Applying EQ

If you can record 'flat' with a good result, that's an ideal situation. But most of us end up applying a little EQ to everything; even if it doesn't happen until the final mix or in mastering. EQ is making up the difference - or equalizing - between what you want to hear and what you've got. So let's now look at some of the main instrument groups, and sounds, look at some common sonic deficiencies and how best to correct them with EQ.

Bass guitar
Start off by making the sound as good as possible by adjusting the controls on the instrument before applying any external EQ. You might think a bass only generates low frequencies but in fact a lot of the energy comes from the mid range and even mid to high frequencies as well. Certainly if you adjust anything around 12k, you're not going to make any noticeable difference because you can only adjust frequencies that actually exist in the sound itself. But if we look around any frequency up to 3kHz on a bass we will definitely hear a difference.

If we need to accentuate the attack we can boost frequencies in the mids (1kHz to 2kHz) and even high mid range up to 5kHz. If the bass is a bit boomy it can be thinned out by filtering some low end using a high pass filter, or low frequency EQ in the 50-100Hz area.

Drums
Drums are complex because they're a collection of related instruments recorded to feel like they operate as a whole. Even though you may apply EQ to one drum or cymbal at a time, it's important that the components fit together naturally. Simon Phillips, a man who has practically lived in the recording studio since he was a teenager, explains more about this:

Simon Phillips
"A drum kit is made out of many parts, but to me I always look at it as one instrument, like the piano, because if I take my four toms away, the snare drum will sound different -it's just physics. The toms all have a sympathetic ring. Even though the microphone is only two inches from the head, if the source changes, then it's going to affect what it picks up. "

Alan: “The kick drum (or the bass drum (if you’re as old as I am) is where most engineers will start on a kit. Kick drums operate mainly in the 40Hz to 250Hz area although the 'attack' of a kick drum you'll find up around 1-3kHz. Once you're sure the instrument itself is the best it can be with respect to tuning, damping, heads etc, look at around 50Hz to reinforce or back off its density and thickness. If you need more attack, you'll find that at around 1kHz. If your kick drum is a bit indistinct try cutting around 200Hz-400Hz.”

“The heartbeat sound on *Dark Side Of The Moon* you may be interested to hear is simply a heavily EQ-ed kick drum used in conjunction with a noise gate. The attack was minimized by reduction mids and highs and the 'boom-boom' was achieved by increasing the low frequencies right down to 30Hz.”

When recording the snare drum it's very important to get the natural sound right acoustically, with tuning and damping, before you start applying EQ. Having said that, rock and pop recording techniques normally include a mic an inch or two from the snare head. Please don’t put your head this close to a snare drum in full flight unless you want to go deaf.

‘Ring’ on the snare is a common phenomenon but here’s the issue: we may want to get rid of ring on a snare but we don’t want to resort to heavy damping, which can destroy the overall sound of the drum.

Here is where parametric EQ comes into its own. The trick is to decide roughly where you think the problem area is. As often as not it’ll be in 600-700Hz range and one easy way to locate the culprit is to apply a dramatic boost and then ‘sweep’ the general area using a fairly sharp Q or resonance setting. When we hit the right spot the ring will then go into overdrive! At this point we can switch an equally dramatic ‘cut’ to the signal at that frequency and the ring should be substantially reduced or disappear. In order to have as natural a sound as possible we can fine tune the Q and/or the amount of cut being applied until we have the best possible result.

Snare drums can inhabit quite a wide range of frequencies from 100Hz right up to 10kHz or higher for the 'crack' of a snare. If more depth is needed, try adding a little at 100Hz. If the sound is a little muddy take out a little in the midrange around 350Hz-750Hz.

Alan: “I invariably end up adding quite a lot of top end to a snare drum.”

Err on the side of caution, though. Don't paint yourself into a corner this early in the recording process.

Depending upon what size drums are being used, toms (once known as tom-toms for us geriatrics) can live in a frequency range from almost kick drum depth to beyond snare highs. What we're looking for in a recorded tom is, generally, definition and punch. Tom fills are played as punctuation so we want them to speak, and be heard clearly. That said, it's helpful to keep in mind the overall perspective of the toms and not focus too much on the individual sound of one drum. Most engineers will spread the toms across the stereo picture, leaving the kick and snare in the center.

Alan: "I usually find that I record toms flat. If they don't sound good, I'm more likely to suggest a retune or physical damping on the drum."

