Session 1

Equalization and Tone Control

Brian Wangler

Tone Control with Equalizers

- Learn how to use an RTA and the different settings on it to analyze frequency response
- Learn the low pass filter, shelving, and general settings of a parametric EQ
- Cover where standard frequencies are found for instruments and vocals
- Controlling feedback and use of an RTA to be more precise when cutting feedback
- Cover speech tone and tone from tracks/computer inputs

Using an RTA to measure frequency levels

- Internal RTAs are built into the soundboard and measure individual channels or the master output
- External RTAs are a separate piece of equipment that measures individual frequencies and volume in the room
- Internal RTAs are easier to use to get consistency between individual audio techs

Using an RTA

Picture above shows a 10 band graphic EQ, as you can see it adjusts adjacent frequencies as well, 30 band does the same with just less width

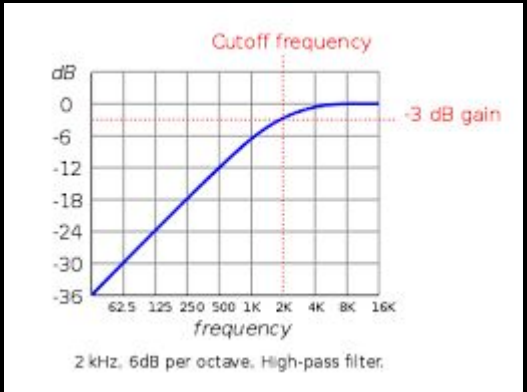
- Reads usually in 30 bands like a graphic equalizer, like a 30 band EQ frequencies near the indicated value are affected as well so the number may be close instead of dead on
- Left shows a RTA, measurement is taken by setting a 0 value at a set dB(for example 100), and then + or - in x many decibels per step from the 0 value, the one above is set so every dot from 0 is at 3 db, internal RTAs the 0 refers to a specific voltage output
- Speed is how long of a period does it average the reading for, example above is fast 1 sec, med 2 sec, slow 3 sec, some also have peak hold options

General Settings for Using an RTA

- Internal RTAs can have the master patched to them or individual channels depending on your mixer
- For finding feedback you should use the fastest response setting possible and adjust your sensitivity until you can see the feedback frequencies peaking above everything else
- For general tone and volume control make sure everyone is using the same 0 setting on the EQ, and use a more medium to slow speed setting, you are looking to see that the tone and volume average is the same from service to service, so 2 to 3 sec response time is perfect
- For steps 2 db is sufficient for most purposes, 3db+ is not sensitive enough and at 1 db it is easy to run out of real-estate on the display

EQ settings available on a digital console

- 4 Band parametric EQ with a low frequency cut
- Low frequency cut is done in decibels per octave, actually starts reducing before selected frequency and lets some sound from below the selected frequency through



Left shows a 2khz, 6dB per octave high-pass(low cut) filter

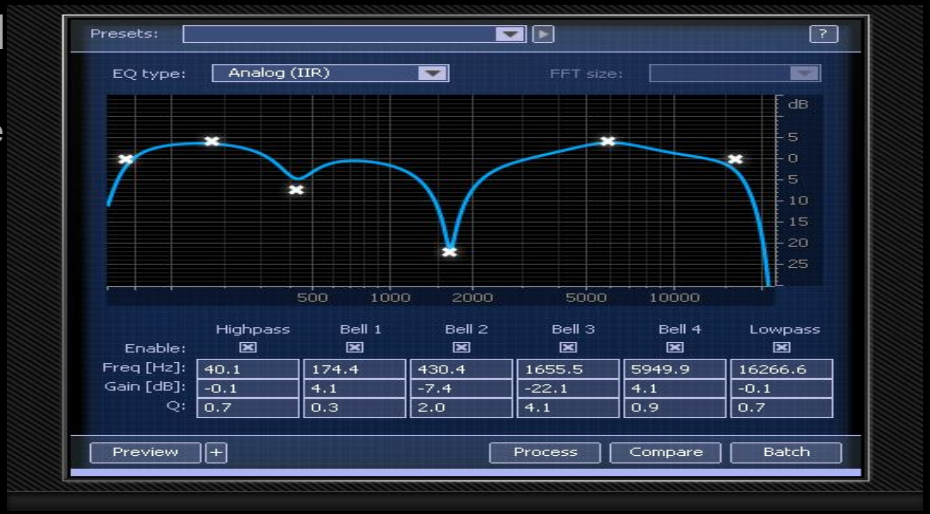
By the 2khz setting 3dB is already cut
By 1k it is at -6dB, by 500hz -12dB(octave = frequency doubling or halving)

