Electro Voice Interface A Serie3

Interface: A™

A rational discussion

Interface: A™

We've been involved with sound since 1927 when our founder learned that he could make better microphones than he could buy. From the first, we've had the attitude that if we can make our products a little better than the other guy, we'll succeed. And so far it seems to have worked out that way. In large measure, our products reflect the creativity and resourcefulness of our engineers — products that do a job better than it has been done before.

Transducer development is a demanding engineering discipline. Part mechanical, part electrical, part science, part art ... speaker designs are as difficult to explain as they are to create. And because performance definitions are obscure, more liberties have been taken with speaker specifications than perhaps any other component.

Our engineers have worked hard to produce a speaker system for home use that provides improved performance in every major area. We would like to offer, in lieu of the usual rhetoric, some insight into the design of the Interface:A.

Building a loudspeaker system (for whatever purpose) is as much an exercise in choosing goals as it is an engineering project. Should you opt for high efficiency, or wide range, or small size, or what? And how much are you willing to sacrifice in one department in order to achieve the utmost in another?

Because serious, basic investigation into the physics of loudspeaker operation is really quite rare, most speaker systems are based on existing technology. And the differences one hears are primarily a matter of how engineers (or sales departments) place emphasis on one or more of the desired goals at the expense of the others. Your choice, then, is rarely among competing technologies, but rather which design goal most nearly meets your own needs.

"YOU CAN'T CHANGE THE LAWS OF PHYSICS."

Of course not. But one can understand and apply the laws more thoroughly, which is what the Interface:A system is about. There are types of enclosures other than sealed, one of which is called vented. By somehow using the energy which is inside the box, it would seem reasonable that low frequency performance could be improved.

"WHAT'S SO NEW ABOUT VENTED BOXES?"

Nothing, really. A hole in the box has occurred many times in acoustic history under a variety of names. However, what is new is the ability (1) to understand the vented system so completely and (2) to know how to precisely manipulate it into a multitude of usable forms. In place of mystique, cut-and-try, and old wives' tales, is a coherent scientific presentation of the subject, based on electrical filter response characteristics. Briefly summarized, when compared to a sealed system, a vented system may have:

- ½ octave more bass
  or
- 4 dB more efficiency
  or
- an enclosure ⅓ the size

Or some of each, much like ordering at a Chinese restaurant.

PICK ONE FROM COLUMN A...

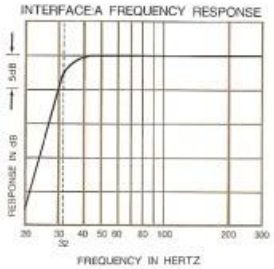
Since the aim of high fidelity is to improve all aspects of performance, we elected to spread this technical largesse. In the process, we selected a system response (Sixth Order Butterworth) which employs an auxiliary circuit, or equalizer. This choice further increases the degree of advantage over sealed systems in the areas of bandwidth, efficiency, and enclosure size. We allocated these combined advantages in a manner highly beneficial for home systems:

- ⅓ octave more bass
  and
- 2 dB more efficiency
  and
- ½ the enclosure size

32 HERTZ. REALLY.

Most speaker system frequency response specifications in print today are meaningless. Prevarication runs rampant for two reasons: everyone *knows* that high fidelity extends down to 20 Hz, and very few people know what the lowest frequencies really sound like.

Response of the Interface:A is down only 0.5 dB at 40 Hz, then quickly turns the corner and drops to -3 dB at 32 Hz. For comparison, 32.7 Hz is the lowest C on the piano, three octaves below middle C. The lowest note of a standard-tuned bass viol or bass guitar is 43 Hz.



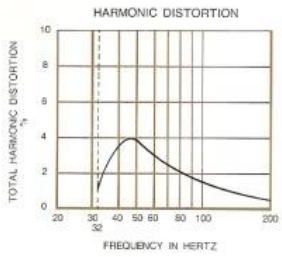
HOW IT IS DONE

The vent required to tune the 1300 cubic inch volume of the Interface:A to 32 Hz is not just a hole in the box; in fact, the smallest usable hole would require a duct several feet long. The Interface:A uses a practical alternative (or vent equivalent) to properly tune the enclosure. It looks like a 12-inch woofer but it has no voice coil or magnet. In fact it is a 10" diameter piston with a mass equivalent to the amount of air required to reach 32 Hz tuning. A "real" vent of this diameter would be 20' long, but please don't confuse this with resonant tube designs such as organ pipes.

