

## **COMPRESSION**

***"The skilful application of compression is a major factor that often determines the difference of an average home recording or mix to a top level professional one"***

***Bryan Evans***

Compression is the process of reducing signal dynamics, restricting by how much loud sections of an audio signal are higher relative to quiet sections and how this relationship varies with time (modifying the shape of sound events as they occur).

It can be used to keep levels under control, make sounds more punchy (be more upfront in a mix), soften triggered digital samples so that they appear more natural and organic, allow different sounds to be clearly heard in a busy mix (in combination with other processes), ... in fact is often responsible for bringing out the character of sounds we enjoy on our favourite commercial releases whilst not compromising the ability of systems to reproduce them.

### **The Action of the Compressor**

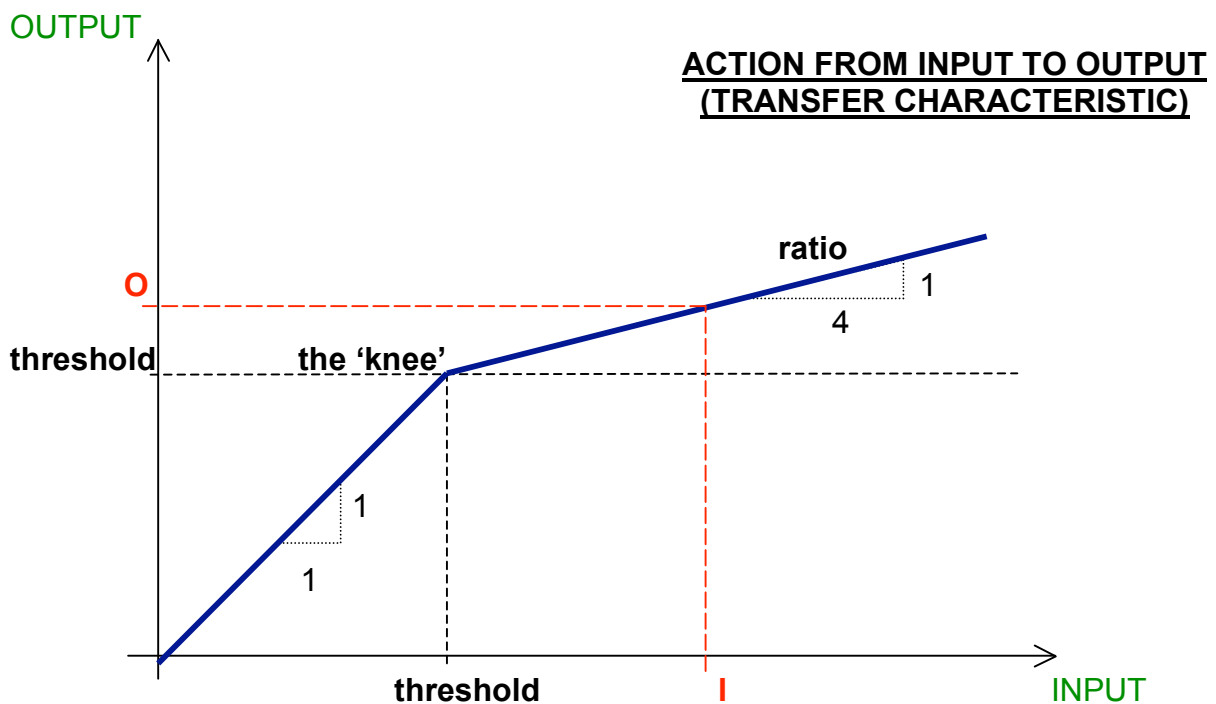
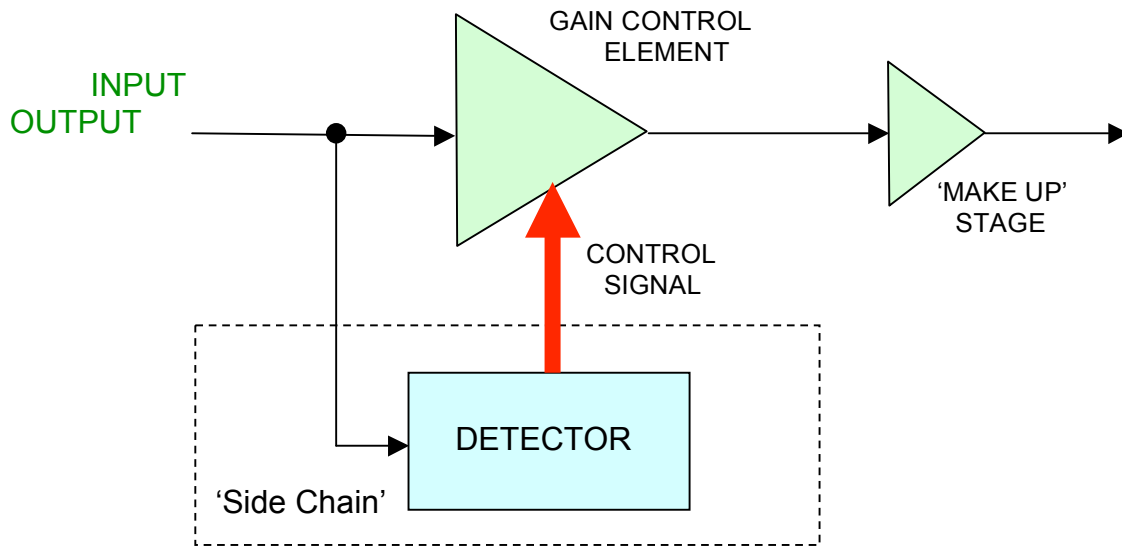
If we imagine someone watching a signal level meter and having control of a volume fader (the gain) connected after the meter. The fader is normally set to 'unity gain' (i.e. it does not amplify nor attenuate) and there is a **threshold** mark on the meter.

