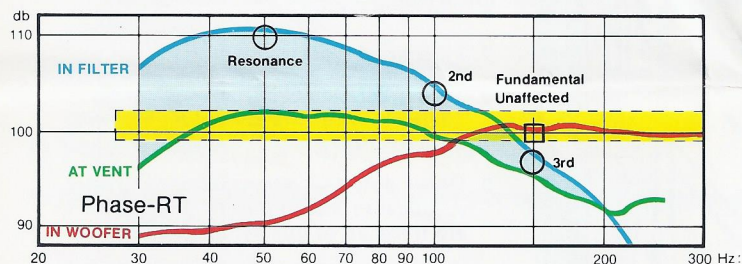
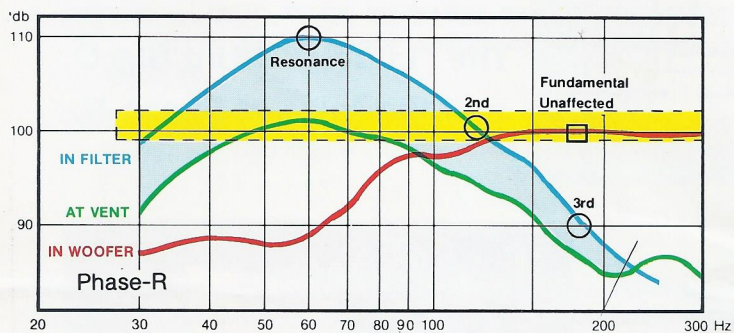


harmonics are typically the highest in amplitude and therefore, their distortion often audible. Low bass frequencies typically require more cone excursion and thus harmonic distortion becomes greater, but not with Phase-R. **Note Figure 5A** showing the continued attenuation or trapping of the second and third harmonics of the resonance frequency. The R-HD filter's operational effectiveness is 100% pure. **Note Figure 5A** again and you will see that 150 cycles as a third harmonic of system resonance (50 cycles) emanating from the rear aperture is attenuated, but 150 cycles as a fundamental emanating from the front of the woofer, is **totally unaffected by the "R-HD Line Filter" and smooth in output.** In other words, **Phase-R's "R-HD Line Filter" has the unique ability to isolate unwanted second and third harmonic frequencies of a wide range of low base fundamentals which include system resonance and tuning frequencies and reduce their unwanted amplitude and distortion, without ever affecting the corresponding fundamental frequencies in output or tonal purity.** **Note Figure 5B** which shows the extremely low distortion measurements of Phase Research speakers using the R-HD Filter even at frequencies as low as 41.2 Hz. The principal upon which the filter works is similar to that of a church pipe organ. Each pipe makes a different note (frequency) because of its internal volume and its mouth opening size. The R-HD filter is the same in reverse. We have designed the R-HD filter to capture predetermined unwanted exaggerated frequencies rather than produce them as in the pipe organ, then filled the filter with dampening material to reduce the output of the frequencies it traps. Unique in all the loudspeaker industry, Phase-R's "Compression Line Loading" and system matched "R-HD Line Filter," both with patents pending, simply put, work.

Figure 5A



Frequency graph of output — Demonstrating Phase-R's unique R-HD line filter and its ability to reduce low bass distortion both Resonance and Harmonic.

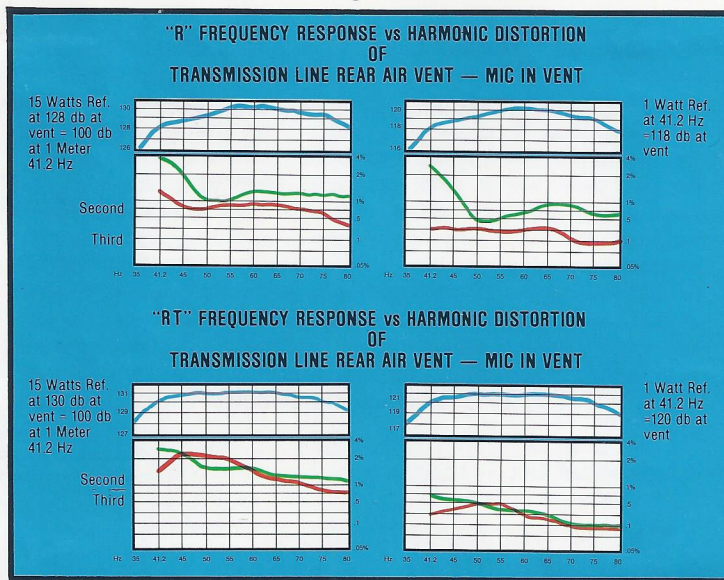


DESCRIPTION — R-HD FILTER CHART

The three curves show the relative sound pressure levels measured with the microphone positioned in the R-HD Filter, at the mouth of the bass vent, and near field in the woofer. The blue area depicts the continuously linear attenuation of unwanted resonance and harmonic frequencies by Phase-R's exclusive bass trap. The yellow area shows the measured frequency response curve as heard by the listener. The response chart shows the R-HD filter attenuating 60 Hz for the Phase-R, 50 Hz for the Phase-RT as the resonant frequencies for each speaker, 120 and 100 Hz respectively as the second harmonic, and 180 and 150 Hz respectively as the third harmonic. *Please note that the R-HD Filter has no objectionable side effects.* For example, 150 Hz (Phase-RT) and 180 Hz (Phase-R) as the third harmonic of system resonance need to be attenuated as they represent distortion. However, 150 Hz (Phase-RT) and 180 Hz (Phase-R) as fundamental frequencies coming from the face of the woofer are totally unaffected and flat in output. No electrical, acoustical or mechanical device can do what the R-HD Line Filter (patent pending) can do to eliminate the effects of bass harmonic distortion, because it is not available at any price except in Phase Research Speakers.

All sounds are alive, vibrant, without haze or restraint, with bass detail and dynamic range that can raise *you and your goose bumps* right out of your chair. Listen specifically to voices, especially male, whose fundamental frequencies around 100 cycles can become slurred by resonance problems. Phase-R's vocal clarity and articulation are astounding. No heaviness or chestiness, no slurring or unnatural tonal quality. Just open, free of the cabinet, and real. Notice also the strong powerful bass and yet it is void of interaction with vocals such that both are natural, uncolored, and free unto themselves. Clean, Dynamic, Live! Phase-R.

Figure 5B



NON-RESONANT CONSTRUCTION

You will notice that inside the cabinet of both Phase-R models there are not the usual four parallel sides which create resonance problems and phase cancellations within typical speaker boxes. To optimize Phase-R's design, the sides and structure of the speaker cabinet have to be as near perfectly solid as possible. To achieve that, Phase-R builds its speakers exclusively out of *high density fiberwood*, a material which is extremely non-resonant, and is far stronger than typically used particle-board. In addition, as you can see from the picture, Phase-R loudspeakers are braced inside in a way that no speakers anywhere near the price are built. Six internal braces in the Phase-R and twelve in the Phase-RT eliminate resonance within the materials in addition to structurally strengthening the speaker cabinet to make it suitable for "Compression Line Loading." Certainly, no other speakers near their price are built as elaborately as a Phase-R.

Figure 6

