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Dynamic Equalisation Part 1

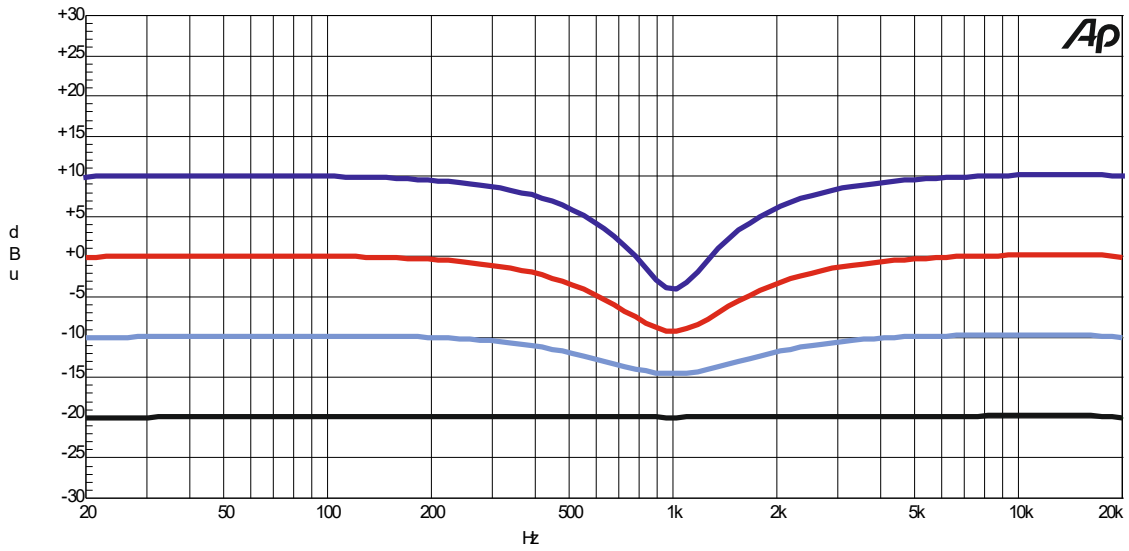
How it works and how to use it to your advantage

What is Dynamic Equalisation?

Dynamic Equalisation (DEQ) is essentially a compressor or expander that can be set to respond to and adjust the gain automatically over a certain range of frequencies. Its behaviour is dependent on the mode chosen – two of these are relatively "traditional", as discussed in part 1 of this document, whilst two modes offer the possibility to turn the normal action of compressors and expanders on their head introducing innovative adaptive control of the program material.

"Cut Above" Mode

This is one of the more traditional modes of operation. Having selected the frequency band to work with, the dynamic eq will "listen" to this band and act upon it by cutting (compressing) any frequencies present in it that exceed the threshold. Consider the example below where the threshold is set to –20dB, and the selected frequency band is centred around 1kHz, with a 'Q' of 1.0.



Signals below the threshold will pass unaltered, but as increasing signal is applied, those frequencies centred around 1kHz will be cut or compressed. The ratio in the above example is set at 2:1 so, as with any compressor, the amount of gain reduction applied depends on how much the signal exceeds the threshold. The red line represents a signal at 0dB, which is 20dB above the threshold. At 1kHz, therefore, the signal has been compressed to –10dB or 2:1.

