5ORCERY

Meta-Multiband Compressor

User Manual – version 1.0

Introduction

Multi-band compression using dynamic EQ.

The traditional way to build a multi-band compressor is to split the signal into the required number of bands (five in this case) using cross-over filters, then run each band-through a separate compressor before mixing them back together again. This approach tends to cause phase problems around the cross-over frequencies, requiring sophisticated filter designs to minimize these effects.

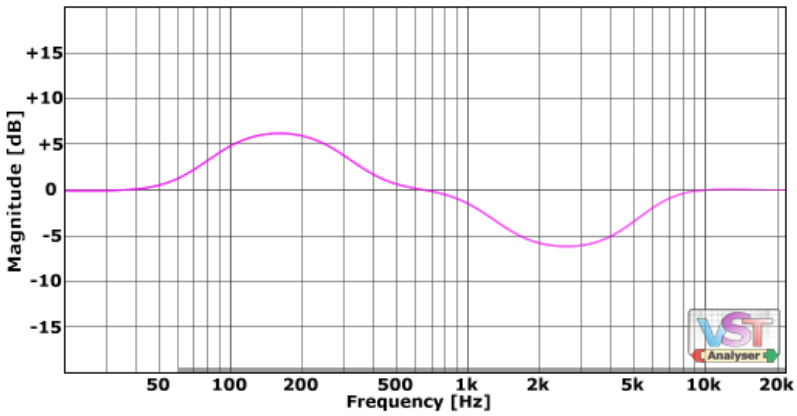
5ORCERY takes a different approach: the signal is still split into five separate bands using cross-over filters, and these feed the side-chains of five separate compressors. But the filtered signals are not mixed back together again: instead the gain modulation signals from all five compressors are matrixed into modulation signals for 4 dynamic shelving filters plus a gain stage.

To put it another way: while this plug-in behaves like a multi-band compressor, and allows you to solve many of the same problems, it is in actual fact a constantly changing 4-band equaliser, and when it isn't doing anything, it *really* isn't doing anything!

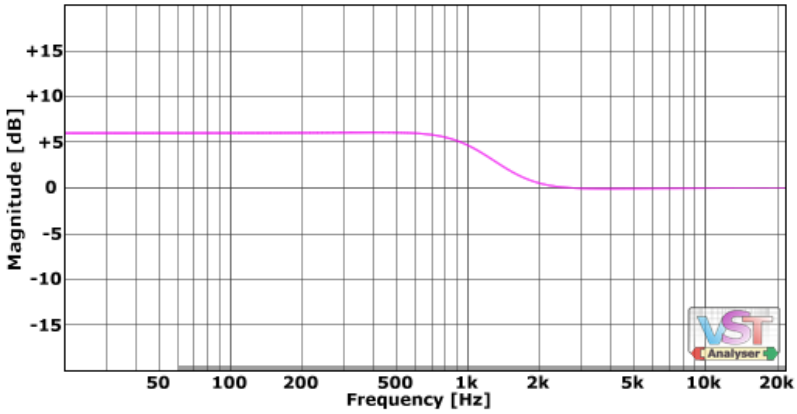
I have therefore dubbed this approach *meta-multiband* compression: all the benefits of a multi-band with none of the usual side effects. Use it wherever you like, on channels, sub-groups or mixes.

EQ filters

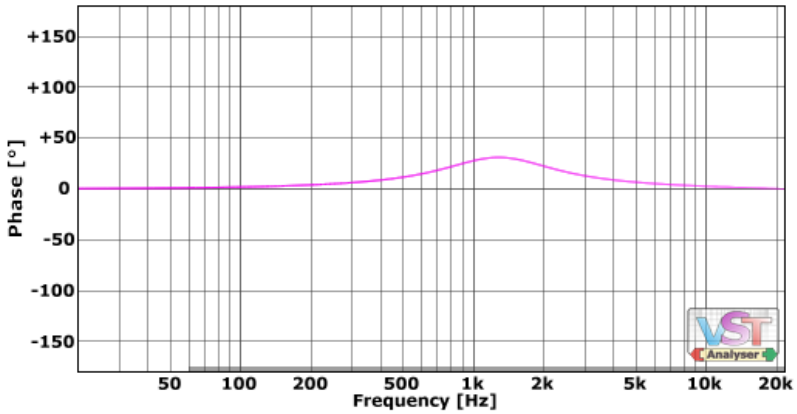
These four dynamic low-shelving filters are the only filters in the actual audio path: they control the *gain difference* between each band, and are calculated at sample-rate so they can react just as quickly as a simple gain stage. The result is a gentle and transparent transition between each band, with no nasty phase anomalies: here's a plot showing the result of a 6dB boost in the “Bass” band combined with 6dB of gain reduction for the “Hi-Mid” band, with the default transition frequencies.



