Subject: Frequencies of interest
Posted by Wayne Parham on Wed, 14 May 2003 17:53:38 GMT
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Yes, tuning the Helmholtz frequency to match that of the motor will reduce its excursion. This in turn will reduce distortion. But it is also important to note that system tuning affects a region and not a specific frequency. The mechanical resonance of the woofer is shifted upwards by putting it in a box, and this new resonant frequency is denoted as Fo.In a bass-reflex system, you have five frequencies of interest - Fs, Fo, Fb, Fh and Fl. Fs is the woofer's free air resonance, Fo is the mechanical resonance that's been shifted by putting the woofer in the box and Fb is the resonant frequency of the box, it's Helmholtz frequency. Fh is the upper frequency of highest impedance, sometimes called the upper resonant frequency, and Fl is the lower frequency of highest impedance, the lower resonant frequency.The upper resonant frequency (Fh) is usually nearly coincident with the enclosed woofer's resonant frequency (Fo). They actually aren't the same, but they are near enough that the port damps the woofer's resonant frequency by a great deal. So for the octave above woofer resonance (approximately Fh) down to resonance (Fo), the port is tightly coupled with the woofer, damping its motion and making the system more rigid. Distortion is reduced because excursion is limited. Then, as frequency drops near Fl, the port begins to augment system output. In this mode, the port isn't limiting motion but it is increasing output so that the woofer doesn't have to move as much. You can find the formulas that define the relationships in the post called "Measure impedance."