Uses of "Cut Above" Mode

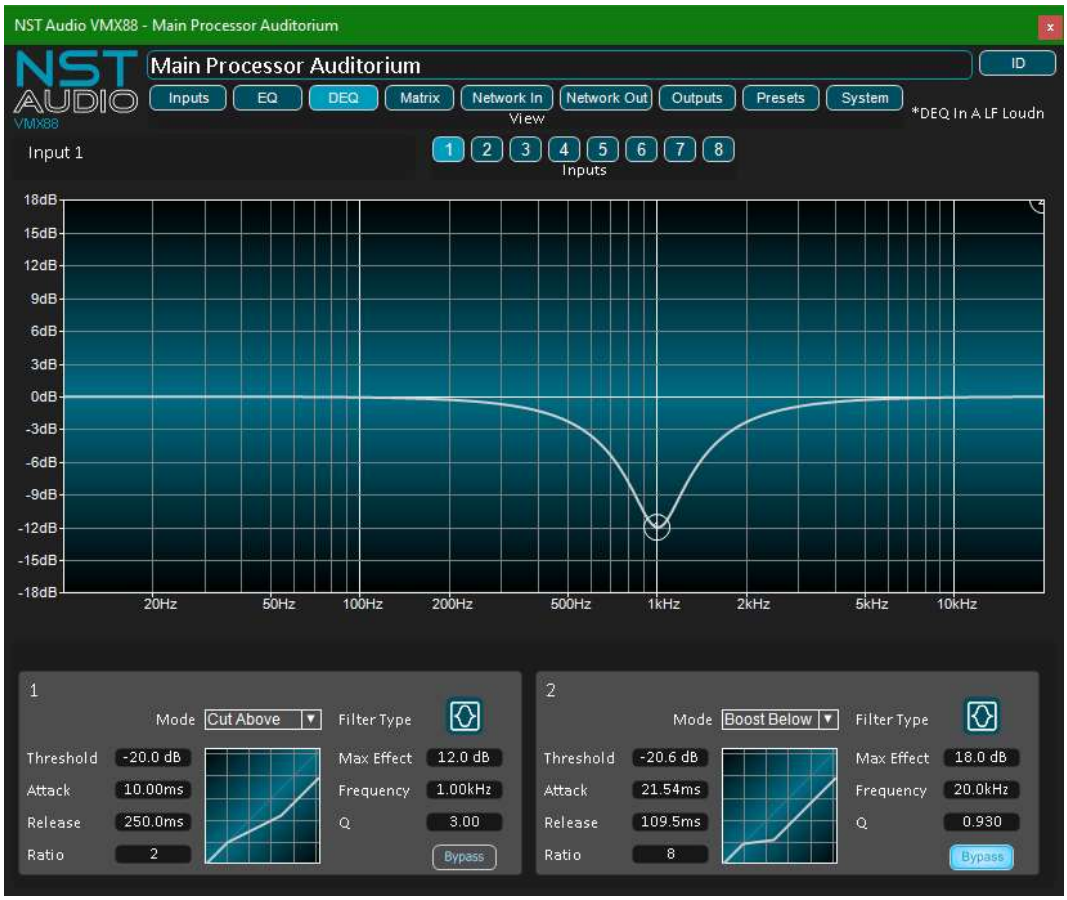
Traditional use of 'frequency conscious' compression is to control or 'tame' a certain band of frequencies within the program material. Insertion of EQ into the sidechain will make the compressor respond to the required band, but it will cause broadband compression of the signal, so any peaks will cause the entire signal to be compressed. This produces the familiar problem of dulling the material if it is bass-heavy, or causing unnecessary dips and changes in ambience when attempting to remove sibilance.

The difference with dynamic EQ is that only the band selected is compressed. This means that it becomes possible to compress the low frequency content of material with no detrimental effect on mid-range or high frequencies. The result is increased volume and perceived level without sacrificing clarity. Any instance where the desired result is to control a band of frequencies, such as de-essing, or de-popping, with minimal effect the surrounding frequency ranges is an ideal use for this mode.

Try de-essing with the filter centred at 8-9kHz, and a relatively narrow 'Q' of 3.2, and a maximum effect of 12dB, attack 1mS, release 100mS.

