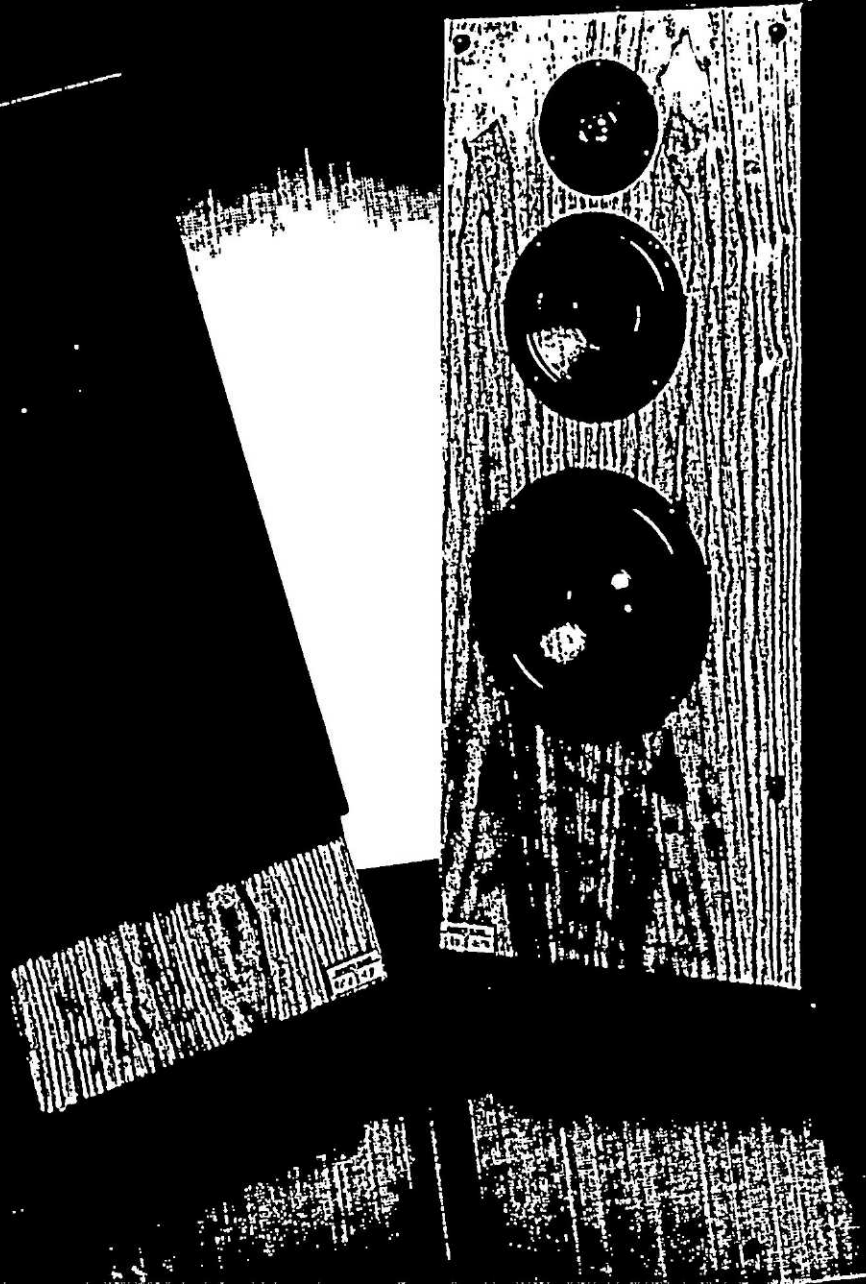


The Infinite Slope Model 1



The Infinite Slope Model 1

The Model 1 is our first and most popular speaker system. It combines both Infinite Slope crossover and Phase Shift (patent #4403112) bass loading (see graphs A, B, C & D) for unexcelled uniformity, detail and tight dynamic bass response. The Model 1 has prodigious power handling and can reproduce large symphony orchestras equally as well as small ensembles or chamber orchestras. Its wide dynamic range makes it well suited for the newest digital software and playback systems being able to reproduce the sudden impact of a cannon blast or the subtle harmonics of a solo violin.

Specifications

System design — 3 driver quasi 2 way floor standing system with casters.

Sensitivity — 90 db 1w 1m.