A DIFFERENT SHAPE DISTORTION CURVE

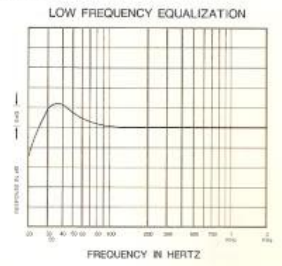
In a general way, low frequency distortion is related to speaker excursion. Non-linearities in the cone sus-

pension, voice coil motion, and even the magnetic flux, combine to give higher distortion levels as excursion increases. Unlike a sealed system, the maximum "woofer" excursion in the Interface:A occurs a half octave or so above 32 Hz. Because the low frequency radiator has no voice coil or magnet, only the suspension nonlinearities are of concern, and are the simplest to avoid. Instead of the constantly rising distortion curve characteristic of sealed systems, distortion actually diminishes as the low frequency radiator comes into play. Total harmonic distortion at 32 Hz with full power input is on the order of 1%, a remarkably small amount by sealed system standards.



TO EQ OR NOT TO EQ

The use of auxiliary circuits to equalize, contour or boost bass is troubling to some people. And indeed, an excessive amount is troubling to us. There are vented system tunings which require 13 dB of equalization (20 times the power), which we consider excessive for this application. There are sealed speaker systems on the market today that require up to 20 dB, or 100 times the power, at low frequencies. In such cases, there is legitimate concern about the low frequencies "using up all the amplifier power."



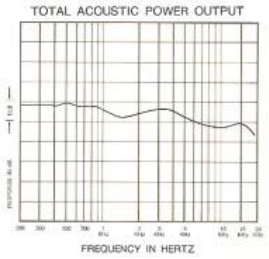
By comparison, the low frequency equalization required by the Interface: A design is modest. Flat acoustic output requires additional input of 3 dB at 50 Hz, rising to a maximum of 6 dB at 35 Hz. This is not an "extra" power requirement for a number of reasons:

- Use of an equalized, vented system design yielded higher overall efficiency. Average power input with normal program material will be less than for a comparable sealed system.
- Below the usable range of the system, the equalizer rolls off the electrical input to the amplifier, eliminating unwanted low frequency content (turntable rumble, record warp, etc.); thus conserving amplifier power below the speaker system's usable low frequency limit.
- By providing low frequency output *in fact* rather than on a spec sheet, there is less need to use bass controls and loudness switches in an effort to obtain satisfyingly solid low end.

The equalizer is designed to be connected to the tape monitor jacks found on most components. It may also be used between preamplifier and power amplifiers. The equalizer includes two channels of equalization for use in stereo systems. Once the equalizer is added, additional Interface:A speaker systems (for remote speakers, for instance) may be connected to the same amplifier and receive the proper equalization.

UNIFORM TOTAL POWER OUTPUT

With so much design concentration on uniform and extended bass output, the tendency is to overshadow performance at higher frequencies. Yet mid- and high-frequency performance is of great significance to the overall sound of, and satisfaction with, a speaker system. A speaker's *total acoustic power output* indicates, as a function of frequency, all of the sound radiated by the speaker — at all angles. This total acoustic power output correlates well with a speaker's perceived performance in the listening room, and is therefore a measurement of major importance. Total acoustic power output may be related to more familiar measurements: uniform *frequency response* combines with uniform *dispersion* to provide uniform total power output.



The primary tweeter (mounted behind the square-of-felt-with-a-hole-in-it) incorporates a 2-inch diameter piston with ⅝-inch diameter aluminum dome. The tweeter output radiates through foam and felt squares to maximize dispersion as frequency increases. In effect, the tweeter size is "shrunk" above 5000 Hz to maintain high dispersion, while the whole piston area radiates at lower frequencies, enabling the tweeter to be used down to 1500 Hz.

A second tweeter located on the rear of the speaker enclosure operates above 7000 Hz, which helps maintain constant acoustic power in the upper octave of the system. Placement of the system is not at all critical, however.

