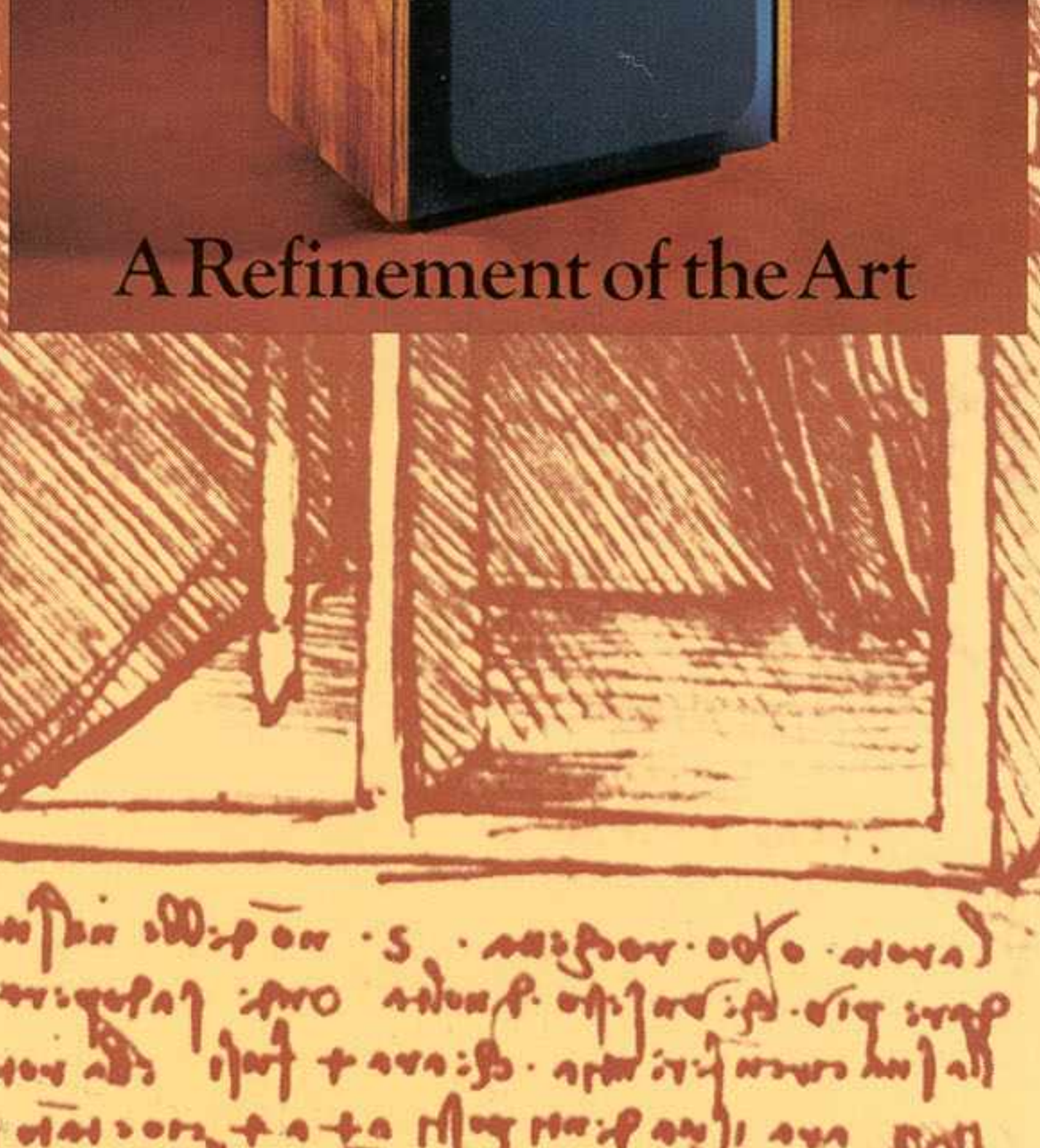


A Refinement of the Art

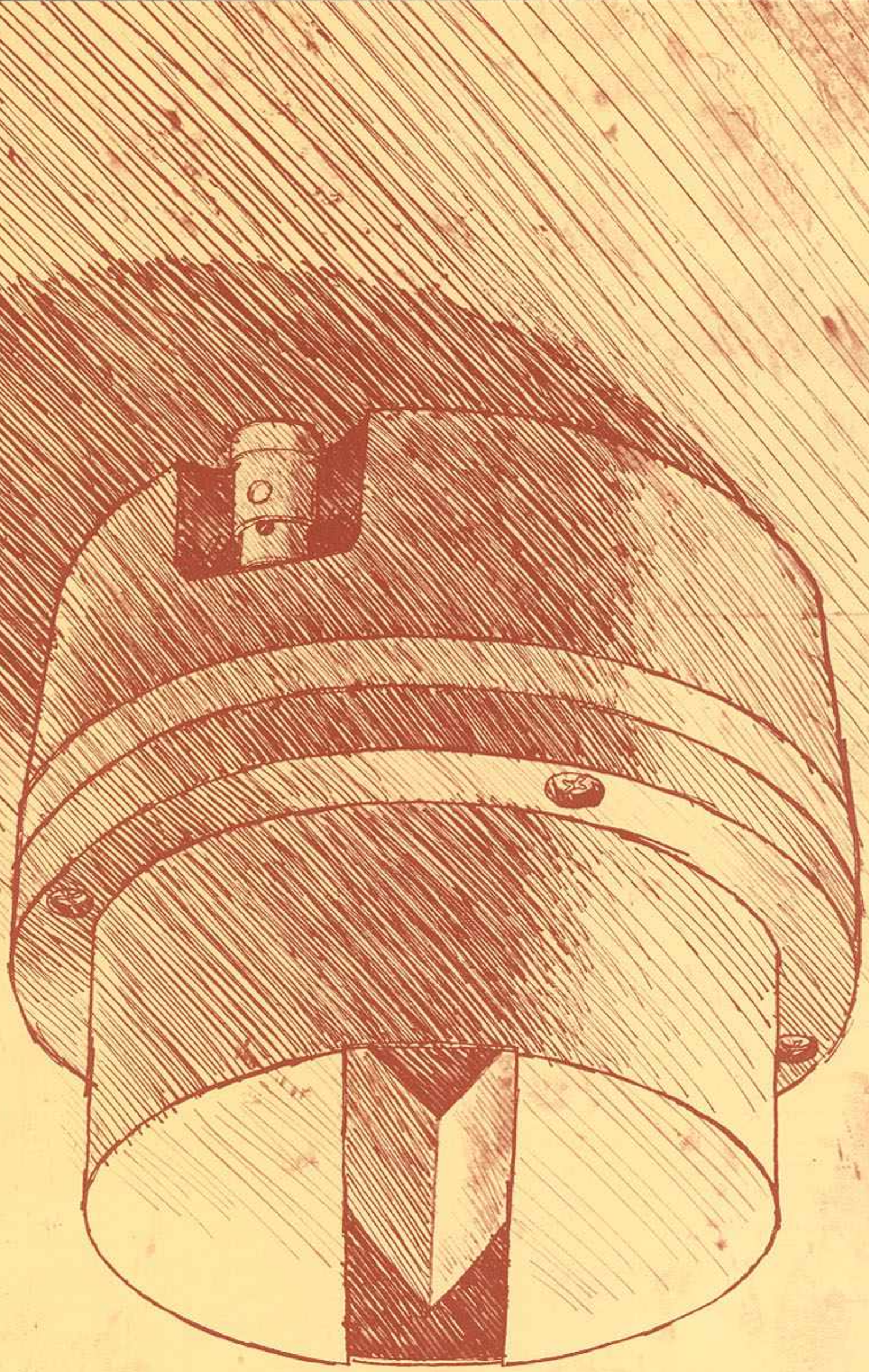
JBL

A Rebirth of Sound

A good loudspeaker system can deliver a good approximation of recorded frequencies; the professional and the purist demand more. Much more. They insist upon searching for that ideal combination of components which will fulfill the dynamic potential in recorded music. They want all frequencies, from bass fundamentals to the upper limit of human hearing, accurately reproduced.