Impedance — 8 ohms.

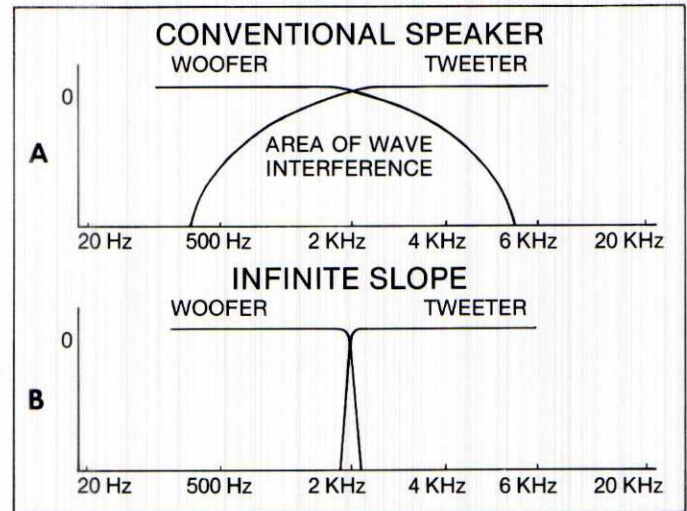
Frequency response — 40hz to 20khz + -3db.

Power requirements — 20 watts minimum — 300 watts maximum.

Crossover — Infinite Slope 100 db per octave 2khz.

Bass Loading — Patented (#4403112) Phase Shift base loading achieved through electrical hookup to crossover. Both 6" and 8" woofers are in phase at 40hz progressing to a maximum condition of 90 degrees shift at system cut off near 300 hz. This provides for uniform bass response without the typical midbass rise.

Tweeter — 1" textile dome with special rear enclosure and hexcoil motor system. Rise time is better than 12 microseconds. Near ruler flat response from 2khz to 20khz.



Bass-Midbass driver — 6.5" with poly filled cone and butyl roll. Its substantial magnet assembly and low Q (.25) make it ideal for Phase Shift bass loading with uniform response to 2khz.

Bass — 8" cast frame with poly filled cone and butyl roll. Its low Q (.25) makes it ideal for Phase Shift bass loading.

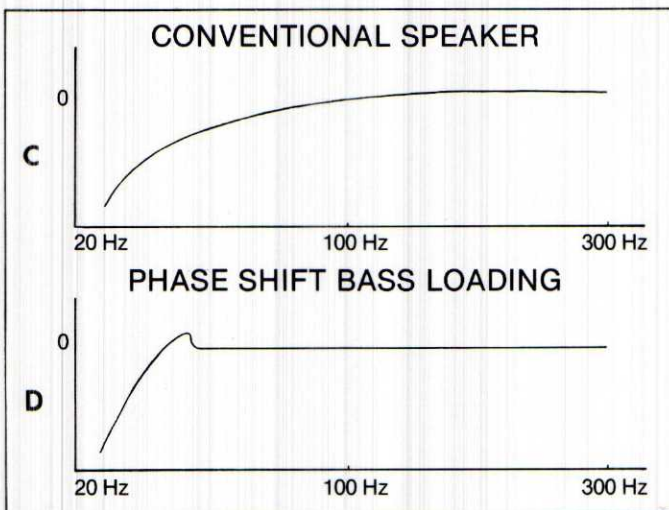
Cabinet enclosure — Sealed Phase Shift system with 3/4" high density particle board throughout plus crossbracing. All adjoining panels are glued, square butted and then pinned together for optimum energy transfer.

Crossover Components — High grade polypropylene (1%), mylar (5%) and electrolytic (5%) capacitors are used throughout depending on the area of the circuit with 2% ferrite and air core inductors.

Dimensions — 31"H x 13"W x 14.5"D (bottom) 6.5"D (top). 15 degree slope from bottom to top.

Shipping weight — 55 lbs.

Standard finishes — Natural oak, walnut and black lacquer. Optional finishes are available (teak, rosewood, cherry, etc.) upon request.



Phase Shift Bass Loading increases low bass output and mid bass uniformity.



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Specifications subject to change without notice.
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Patents pending and granted.

