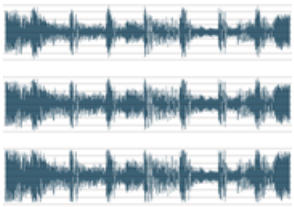
technique advanced compression

advanced compression techniques

Part 2: Paul White further explores the secrets of successful compression, and explains how to use advanced techniques for mastering your mixes.



In this second installment, I'll be covering compression in mastering and multi-band compression. But first I'd like to take a closer look at the main ways in which a full-band compressor can be used — after all, if you are going to set the appropriate controls correctly, you have to know what you are trying to achieve. I like to simplify things by defining two main types of jobs you might want a compressor to do — the effects of these two approaches can be seen on the waveforms in Figure 1 (right).

Double Vision

The first use of compression is for controlling signal peaks, so if you want to reduce peak levels without affecting the dynamic range of the rest of the recording, the usual approach is to set a threshold that's just above the average music level. This way only the peaks are subjected to gain reduction, and the more compression you wish to apply to those peaks, the higher the ratio you'll need to set. As a rule, ratios of between 2.5:1 and 8:1 are used for this kind of work.

It is sometimes easier to set up the threshold control using a high ratio along with fast attack and release settings, as the gain-reduction meters will kick in very obviously whenever a signal peak exceeds the threshold. Simply reduce the threshold until the gain-reduction meters start to show a significant amount of gain reduction between peaks, then bring it back up until only the peaks are affected. Once you've adjusted the threshold so that only peaks are being affected, you can return the attack and release settings to more suitable values and then work on the ratio control. A practical way to set the ratio control is to watch the gain-reduction meters as you vary the ratio and aim for a maximum gain reduction of between 8dB and 10dB. However, it's still vital that you listen carefully to the processed signal to see if it sounds the way you want it to — meters can only tell you so much, and if the peaks start to sound squashed, you'll probably need to either reduce the ratio or increase the compressor attack time. As a rule, a hard-knee compressor will give the most positive results in situations where the signal peaks are in need of assertive control and, as explained last month, a compressor with a peak-sensing side-chain mode will track peaks more accurately.

Even though you are, in effect, compressing the signal peaks, it is important to keep in mind that, unless you are using a very fast compressor set to its fastest attack time, there may well be signal overshoots that the compressor can't catch. In a situation where overshoots can't be tolerated, it's safest to follow the compressor with a dedicated peak limiter. In a CD

mastering situation, following compression with limiting is standard practice — it's unreasonable to expect a compressor to prevent digital overloads on its own.

The second basic way in which you can use a compressor is for compressing the dynamic range of an entire signal, not just the peaks. In this case, it's usual to set a very low ratio of between 1.1:1 and 1.4:1 and to set the threshold at around 30dB below the peak level. Soft-knee compressors work well in this role and gentle overall compression is commonly used in mastering or for processing submixes. Conventional RMS, rather than peak, sensing would be the norm for this type of job, though don't let that put you off experimenting, as different makes of compressor can behave very differently.

Mastering The Art

One question I frequently hear is, 'Why should we need to compress at all during the mastering stage if individual tracks have already been compressed during recording and mixing?' The answer is that not all material will need compressing, but the application of a little overall compression can help the sounds within the mix to gel more effectively, even in cases where every track was compressed flat at the time of mixing. Just because individual tracks have been compressed doesn't mean the mix is always going to be at the same level throughout — vocal lines will still have gaps between phrases, and instruments may come and go according to the arrangement of the song. The outcome is that the overall level of a typical pop mix still fluctuates according to what is and what is not playing at any given time.

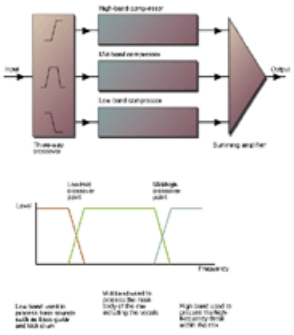
Because the dynamic characteristics of a complex mix can vary considerably over the period of a track, a compressor which automatically sets suitable attack and release times is often easiest to use in this application. If your compressor doesn't have an auto mode, try an attack time of around 20mS and a release time of around 300mS, but experiment with these values, because every make of compressor responds differently. Use a low threshold in conjunction with a low ratio to trim a few dB off the original dynamic range and you should find that the impression of energy and mix integration increases. What's really happening is that the pauses between vocal and instrumental lines, as well as the gaps between drum beats, are compressed just a little less, which means that the level of the backing track is constantly adjusting itself to maintain a more even overall level. If this were overdone, there would be audible gain pumping, but kept down to two or three decibels, the subjective result can be very musical and can often help prominent parts, such as vocal lines, sit better within a mix.

