Fundamental Guides to Using EQ

Thanks for downloading my guide to using an EQ. I will be sharing with you the fundamental knowledge of what an equalizer(EQ) is, what it does and how to use it, and I will be using diagrams to help you visualize things to help you understand quicker and better. Have you wondered why you can't seem to get that clarity and low end definition in your mix that you hear on radio? Don't fret as this guide will help you improve your skill and help you mix like a pro, Enjoy!

First let us start with the four basic components of an EQ. This will establish the foundation that we will build on later.

The 4 Basic Components of EQ

 Frequency (20Hz – 20kHz): Understanding frequency is very crucial to learning how an EQ works. Lets just say that an EQ's purpose is simply to balance the frequency spectrum on a n audio signal. Take for example a drum set, we know each component of a drum set produces its own unique and distinctive sound. The kick drum produces a low (bottom end) sound while the crash or ride is known to produce a high (top end) sound. So it is safe to say that each instrument produces different frequencies when it is played.

For example: When a bass guitar is played you can hear the dominant low frequencies and at the same time hear some mid to high frequencies coming from the bass guitar simultaneously.



The frequency spectrum on an EQ ranges from 20**Hz** to 20**kHz(**20,000hz) as seen in the diagram above. 20Hz being a low frequency and 20kHz and above being a very high frequency. It is good to know where different instruments lie on the frequency spectrum as this will help you make good EQ moves during mixing and also during the recording or production process.

For example: A male vocal singer can have a frequency range from 85Hz to 10kHz while a piano track can range between 40Hz and 7kHz, of course depending on what octaves they are.

Frequency(Hz -kHz)	Terms	Description
20Hz – 60Hz	Sub Bass	Contains super low bass frequencies that can mostly
		be felt than hear.
60Hz – 250Hz	Bass	This area is where the bass lives. Boosting in the range
		can add fatness and punch to a sound
250Hz – 500Hz	Low mids	Contains low order harmonics of most instruments.
500Hz – 2kHz	Midrange	
2kHz - 4kHz	Upper mids	
4kHz - 6kHz	Presence	The presence range gives clarity and definition to a
		sound
6kHz – 20kHz	Air	This range contains harmonics and it adds sparkles to a
		sound.

See how these frequencies are characterized in the music world.

So knowing the dominant frequencies an instrument is meant to produce will help you know how to EQ the instrument. As you can see in the diagram below how each instruments are placed in the frequency range that they are dominant in.

Now that we understand what frequency is, it is time to know why it is a staple component of an EQ and how to use it. *A frequency can be altered by simply increasing or decreasing its level and you can do that by using a gain function/knob.* Which brings us to the second component of an EQ.

2. Gain (db): Every EQ has this function, you simply select the frequency you like to alter and then use the gain to increase or decrease that frequency.

Example: Let say you want to boost 2.3kHz on a vocal track by 6db, you would simply select that frequency and then increase the gain knob/slider which brings up the level of frequency you selected.



Boosting 2.3khz by 6db on a vocal track

Now it is important to know that you can't just boost a frequency without affecting the surrounding frequencies. Which brings us to another component of an EQ called the **bandwidth or Q**. this function gives you control over how much of the surrounding frequencies on either side is affected.

3. Bandwidth(Q): with the Q you can adjust the shape of the EQ curve by making it broad or narrow. The bandwidth(Q) is your friend, because it enables you to shape your sound exactly how you want it. In the diagram below, you can see how you can use the bandwidth to control how much of the surrounding frequencies are affected. And we will talk more on when to use a narrow or wide bandwidth and how it can impact your sound.



Showing how bandwidth(Q) can control the shape of a bell curve, which affects the end result of a sound.

- **4.** Filter Types: There are a lot of filter types available in modern EQ's but we will only focus on the four most used filter types.
 - **a. Bell Curve**: it is shaped like a bell, hence its name. The bell curve boost or cut frequencies over a determined frequency range and they can be wide or narrow.



b. Low and High Shelf Filter: This filter types simply lets you select a frequency you want to alter, and it equally affects every other frequencies either to its left or right.

Low Shelf Filter: when applied, it usually alters the frequency selected and everything to its left. It is used often to boost or cut low frequencies. *High Shelf Filter:* when applied, it usually alters the frequency selected and everything to its right. It is used often to boost or cut high frequencies.

Example 1: if you set a low shelf at 100Hz and you boost it by 3db, it means the frequencies below 100Hz will be boosted by 3db as well

Example 2: if you set a high shelf filter on your vocal track at 5kHz and you boost it by 6db, it means that everything from 5khz and above will be boosted by 6 db as well.