Presenting the Infinite Slope Loudspeaker Model 1

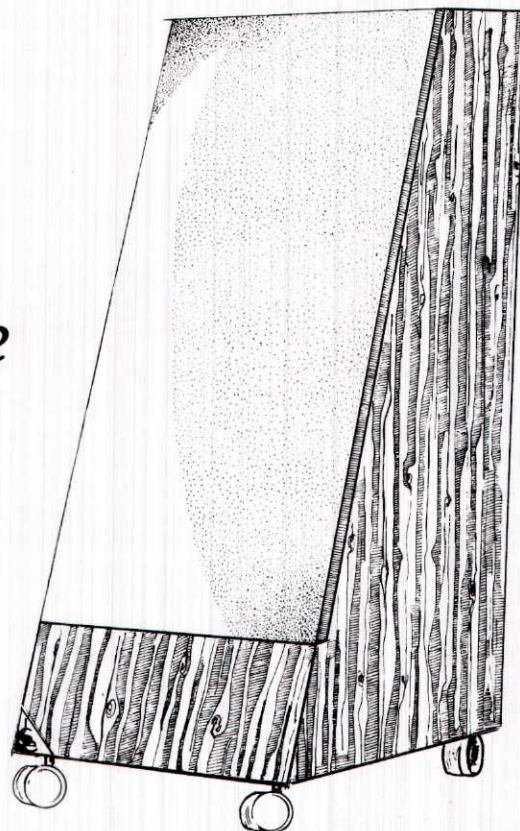
The loudspeaker system described in this literature is a direct result of nearly 7 years of research and development. Our goal was to produce a speaker system that would establish a new reference level of performance. In order to do this many factors including cone breakup, wave interference, distortion and moving mass had to be either improved upon or eliminated (no small challenge).

JSE Corporation's Infinite Slope Loudspeaker, Model 1, has done it. You are, of course, the final judge, but we're certain our Model 1 will raise your standards for loudspeaker sound. It's the first speaker ever to offer patented Phase Shift Bass Loading with an Infinite Slope (pat pend) crossover of greater than 100 db/octave. The result is a system that "puts you there". Let your ears be the judge.

Background

Audio publications generally judge the performance of tuners, turntables, preamplifiers and power amplifiers based on electrical test measurements. These measurements are specified by the IHF, and are considered to be repeatable and accurate standards by which one might determine the closeness to "State of the Art" performance achieved by High Fidelity Electronics. However, it is a commonly accepted practice to judge speakers by their sound only. Unlike electronics which are judged by a set of standards as to distortion, damping, power etc. Loudspeaker design is still regarded as more of an art than a science. A truly uniform response-minimum phase shift loudspeaker is a system of very complex sonic interrelationships properly brought together and is rarely accomplished due to the fact that there are so many factors to consider when designing a system and so many interactions that take place simultaneously. Many designs take years to complete. Some may employ new radical driver designs (electrostatic, ionic, ribbon etc.). These have their drawbacks due to their physical size or prohibitive cost, and are constantly being either modified or updated. Our findings clearly show that superior high quality systems are attainable using dynamic drivers and in many cases surpass the performance of so called "radical" designs.

The Infinite Slope Model 1 Loudspeaker is a highly advanced system using 3 dynamic drivers in conjunction with Infinite Slope (pat pend) Crossover and patented Phase Shift Bass Loading.

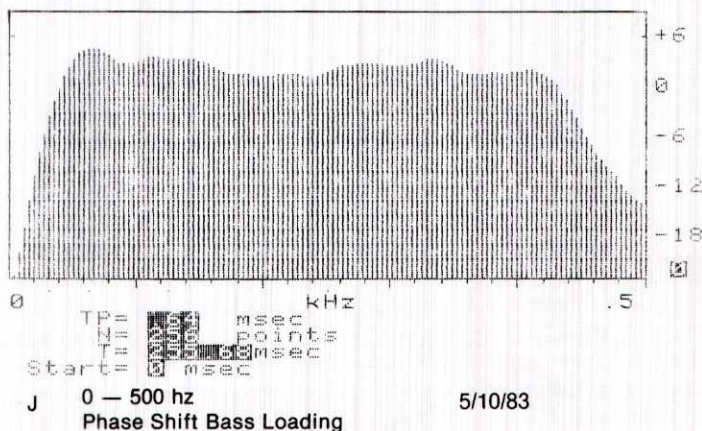


What does our new crossover do? An Infinite Slope Crossover drops the output of a given driver at crossover at an incredibly steep rate (see graph C). In most cases the rate of cut-off exceeds 100 db per octave. Some experimental models have been close to 200 db per octave.