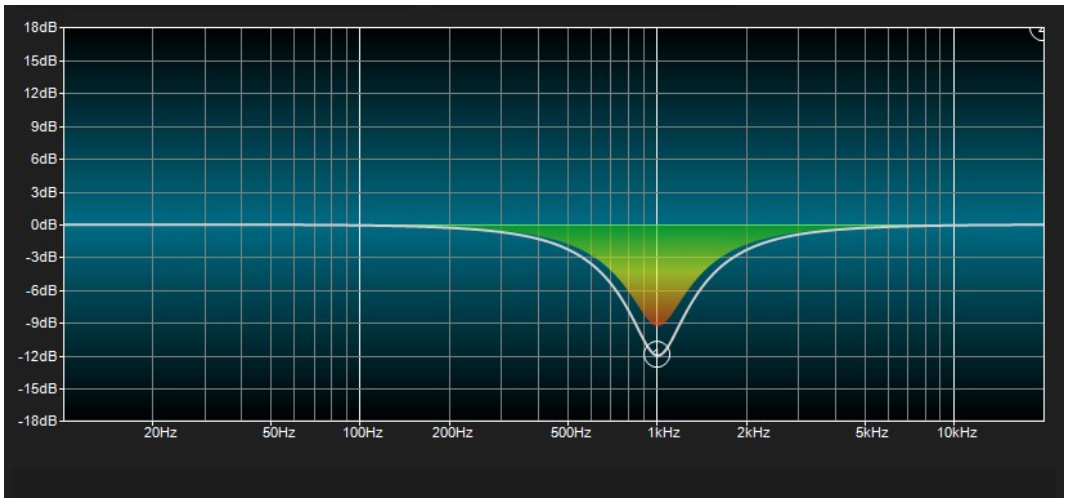
How It Looks In D-Net

The response curve displayed on the DEQ pane in D-Net , in the absence of signal, shows what will happen to the audio when it crosses the threshold. The white curve shows the maximum affect that will be applied and this value is affected by adjusting the "Max. Effect" parameter for that band. The curve node can also be dragged up and down to adjust this value. Remember that this is the ceiling or limit to how much gain adjustment is allowed. This parameter is not normally offered for standard dynamics processing (apart from noise gates – the equivalent is the "Range" control).



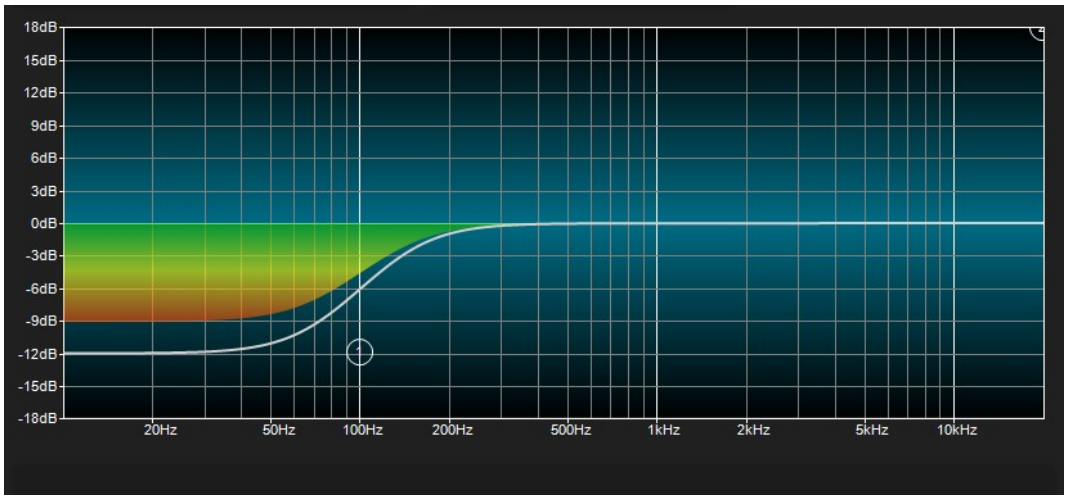
The mini I/O graph in the parameter section shows the Threshold at which gain change will start to happen (the lower knee), and the steepness of this is affected by the Ratio. The upper knee point will move with the value of the "Max Effect" setting, showing that audio exceeding the [Threshold + the Max Effect] point cease to adjust the gain further – so the graph returns to a 45 degree line (or 1:1 ratio) once more.

As the signal exceeds the threshold, the curve will begin to fill in real time response to the audio, with this behaviour determined by the time constant controls of attack and release.



