

Creative EQ

We know it's tempting to just grab those EQ dials and twist away until it sounds good, but your mixes will benefit if you apply a little science to the art of frequency manipulation...

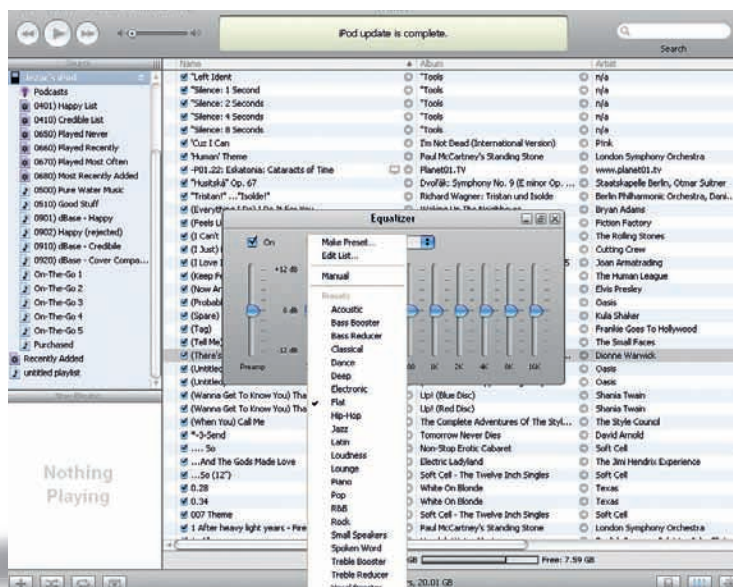
EQ is one of the most common, yet least understood areas of sound processing. At first, it seems like you're simply operating turbo-charged hi-fi bass and treble controls. After your first few unsuccessful mixes however, you'll start to realise that there's a lot more to this black art than meets the eye... or rather, the ear.

The original purpose of EQ was to repair technical deficiencies in a sound recording. In the days when

“OFTEN IT'S THE INBUILT EQ SWEETENING THAT MAKES A PARTICULAR MICROPHONE A GOOD CHOICE FOR A SPECIFIC INSTRUMENT”

recording engineers carried clipboards and kept biros in the top pockets of their white lab coats, engineering wasn't considered a creative job. Instead, the engineer's job was to ensure that the equipment captured the performance faithfully, with minimum colouration, and a flat frequency response. If the frequency balance was (for some reason) unequal, the engineers could use an equaliser to correct it – hence the name.

► The iPod's EQ presets aren't to be taken seriously



The science

Equalisers allow you to adjust the relative volume levels of the frequencies spanning the audio spectrum independently of one another and in a number of subtly different ways. Many people think that you simply play with the controls until things 'sound better' but, as with most signal processors, you'll become a lot better at your use of EQ once you start to discover the reasons for all of its different and subjective effects.

These subjective effects are produced because real life naturally 'EQs' things for us. Firstly, all rooms have resonant frequencies, which depend on the size and shape of the space. When an instrument is playing, those frequencies will be amplified by the room itself.

Secondly, different frequencies radiate in different ways. High frequencies are rather directional, but low frequencies spread themselves around easily. This can have a number of different consequences, depending on where the sound and the listener are located.

Thirdly, even our ears shape the overall sound depending on the volume. Both high and low frequencies become harder to hear than middle frequencies once the overall volume gets quieter. This is why some home music systems have a Loudness button that's linked to the volume level. This keeps the high and low frequencies artificially boosted when the main volume control is set at a low level.

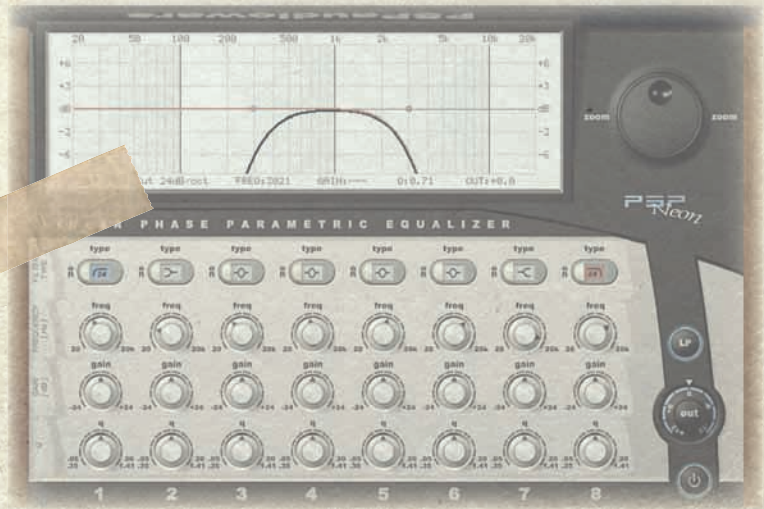
Through the use of EQ then, you can help correct the effects of room resonance, make a sound feel subjectively louder or quieter, and influence its perceived location. Now, that's pretty powerful stuff – and all three have been primary functions of professional equalisers ever since the devices were invented.