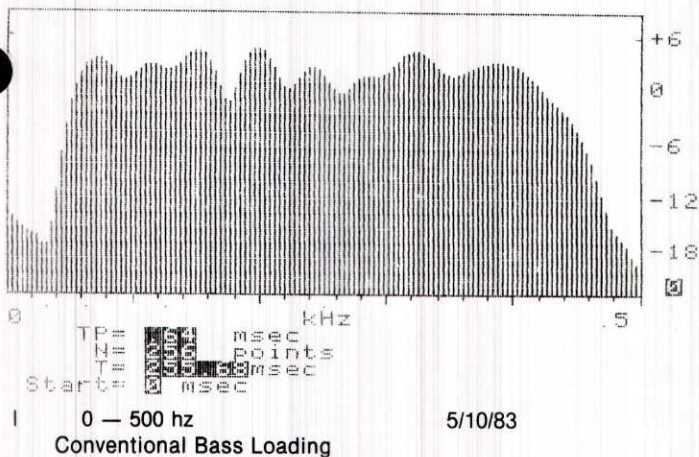
What is Phase Shift Bass Loading? Phase Shift Bass Loading is a bass loading system that utilizes 2 active bass drivers wired to a special phase shift crossover. At the lowest bass frequencies both drivers are in phase (working together). As frequencies increase above low bass both drivers progressively change their phase relationships until a condition approaching a shift of 90 degrees (nearly opposing each other) is reached near the upper-lower bass woofer crossover frequency of the system. In the Model 1 it is 400 hz.

What sonic improvements does Phase Shift Bass Loading provide?

1. Increased low bass response. By using two active drivers of low Q (high quality with large magnets) deep bass extension is increased. Graph I represents a high quality system sold for nearly \$400 each by a major manufacturer without Phase Shift Bass Loading. Graph J represents our Model 1



System with Phase Shift Bass Loading and shows superior uniformity and bass extension.



2. Far lower distortion than conventional bass systems because 2 drivers with large magnets and low mass are used as opposed to a single driver of significantly higher mass.

3. Better transient response, smaller woofers, having large magnets and light cones, respond quickly and accurately to fast signal waveforms.

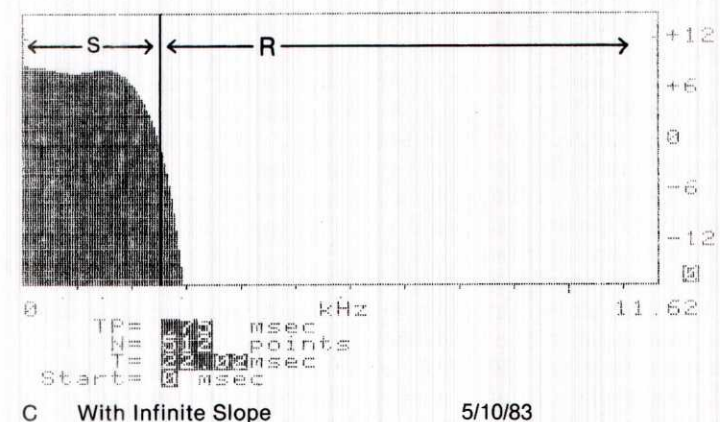
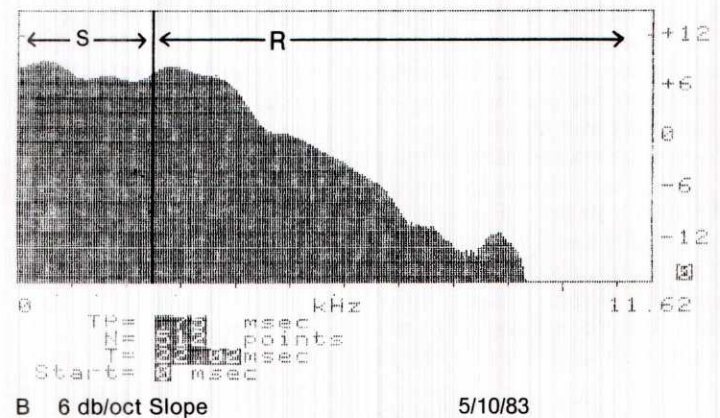
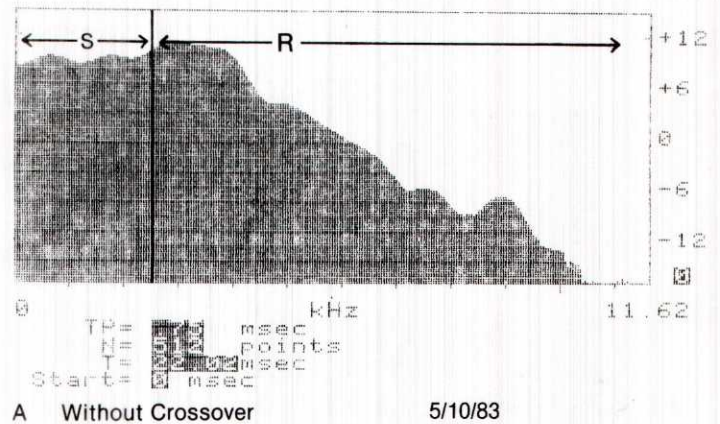
4. By forcing the drivers out of phase at the crossover frequency there is a dramatic reduction in wave interference (see wave interference below) allowing far cleaner midbass response. The all too common midbass rise in conventional speakers has been replaced with open, balanced bass response.