Many Bands Make Light Work

When processing complex mixes using a conventional compressor, you can easily reach the point where gain pumping becomes audible, with high-energy, low-frequency sounds affecting the gain of the whole mix. Multi-band compressors were designed to avoid this problem, by treating different sections of the frequency spectrum independently. In such systems, the audio is split up into separate frequency bands, usually three, by means of a crossover circuit, each band then being treated with a separate compressor. At the output, the various bands are again combined to provide a full-range signal. Figure 2 shows a block diagram of such a setup.

The clear advantage of this system is that a loud, low-frequency sound will only instigate gain reduction in the low-frequency compression band, so any mid-range and high-frequency

sounds occurring at the same time will be unaffected. This is in contrast to the conventional full band compressor where a loud kick drum will pull down the level of any simultaneous hi-hat and snare beats. Essentially, the ability to apply more compression without audible side effects is the main benefit of a multi-band compressor.



However, in a system where each band's compressor can be adjusted separately, there's a lot more you can do. For a start, the output gain of each compressor can be adjusted to alter the overall tonality of the mix. For example, if you feel the mix needs more mid-frequencies, you can simply turn up the output level of the mid-band compressor by a few decibels. You can also increase the perceived bass level by using more compression in the bass band than in the mid and high bands — just set a higher ratio or a lower threshold. If you use the make-up gain control to compensate for this extra gain reduction, the average level of the bass will have been increased without increasing the peak levels, therefore making the mix sound more powerful at any given playback level. Similarly, if the top end needs a bit more sizzle or enhancement, it can be compressed a little harder too, in much the same way.

Most multi-band compressors also allow you to move the crossover points, and in most circumstances these need to be set in such a way as to separate the main bass and treble sounds from the mid-range. Kick drums and bass instruments need to be mainly in the low band while the mid band should be wide enough to accommodate the entire vocal range except for perhaps the highest harmonics and breath noises. This is important, as placing the crossover point of a multi-band compressor in the middle of the vocal range can compromise the vocal sound. In the top band, you should be aiming to capture cymbals, the bright edge of acoustic guitars and so on. For a pop mix, a low crossover point of 150 to 200Hz and a high crossover point of 5 to 8kHz would be typical.

When working with other material, listen to the mix and try to pick out the different ranges covered by the various instruments and sounds, then adjust the crossover points accordingly. Choosing the right compression settings when mastering takes a little experience, but the first step is always to identify the problem — is it just a question of balance or is part of the mix more dynamic than it needs to be? Once you've pinpointed the problem, try to fix it using the least amount of processing.

In a mastering situation, having independent control over each band can really help to sort out a problem mix. One popular strategy is to use a higher ratio and higher threshold to sort out low-end peaks while using the gentler low-ratio and low-threshold approach in the other frequency bands. On the other hand, using more compression in the mid-band can often help lift the vocals out of a problem mix. Some multi-band compressors, such as TC Electronic's Triple*C, don't have independent control over the bands other than for level, but they do provide templates for different types of music where these more advanced settings are preset within the templates. In most cases, the

EQ Before Compression Or After?

Compressors are often used in conjunction with equalisers, especially in mastering applications. However, there's a big difference in the results achieved, depending on whether you put the EQ before or after the compressor, especially if the compressor is a full-band type. Let me give you an example: let's assume that a mix needs more low-end energy, so we add some bass boost at 80Hz. If we then feed the EQ'd signal through a compressor it will respond most to the loudest signal peaks, which in all probability will occur exactly where we

appropriately named template will be the right one for the job in hand, but don't let that put you off trying different templates to the obvious ones just to see what happens.

However, even if your mastering compressor provides full and independent control over each frequency band, it's usually a good idea to use similar attack and release settings across the three bands unless you have a very clear reason for doing otherwise. Generally the attack will need to be as fast as possible without making the compression process sound too obvious, though in some situations, you may want to increase this a little to allow brief transients to stand out a little more. If the attack and release times are set too differently, then the attack of a transient sound may be disturbed, with some parts of the spectrum coming in before others or coming in with more initial intensity. In extreme cases, badly mismatched attack and release settings can even have a detrimental effect on the apparent timing of the music.

The Final Word

Compression is a much more subtle process than adding an effect such as delay or reverb, so you may have to play around more before you feel you have enough experience to get the results you want. Dynamic control is a key element in modern music production, whatever the style, so give yourself time to learn, and be aware that different types of compressor can produce very different subjective results. If you have a digital compressor with factory presets, look at the way the presets are set up and try to figure out why the designers chose those parameter values — can you imagine what effects those settings will have on the type of signal they were designed for. You can also learn a lot from listening to commercial records to see how they were mixed and mastered. Most importantly though, learn restraint. Overprocessing is almost always more damaging to a piece of audio than underprocessing. SOS

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