Now when the signal level is below the mark, the operator leaves the fader where it is; but when the level goes above the mark he turns the fader down (relative to how much the signal increases) and only returns it to unity when the signal falls back below the mark again.

This is basically what a compressor does, but obviously automatically and with significantly faster reaction times.

## A Typical Modern Compressor

### BLOCK DIAGRAM



Up to the **threshold** point the compressor is set at unity gain (1:1 ratio), but above this point **gain reduction** is applied depending on the chosen setting of the **ratio** (the compression 'strength' and gradient of the characteristic, for example here 4:1).

When the level of the input signal exceeds the **threshold** the output will be reduced, but while the input stays below the **threshold** the signal passes unaffected.

For example on the previous diagram it can be seen that instantaneously a given input signal above the threshold (**I**), measured on the horizontal axis, will cause a lower output level (**O**), measured on the vertical.

This loss of volume by the action of the compressor can be then be restored (for instance to make a clear comparison with the bypassed uncompressed signal) by an additional amplification stage known as the **output** or **make-up gain**.

### **Compression Reaction Times**

The **attack time** varies the reaction of the compressor when the signal goes over the threshold.

A fast setting will catch sounds as quick as possible keeping them under control, a slower setting (10 mSec. or more) allows the front edge of sounds (the transient) to pass through before the compressor begins to work. This can help signals sound more percussive or punchy and not so squashed.

The **release time** determines how quickly the compressor will return to unity gain after the signal has dropped back below the threshold. No surprise then that this was called the 'recovery' time on some older units.

Generally this can be set fast (40-100 mSec.) for sound events that occur fast and furiously, longer when less frequent and sustained.

### **Other Relevant Points**

High ratio compression (20:1 and above) is often called **limiting** and may be presented as purpose designed units or plug-ins.

The side-chain detection may be set to respond to the peaks of the signal (fast action) or the average (often called RMS) signal level. The latter will produce a less obviously compressed (or more 'transparent') sound, as would a low ratio setting (2:1-3:1) and/or a **soft-knee** setting (a gradual increasing of ratio around the threshold point).

Over the years compressors have employed different types of circuitry and electronic devices, which naturally produces different measured and audible characteristics. Here is a summery of the most well known:

- valves are known for their warmth and smoothness e.g. Fairchild, TLA, ...
- optical devices are regarded 'musical' if not precise or fast reacting (their characteristic also shows an increasing ratio with level) e.g. Teletronix (now Universal Audio) LA-2A, UREI LA-3A, Joe Meek, Focusrite Platinum range, ...

- discrete transistors can be more precise and severe e.g. UREI (now Universal Audio) 1176. ...
- VCA chips (the most modern design) are fast, precise and very variable e.g. DBX, Aphex, Alesis, ...
- Software plug-ins are now made that emulate all of the above e.g. Waves, Universal Audio, Bomb Factory, ...

... **BUT YOU** should hear this equipment and learn to recognise their sonic signatures and practical applications !!

### SO WHERE DO I START WITH COMPRESSION SETTINGS?

Here are some suggested start points :

- ratio to an average setting (say 4:1)
- attack time about 10-15 mSec., release time 80-100 mSec.
- adjust the threshold so that a reading of 3-6 dB shows on the gain reduction meter
- trim the make-up gain up about +2 dB and set so that the perceived signal volume is the same when the compressor is bypassed.

Note threshold and make-up gain will need re-adjustment when different settings are tried (all the parameters interact to some degree).

A/B-ing and listening to the result in context are useful methods to determine whether your setting is good or not.

It's always useful to develop some idea of what you are trying to achieve from simply listening to the original sound, this will give you direction when making adjustments. But of course (and certainly initially) experimentation can work too.

## **Further Investigation**

**NOW** you should put 'compressors' into your favourite search engine, read any article you find on compression, absorb any more practical tips you come across **AND (most important)** try/test the application of these devices in your music.