The U.S. patent office, after nearly 2 years of review, having been satisfied that all claims were valid, issued the patent for Phase Shift Bass Loading in May of 1983.

Why Infinite Slope? Infinite Slope Crossover dramatically reduces or eliminates major sonic deficiencies inherent in loudspeakers- cone breakup, wave interference, harmonic distortion, phase distortion, and dramatically increases power handling, dispersion, uniformity of response and imaging capability.

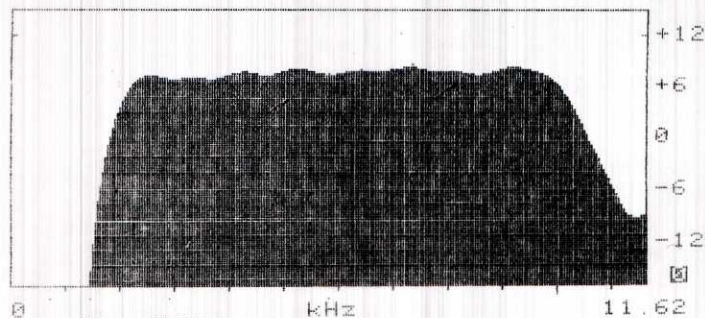
Cone breakup: Simply stated, every woofer, tweeter, midrange etc. has an optimum frequency range where they have the cleanest sound, lowest distortion and widest dispersion (see range "S" in graphs A, B and C). Beyond this optimum range cone breakup occurs as a form of abnormal cone behavior that "colors" the sound and gets progressively worse with increasing frequency. This is largely determined by the physical size of the driver cone. When comparing a 12" woofer to an 8" woofer the 12" woofer must be band limited by a low pass crossover filter having a much lower cut-off frequency than that used for an 8" woofer because large woofers will exhibit cone breakup in the midrange region while smaller (8" & 6½") woofers will reproduce the midrange region without breakup. This is why 12" systems are almost always 3 way. Sonically the ear perceives cone breakup as a muddy and highly directional sound quality with poor focus. Infinite Slope virtually eliminates cone breakup effects by "chopping off" the electrical input to the driver at frequencies above cut-off at an incredibly steep rate just before cone breakup can occur. Conventional crossovers can not do this as there is still a significant amount of output beyond the crossover frequency. Graphs A, B and C done on our Fourier analyzer on a high quality 6½" driver show how the Infinite Slope Crossover eliminates cone breakup. Graph A represents the driver alone without a crossover. Graph B represents the same driver with a conventional 6 db/oct

crossover network. Graph C- same driver but with Infinite Slope Crossover. A close examination of region "R", the area of significant cone breakup shows how Infinite Slope cuts off the response sharply just before cone breakup to provide lower distortion and coloration with wider dispersion. This is extremely important for proper focus, detailing and stereo image. With conventional crossovers region "R" (the region of poorest performance and cone breakup) is quite audible causing coloration, "beaming" and distortion.