Getting creative

But as the men in white coats were gradually replaced by trendy young types with ponytails, these newcomers realised that they could use EQ to artificially exaggerate the essential characteristics of different types of recorded material in order to make it seem subjectively better. This is a bit like fast-food restaurants adding salt to everything to make it taste nicer. Purists certainly frown upon it (take those EQ presets on the iPod, for example: if those 'Classical', 'Dance', 'Hip Hop' and 'Rock' settings really made those types of music sound better, then wouldn't such music be mixed like that in the first place?).

Actually, no. It's like we just said: musical salt, that's all. And the iPod-wearing, tube-travelling public like to take it with as much salt, sugar and artificial flavouring as they

LINEAR PHASE PARAMETRIC EQUALIZER



LINEAR PHASE PARAMETRIC EQUALIZER

► In Cubase SX, pre-compression EQ has to be done using a channel insert

possibly can during that busy morning commute on the Piccadilly Line.

Trying to be a purist about such creative EQ is like trying to ban sugar from cookery books. Most of us are sensible enough to know when just a pinch of it is required, and when none at all would be best.

Hands-free EQ

Having established that a little dash of creative EQ is perfectly acceptable, we do need to point out that if you're recording audio, with practice you can do much of it without resorting to equalisers. You can EQ simply by correctly positioning the right kind of microphone at the

“DON'T OVERDO THE SOUND SWEETENING, OR THE VARIOUS ELEMENTS OF YOUR MIX WILL BE FIGHTING FOR ATTENTION”

time you record – that's one of the reasons there are so many different mics on the market.

All but the cheapest of microphones are sold with a printed chart of that model's frequency response. The most expensive models are individually tested and have personalised printouts. Although the response is seldom flat, it is nearly always deliberate. When a manufacturer designs a new microphone for acoustic guitar, for example, they've already done some of the creative EQ for you.

That's why you'll see familiar patterns of usage. Take drum kits, for example. That old faithful combination of a Sennheiser 421 on toms, Neumann U84 on hi-hat, Shure SM58 on snare, ElectroVoice RE20 on bass drum and a pair of U87's as overheads has been used on countless recordings. Sometimes the choices are practical (the ElectroVoice RE20 is virtually immune to overloading, so it's perfect for use inside a bass drum), but often it's the in-built EQ sweetening that makes a particular



microphone a good choice for a specific instrument. It's a good idea to check out the specs for these popular microphone models, since they'll give you a good behind-the-scenes insight into what EQ curves are suitable for sweetening a particular musical instrument.

Choosing an EQ

Equalisers come in many different shapes and sizes. There are simple filters for bass and treble response, semi or fully parametric equalisers that shape a portion of the frequency range accurately, and, of course, graphic equalisers, the design of which was basically conceived to reflect the changes across the entire audio spectrum.

Don't make the mistake of assuming that all parametric EQs are the same, or all filters, or even all graphic EQs. It takes a great deal of careful engineering to build great-sounding equalisers, irrespective of whether they're implemented in hardware or in software. That's why some EQ plug-ins are free, while others can cost hundreds of pounds. Bear in mind that any EQ modules built into your sequencer will be designed for speed, not comfort. In other words, they'll sacrifice sound quality for processing speed, simply because most users expect to use lots of EQ without burning up all of their computer's processing power at the same time.

But don't panic; in many cases this isn't going to matter very much. Nobody should be losing sleep over the brand name of the equaliser used on a cowbell part, for example, and within limits, both synthesizer and electric guitar parts can be extremely forgiving over the quality of the EQ module used. However, when it comes to using EQ on acoustic instruments, such as a grand piano or perhaps an orchestral string section, you do need to go for quality, or be prepared for brittle and unpleasant results.

On vocals, much depends on the style of the track. With loud, shouty vocals (on rock or rap for example), you can often do as much violence to the vocal as you like and no-one's going to complain, as long as it sounds



▲ The Waves SSL4000E Channel Strip sounds as good as it looks

“EQING A SOUND TO BE DELIBERATELY BAD CAN HELP CREATE LIGHT AND SHADE WITHIN A MIX”

appropriate within the context of the song. But with softer, more sweetly sung or quietly articulated vocals – the sort where you really want the true character of the voice to come through clearly – then once again, it pays to go for a quality EQ.

