BAG END

INFRA PROCESSOR vs DSP

T E C H N I C A L N O T E

An often asked question is how to emulate our Infra processor in commercially available DSP's.

There are a number of Bag End loudspeakers installed using a commercial DSP set to emulate the Infra processor. This does work, although there are some drawbacks. It is useful to listen and compare as including an Infra processor is often worthwhile.

The Bag End Infra bass processor is an analog dual integrator developed in the late 80's and commercially introduced in the early 90's. The integrator has 110 dB of dynamic range and typically -100 dBu self noise. The implementation of this simple circuit has been perfected over time.

In the frequency domain even a modest DSP as the one in the graph can duplicate the frequency response well enough to make the bass mostly sound like a Bag End bass system. Looking at the Infra processor in comparison, you can see the noise in the upper range (above 500 Hz) is much lower and while this seems better (and it is) realistically it is not important as the response of the woofer cone is falling off so the higher noise floor is not reproduced audibly.

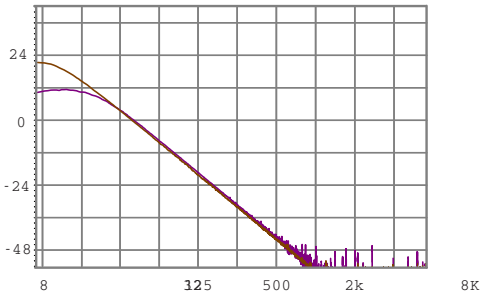
In studio and mastering facilities or other critical listening environments the lower extension is useful for monitoring and also sounds noticeably better. Many DSPs do not respond below 20 hertz. The graph shows the extension with the Infra processor is another octave lower.

One very important aspect of making our systems practical is the protection scheme. The Dynamic Filter leaks the integrators via a voltage controlled detector. You set the detector threshold as you would with a limiter but rather than limiting the entire band the dynamic filter dynamically reduce the bass extension. This is an elegant solution to protect the system as it is not audible. In comparison the conventional approach is a band limiter which reduces the entire bass range. This also changes the crossover point and is audible. Crossing the threshold, the Dynamic Filter reduces the lower bass level but still plays the note at the maximum safe level and leaves the rest of the middle and upper bass unaffected. This allows practical use of the extended bandwidth as there is no power penalty for allowing the low extension. It allows the system to be used safely to its maximum level while never sounding compressed or protected making any design more efficient.

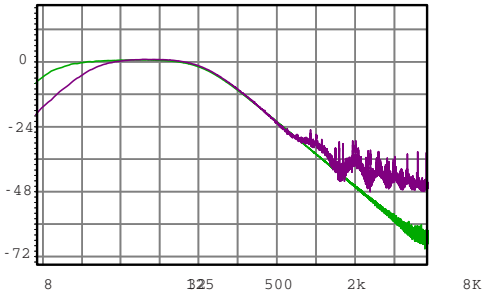
Reducing the low bass is not audible as there are many sounds in nature that do not have low bass content. Unless you know the material and are expecting low bass content you do not miss it. Full band compression is not natural and is audible.

It is easy and reliable to set the protection threshold so systems do not distort or break. First, size the amp to the speaker then, set the threshold on the processor to engage just before the amp would clip, thus preventing it from clipping. Self processed powered systems have this internally set.

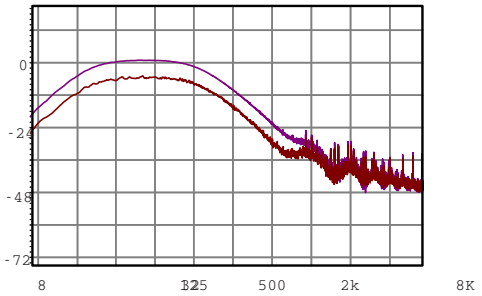
Graphs show the typical difference between a DSP processor set to imitate the Infra processor and the Infra processor. The loudspeaker response is an accurate computer model, not an acoustical measurement.



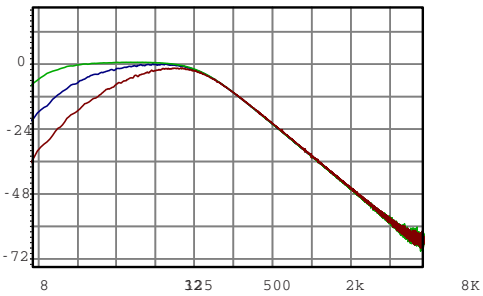
1. Response of Bag End Infra and DSP processors. The Infra processor continues to rise below 20 hertz.



2. Response of processors with loudspeaker simulation. The DSP has higher noise in the upper range, this noise is not audible as the bass speaker response does not reproduce it.



3. Response of DSP processor and loudspeaker simulation with and without limiting protection. The DSP limiter reduces the entire bass band there by changing the upper crossover frequency.



4. Response of Bag End Infra processor and loudspeaker simulation with and without dynamic filter protection. The Dynamic filter reduces the lowest frequencies as required protecting the system where the most power is required. It does not effect the middle and upper bass range and leaves the upper crossover point unaffected.

BAG END Loudspeakers
22N272 Pepper Road
Lake Barrington, Illinois
60010 USA
Voice 847 382 4550
Fax 847 382 4551
www.bagend.com

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