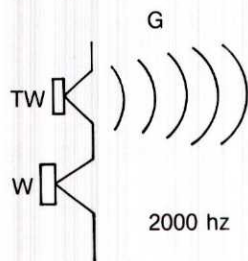
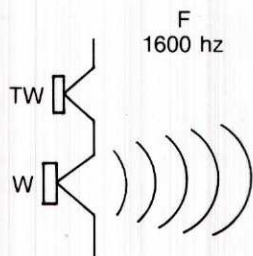
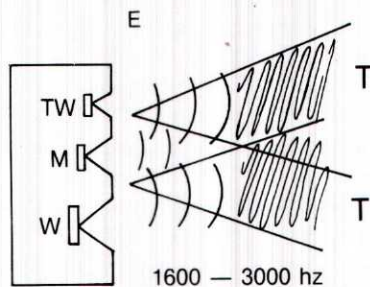
Wave interference: Wave interference is an interaction that occurs when the same frequencies are reproduced by more than one source or driver unit. Our contention is that, for instance the band of frequencies between 1600 hz and 3000 hz should be reproduced by either midrange or tweeter, but not by both together. This is due to the fact that two different sources reproducing the same information are separated by distance and have different acoustical centers and therefore can not operate simultaneously in the time domain causing phase distortion. This becomes increasingly important in the

midrange and upper midrange frequencies as proper phase characteristics are essential for an accurate stereo image. A careful examination of graph B shows a significant woofer output up to 4 kHz due to a conventional 6 db slope. Upon examination of graph D (showing the response of a tweeter properly crossed in with Infinite Slope Crossover) It is clearly visible that there is considerable "overlap" between woofer and tweeter. The woofer doesn't start to drop until past 4000 hz thereby smearing on top of the sound output from the tweeter. Sketch E, below, represents a conventional design with wave interference with the woofer and mid sharing a broad band of frequencies and the mid and tweeter sharing a broad band of frequencies. Regions "T" indicate the areas where these frequencies merge to cause interference. Sketches F and G show frequencies as close as 1600 hz and 2000 hz respectively when used with Infinite Slope Crossover- no overlap.



D TW Infinite Slope

5/10/83



The summing up of wave interference can best be understood from an excerpt written by the inventor, Richard Modafferi, in his lab notes a few years ago. "In my opinion the worst thing that ruins the sound of speakers is wave interference between drivers. When I first began building speakers in 1974 I noticed these bad effects and was told by everyone that you can't fix them as one is limited by the laws of physics. The audible effect of wave interference is a blur-

ring of the sound because of the random and varying effects of the amplitude and phase variations in the acoustic space caused by comb filter effects. The end result is that one listens to not one speaker but to a nearly infinite number of slightly different sounding speakers, all going at once and all slightly wrong. In mono, wave interference isn't so bad. In stereo, it's devastating. The reconstruction of a stereo image from two loudspeakers in acoustic space is possible only if the speaker's amplitude response is, in that space, very uniform. Wave interference will destroy stereo image by distorting the necessary amplitude information the listener needs to reconstruct the image from the stereo pair."

A Description of the Model 1

The first Infinite Slope Model 1 is a highly elaborate 3 driver two way system utilizing an 8" polypropylene bass driver, 6½" polypropylene (filled) midbass-midrange driver and 1" dome tweeter. Crossover is at 2 kHz with greater than 100 db per octave crossover slopes for both 6½" and 1" drivers. In addition Phase Shift Bass Loading is employed for cleaner and more enhanced bass response. Both bass drivers essentially work in phase at the lowest frequencies and progressively out of phase as the bass frequencies increase on up to crossover. This allows for unprecedented detailing of lower and midbass information without the smear and hangover commonly associated with systems capable of deep bass response. In addition, drivers can now be used that have very low moving mass and therefore minimal inertial problems.

The Infinite Slope Crossover of greater than 100 db per octave also provides advantages over conventional crossover designs (explained above). Due to the very steep attenuation rates of over 100 db per octave in this system, both midrange and tweeter are effectively isolated from one another. Wave interference between tweeter and midrange-midbass driver is virtually eliminated. In addition power handling is greatly increased with the added benefit of lower distortion when compared to conventional speaker systems. In addition "comb filter" effects in the crossover region are virtually eliminated due to the extremely narrow bandwidth of frequencies "shared" by both tweeter and midbass-midrange driver. Comb filter effects are a form of amplitude and phase distortion caused by two separate sources reproducing the same frequency information.