Making the adjustments

In equalisation, as in life, it's a good rule not to fiddle about with something until you know exactly what you're doing. So before you go reaching for the EQ controls on a particular track, have a good listen to how it sounds already – not merely in isolation, but in context with the rest of the project. It might be fine as it is.

Remember that your listeners will hear the track along with everything else, not standing in isolation with the solo button on. It isn't at all unusual for something to sound strange in solo, yet perfectly acceptable when mixed in with everything else.

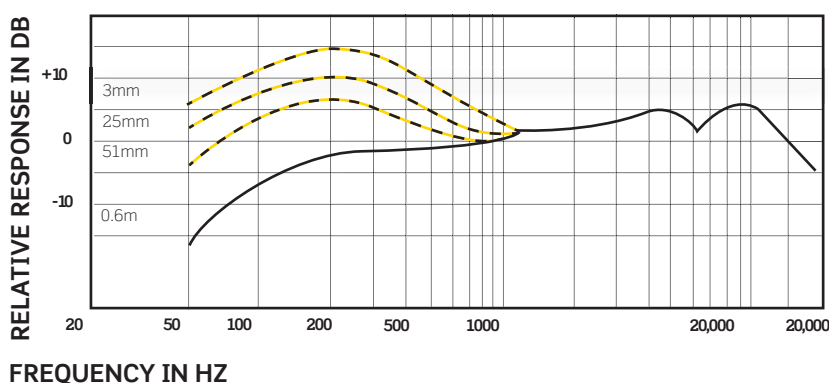
Equalisation, as we mentioned earlier, performs a wide range of simultaneous duties on a sound, and there are no hard and fast rules as to which job you should get it to tackle first, but here's a good place to start. Before you perform any creative EQ processing on a track, listen to it very briefly in isolation in order to hear whether there's anything overtly wrong with it. We're talking here in very broad and general terms: is the sound much too bassy? Too bright? Is there noise, or accidental thumps and bumps that need filtering out? Does it perhaps have a screechy peak in the middle that blasts out and needs knocking down with a parametric EQ on a high Q setting? You should have prevented any such defects during recording, of course, but there's no point in us telling you off at this late stage!

This kind of equalising activity needs to be performed before any channel compression takes place. The reason is quite simple: at this point, we're essentially resolving a defective sound, and we don't want those defects confusing the compressor.

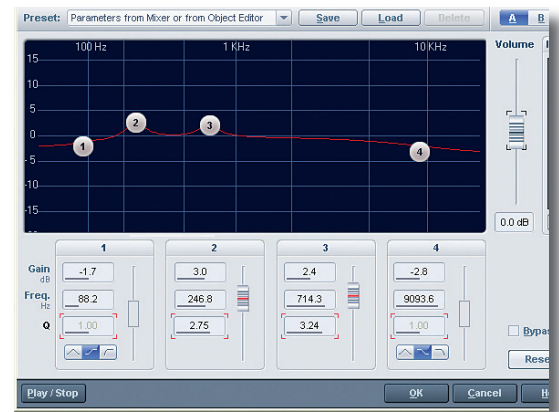
However, on some sequencers (such as Cubase, for example), the channel's equaliser is located after all of the

Learn to master EQ

If you're new to music production, it can be extremely hard to wrap your head around the concept of mastering. Surely if the mix is good, it should be left alone? Well, in the same way that every element in a mix is only effective when heard in context with everything else, a final mix only sounds good in context with other songs, and that depends very much on the situation in which the mix will be played. So, in addition to basic compression and making sure that the song doesn't sound too dull or too bright, there are other considerations when mastering. If the song is part of an album, it must be equalised so that the frequency content is broadly similar to the other tracks. These will usually have been mixed on different days, and possibly even in different studios. The most extreme case is a compilation of songs from different artists, where the subjective frequency balance of every song must still be broadly similar. Mastering a song for release as a single, on the other hand, may have more to do with boosting the upper-mid frequencies to help the song stand out on radio, TV, or as part of a jukebox collection. This may also involve more extreme compression and hard-limiting than would normally be acceptable on your average album track.