JBL dedicates itself to achieving sound reproduction that is literal to the original. The acoustic accuracy of JBL professional equipment is attested by its wide acceptance among recording engineers who must hear what is recorded on their tape and who are completely dependent on studio monitors for that information.

The purists have no less desire to hear all frequencies without distortion, but most want studio sound designed into an enclosure small and decorous enough to complement a living area. JBL undertook that exercise. The Jubal L65 is the result.

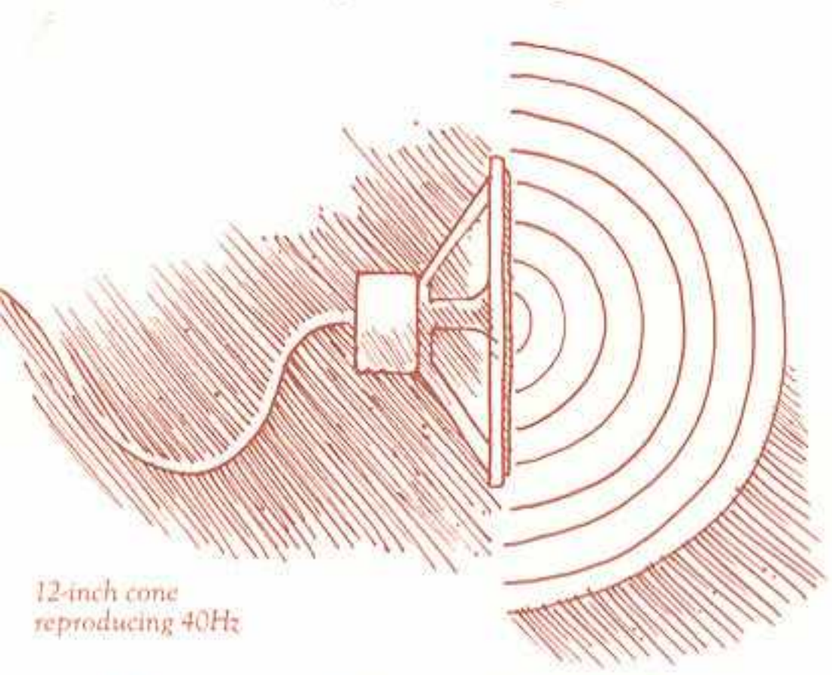


A Law of Nature

Dispersion may be one of the least understood and most neglected of all the specifications listed for a loudspeaker system. Yet, the dispersion specification has important implications for the ability of a system to reproduce open, spacious sound.

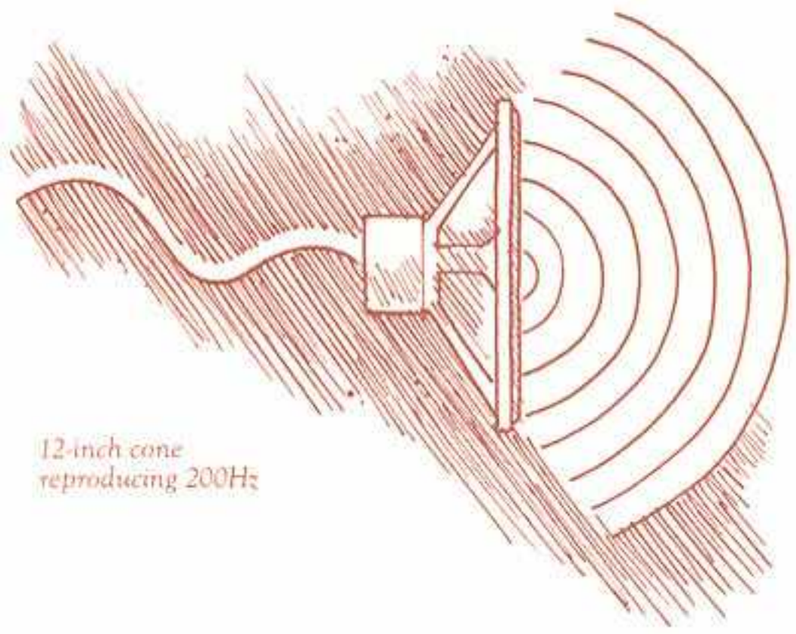
It should be understood that the quoted angle of dispersion is not a constant. The law of nature is that the angle of dispersion decreases as the wavelength of the frequency becomes shorter relative to the diameter of the cone or diaphragm that reproduces it.