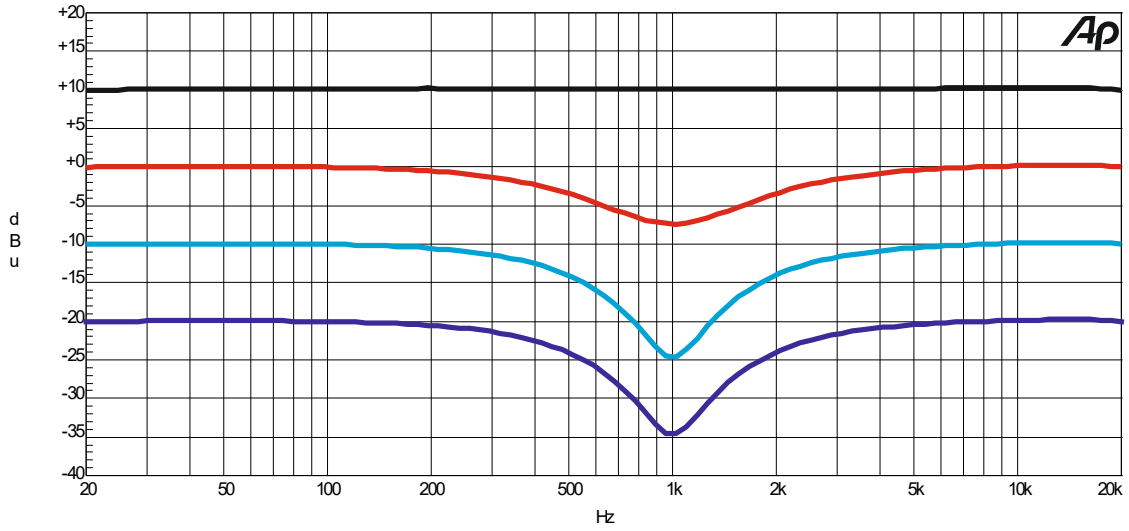
Adjusting the signal level will vary how much the curve fills and the relationship between the “Max Effect” and Threshold controls can be easily seen by turning the incoming audio up and down and observing the effect.

Note that the filter type can be changed from a standard parametric response to a high or low shelving filter whose gain adjusts dynamically in the same way. This is useful, for example, in controlling LF response as signal level increases, where a normal compressor would cause the audio to become dull if used. Enable “Bypass”, then press “Filter Type” and choose high or low shelf or PEQ. Below is a band set to control LF with a shelf:



“Cut Below” Mode

Having selected the frequency band to work with, the dynamic eq will listen to this band and act upon it by progressively cutting any frequencies present in it that drop below the predetermined threshold. Consider the example below where the threshold is set to +10dB, and the selected frequency band is centred around 1kHz, with a ‘Q’ of 1.0.



Signals above the threshold will pass flat, but as the level decreases, those frequencies centred around 1kHz will be cut or expanded. The amount of gain reduction applied depends on how much the signal drops the threshold and the ratio set – a 2:1 ratio would mean that for every drop of 1dB below the threshold, the band centred around 1kHz would drop by 2dB.