▲ A microphone at close range can dramatically over-boost bass response



▲ A parametric EQ can be used to highlight particular note ranges

pre-fade insert points (it's placed in a fixed position, immediately before the channel fader). This means that you'll have to use a plug-in equaliser for these basic sound clean-up duties. That is, unless you've decided to insert your compressor post-fader. That's not as daft as it sounds, since it's a technique that works well when riding the volume of a highly dynamic part while programming complex automated fader moves (particularly on vocals). Some EQ designs allow you to split off the filters so that they become pre-compressor precisely for this reason.

Going the distance

The spectral balance of a sound plays an important role in where that sound is perceived as coming from. Since, at this point, we're broadly adjusting the bass and treble in order to produce an evenly balanced sound, now is also a good time to experiment with this important concept.

Here's how it works: Because bass energy spreads out far more widely than higher frequencies, the further a sound is from the listener, the more the bass frequencies will start to drop away. Additionally, the elasticity of air starts to absorb some of the high frequencies as well. Therefore, when you want to make something sound further back from the speakers within a mix, roll off the high frequencies slightly, and gently roll off the very lowest frequencies as well. If the part is meant to sound like it's performing indoors, the addition of a moderate amount of short reverb – perhaps in conjunction with a medium or long one – helps complete the sonic illusion of distance.

Conversely, microphones (and, indeed, your ears) exhibit something known as the proximity effect when picking up sounds at a very close range. The bass – and, to some extent, the high frequencies – become somewhat over-exaggerated at such a short distance. If you want a sound to appear very close, boosting the very top and very bottom frequencies, coupled with some slightly exaggerated compression and a reduction in the amount of reverb that you'd normally use, can create this impression very effectively.

Now that you've essentially equalised the sound pre-compressor (in terms of getting its spectral balance correct for its placement), and perhaps also rolled off any problems occurring at both extremes of the frequency spectrum (noise, thumps and pops), it's time to do some more corrective post-compressor EQ – once you've got some of the basic settings for that compressor up and running, of course.

On the level

Now we're going to look at a little-known, post-compressor EQ trick of the trade that can save you a great deal of time and effort, because it often removes the need to automate

Additive or subtractive?

There are two basic ways to create an EQ shape like this one. Let's start by assuming that the level going into the equaliser has been correctly set. The first way is to boost the low frequencies to the required level, using a low frequency shelving EQ, and then boost the high frequencies to the required level using a high frequency shelving EQ.

The second way is to start out by cutting the middle frequencies using a notch filter, then to cut back the low frequencies a little bit as well, using a low-frequency shelving filter.

Which way is better? It depends on the type of EQ, but although the first way seems to be the most intuitive, using the second method will almost always give you smoother and sweeter-sounding results.



Boost the low and high frequencies or cut the middle frequencies – the choice is yours

“IT ISN'T AT ALL UNUSUAL FOR A PART TO SOUND STRANGE IN A SOLO, YET PERFECTLY ACCEPTABLE WHEN MIXED IN WITH EVERYTHING ELSE”

the volume levels for individual tracks.

Listen to the part in context with the rest of the song, at approximately the level that you think it'll probably end up. As you listen, notice how certain note ranges are probably a bit too loud in the mix, whereas other note ranges are too soft and get swamped by the rest of the mix. Many people resort to automation at this point, but that really isn't necessary; there's a far more musical solution available for this.

Using a parametric equaliser (it's best to avoid graphic equalisers until you've exhausted all other possibilities), gently raise or dip the relevant note ranges until you get a nice, even balance. You'll probably have to slightly adjust the overall level of the part within the mix at the same time, but that's only natural, since the two processes go hand in hand.

It's quite obvious why this technique should be carried out post-compressor. If you try to do this with an EQ module that's pre-compressor, the compressor will fight against you and you'll begin to over-compensate. The result: a sonic battle with no clear winner!

With careful track equalisation and track compression, along with final mix equalisation and mix compression, it's almost always possible to create at least a reasonably good mix without any need to turn to your sequencer's fader automation system.

So sweet it hertz

As you can see, there's quite often a fair bit of hard work to be done before you even get to start working on what beginners incorrectly assume is the primary function of

EQ: to sweeten the sound. Let's turn our attention to that subject now.

Sound sweetening is naturally a pretty subjective thing, and there is no absolute right or wrong approach. Although the general application is usually to exaggerate the portion of a sound's spectrum that characterises the sound overall and makes it feel subjectively good (eg, the boom of a bass, the crispness of a vocal, or the crack of a snare), it's usually a good idea not to overdo things, since the various elements of a mix will be fighting for attention and the whole mix will start to fall apart.