For instance, the wavelength of 40 Hz is 28 feet. If it is reproduced by a 12-inch cone, it should disperse 180 degrees.



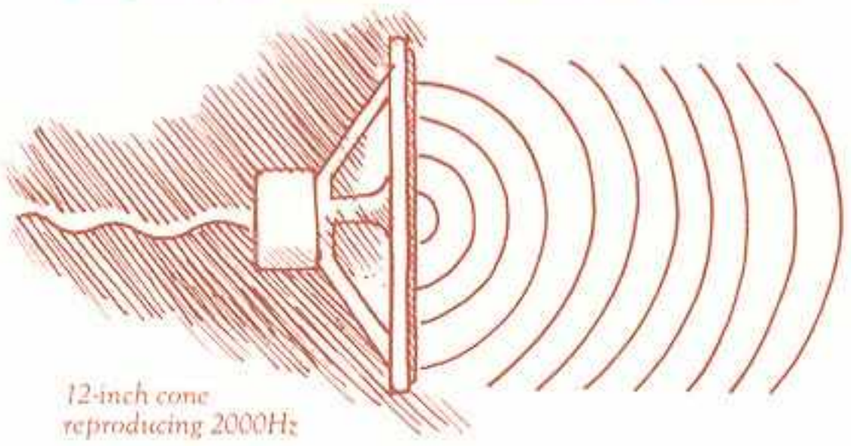
12-inch cone reproducing 40Hz

However, as frequencies get higher, wavelengths get shorter. Taking another point of reference, at 200 Hz, there is a wavelength of 5 feet. Since that is still greater than the 12-inch cone, it disperses well, but not quite as widely.



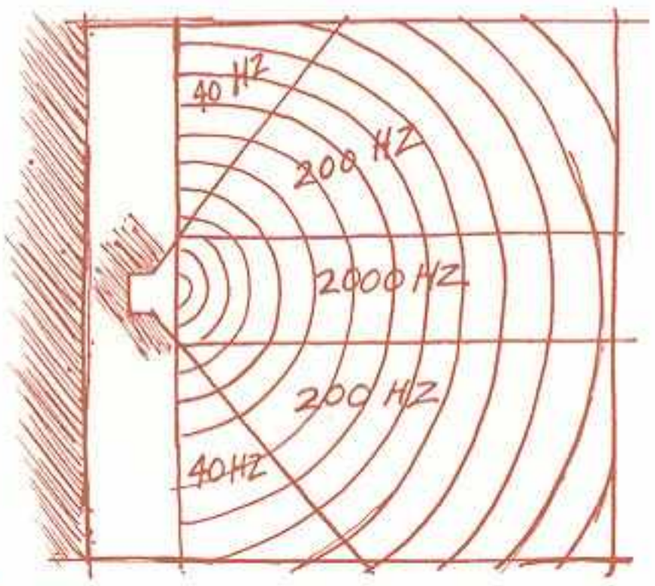
12-inch cone reproducing 200Hz

At a frequency of 2000 Hz, the wavelength is only about 7 inches. If the same 12-inch cone were made to reproduce that frequency, it would be focused into a beam.



12-inch cone reproducing 2000Hz

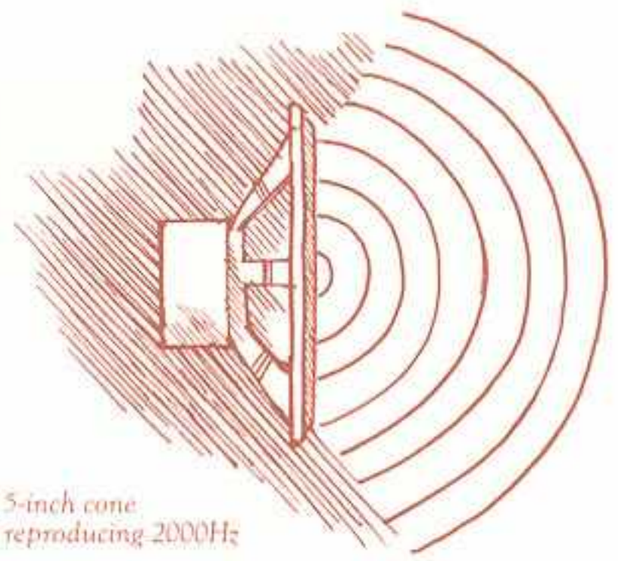
The listener would be able to hear 40 Hz reproduced by that 12-inch cone from any position in the room. He could hear 200 Hz over a wide area of the room, but to properly hear 2000 Hz, he should be nearly on axis, or in a straight line from that loudspeaker.