Cymbals are the drummer's only sustaining instruments and their tone is crucially important because their sound lives on beyond mere milliseconds. They would normally be captured by overhead mics placed two or three feet above the kit. Overhead mic placement will depend on the location and spread of the cymbals. They can be miked individually but it's not a very common practice these days, although sometimes the ride cymbal is lacking on the overheads and might need its own mic. Remember that if we apply EQ to overhead mics we are effectively EQ-ing the whole kit, but by applying EQ at high frequencies only - say 8-12kHz - we can change the perceived balance between the cymbals and the rest of the kit.

That said, cymbals should be trusted to speak for themselves and shouldn't need a lot of EQ. When recording either very old, dirty, or somehow dull cymbals they might need brightening up a little - a lot of people call this giving them a little 'air' - at around 8kHz to 10kHz. Do not overdo this, though, especially on recording as overly or unnaturally bright cymbals will get very wearing on the ears and they will be very difficult to get to 'sit' in the track.

Alan: "Ribbon mics work particular well with cymbals and I almost always use them as overheads. They need to have top end added because they are 'darker' than condenser mics, but I prefer that result over the brighter non EQd sound of condensers as overheads.

Hi-hat can pose several challenges, especially its relationship with the snare drum to which it is both aurally and physically close.

Alan: "Level is what I've found to be the most important adjustment. Personally, I'll very rarely EQ the hi-hat. Because of its proximity, it's often the snare EQ that will define the sound of the hi-hat.

I'll usually pan the hi-hat hard right but adjust its level so it appears to be half way between center and right. The snare mic will have some hi-hat on it, especially

with a lot of top EQ, so the snare mic will tend to pull the hi-hat towards the center".

A hi-hat shares the same 'shimmer' as an acoustic guitar, so you can look at the 8-10kHz region if you want to add or subtract in that area. A thick or clangy hi-hat not only devours space in a track it just don't sound good. Depending on the player, their flexibility, plus the hi-hat they're using and of course the material being recorded, a shelving filter—rolling off everything below say 600-700Hz—can be effective. The 'clang' of hi-hat is in the midrange; anywhere between 1kHz and 3kHz, so if this is a problem cut at around these frequencies.

Electric guitar
The basic tone is best left to the guitar, the player and the amplifier. The idea then is to capture that tone as faithfully as we can using the best combination of close and room mics, or in some cases the direct sound right out of the instrument or preamp.

EQ-ing electric guitar is more a matter of bracketing. In other words encapsulating the sound that the engineer or the guitarist wants to capture and not cloud it with unnecessary top or bottom (which can be done using high and low pass filters) and then very gentle adjustments to refine or perfect the sound.

An interesting side note is that the popular guitar stomp box effect, wah-wah, is actually an EQ boost at variable frequencies according to the position of the pedal: Here's how to do it on a parametric equalizer: set something like a 12dB boost and then sweep the center frequency with a narrow Q setting.

Acoustic guitar
Acoustic guitars generally have their own individual character and we want to capture that character as faithfully as possible. Boominess can be a problem area as it will tend to cloud the rest of the track if not addressed. Boominess can be minimized by appropriate mic positioning (the closer the mic, the more boomy it will tend to be). You can also do it with EQ.

Alan: "I usually use a high pass shelving filter around 250Hz. This should reduce the bottom end without losing too much richness."

To add sparkle or presence to an acoustic guitar, try adding a little around 10kHz-12kHz using a broad Q.

Brass, horns, reeds, and woodwind
Brass, horns, reeds, and woodwind shouldn't require too much by way of EQ on recording. When recording a section you obviously rely on the tonality of the players and the blend of instruments you're working with to produce a unified 'section' sound. Trumpets and trombones tend to cut through everything like a

laser! Conversely, French horns can sound muffled. If you want a bit more ‘rasp’, rather than apply EQ to solve the problem, ask them (diplomatically!) to blow harder and then reduce your level. A close-miked sax that is sounding honky might need some brightening up and removal of mid-range at around 7-800Hz. For some strange reason, French horns have a tendency to throw the mix out of phase. Ask any classical engineer. It’s probably something to do with the fact that the bell of the horn faces backwards. This can be averted by not panning them to extreme edges of the stereo picture. There are endless arguments about whether they should be miked from in front or behind.

Alan: “A personal point I'd like to make about saxophone and other reed instruments: the sound does not just come from the bell. It also comes from the mouthpiece and along the entire length of the instrument. You often see saxes recorded only through the bell on TV but I prefer to record them from a distance of 3-4 feet.”

Flutes, oboes, clarinets, and bassoons, can sometimes be given a more airy sound by adding brightness around 8kHz. Bottom end EQ is unlikely to be needed unless there are boominess or rumble problems, which can usually be fixed with a high pass filter.