Most EQ sweetening only works because of a sound's context within the rest of the overall mix. In isolation, our ears get used to the EQ change very quickly, which is why it's important not to EQ a track in solo mode for too long, or you'll overdo it. Conversely, equalising a sound to be deliberately bad is often a good thing to do in order to create light and shade within a mix. Telephone-style vocals, artificially small snares, and stomach-pumping kick drums are all excellent effects to use – but only if the rest of the mix is carefully proportioned to accommodate them.

To get you started on your own self-styled sweetening techniques, look at the *Playing With Frequencies* box on the opposite page, which will help you identify the elements of certain sounds that give them their unique characters. Play around with these elements, and see how they affect the feel of the part within the context of your own mixes – after all, every song is different.

You are the master

There are two schools of thought when it comes to mastering. Some traditional engineers will maintain that even with the best mix in the world, it's rare that a stereo mixdown will sound like a finished record until it has been properly mastered. Others, particularly since the advent of home studios, have gradually absorbed mastering into the mixing stage instead.

If you're firmly in the first camp, it's still worth doing a little bit of amateur, rough-and-ready mastering before recording the final mix – but only if you also record the raw mix as the official production run-off for final mastering later. There's a good reason for this: it's far too easy to over-equalise and over-compress the stereo output during the final mixdown. Neither is easy to undo, and over-compression sounds particularly offensive to fresh ears, and can be impossible to correct.

It only takes seconds to run off the unprocessed mix so that it can be safely stored, mastered and remastered in future for any purpose. Once you've done that (and clearly labelled the file as such), you can then feel free to squash your listening copy as much as you want, knowing that you've always got the original to fall back upon.

▼ A very posh mastering compressor, yesterday



One final word of caution: whenever you're adjusting EQ, keep a close eye on your levels. If the EQ settings are boosting the overall signal level too much, reduce the levels going into the equaliser. If, on the other hand, the EQ has reduced the overall level too much, boost the level coming out of the equaliser. This is the correct way to ensure that you won't get distortion occurring before, after, or inside the equaliser module – the last thing you want is for distortion to ruin your excellent work! **cm**

“TO MAKE SOMETHING SOUND FURTHER BACK IN THE MIX, GENTLY ROLL OFF THE HIGHEST AND THE VERY LOWEST FREQUENCIES”

Playing with frequencies

50Hz	70-100Hz	200Hz-400Hz	400Hz-800Hz	800Hz-1kHz	1-3kHz	3-6kHz	6-10kHz	10-16kHz
This is the super low-end range that can make your internal organs dance around when you're in a club with a good sub-bass system cranked up. We love it! Use it to beef up bass drums. Get rid of anything you find around here on vocal tracks.	This is nice added to bass drums and basslines for that sub sound so essential in dub. Again, this is a roll-off frequency for vocals. Note: many sources of sub-bass end up cancelling each other out, as bass frequencies are very susceptible to phase problems. For example, if your bass drum disappears now and again in the mix, it's because something else is hitting the exact same frequency. In other words, adding more bass to things can often lead to a bass loss in your mix.	Use to either remove or add that woody effect to/from a snare, or to warm up or remove that muddy sound from vocals. Boost here to fill out guitars; cut to thin out percussion parts or cymbals.	Use these frequencies to adjust the clarity of a bass tone or warm up the 'box' sound of toms. Boost or cut here to thicken/thin out guitars. Reducing some of these frequencies can help tighten up the overall bass sound of your mix.	You can use this for vocal thickening of a different nature to the low-end stuff mentioned earlier. Boosting at 1k can add to the 'knocky' sound of bass drums – especially useful in dance music.	Now we're getting into the hard stuff. Boost around 1.5-2.5k to add edge to guitars and basslines. Cut some of the upper 2-3k range to help smooth out vocals, especially those vox that seem to cut your head off when listening at high volume. Boosting here can also add edge to pianos and vocals. This is a hard range that is not pleasant-sounding, but it can help instruments stand out in your mix.	Boost some of these frequencies for that plucky fingered bass sound. Cut at the 3k range for less of that hard sound on vocals. To soften sounds, cut the upper range to dull off certain parts. Boosting at 6k can be a good upper point for adding clarity to vocals, and effective on distorted guitars.	Boost here to sweeten vocals (as you go up in frequency, you add more air, getting that breathy sound), add crispness and sparkle to acoustic guitars (but be careful not to overdo it), to enhance the ring of a snare and the top edge of a bass drum (yep, a bass drum), and to add edge to synth sounds and strings.	Boost here for even more of that breathy vocal sound, and to add that extra zing to cymbals and percussion. Cut to reduce noise on sounds that aren't bright. Boost for more sparkle on pad sounds, but only if the frequencies are there to begin with – otherwise you'll just be adding noise.