In a room, dispersion of different frequencies reproduced by a 12-inch cone.

Another effect to be considered is reflection. The narrowing dispersion causes the direct/reflected sound ratio to change in the favor of direct sound. In the hypothetical room above, if the listener were on-axis the 2000 Hz signal would sound very "up-front" while the 40 Hz signal would be perceived as more "distant." The off-axis listener would hear sound that favored the low frequencies since the direct sound of the higher frequencies would miss him.

Actually, this problem has a simple solution. Those frequency wavelengths too short to be dispersed widely by the 12-inch woofer can be crossed over by a dividing network to a midrange transducer with a diameter of, perhaps, 5 inches. Then a 2000 Hz signal with a 7-inch wavelength will be reproduced by a 5-inch cone giving superior dispersion.

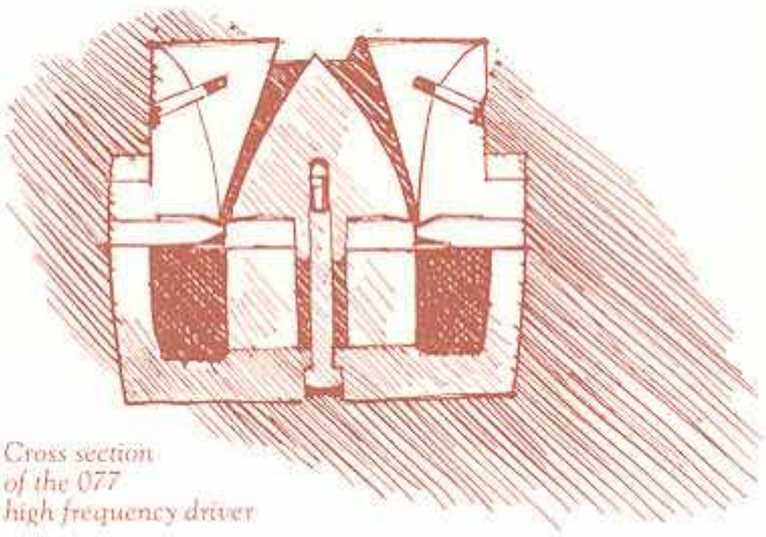


5-inch cone reproducing 2000Hz

The dispersion limitation on the 5-inch midrange does not become acute until the frequency has reached around 8000 Hz. So, typically above 6500 to 7000 Hz, frequencies are directed by another cross-over network to a tweeter with a diameter of approximately 1½ inches. Again, wide dispersion. But only up to a point. When wavelengths approach 1½ inches, the usual tweeter will be unable to disperse them. Radiation starts to focus into a narrow beam.

The Design of Man

JBL Transducer Engineers had to get past the limiting concept that dispersion is a function of the diameter of the diaphragm. For professional use at first, there was designed an extremely efficient, high frequency ring radiator capable of reproducing 6500 to 21,000 Hz.