A low shelf cutting 100hz by 6db and a high shelf boosting 4khz by 6db.

c. High and Low Pass filter:

- *A high pass filter/low cut* simply cuts out low frequency from the frequency point selected, which lets more high frequencies stay.
- *A low pass filter/ high cut* simply cuts out high frequencies from the frequency point selected, which lets more low frequencies stay.

Look at the examples and diagrams below to help you visualize and understand what a high and low pass filter does.

Example 1: You can use a *high pass filter* to cut out some low rumble below 30Hz on a kick drum or cut out everything below 90Hz on female vocal track.

Example 2: You can use a *low pass filter* to cut out some unwanted hisses from a guitar track and a low pass filter can also be used by mastering engineers during mastering to cut off unwanted top frequencies on a song.

It is very important not to high pass or low pass every every single track in your mix as this can make your mix sound thin because all your low end is gone or sound dull because all the top end frequencies are gone. So please don't overuse it.



High and low pass filter

High or Low Pass Filter DB/Octave

A high pass filter has a per octave base bandwidth which lets you control how hard or smooth you want to eliminate or roll off frequencies above or below your selected frequency. This is a very useful that can sometimes be misused by beginners. Sometimes you don't want to completely get rid of the frequencies below or above your selected frequency.





How to use an EQ

The job of an EQ is simply to balance the frequency spectrum of an audio signal and this achieved by either increasing or decreasing the level of a particular frequency.

Let's begin with this important advice. It isn't bad to start fetching for a frequency to boost, but its even better to look for those unpleasant and nasty frequencies and cut them out, and by doing this you will notice that you are immediately getting a clearer and defined sound with less muddiness or harshness.

So, we will begin with how and when to do a subtractive EQ move.

Subtractive EQ

- Remove bad and unpleasant frequencies from a track, which then reveals the good and pleasant frequencies, which makes everyone happy.
- Set your bandwidth accordingly to only affect the frequencies you want to reduce.

Example 1: if there is a harsh frequency on a vocal around 2.5kHz, you would want to use a very narrow bandwidth(Q) to only remove that harsh frequency.

Example 2: if you have a build up of 350Hz – 450Hz on a drum track that you want to cut, you would want to set your frequency at about 375Hz and then use a wide bandwidth and cut the frequency by 3db or 6db (*no magical number, reduce to taste*) and by doing this you eliminate those unwanted build up frequencies.



Subtractive EQ'ing

And you can also have several cuts in that area by reducing another frequency. it doesn't always have to be only one. Adjust it until it sits well in the mix and remember that a little move goes a long way. You can choose to have aggressive or subtle cuts based on the material you are working on.

How to find bad and unpleasant frequency

- 1. Pick any frequency point on the EQ
- 2. Boost it by 6db, 9db or 12db
- 3. Narrow your bandwidth(Q)
- Sweep the frequency knob/slider along the frequency line until you hear an unpleasant frequency



5. And then Cut the frequency by 3db to 6db (or best cut to taste) and you are done

It is important to know that sometimes you might want to adjust the Q after cutting, maybe a little broader or narrower, it completely depend on the sound you are working on. If it's a vocal and you are removing harsh frequency in the high-midrange, you don't want a wide bandwidth as it will be very noticeable and might sound unnatural. You can have a fairly wide bandwidth if you removing bad frequencies in the low-mid area.

Spend sometime to practice and listen to recognize those good and bad frequencies.

Addictive EQ

- Add or boost frequencies that will enhance the quality of the sound source relative to the overall mix.
- Set your bandwidth accordingly to only affect the frequency you want to boost. *It is advisable to use a wider bandwidth(Q) when boosting a frequency compared to when cutting out a bad frequency, because it sounds better.*
- Sweep along the frequency line with your gain boosted, with a fairly wide bandwidth and find a pleasant frequency or frequencies to boost, and don't be scared to go crazy with boosting. If you have to add a 10db of gain to make the audio sound good, just do it, as long as it helps the entire mix. Don't be scared but just make sure it is adding something relevant to the entire mix and its your ears that can decide that not really your eyes.

Sometimes you want to boost a frequency not just because it's good, but because the level is low and you can't hear it. You can boost the low and high harmonics which can add some excitement to the sound or the entire mix.

For example: If you record a vocal with a mic that doesn't produce high levels of high frequencies (top end) you can then decide to crank up the gain of the top frequencies and push them up a little bit, adding more sheen and presence to the vocal track.

Example 2: Add more body to your 808, kick, bass or the entire mix by boosting between 50hz and 100hz.



Addictive EQ'ing

When to use addictive EQ

1. You can use addictive EQ to **bring an element forward** in the mix. Think of it this way, we humans tend to hear things clearly when the high frequencies are present (2kHz to 5kHz) so you can boost the mid range of an acoustic guitar or a vocal track if you want them to poke out in the mix.

