

# Equalization - EQ

## Effects: EQ & Reverb

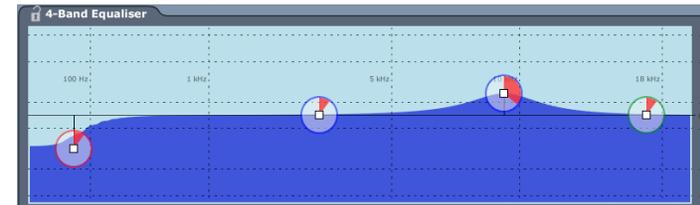
- Usually “plug-in” tools that can work with your digital audio workstation.
- Some bundled with Audacity, Studio 1, etc.
- Many very useful plugins are purchased separately, such as from WAVES.
- Macs have **au** plugins in the system library, that can be used in Audacity, or any other DAW you buy.

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- An “evolved” bass and treble control
- Usually many bands of control across the Hz range of hearing.
- Hardware:



- Software:



## EQ boosts or cuts the amplitude of a frequency *range*

- Adjust timber of an instrument, formant or sibilance of a voice, or the character of a sound
- Fix a poor recording (“dull, boomy, tinny, thin”)
- Eliminate a *noise* centered on a particular frequency
- Making two sounds mix together without masking
- Roll off *low frequencies* to make something stand out. Roll off *highs* to make it blend.
- Compensate speakers for room *resonances problems*.

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## Center Frequency, Shelves and Q

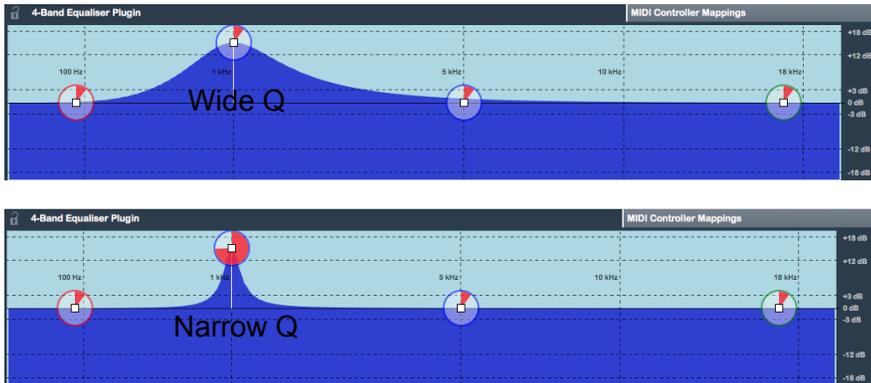
- You pick a **center frequency** to boost or cut.
- **Shelf**: a type of EQ that boosts or cuts every frequency above the selected frequency. (Or frequencies below. You choose.)



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## Center Frequency, Shelves and Q

- The **Q** is how wide a range of frequencies are boosted or cut on each side of the center frequency.



## Sound in a Scene has 3 Stages Heard in this Order...

1. Direct sound from the source
  - Whisper in ear might have no delay, reflections, or reverb.
  - Must be recorded with no delays, reflections, or reverb!
  - A bit of an EQ boost around 150 Hz and 6K Hz might enhance a whisper

## High Pass or Low Pass “Filters”

- Sharply cut frequencies above or below a threshold you set.
  - Remove the bass drum from the snare drum track
  - Remove the background hum from a track recorded with a poor quality mic cable
  - Remove hiss from a bass track
  - Usually used on individual tracks, not mixes
- How sharply?
  - Example: Using a high-pass filter set at 200 Hz *threshold*, frequencies around 100 Hz will be at -18 dB, frequencies around 50 Hz will be at -36 dB

## Stage 2: First Reflections

2. First reflections communicate the size of the room, and something about the surfaces.
  - Time delay = size
  - Bright = hard surfaces
  - Long flutter echo = hard surfaces
  - About 25 - 50 ms
- Any reflections < 30 ms tend to merge with the direct sound and simply make it sound a little louder and fuller. But this depends on the length of the sound envelope.
- Used more in film, less in music.

## 3rd Stage: Reverberation

- **Densely space reflections**
  - Recreates diffusion / scattering.
  - Also communicate the size of the room, and something about the surfaces.
    - Long reverb length = big room with hard surfaces
  - Highs roll off over time (in the envelope)
  - Bass is emphasized a little over time
  - Reverb length 100 ms to 4 seconds or more.

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## Echo Plug-ins

- **Echo:** Makes a recognizable copy of the original sound, plays it back a little lower amplitude.
  - Can keep repeating. (“Feedback”)
- **Controls**
  - **Time:** how long between the start of the direct sound and the start of the echo.
  - **Feedback:** should it keep repeating?
  - **Feedback %:** how much less than the direct sound amplitude is each of the repeated sounds?

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## Delay Plug-ins

- **Delay:** In reverb, it sets the time it takes for the first reverb to bounce back to the listener.
  - Reverbs for big rooms need more delay because the sound would take longer to *begin* bouncing back from the distant walls.
- **Delay** can also be a *separate* plug-in that is more like echo. It is commonly used in music mixes and the timing is synchronized with the tempo of the music.

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## Reverb Settings

- **Reverb Time**
  - How long does it take for the full envelope?
- **Damping**
  - How intense is the reverb level through the envelope?
  - The slope of the decay part of the envelope.
- **Delay**
  - How soon after original (direct) sound does this effect start?
- **Bandwidth**
  - High and low pass filters applied
- **Dry - Wet**
  - A *mix*. Dry = original only. Wet = reverb only.
- **Hall - Room - Plate**
  - Shortcuts to typical sets of settings
  - Plate is brighter and more metallic, & sounds best on vocals.

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## Applying Reverb and Echo/Delay

- Fits a sound track to a perceived physical space
  - To simulate a wall 50 ft away?
    - $50/1130 \text{ fps} = 44 \text{ ms delay}$
  - Small room?
    - 5-10 ms (this tends to blend with the direct sound)
  - Room with hard surfaces?
    - Longer reverb time + echo + some low pass
  - Whisper in character's ear?
    - No reverb + boost high frequencies

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## Chorus and Pitch Shifting

- Chorus: The perception of similar sounds from multiple sources as a single, richer, sound.
  - Makes copies of the original with slightly altered pitch, and adds them back in with original.
- Pitch Shifting: The changing of pitch frequency either up or down.
  - In an effect, usually has the amount of shift vary over time.

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## Applying Reverb and Echo/Delay

- In a music mix
  - Giving one instrument extra reverb makes it appear behind the other instruments
    - Further away
  - Reverb tends to add the perception of brightness to the original sound
  - In music the delay is almost always timed to the tempo of the piece.
    - 130 beats per minute?
      - Each beat is .46 second
      - Reverb delay could be set at .46s or .23s or .92s or?
      - Reverb time also usually matched

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## Compressors and Limiters

- Basically versions of the same processes
- **Compressors** compress the dynamic range of a track
- **Limiters** limit how high the level can get, like a safety valve. Great for live sound control also.
  - Both manipulate the dynamic range of a signal
  - Limiters tend to have a quicker attack time and a stronger compression ratio.

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