ByteNoise

Mastering

In terms of composing and performing music, mastering is the process of taking the sounds the band has created, or the electronic instruments have synthesized, and turning them from a demo that sounds good into a final mix that sounds great. There are five main steps to this: balancing, panning, equalization, compression and adding effects.

Balancing

The most basic yet most important part of mixing is getting the balance right. The idea is to ensure that no two instruments clash with one another.

An instrument, or a group of instruments working together, is called an element. There are five main elements in most modern popular music:

- **Foundation** This is usually the bass and drums. It's the main driving force of the song.
- **Pad** Long, sustained notes or chords. Usually generated by synthesizers, but can be an organ, strings or even a choir.
- **Rhythm** Any instrument playing counter to the foundation element, such as a rhythm guitar strumming on the backbeat.
- **Lead** Usually a lead vocal or guitar solo, but it can be any

lead instrument.
- **Fills** These usually occur in the spaces between lead lines, like an answer to the lead.

Usually it is best to have any three or four of these elements present at any given time, substituting some for others when switching between the verse and chorus.

You should try to ensure that no two instruments occupy the same frequencies in the same place at the same time. You can either try moving one up or down an octave, or ensure that they never play at the same time. It may also be possible to resolve the clash with panning or equalization, as detailed below.

Panning

When mixing in stereo, leaving fancy effects aside, all the sounds in a song appear to come from either the left speaker, the right speaker, or somewhere in between the two. This space where all the sounds appear to originate is called the sound field.

The important thing to remember is to never pan hard left or hard right. Even if you have a synthesizer that has a stereo output, you shouldn't pan its outputs hard left and hard right. If you did that with every instrument, it would still sound like the instruments were all in the same location as each other, which defeats the point of a stereo mix: to make it sound like different instruments are in different physical locations from each other.

Other than avoiding hard left and hard right panning, there are few rules. In general, you should aim to have roughly the same amount of instruments to either side of the listener, and make

sure none of them are clashing with each other. Apart from that, you're free to experiment. Most modern mixes have centered kick drums and bass guitars, but many old recordings feature these instruments panned quite far to one side. Similarly, it is quite common to find a drumkit spread out across the sound field in recent songs, whereas it was seen as just one instrument with just one position for the whole kit in older recordings. There are very few right and wrong ways of panning a mix, as long as none of the instruments conflict with each other.

Equalization

Equalizers boost or cut certain frequencies of a sound. They can make sounds brighter, clearer and bigger. Just as importantly, they can help the different instruments fit well together in a complete mix.

The parametric EQ is perhaps the most useful kind of equalizer, as it lets you determine the frequency to alter, the amount to cut or boost it by, and the amount of bandwidth (often labelled "Q") to affect either side of that frequency.

A good method of EQing with a parametric EQ is to do the following:

1. Set the EQ to cut by about 8 or 10dB.
2. Gently sweep through the frequencies until the instrument has the most definition.
3. Adjust the amount of cut and bandwidth until it sounds good.
4. Turn the EQ off, or bypass it on the mixing desk, then turn it back on again, to ensure that it sounds better with the

change than without.

The same can work with boosting rather than cutting, but it is always best to try cutting first. Frequencies are cut in nature by the objects in the way of the sound source, which is why you can't hear the hi-hats but can hear the bass of your next door neighbour's music. Boosting also adds phase shift, which is something you want to avoid too much of.

Compression

Compressors lower the amplitude of a signal once that signal reaches a certain volume. The two main reasons for using compression are to either control the dynamics, or use it as an effect.

In terms of controlling the dynamics, a compressor can be used to make loud sounds less loud. As they usually have the option of amplifying a sound, in effect they also make the quiet sounds less quiet. After adding compression, the way the vocals are sung or the instrument is played sounds much more consistent, with only minor variations in volume.

In terms of using compression as an effect, compressing with the right settings can make a track seem closer, more aggressive or more exciting. The most predominant frequency of a sound will stick out even more with compression.

Compressors usually have the following five controls: threshold, ratio, attack, release and gain.

The threshold is the volume a signal needs to reach in order for the compressor to kick in. The lower this is, the more dramatic

the effect will be.

The ratio is the number of dB by which the input level needs to increase in order to cause a corresponding 1dB rise in the output level. For example, with a compression ratio of 3:1, an input signal 3dB louder than the threshold will cause a 1dB increase in the output level, and a signal 6dB louder than the threshold will cause a 2dB increase in the output level.

A ratio of 2:1 will sound relatively natural, whereas any ratio above approximately 10:1 will give the effect of the signal never getting any louder than the threshold. This is known as limiting.

Conventional compressors are known as hard-knee compressors: they do absolutely nothing until the threshold is reached, then all of a sudden they abruptly kick in and start affecting the volume of the signal. This can sound pretty unnatural, so a smoother technique was worked out, and implemented in the form of soft-knee compressors. These start everso slightly decreasing the volume when the signal is still lower than the threshold, building up until the threshold is finally reached and the user-defined ratio is fully in effect. Soft-knee compression is advisable when you don't want to draw attention to the fact that you're altering the sound, whereas hard-knee compression is recommended for really making a sound stand out in the mix.

It can sound much more natural for a compressor to be relatively slow to respond, so the attack and release dials are included to let you determine the time it takes for the compressor to notice that the threshold has been reached (the attack) and that the signal's safely below the threshold once more (release) and respond accordingly. The slower the attack and release settings are, the less obvious the compression is.

However, a slow attack setting causes quick bursts of a loud signal — say percussion — to pass through the compressor unaffected, and a slow release setting will cause quiet sounds just after loud ones to be dragged down even further. It takes patience to learn to get the balance right, as what works well for one mix may cause problems in another.

Like with most other tools at your disposal, the only real way to learn how to effectively use a compressor is to practice using one.

As compressors just decrease the volume of the output, they usually have amplifiers in them which boost the signal. This gives the effect of the quiet sounds appearing to be louder rather than the loud sounds appearing to be quieter. Most compressors have a dial called gain or output, which simply controls how much the entire signal is boosted.

One last thing worth noting is the compressor's distant cousin, the gate. Gating means attenuating or completely muting out any signal *below* a certain threshold, as opposed to compression which severely limits the increase of any signal *above* a certain threshold. Gates were traditionally used to get rid of background noise and tape hiss during quiet parts of recordings, but can be used in other ways. For example, a snare with a lot of reverb which was then run through a gate was the staple of a lot of eighties pop music.

Effects

Effects are the finishing touches of a mix. While there are too many to list here, an example of what can be achieved with reverb and delay is given.

Whereas stereo panning adds a dimension to a mix, from left to right, adding a little reverb can make a sound seem more distant than the others, giving the track depth.

Another use of effects is to fatten sounds by making them seem to stretch across between two points in the sound field. To do this, use a very short delay and pan the original sound and the delayed sound to different positions.

Effects are really there for you to use creatively, however. Keep experimenting, and if something sounds good, don't worry about if it's the "right way" to do it. Go with what works for you. Find your own style.

References

- The Mixing Engineer's Handbook, ISBN 0-87288-723-5
- Sound on Sound: The Big Squeeze