Uses of “Cut Below” Mode

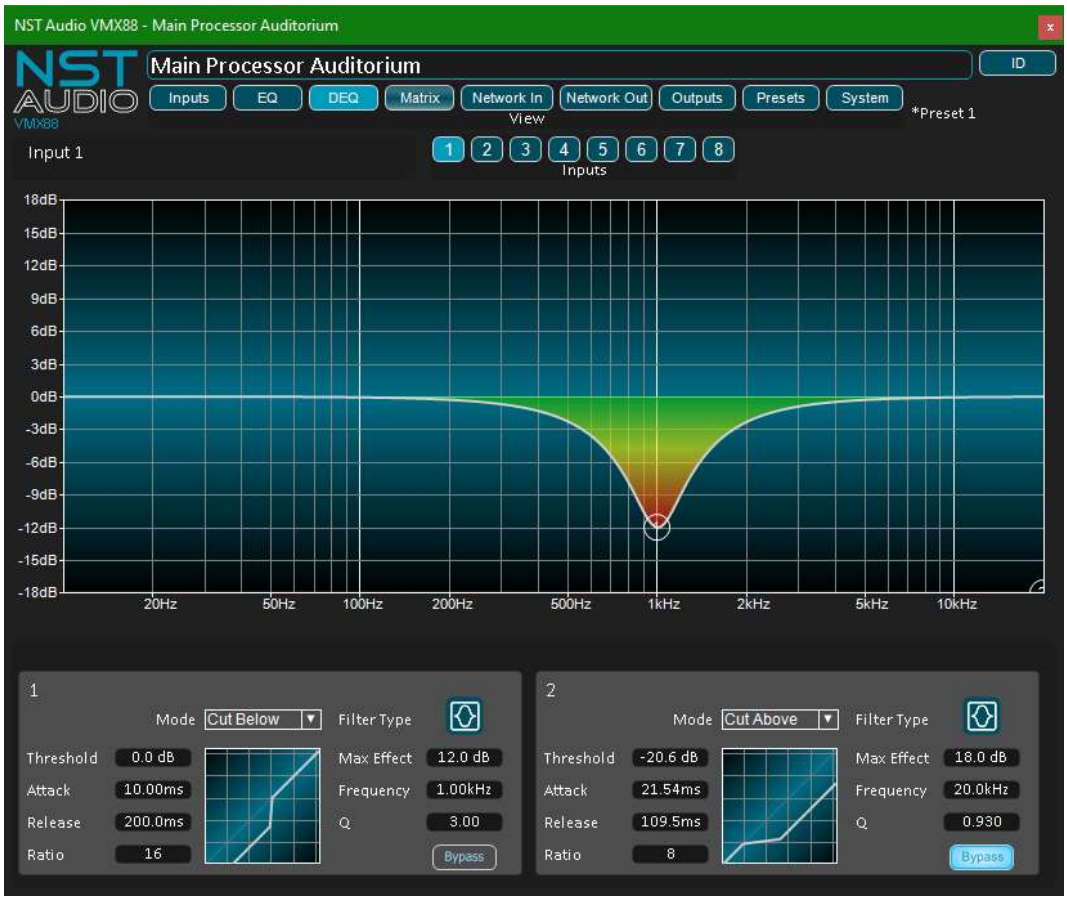
Reducing the level of high frequency noise can be effectively implemented in this mode. Particularly effective on percussive material, unwanted ground noise and interference can be usefully masked without affecting the signal at normal levels.

Try the filter set to a wide band at 8kHz, and a maximum gain of 12dB, attack 25mS, release 100mS. The threshold setting is more crucial in this mode than usual, with the trade-off being effective removal of noise against possible intrusive dulling of the program material.

Try experimenting with the high shelf mode instead of a parametric EQ, if wider band hiss is the problem instead of a specific objectionable band, and remember that the release time is very important on percussive material if the noise is not to be audible as “pumping”. Use faster attack and release on instruments with more impulsive envelopes.

How It Looks In D-Net

As this mode takes action as the signal drops below the chosen threshold, in the absence of signal it will show full gain reduction up to the Max Effect level. The mini I/O graph in the parameter section shows that when the signal drops below the Threshold (the upper knee) the gain will be reduced by an amount determined by the Ratio. Below the level of the [Max Effect – Threshold] the gain will not further reduce so the graph shows a 1:1 ratio once more. The Max Effect therefore controls not just the low point on the dynamic curve, it also moves the lower knee of the I/O graph.



Observing the dynamic effect of audio on the frequency response shows that as the signal level increases, there will be less and less filled in. If the signal stays above the threshold, the curve will simply show the white outline.

Adjustment of the attack and release times will affect the speed of response of the gain reduction action, and this is reflected in the dynamic nature of the curve fill.

What About The Other Two Modes?

The slightly more esoteric nature of the Boost Below and Boost Above modes is covered in Part 2 of this Tech Library article. Find out how they can be used as creative tools instead of just corrective tools...