As a bonus, when two adjacent bands have the same gain the shelving filter between those bands will be doing nothing at all. In mathematical terms, it will be literally just multiplying by 1. The plot below shows a 6dB boost for bands 1 to 3, with bands 4 and 5 at unity:



In this case the only processing taking place is a low-shelving boost at 1.28KHz. The other filters at 80Hz, 320Hz and 5.12KHz are effectively not there. If we look at the phase response for this same setting we can see a mild and gentle phase shift around the 1.28KHz transition frequency, and nothing else:



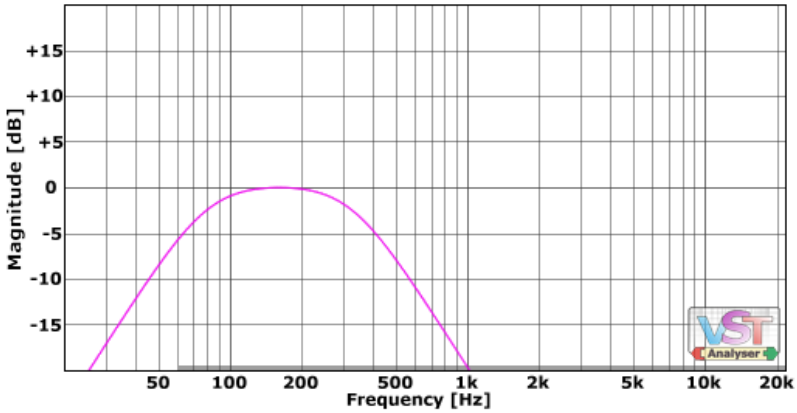
The transition frequencies default to 80Hz, 320Hz, 1.28KHz and 5.12KHz, but can each be tuned up to an octave higher or lower using the parameters at the bottom intersection of each band. Of course, these parameters also determine the frequencies for the filters that process the side-chain.

Sidechain filters

5ORCERY uses mild and gentle 12dB per octave filters for the side-chain, to match the gentle transitions of the main EQ filters. The first four bands all pass through a high-pass filter plus a low-pass filter, while the final “Treble” band only has a high-pass filter with no upper limit.

You can listen to the side-chain filters by pressing the Solo button for that band: this will solo that band's filters, and also enables a dynamic gain stage so you can hear any compression applied to that band.

Soloing the “Bass” band with default settings produces the following frequency response:

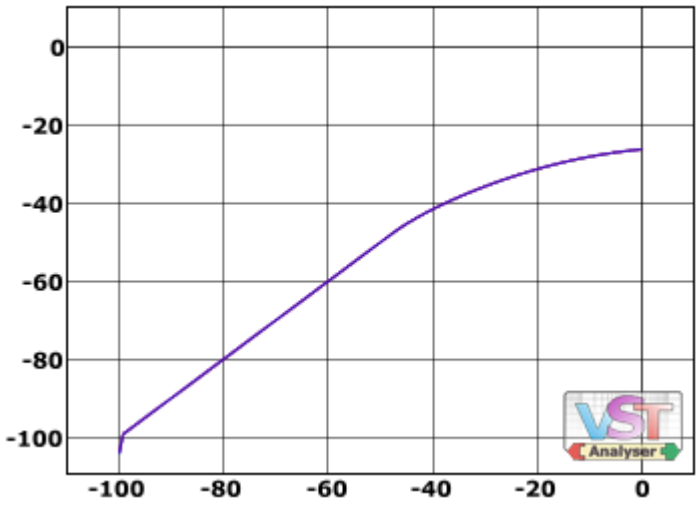


You can solo multiple bands at the same time if you wish. In fact, you could solo all 5 bands at once to create a traditional style multi-band which mixes the filtered signals back together again. But of course (as my cross-over filters are not optimised for this) the result will be a very lumpy frequency response, and I don't recommend it! Active solo's can be reset individually, or with the global reset button at the bottom.