Generally a setting on a console is between 6 and 12dB, but can go as high as 18dB per octave

Parametric Eq Settings

- Frequency - 4 channels that overlap, some consoles all 4 can go from 20hz to 20khz
  - Lows 400hz and below, Low Mids 200hz to 800hz, High Mids 600 hz to 2.6khz, Highs 1.6khz and above
- Width determines how wide an adjustment is made, and gain is by how much
- Gain is + or - volume for that channel

Highs and lows can often be turned into a shelfing type, where like a high-pass filter selects a frequency, though instead of db/octave go to a fixed point and boost everything above or below that frequency by x amount, this is a gradual sweep to the maximum value



EQing an instrument

- Most instruments respond well to a flat response system with flat eqing on the console
- All instruments should be able to play with the same intensity across all notes and have the volume remain the same
- Stringed instruments you should be able to hear the string vibration across all notes, especially hard to on lower notes but still should be there. If there is a problem with this it is generally that a specific frequency range is being boosted too much
- You can only work with what you are given, try to work with musicians for processing they do themselves in relation to the quality of audio they provide to you

EQing an instrument

- Bass Guitar - 30hz to 2.5 khz
- Acc Guitar - 220hz to 4 khz
- Electric Guitar - 185 hz to 6 khz
- Piano - 35 hz to 12 khz
- Violin - 180hz to 8 khz

Most resonant frequencies of the instruments go from 60 hz to 2 khz, the frequencies above that generally have to do with string noise or with frequencies above or below that also have additional resonant frequencies, a single note does not just apply to 1 frequency but often times is resonant at other octaves

Singer Vocal EQ

- Attempt to make them sound the same as if they were not using a microphone and you are standing reasonably close to them
- Frequency range of vocals covers from 120hz to 4 khz
- Definition defined in 800 hz to 2.4khz, lower frequencies should vary as the singer makes a note change, watch for resonant frequencies being too loud
- Proximity effect for lows generally affects frequencies 160hz to 315hz
- Proximity effect for highs generally affects 2khz+
- Proximity to the mic and the specific head often has a resonant frequency, can especially be troublesome if it is the same range as the resonance of the room you are in. SM 58s tends to be around 450hz, but varies based on room resonance and proximity to the singer from 385hz to 550hz, caused by spacing of the head and the solid body of the microphone below it

Feedback, cutting it while still controlling the tone

- Using an RTA to find the very specific frequency can make the cut often smaller, remember the RTAs parametric tendency as you do this
- By hitting the frequency exact with a parametric eq can often do less of a cut, your at the maximum cut right at the frequency, and can often make the width smaller
- Feedback often happens in multiples of 10s, for example if you have feedback at 4khz your more likely to have it at 400hz, this has to do with the resonance of the frequencies.
- Proper sound system design often gives you more headroom before feedback eliminating many of the problems often encountered with little to no effort

EQ for a presenter

- Frequency range narrows to 400hz to 2.2khz
- Can sacrifice some tone quality for volume
- Especially loud in the consonant definition range of 800 hz to 2.4khz
- S sounds can be controlled by 1.8khz to 2.4khz
- T is a bit lower at 1.6k to 2khz
- Rest are a bit lower varying all the way down to the stated 800hz
- Want the definition range to be as flat response as possible so that entire words sound even

Track and Computer input EQ

- If properly recorded should be able to leave EQ flat but often times not the case
- Tracks especially can have an issue of a specific instrument being too loud, this is often times because they are made either using or to sound better on residential speakers and you have a full range sound system
- Low frequency shelf can be used to quickly adjust bass frequencies in the way they are most commonly mis-eqd on the track for a system that is not full range
- Most cheaper speakers lack output above 4khz so it can be boosted heavily above that as well, watch for that if required and reduce it
- Caused by the smiley face EQ people try to use for cheaper speakers that are only strong in the mids

Questions

Brian@PrecisionAV.biz