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**Equalizing (Frequency Range)**

Even though an engineer has every intention of making his tracks sound as big and as clear as possible during tracking and overdubs, it often happens that the frequency range of some or all of the tracks is still somewhat limited when it comes time to mix. This can be because the tracks were recorded in a different studio using different monitors, a different signal path, or highly influenced by the producer and musicians. As a result, the mixing engineer then must extend the frequency range of those tracks.

In the quest to make things sound bigger, fatter, brighter and clearer, the equalizer is the chief tool used by most mixers. But, perhaps more than any other audio tool, the use of the equalizer requires a skill that separates the average engineer from the master.

**Allen Sides**: What I would say is that I tend to like things to sound sort of natural but I don't care what it takes to make it sound like that. Some people get a very pre-conceived set of notions that you can't do this or you can't do that. Like Bruce Swedien said to me, he doesn't care if you have to turn the knob around backwards; if it sounds good, it is good. Assuming that you have a reference point that you can trust, of course.

**WHAT ARE YOU TRYING TO DO?**

There are three primary goals when equalizing:

1. To make an instrument sound clearer and more defined
2. To make the instrument or mix bigger and larger than life
3. To make all the elements of a mix fit together better by juggling frequencies so that each instrument has its own predominant frequency range

**MAGIC FREQUENCIES**

Before we examine some methods of equalizing, it's important to note the areas of the audio band and what effect they have on what we hear. The audio band can effectively be broken down into six distinct ranges, each one having enormous impact on the total sound.

* **Sub-Bass** - The very low bass between 16Hz and 60Hz that encompasses sounds that are often felt more than heard, such as thunder in the distance. These frequencies give the music a sense of power even if they occur infrequently. Too much emphasis on this range makes the music sound muddy.
* **Bass** - The bass between 60Hz and 250Hz contains the fundamental notes of the rhythm section, so EQing this range can change the musical balance, making it fat or thin. Too much boost in this range can make the music sound boomy.
* **Low Mids** - The midrange between 250Hz and 2000Hz contains the low order harmonics of most musical instruments and can introduce a telephone-like quality to the music if boosted too much. Boosting the 500Hz to 1000Hz octave makes the instruments sound horn-like, while boosting the 1kHz to 2kHz octave makes them sound tinny. Excess output in this range can cause listening fatigue.
* **High Mids** - The upper midrange between 2kHz and 4kHz can mask the important speech recognition sounds if boosted, introducing a lisping quality into a voice and making sounds formed with the lips such as "m," "b" and "v" indistinguishable. Too much boost in this range - especially at 3kHz - can also cause listening fatigue. Dipping the 3kHz range on instrument backgrounds and slightly peaking 3kHz on vocals can make the vocals audible without having to decrease the instrumental level in mixes where the voice would otherwise seem buried.
* **Presence** - The presence range between 4kHz and 6kHz is responsible for the clarity and definition of voices and instruments. Boosting this range can make the music seem closer to the listener. Reducing the 5kHz content of a mix makes the sound more distant and transparent.
* **Brilliance** - The 6kHz to 16kHz range controls the brilliance and clarity of sounds. Too much emphasis in this range, however, can produce sibilance on the vocals.

*Leo di Gar Kulka - "Equalization - The Highest, Most Sustained Expression of the Recordist's Heart," Recording Engineer/Producer, Vol. 3, Number 6, November/December, 1972*

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| --- | --- | --- |
| RANGE | DESCRIPTION | EFFECT |
| 16-60Hz Sub-Bass | Sense of power; felt more than heard | Too much makes the music sound muddy |
| 60-250Hz Bass | Contains fundamental notes of rhythm section; makes music fat or thin | Too much makes the music boomy |
| 250 - 2kHz Low Mids | Contains the low order harmonics of most instruments | Boosting 500 - 1kHz sounds hornlike; 1 - 2kHz sounds tinny |
| 2kHz - 4kHz Hi Mids | Contains speech recognition sounds like "m," "b" and "v" | Too much causes listener fatigue |
| 4kHz - 6kHz Presence | Responsible for clarity and definition of voices and instruments | Boosting makes music seem closer |
| 6kHz - 16kHz Brilliance | Controls brilliance and clarity | Too much causes vocal sibilance |

For those of you who have an easier time visualizing the audio spectrum in one-octave increments (like those found on a graphic equalizer), here's an octave look at the same chart.

|  |  |
| --- | --- |
| 31Hz | Rumble, "chest" |
| 63Hz | Bottom |
| 125Hz | Boom, thump, warmth |
| 250Hz | Fullness or mud |
| 500Hz | Honk |
| 1kHz | Whack |
| 2kHz | Crunch |
| 4kHz | Edge |
| 8kHz | Sibiliance, definition, "ouch!" |
| 16kHz | Air |

**EQ METHODS**

Since each specific song and instrument and player is unique, it's impossible to give anything other than some general guidelines as to equalization methods. Also, different engineers have different ways of arriving at the same end, so if the following doesn't work for you, keep trying. The method doesn't matter, only the end result.   
  
Before these methods are outlined, it's really important that you observe the following:

**LISTEN!**

**Open up your ears and listen carefully to all the nuances of the sound. It's all-important.**

**Make sure you're monitoring at a comfortable level, not too loud and not too soft.** If it's too soft, you may be fooled by the non-linearity of the speakers and overcompensate. If it's too loud, certain frequencies may be masked or overemphasized by the non-linearity of the ear itself (thanks to the Fletcher-Munson curves) and again you will overcompensate.