The high-pass frequency for the lowest “Sub” band is fixed at 20Hz. The other four critical frequencies are determined by the transition frequencies for the main signal path. So, with the default transition frequencies the “Lo-Mid” band will be high-pass filtered at 320Hz and low-pass filtered at 1.28KHz, while the “Treble” band will just be high-pass filtered at 5.12KHz

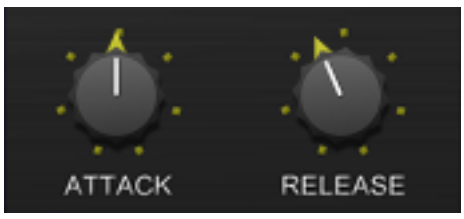
Compression

The compression algorithm used is the same as my FL4TT3RY 2 plug-in, which was in turn "inspired by" a specific hardware compressor that I use a lot while tracking. This design dispenses with the conventional Ratio parameter, and instead implements a very soft knee compression transfer, with the ratio very low around the threshold, but then gradually increasing to eventually become hard limiting. The higher ratios at the upper end of the graph benefit from the extremely soft knee, so the compression remains remarkably transparent even when applying large amounts of gain reduction.



Compression can therefore be quickly and intuitively dialled in with just the Threshold knob: turn this *up* to *reduce* the threshold, and therefore *increase* the compression. You can then use the Gain knob next to it to set a fixed "make-up" gain, and thereby increase the average level of that frequency band.

The Attack and Release knobs control the smoothing applied to the gain modulation signals. Turn these down (anti-clockwise) to make them faster, and up (clockwise) to make them slower. I haven't attempted to calibrate these controls: this is partly because there is no standard way to measure these settings, so the values displayed by most compressors are actually pretty meaningless, and partly because the smoothing applied is highly program dependent, so the actual values always depend on the input signal as well as the settings.



Attack

This controls how quickly the gain is reduced in response to incoming signal peaks. The default setting of halfway up is a good general purpose setting that should work well with most material: turning the knob to the left will make the compression respond more quickly, which will tend to squash signal peaks more brutally, and can help to make the audio sound “fatter”.

Conversely, turning the knob to the right to dial in slower attack times makes the compression respond more slowly, so more of the initial transient spike at the start of each peak will squeeze through. This can help to emphasize the attack, and can help to make the audio sound “punchier”.

Release

This controls how quickly the compression recovers back to unity after a peak in signal level. Fast settings result in higher average signal levels, as the gain rides back up again much more quickly after each peak. But fast settings can sometimes cause distortion (especially with low frequency signals, so listen out for this when setting the “Sub” and “Bass” bands in particular) and can sometimes also sound “hyped” and unnatural.

Slower release times will usually sound more natural and less processed, but as the gain takes longer to recover, the quiet parts in between each peak will not end up as loud as with the faster setting, so average levels will not be as high. Also worth bearing in mind: if the release time is slow enough that the gain is still recovering when the next transient comes along this will reduce the transient shaping effect of the attack time setting as well. Once again, the default halfway setting should be a good starting point for most material.

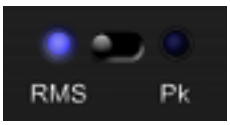
The release time can also have a powerful influence over the “glue” effect that can come from compressing a full mix. However, this is often better achieved using full-band compression, so make sure you try a good conventional stereo compressor before reaching for a multi-band.

Note: the points above regarding attack and release times are generally true of all compressors, but the specific attack and release characteristics can vary dramatically depending on the compressor design. As far as I am aware, the FL4TT3RY 2 algorithm is unique, and none of my other compressor plug-ins respond in quite the same way. You should also be aware that the gentle curves and program dependency tend to make 5ORCERY sound pretty transparent with most settings: if you are after radical and brutal dynamic shaping this is probably the wrong plug-in. But the attack and release parameters nevertheless provide subtly powerful ways to change the dynamics of your source material, and will reward careful setting up.

Here's a useful exercise: try running an acoustic drum loop through FL4TT3RY 2 with a healthy amount of compression applied, then play around with different attack time settings while listening carefully to the effect this has on the transient peaks. Then experiment with different release times while listening for the effect this has on the decay of the drums, and on the ambient room sound. Now bypass FL4TT3RY 2 and load 5ORCERY instead: if you dial in some compression for the Treble band you can use the Attack and Release controls for that band to shape the dynamics of just the hi-hats and cymbals. And you can use the Bass band to shape the low thud of the snare and toms, or the Sub band to control the low weight of the kick drum.

Level Detection

Each band also provides a choice of two different level detection methods: RMS detection keys from average levels, while Peak detection keys from instantaneous peak levels.



RMS averaging closely resembles the way human hearing works, so use this if you want the compression to key when something *sounds* too loud, eg: when using the Hi-Mid band to tame the harsh painful region of a female vocal when singing loud.

Peak detection on the other hand can be useful when shaping the transients of drum parts, and for more aggressive control of peak levels for volume maximizing.