Exercise for addictive EQ'ing: Take a vocal track in a mix, cut 3kHz by 3db with a fairly wide bandwidth(Q). Toggle it on and off while its playing with the rest of the track. What

do you notice? You will notice that clarity disappears to some extent when you cut that frequency. And you can also boost instead of cutting just to hear the effect.

- 2. Use addictive EQ to bring out the **sweet spot or harmonics** of track. You can find a sweet spot on almost any instrument by fetching for it and pulling them up.
- 3. When you feel you need more lows, mid range or high frequencies, simply find the frequency you like and boost it.

Hint: I strongly advice that you find a troublesome frequency and cut it out before you think of boosting a frequency as you might not need to even boost because things become more clear and defined when you subtract unwanted frequencies.

Should You EQ on Every Track in the Mix?

When not to use EQ

If a track sounds good already and it sits well in the mix, don't bother to EQ it, just let it be. For example, if you think a tambourine sounds bad on its own but when its in the mix it adds life to the mix, just leave it. Avoid applying EQ to everything when it isn't necessary.

When to use EQ

- **During Production**: Make sure to carve your sound using EQ when necessary right from the production stage and don't wait to fix things later in the mix. That's why its important to know the basics of EQ'ing. Inspiration can sometimes come from knowing how to use your tools.
- **To Eliminate masking**: Masking is when multiple frequencies are overlapping each other, which can easily break your mix. The mix will lack focus with no sense of space and clarity.

For example: If you have a bass, a kick drum, a cello, guitars and a synth bass playing at the same, all these being low end instruments you would run into masking issues if its not taken care off properly using EQ. What to do in this case would be to *decide* what instrument you want carrying the low lows and give it priority. This doesn't mean you have to extremely high pass every other instrument by cutting out the lows.

Let say we want the bass to dominate our low end, we can slightly high pass the kick drum at 40hz and boost it by 3db with a fairly wide Q at 100hz. And then we cut the bass at 100hz by 3db with a fairly narrow bandwidth(Q). For the Cello we can high pass at 110hz. By making this simple moves we are already creating space, focus and eliminating masking. Remember that all this depends on the source a material, sometimes you might not need to do any of this while other times you have to use.



Note that there are other tools and techniques we can use to solve this problem plus the EQ or even without it. Tools like a multiband compressor, gate, dynamic EQ, side-chaining or even adding distortion from some of the element to make it stand out.

• To Create Width: Using the same technique we used above we can create width by using an EQ. The first way is panning two similar instruments hard left and hard right, and then cut a certain frequency on an instrument on the left and boost the same frequency on the instrument on the right. You can use this technique when you have multiple layers of string instruments, synths or vocals playing at the same time.

The second way to create width is using a mid-side mode on your EQ plugin or hardware. With this technique you are creating a sense of space. *You can use mid-side EQ on individual stereo tracks or on your mix buss.*

You can achieve this width by first setting your EQ to mid-side (*not all EQ have this function, so check yours have it*) and then select "**side(S)**" on the EQ plugin. Once you've done that, you can set a high shelf or a wide bell curve at about 8kHz and boost

accordingly and you can also roll off some low frequencies on the side channel by adding a high pass filter. You will notice a top lift in the sides and width.

You can also alter the middle(M) or center as well. For example, if you want to create width with mid-side on your mix buss, with the middle(M) icon selected, you might can bring out the vocals a little by slightly boosting between 2khz and 5khz using a bell curve or you can also boost your centered kick and bass by adding a little low frequency boost. And for the sides(S) you can use a high shelf to boost as we mentioned above.



Creating width using Mid-side EQ Technique

Using EQ on the Mixbuss

A common practice of mine and several engineers is to always use EQ on my mixbuss at the beginning stage of mixing. An EQ on the mixbuss generally affects all the tracks on your session since they are routed to the mix buss. You are thinking like an engineer

Benefits of using EQ on the mix buss

- 1. You can quickly and easily establish a cohesive sound by using an EQ on your mix buss
- 2. Typically, you can add a high shelf boost around 8khz to add overall air to the entire mix

- 3. You can get clarity quickly by cutting out low mid build ups around 200Hz and then boost between 2-5kHz to add presence to the entire mix. This will make your vocals, snare or claps come a little forward.
- Clear out low end rumbles easily by adding a high pass filter (low cut) at around 30 35Hz as we can't hear this frequency and possibly feel them and this will help create space and more defined low end.
- 5. You can also beef up your low end by adding a boost at 100hz.

These frequencies are mostly my go to frequencies, but it might not work for every song, so you want to make sure to find the right frequencies to alter.

There it is, these tips and guidelines if followed and mastered will transform your mix and take your eq'ing skills to the next. Remember that a mix with clarity, focus and depth always win. I hope you enjoyed reading this as much as I enjoyed putting this guide together for you? And please let me if you have any questions, contributions or feedback.