Gain Structure, Noise and Distortion - Knowledge Organiser

GLOSSARY	
Impedance (Z)	The amount of opposition that a circuit applies to current when a voltage is applied to it
Pre-amp	An amplifier that boosts a signal to a level suitable for processing and further amplification
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 avoid clipping
High Pass/Rumble Filter	Removes frequencies below a set cut-off
Polarity/Phase Switch	Inverts the polarity of a signal to avoid cancellation
Clip/Activity LEDs	Light up when a signal is clipping and when a signal is going through a channel
Noise	Undesired sound
Signal-To-Noise Ratio (SNR)	The difference in volume between the desired signal being captured and the unwanted noise being captured
Headroom	The difference in level between the loudest peaks in a signal and the point at which digital clipping starts to occur

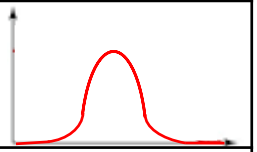
MICROPHONE, LINE AND INSTRUMENT LEVEL		
⇐ Lowest Level		**Highest Level ⇒**
Microphone	**Instrument**	**Line**

- Microphone and instrument level signals require a boost from a pre-amp for them to reach a workable 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

SETTING GAIN LEVELS

- The dynamic range of all the audio equipment being used should be adjusted to minimise noise and undesired distortion
- The level sound be set 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

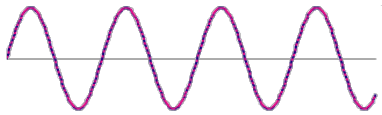
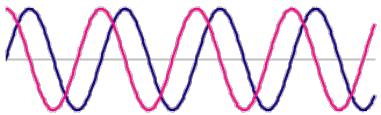
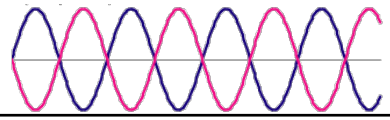
HISS AND HUM

Low Pass Filter	High Pass Filter	Band Pass Filter
		
• Used to remove hiss	• Used to remove hum	• Used to remove specific problematic frequencies

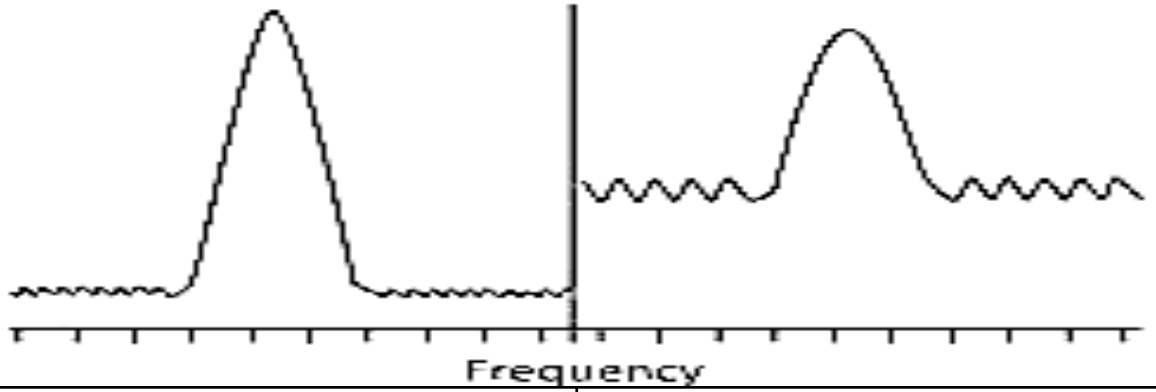
AVOIDING NOISE IN CAPTURE

- Mount microphones in shock mounts/cradles to isolate vibrations travelling up the microphone stand
- Get performers to wear closed-back headphones
- Keep the monitor mix in the headphones low
- Use acoustic screens and isolation booths

PHASE AND POLARITY

In phase	Partially/90˚ out of phase	Completely/180˚ out of phase
		
No destructive interference	Some destructive interference	Complete cancellation of the sound

- Phase refers to a shift in time relative to an initial wave
- Polarity refers to the reversal of two connections on a cable

SIGNAL-TO-NOISE RATIO	
High Signal-to-noise ratio	**Low Signal-to-noise ratio**
	
• Low system noise • Clearer signal	• High system noise • Less clear signal