There are no rules however: RMS averaging can sometimes sound great on drums, and peak detection might sometimes be better for vocals: try them both and use whichever you like better, but be aware that you may need to adjust the Threshold to achieve a proper comparison.

Metering

Each band features a large gain / gain reduction meter at the top.

Left clicking any of these meters switches the display range for all of them. Three different ranges are available: the medium 12dB setting is shown above, but there is also a 6dB setting for subtle mastering type situations, and an 18dB setting for massive squashing.

You can also right-click any of these meters to switch them all from the “Gain Reduction” mode shown above to the “Gain” mode shown below:

This mode also includes any static make-up gain applied with the Gain knob, so is therefore bi-directional with zero in the centre. While Gain Reduction mode may be more useful when judging the Threshold setting, Gain mode can be more useful when judging how much make-up gain to apply, as you can easily see how the overall gain swings around unity. The screenshot above shows the subtlest 6dB range setting, with just 3dB of gain change displayed each side of unity.

External Side-Chaining

Each band also features an “Ext” button, which switches the compressor side-chain for that band to the extra pair of inputs provided.

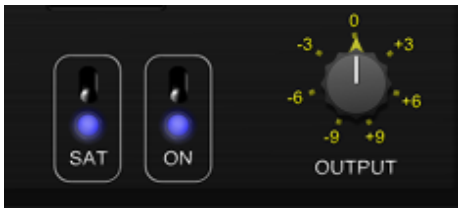
This provides a range of advanced options: you could patch in some extra filtering or dynamics processing for the side-chain to tweak the response of the compression. Or you could route an entirely different signal to the side-chain to create “ducking” effects for specific frequency bands. Eg: you could duck the low frequencies of a bass guitar whenever the kick drum hits, or you could duck the hi-mids of a distorted guitar whenever the snare drum hits.

Be aware that the external side-chain inputs are still processed by the internal side-chain filters, so if you route a full drum loop to the side-chain, the Sub band's compression will be triggered by the just the lowest frequencies of the drum loop.

Bypass

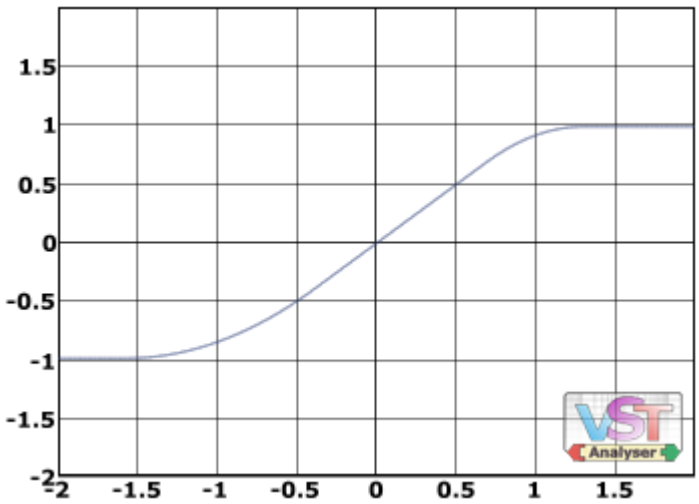
Each band can be bypassed individually using the blue button at the bottom left of the compressor section. in which case the compression for that band is disabled and the gain set to unity, and the “lamp” is turned off for the meter as a visual reminder:

Of course you can also bypass the entire plug-in using the master ON switch at the bottom. This bypasses all processing, including the main Input and Output gain stages, and the Saturation stage if it's enabled.



Saturation

This is also the same algorithm used in FL4TT3RY 2: a relatively gentle parabolic saturator which will keep your signal peaks just below full scale. The design is assymetric, with a gentler curve for negative peaks than for positive, and can tame short transient peaks very transparently.



Note: the saturation stage is not over-sampled, so the plug-in remains zero latency with all settings. This does make aliasing a potential problem however, so I recommend running sample-rates of 88.2 or 96KHz if you are using the saturation in a mastering context, or on signals with lots of high frequency content.

Presets

I've included a number of presets to serve as starting points. The easiest way to tweak these to suit your material is to re-balance the gain structure through the plug-in using the Input and Output gains controls: turning the input up and the output down by the same amount will drive the compression harder, while doing the opposite will tame the compression into a gentler version.

Credits

Made with Synthmaker

Graphics created with Knobman, Skinman and GIMP

Thanks to Bootsy for the RMS detector code.

Dan Worrall
June 2011

www.platinumears.com