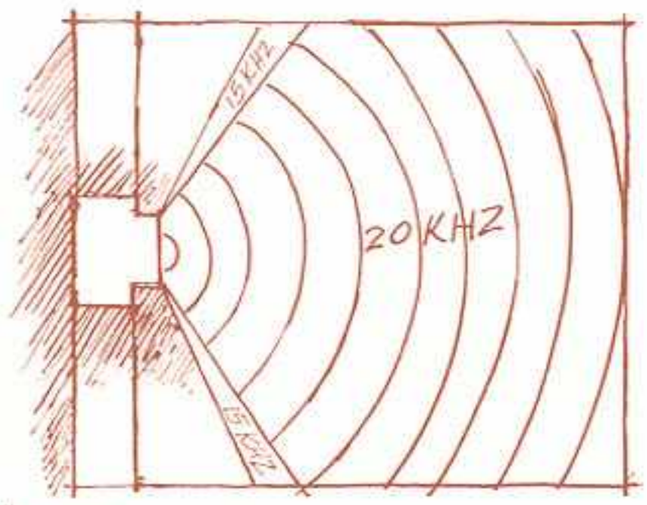
Cross section of the 077 high frequency driver

The 077 has unusually high efficiency as a result of horn-loading, but the significance of the horn is much greater when its effect on dispersion is considered. In professional use, this assembly has been variously called a slot radiator and a diffraction horn. In fact, the horn is a very unusual development combining a tried and true idea: basically it's an exponential horn, but it incorporates diffraction characteristics.

Horizontal dispersion of the 077

Vertical dispersion of the 077

The dispersion of the 077 high frequency driver is 130 degrees at 15,000 Hz, wider than any other single directional tweeter. Even at frequencies reaching 20,000 Hz, the upper end of audibility, the 077 still disperses 110 degrees.



In a room, dispersion of different frequencies reproduced by the 077

But as important as dispersion is, it's only one part of the story. Another part is efficiency. As a horn-loaded, ring radiator, the 077 is effortlessly efficient. It has such reserve acoustical power handling capability that no component amplifier designed for home music reproduction is likely to challenge it. Frequency response of the 077 in the Jubal L65 begins at 6500 Hz and continues smoothly beyond the range of human hearing. With such high efficiency and extended frequency response, the 077 reproduces transients, those bursts of sonic power, with outstanding accuracy and crispness.

What you hear from the Jubal L65 are highs you've never before heard in a home entertainment system. Cleaner, more open highs that are literal to the original.

Discovery and Application of Sound Principles

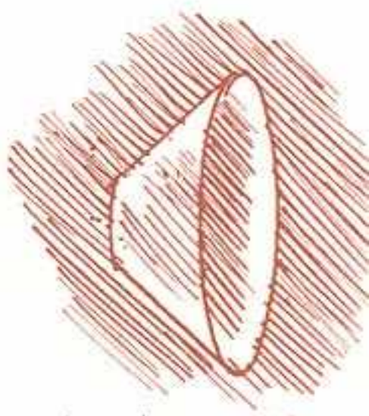
The Jubal L65 was conceived as a project to integrate a high frequency driver which previously had only been used in professional sound systems with a suitable midrange transducer and low frequency loudspeaker for a compact, floor standing, home entertainment system. The unusually high efficiency of the 077 demanded compatible performance in the midrange and low frequency components.

Midrange was already well handled by a 5-inch transducer affording high efficiency and excellent transient response which are achieved by its very large magnetic assembly, its 7/8-inch edgewound copper voice coil and the traditional excellence of die casting and machining to JBL's typical close tolerances.

Coincident with the development of the 077 was the evolvement of principles which resulted in a woofer sufficiently innovative to qualify for patent filing. The discovery was a new application of mass to the cone assembly for better performance.