Percussion
Percussion covers an enormous range of sounds from everything that shakes, rattles and rolls to tuned percussion like marimba, xylophone and glockenspiel. It’s impossible to generalize about EQ with such a wide range of tonalities. An orchestral percussion section might go through hundreds of instrument changes.

A good solution to brightening up tuned percussion, rather than EQ-ing them, is asking the player to use harder sticks. Pro session players will usually be able to accommodate that request. This also applies to vibraphone which is a notoriously difficult instrument to record.

Alan: “In fact the only thing harder to record than a vibraphone is a steel drum, for which, in my experience no form of EQ ever seems to work!”

Strings
A lot will depend on the miking technique being used on strings. For an ensemble of string players, we can mic each pair of players or we can use a more distant mic being used to cover the entire string section. Close miked violins might tend to get a little ‘hard’ and an EQ cut around 1-3kHz can help. Violas and 'cellos might cut through better with some EQ boost around 6-8kHz. Double basses can occasionally get boomy and can benefit from a cut in the low frequencies or the application of a high pass filter. If you’ve got a lot of mics going you might not have the inclination to activate say, 20 equalizers. With the luxury of unlimited

tracks on DAWs, it's probably best to get the balance right and think about EQ later, maybe section by section, rather than mic by mic.

Acoustic piano
Acoustic piano, especially a grand piano, is a complete orchestra in a box and it occupies a frequency range from bass and kick drum depth at around 30Hz to competing with the highest of the high in the upper registers at 15kHz or above. Ideally tonal adjustment is best left to the player, microphones and mic placement unless we are going for a very specific type of effect. In a non-classical or jazz setting, acoustic piano frequently needs to fit into an arrangement of other instruments with competing frequencies. The player's left hand might for example compete with the bass guitar. This can be tackled with EQ, but a better solution may be to work on the arrangement so that clashes don't occur in the first place. For rock recordings we might need to brighten up the average piano between 4-6dB with an 8kHz shelf. But some studio pianos are very bright to start with, having had their hammers 'doped' to make them so.

Sampled pianos should need little EQ, as it may have been applied during the sampling process. Upright pianos sound very different to grands, but a lot of the same general rules apply.

Electric piano
Electric piano, in particular the Fender Rhodes, is another notoriously difficult instrument to record. The bass runs to extreme bouts of boominess, the middle can be extremely muddy and the top end teeters between shrill and annoying or light and insubstantial.

Although EQ can be used to offset these it's really best adjusting the balance of the instrument internally and then using some compression to even up the overall sound.

Vocals
Vocal EQ is another sensitive area. Over EQ-ing a vocal, unless we're going for a particular effect like a telephone voice or space-alien sound, can easily result in a vocal sound that is tiring and harsh.

Microphones play a huge role in the tone of a vocal. A good approach is just to apply a high pass shelving filter to lose any potential rumbles and reduce pops but check that it is not affecting the vocal sound in any way. Wait until the mix for final adjustments to make the vocal cut, sit, or have some air around it. As with snare drums 1-2kHz is often a problem area where vocals can get a bit honky and nasal. Of course limiting, compression and reverb are all going to affect the vocal sound.

To make a vocal stand out better, try boosting the vocals at around 4kHz and at the same time *cutting* that frequency on instruments that are playing at the same time. This way, the vocals get a bit of space by themselves. But be careful not to over EQ vocals so that they become harsh. To add a bit more fizz to vocals, boost the frequency range starting at about 10kHz. Alternatively, if there's a too sibilance problem—the S sound—back off the same frequency or use a de-esser which is looked at more closely in the Compressors and Limiters chapter.

If a vocal is sounding hard, look at frequencies around 2.5KHz to 3kHz and apply a gentle cut. A parametric EQ or notch filter can be useful here so as to focus in on the optimum frequencies and not disturb the balance of neighboring material.

Problems

Unwanted hum (OK, hum is very rarely wanted!) is usually low frequency and often at the frequency of the AC electricity supply - 50 or 60Hz. Depending upon the circumstances, a simple High Pass filter can be applied so long as there's no other information around the hum frequency that we want to retain. For all kinds of consistent hums buzzes and whines, parametric EQ can dial very specifically into the frequency of the noise without affecting too much else around it. So, the sharper your Q the better. This is an ideal application for Notch Filtering.

Mixing: If a track lacks punch, try boosting the upper frequencies of the drums or the rhythm section, or even the whole mix. If the track seems boomy or thick try applying EQ cut over individual sounds or even the entire track at around 200Hz. Be careful, though, if backed off too much the track will start sounding thin.