**1) Equalize to make an instrument sound clearer and more defined**

Even some sounds that are recorded well can be lifeless, thanks to certain frequencies being overemphasized or others being severely attenuated. More often than not, the lack of definition of an instrument is because of too much lower midrange in approximately the 400Hz to SOOHz area. This area adds a "boxy" quality to the sound.

* Set the boost/cut knob to a moderate level of cut (8 or 10dB should work).
* Sweep through the frequencies until you find the frequency where the sound has the least amount of boxiness and the most definition.
* Adjust the amount of cut to taste. Be aware that too much cut will cause the sound to be thinner.
* If required, add some "point" to sound by adding a slight amount (start with only a dB; add more to taste) of upper midrange (1kHz to 4kHz).
* Ifrequired, add some "sparkle" to sound by adding a slight amount of high frequencies (5kHz to 10kHz).
* If required, add some "air" to sound by adding a slight amount of the brilliance frequencies (10kHz to 15kHz).

**Please Note!**

Always try attenuating (cutting) the frequency first. This is preferable because all equalizers add phase shift as you boost, which results in an undesirable coloring of sound. Usually, the more EQ you add, the more phase shift is also added and the harder it will be to fit the instrument into the mix. Many engineers are judicious in their use of EQ. That being said, anything goes! If it sounds good, it is good.

**Alternate Method**

1. Starting with your EQ flat, remove ALL the bottom end by turning the low frequency control to full cut.
2. Using the rest of your EQ, tune the mid-upper midrange until the sound is thick yet distinct.
3. Round it out with a supporting lower-mid tone to give it some body.
4. Slowly bring up the mud-inducing bottom end enough to move air, but not so much as to make the sound muddy.
5. Add some high frequency for definition.

**Ed Seay**: I just try to get stuff to sound natural, but at the same time be very vivid. I break it down into roughly three areas: mids and the top and the bottom. Then there's low mids and high mids. Generally, except for a very few instruments or a few microphones, cutting flat doesn't sound good to most people's ears. So I'll say, "Well, if this is a state of the art preamp and a great mic and it doesn't sound that great to me, why?" Well, the mid range is not quite vivid enough. Okay, we 'lllook at the 3k, 4k range, maybe 2500. Why don't we make it kind of come to life like a shot of cappuccino and open it up a little bit? But then I'm not hearing the air around things, so let's go up to 10k or 15k and just bump it up a little bit and see if we can kind of perk it up. Now all that sounds good but our bottom is kind of undefined. We don't have any meat down there. Well, let's sweep through and see what helps the low end. " Sometimes, depending on different instruments, a hundred cycles can do wonders for some instruments. Sometimes you need to dip out at 400 cycles because that's the area that sometimes just clouds up and takes the clarity away. But a lot of times, adding a little 400 can fatten things up.

**2) Equalize to make the instrument or mix bigger and larger than life**

"Bigness" usually comes from the addition of bass and subbass frequencies in the 40Hz to 250Hz range. This will come from a region below 100Hz, a region above 100Hz or both.

* Set the boost/cut knob to a moderate level of boost (8 or lOdB should work).
* Sweep through the frequencies in the bass band until you find the frequency where the sound has the desired amount of fullness.
* Adjust the amount of boost to taste. Be aware that too much boost will make the sound muddy.
* Go to the frequency either half or twice the frequency that you used in B and add a moderate amount of that frequency as well. Example: If your frequency in B was 120Hz, go to 60Hz and add a dB or so as well. If your frequency was 50Hz, go to 100Hz and add a bit there.

**Please Note!**

1. It's usually better to add a small amount at two frequencies than a large amount at one.
2. Be aware that making an instrument sound great while soloed may make it impossible to fit together with other instruments in the mix.

**Rule of Thumb**

The fewer instruments in the mix, the bigger each one should be. Conversely, the more instruments in the mix, the smaller each one needs to be in order for all to fit together.

**3) Equalize to make all the elements of a mix fit together better by juggling frequencies so that each instrument has its ovvn predominant frequency range**

* Start with the rhythm section (bass and drums). The bass should be clear and distinct when played against the drums, especially the kick and snare.
* Each instrument should be heard distinctly. If not do the following:
  1. Make sure that no two equalizers are boosting at the same frequency. If so, move one to a frequency a little higher or lower.
  2. If an instrument is cut at a certain frequency, boost the frequency of the other instrument at that same frequency. Example: The kick is cut at 500Hz. Boost the bass at 500Hz.
* Add the next most predominant element, usually the vocal and proceed as above.
* Add the rest of the elements into the mix one by one. As each instrument is added it should be checked against the previous elements as above.

**REMEMBER:**

1. The idea is to hear each instrument clearly and the best way for that to happen is for each instrument to live in its own frequency band.
2. After frequency juggling, an instrument might sound terrible when soloed by itself. That's OK, the goal is that it work in the track.

**Jon Gass**: I really start searching out the frequencies that are clashing or rubbing against each other. Then I work back towards the drums. But I really try to keep the whole picture in there most of the time as opposed to really isolating things too much. If there are a couple, two or three instruments that are clashing, that s probably where I get more into the solo if I need to kind of hear the whole natural sound of the instrument. I'll try to go more that way with each instrument unless theres a couple that are really clashing, and then I'll EQ more aggressively. Otherwise, I'm not scared to EQ quite a bit.   
  
**Ed Seay**: Frequency juggling is important. You don't EQ everything in the same place. You don't EQ 3k on the vocal and the guitar and the bass and the synth and the piano, because then you have such a buildup there that you have a frequency war going on. So sometimes you can say, "Well, the piano doesn't need 3k, so let s go lower, or let s go higher. " Or, "This vocal will pop through if we shine the light not in his nose, but maybe towards his forehead. " In so doing, you can make things audible and everybody can get some camera time.

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