
- Connecting a line level source to a mic level input will result in a distorted signal
- Connecting an instrument level source to a line level input will result in a poor SNR



- Impedance = The amount of opposition that a circuit applies to current when a voltage is applied to it
- DI boxes are able to convert an instrument level signal to microphone level and can convert a Hi-Z signal to a Lo-Z signal
- The line source is louder than the mic input is able to accept
- The instrument signal will require a large boost to be used which will also boost the noise
- As well as the level, the impedance also need to match, otherwise, the frequency response will be affected

Pre-Amps

- Converts a lower level signal to line level
 - Gets the signal ready for further processing
- Most audio interfaces will come with built-in preamps
- Higher quality external preamps can help to increase the overall quality of the signal



Pre-Amp Controls

Phantom Power	48V from a mixing desk or audio interface to provide power for condenser microphones or active DI boxes
Gain	The amount of boost applied to the pre-amp stage of an audio channel
Pad	Attenuates the gain by a set amount to prevent clipping
High Pass/Rumble Filter	Removes frequencies below a set cut-off
Polarity/Phase Switch	Inverts the polarity of the signal to avoid cancellation
Clip/Activity LEDs	Will light up when a signal is clipping and when a signal is going through the channel

Phantom Power: Many audio interfaces and mixing desks let you toggle phantom power on and off as it can be damaging to some equipment

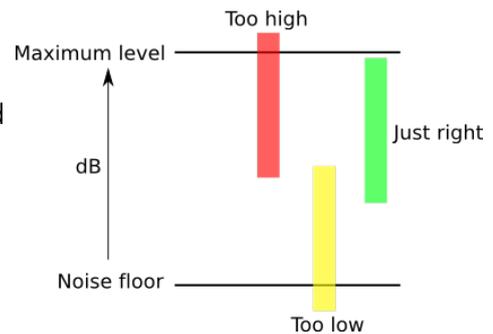
Gain:

- Ratio of output signal level to input signal level
- 0dB or Unity Gain: Output signal level = Input signal level
- Can be used either to boost signals to an operable level or to boost beyond that point to drive a signal into distortion for musical purposes

Clip/Activity LEDs: Clipping/Distortion = Amber/Red, Activity = Green

Setting Gain Levels

- Process of setting gains for the different stages of amplification in an audio signal chain
- The dynamic range of all the audio equipment being used should be adjusted to minimise noise and undesired distortion
- The level sound be set so as to maximise the SNR, but not allow the peaks of the signal to clip
- The gain at each stage in the signal chain should be well above the noise floor, but with enough headroom to keep it below the point of distortion



Sending signal from an instrument to a DAW

- Adjust gain on the instrument
- Adjust gain on the pre-amp/audio interface
- Adjust gain on the DAW

Red is too high - If the level on your instrument is set low, but the gain on the audio interface is turned up to max, a lot of hiss will be captured

Yellow is too low - If the level on your instrument is at max, you may capture a distorted signal

Combined amplification stages can cause clipping later on in the signal chain

Best Practices for Setting Gain

- Most important point in setting gain is at the very beginning of the signal chain
- Best practice when using hardware mixers is to set all faders to unity gain and adjust gain levels of the preamps
- Better to leave more headroom when using DAWs

Easy to just turn down the input level once audio is in a DAW but if clipping occurs as early as the initial capture, there is usually almost nothing you can do to fix it

Digital signal chains are less susceptible to noise when compared to analogue
Peaks can be closer to -6dB rather than 0dB