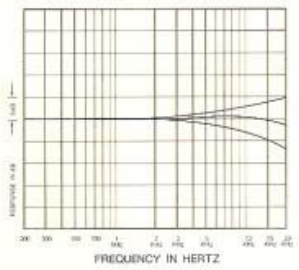
MORE EQ

Since a piece of electronics is required for low frequency equalization, it has been utilized at high frequencies as well. A choice of three switch-selected equalizations provides both operational and technical benefits:

- Choice of equalization is available at the equipment position, not buried in the speaker cabinet.
- Removing the tweeter control from the crossover eliminates a major long-term reliability problem of speaker systems.

Interface: A™

HIGH FREQUENCY EQUALIZATION



FREQUENCY IN HERTZ

SHOULD A LISTENER EXPECT TO BE OVERWHELMED BY THE SOUND OF THE INTERFACE:A?

No. Any speaker which immediately stuns you should be suspect. Systems which attempt a spectacular first impression often cheat on overall balance of parameters, and may soon produce dissatisfaction growing out of listening fatigue. It is also possible to make any system good *or* bad simply by judicious selection of program material, of course. There are some general differences you will find with the Interface:A however:

- Our concern with total acoustic power output, coupled with our somewhat higher efficiency, results in the subjective judgement that the Interface:A is "brighter." If the program material has good clean high frequency response, the effect is one of opening a curtain on a live performance. On the other hand, if the program material is distorted, fuzzy, clipped, or whatever, a speaker system with less high frequency output will offend the ear less. If high frequency distortion is a problem, one must either get clean program material, or roll off high frequency response. Since we have no desire to forever limit you to rolled-off response, that option is available on the equalizer at the turn of a switch.
- Bass response can be misleading. The ear tries to judge low frequencies by comparison to higher frequencies. Thus if a speaker system has a bumped-up bass response, or rolled off high frequency response, one may conclude it has "more bass." Characteristics of the listening room make a tremendous difference in the perceived amount of bass, which also depends upon where one is located in the room. However, if the program material has fairly continuous power below 50 Hz, the Interface:A will reproduce it, providing a solidity and foundation to the music that defies description.

In summary, Interface:A is the result of a painstaking study to identify the optimum design choices available to the serious audio engineer. Using objective measurement as a guide, plus a thorough understanding of basic transducer theory, we have created a system with a clear advantage in every important performance attribute. Interface:A is eminently suited to the vital task of reproducing music of every stamp . . . in your home, accurately, and with musical validity.

Interface:A. It's not as far from perfect.

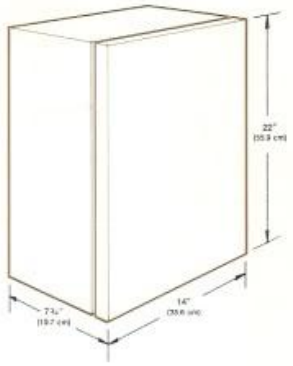
WARRANTY

Interface:A is guaranteed against malfunction due to defects in workmanship and materials. If such malfunction occurs, Interface:A will be repaired or replaced (at our option) as follows:

Speaker systems will be repaired or replaced without charge for parts or labor for a period of five years from the date of original purchase.

Equalizer will be repaired or replaced without charge for parts for a period of three years from date of original purchase and without charge for labor for a period of one year from date of original purchase.

All units must be delivered prepaid to the proper Electro-Voice service facility and will be returned prepaid. Warranty does not cover finish or appearance items or malfunction due to abuse or operation at other than specified conditions. Repair by other than Electro-Voice or its authorized service agencies will void this guarantee.



Electro-Voice®

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Certain design concepts included in the Interface:A have been the subject of technical papers given by Electro-Voice engineers:
D. B. Keele, "The Vented Loudspeaker Cabinet: A Restatement," Audio Engineering Society Convention, May, 1972.
J. R. Gilliom, "Distortion in Dynamic Loudspeakers Due to Modulation of the Permanent Field," AES Convention, May, 1972.
R. J. Newman, "A Loudspeaker Designed Utilizing a Sixth Order Butterworth Response Characteristic," AES Convention, September, 1972.

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