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 in the system 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 less than 100 dBu self noise. The implementation of this simple circuit has been perfected over time.

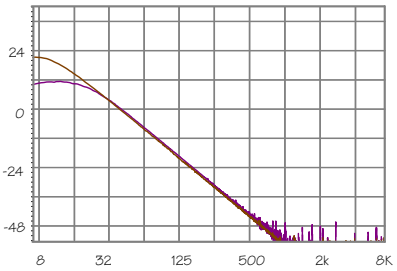
In the frequency domain even a modest DSP, as the one used in the graph, can duplicate the frequency response well enough to make the bass mostly sound like a Bag End bass system. Looking at the Infra processor in comparison, you can see the noise in the upper range (above 500 Hz) is much lower and while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

In a recording studio, mastering facilities or other critical listening environment the subsonic lower bass extension is useful for identifying unwanted low frequency noise on recordings. In addition the extended low frequency response also extends the phase response making the lower bass more musically connected in the time domain. This sounds noticeably better. Many DSPs do not respond below 20 hertz. The graph shows an octave lower extension with the Infra processor.

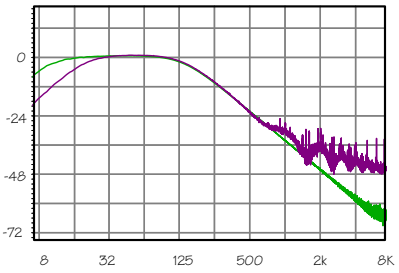
One very important aspect of making our systems practical is the protection scheme. The Dynamic Filter leaks the integrators via a voltage controlled detector. Setting the detector threshold as you would set a limiter keeps the system from distorting or damage. But rather than limiting the entire band the Dynamic Filter dynamically reduces the bass extension only as needed.

This is an elegant solution to protect the system as compared to a band limiter. A modest amounts of Dynamic Filter protection is not audible while a band limiter reduces the entire bass range, changes the crossover point and is very audible.

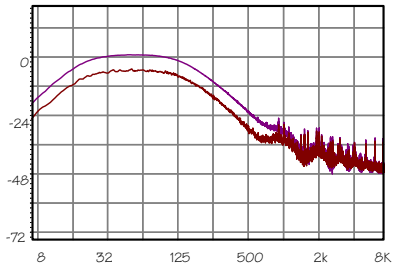
Graphs show the typical difference between a DSP processor set to imitate the Infra processor and the Infra processor. In these graphs an electrical hi pass filter is used to simulate the acoustical response of the loudspeaker. These are not acoustical measurements but are representative of the actual acoustical response.



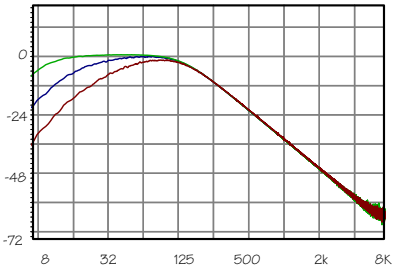
1. Electrical response of the Bag End Infra dual integrator and DSP processor. The Infra processor continues to rise below 20 hertz.



2. Response of Infra and DSP processors and loudspeaker simulation. The Infra response goes lower and the DSP has higher noise in the upper range. This noise is typically not audible as the bass speaker's 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 thereby 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 amplifier power and loudspeaker cone excursion is needed. It does not reduce the level of the middle and upper bass range and leaves the upper crossover point unaffected.

Crossing the threshold, the Dynamic Filter reduces the lower bass level but still plays the lower bass at the maximum safe level and does not effect the middle and upper bass range. This provides practical use of the extended bandwidth as there is no power penalty for allowing the extended low frequency response. The Dynamic Filter allows the system to be used safely to its maximum level without sounding compressed or protected.

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

It is easy and reliable to set the Dynamic Filter threshold. 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. If the amplifier has much more power than the speaker can handle then measuring the voltage of a test sine wave at the speaker and setting the threshold as required is the best method. Listening for stress and lowering the Dynamic Filter threshold may also be useful but not as foolproof. Our self processed powered systems have the threshold internally set.

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