

## Feedback Controlled Room Adaptable Subwoofer

We are all familiar with the chronic listening room problem provoked by room low frequency resonance or standing waves (modes). Any enclosure, especially the ones with opposing walls, including listening rooms and large vehicles such as SUVs are susceptible to this problem. These standing waves, especially the first one, cause wildly uneven distribution of bass energy, yielding boomy, ‘one-tone’ quality bass at some locations in the listening room (e.g., near the side walls and the middle of the room along the longest dimension of the room). This problem, known as *room coloration*, causes the performance of a subwoofer to depend heavily on the listening room.

A patent-pending, feedback controlled, **electronic bass trap** technology is developed at DEICON which smoothes out the bass by adding acoustic damping to the first or the first few standing waves of the listening room. This technology can be imbedded in the electronics of a powered subwoofer **enabling it to adapt to the acoustics of a room**. An innovative internet-based approach is also developed to assist buyers tune the product to their particular listening/recording environments.

Electronic bass trap uses feedback control techniques for reducing the boominess of sound at frequencies corresponding to offending (coloring) standing waves of a room. These controllers can be tuned to a single (or multiple) resonant bass modes and abate sound coloration at their corresponding resonant frequencies. Figure 1 shows the acoustic frequency response of a small room excited by a subwoofer with and without the electronic bass trap system. The room is rectangular shape with the longest dimension (length) of 172 inches, having a dominant coloration due to the 38 Hz standing wave that shapes up along the length of the room. Clear from Figure 1, the subwoofer equipped with electronic bass trap, which was tuned to the frequency of the first standing wave, has effectively reduced the coloration due to that mode.

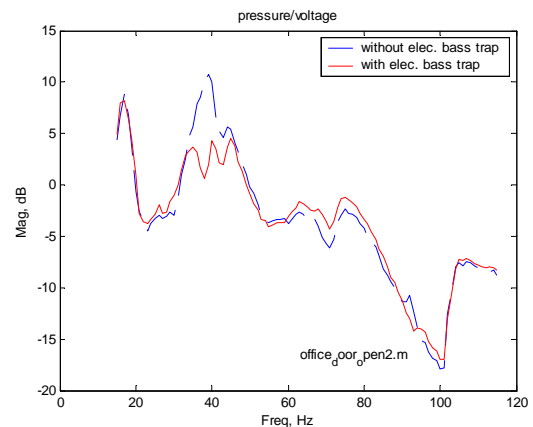


Figure 1 Frequency response functions with the controller on (solid line/red) and off (dashed line/blue)

In addition to being tunable, the electronic bass trap is highly reliable, robust, cost-effective and *small in size (practically the size of a subwoofer)*. The feedback controller is built in a low-cost op-amp electronic circuit. What electronic bass trap technology does is somewhat similar to what ‘room adaptive bass optimization system (RABOS™)’ incorporated into the Infinity™ 's PRELUDE MTS™ speaker system does, except DEICON’s electronic bass trap uses a completely different technology to do it.

RABOS allows the user to tailor the bass output of the speakers to the unique dimensions (geometry) of his/her listening room using an adjustable parametric equalizer operating at 100 Hz and below, nulling out the main low-frequency room mode. Figure 2 shows the frequency responses of a room without (solid line) and with (dotted line) Infinity’s RABOS technology. Note the coloration due to the first standing wave of the room is abated by RABOS technology.

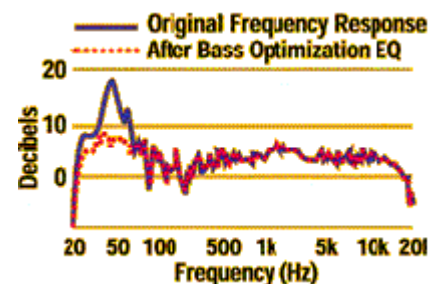


Figure 2 Room frequency response with Infinity PRELUDE MTS™ system