Sonic Advantages: The numerous sonic advantages of an Infinite Slope Crossover include superior detailing and lack of "confusion" in complex passages containing a large complement of instruments. Due to a nearly total absence of wave interference and distortion every instrument and/or vocalist remains finely distinct and detailed with proper tonal balance. Many designs incorporate certain "desireable tilts" in the overall response of the system, in most cases emphasizing the upper midrange to increase clarity. Unfortunately this also results in a lack of tonal balance which shows up especially in the lower midrange. With Infinite Slope there is no need for any accentuation of any frequency band as superior detailing is inherent in the design of Infinite Slope.

Imaging: The ability of a speaker to "image" is its ability to position instruments in a precise manner throughout the sound field with proper front to back perspective. In addition, a uniform sound field is important with uniform response up to 30 degrees off axis. Infinite Slope is ideal for these requirements due to its unequalled uniformity of response without comb filter effects or phase distortions. Therefore system imaging is also superior with the added benefits of uniform frequency response.

Specifications

Driver Parameters:

Tweeter: D 28. Made in Denmark, this 28 mm dome is outstanding. Rated to handle over 300 Watts of power, it can be integrated into almost any high quality high power system. It can be operated at frequencies as low as 2000 hz in a truly audiophile system without distortion or lack of power handling. It has the flattest response of any tweeter ever measured by our Fourier analyzer and has a rise time (indicating speed and bandwidth) of 12 micro seconds! Flux density over 17,500 gauss! Its vented pole piece directs rear dome radiation to a special subenclosure in the back of the tweeter to minimize internal reflections. In addition ferro fluid has been added to the gap for maximum damping and power handling. Graph D (1k-11k) shows the extreme linearity of the D-28.

Midbass-Midrange Driver-6½" filled polypropylene. Extremely high internal damping. High quality low Q of .3 assures maximum control. Near ruler flat response up to 2500 hz. Flux density 8,700 gauss.

Lower Bass Driver- 8" reinforced polypropylene. Extremely high stiffness to mass ratio for minimal "cone flex" at the lowest bass frequencies. Low Q of .28 assures tight well controlled bass response to the deepest octaves. Flux density 10,000 gauss.

Cabinet Enclosure- High density fiber board with architectural grade veneer finish. 15 degree slope helps eliminate internal standing waves and more properly time aligns the driver units. The interior is channelled and braced with special struts to break up standing waves and reduce resonances. Special optimized interior damping materials

consisting of a blend of acoustical foam and fiberglass are used to eliminate midrange colorations.

System Resonance- 45 hz. 3 db down at 35 hz.

Distortion- Less than .6 percent. From 200 hz to 20 khz.

Frequency Response- 35 hz - 20 khz. From 200 hz to 20 khz > +/- 2 db.

Power Requirements- 20 watts min 300 max rms.

Sensitivity- 89 db 1w 1m.

Impedance Nominal 8 ohm

Impedance Minimum 5 ohm

System Type- 3 driver quasi 2 way floor standing with casters.

Crossover Frequencies- 2 khz for 6½" driver and tweeter. Both 100 db per octave. 8" lower bass driver- 300 hz.

Crossover Complement- 21 devices- 16 discrete values.

Finish oiled walnut or red oak. Exotic finishes are available upon request.

Size 31"X 13"X 14" at bottom. Front face has a slope of 15 degrees

Shipping weight 75 lbs.

The Inventor: Richard Modafferi has established himself as one of the world's foremost authorities on tuner design and development. While at McIntosh Laboratories from 1968-74 he designed the MR 77 and MR 78 tuners and the design of the famous "Rimo" Filter. The MR 78 tuner has received world wide acclaim for its State of the Art performance. From 1974 to the present, Richard has devoted himself entirely to the design of loudspeakers, spending over 7 years in developing the Infinite Slope Crossover and Phase Shift Bass Loading. The patent for Phase Shift Bass Loading has just been granted by the U.S. patent office. A summary of the patent applications is available upon request. Richard is also a contributing editor to the "Sensible Sound" Magazine.