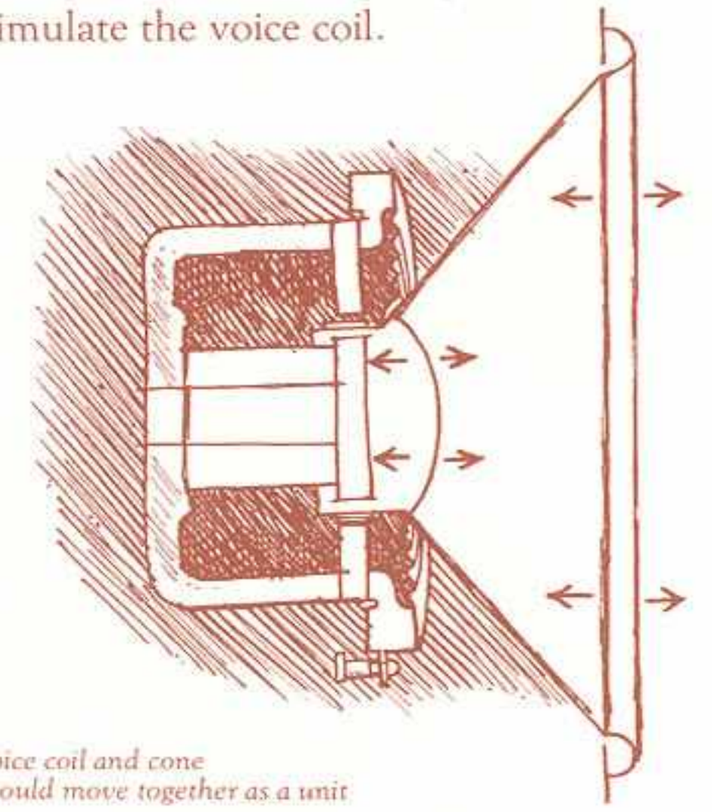
A complete cone would have structural integrity, but a speaker cone is truncated at the apex to accept a voice coil. As a result, large cones like the L65's woofer could be susceptible to deformation.

A complete cone



A speaker cone with the apex truncated

The voice coil and cone together should act as a piston which pushes air in response to electrical impulses that stimulate the voice coil.

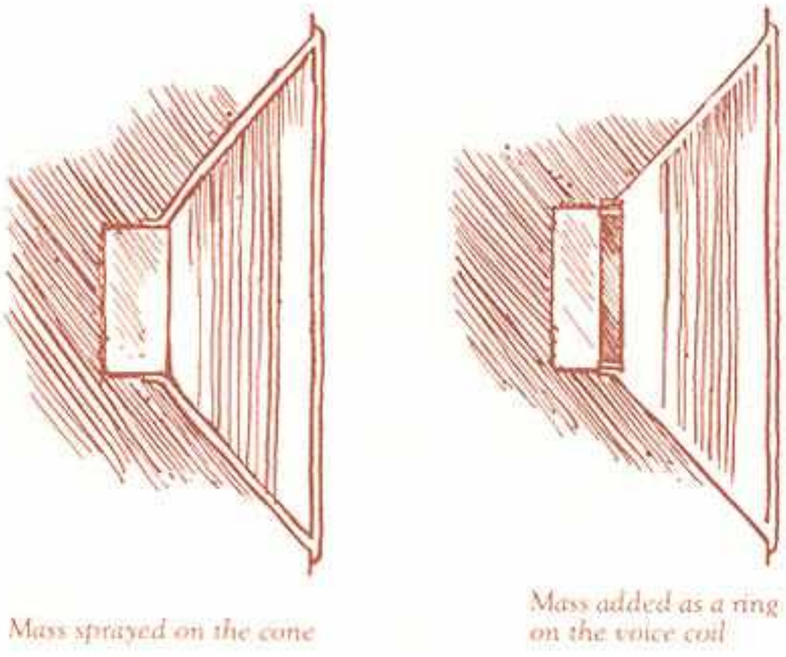


Voice coil and cone should move together as a unit

Unless the voice coil and entire cone move together, response will not be uniform. This combination needs stiffness to prevent, as much as possible, deformation and break-up during excursion.

To provide the desired degree of mass and stiffness, JBL has traditionally applied a special dampening material, Lansaplas, directly to the woofer cone. This carefully measured and controlled process gives the cone the white appearance which has been emulated by others solely to achieve color, rather than function.

The new discovery adds a die cast ring as mass to the voice coil form instead of adding mass to the cone.



Mass sprayed on the cone

Mass added as a ring on the voice coil

The die cast ring gives greater rigidity to the cone, preventing radial deformation even at the higher frequencies where it is most likely to happen. The voice coil and cone act as a pure piston, so that frequency response is smooth through the transition from low frequency to midrange, the typical problem area.

This new center mass application has resulted in a low frequency loudspeaker more accurate than any previous 12-inch speaker. Naturally, it was chosen for the Jubal L65.

Technical Information

Low frequency—A 12-inch, long excursion loudspeaker with a 3-inch edge-wound copper ribbon voice coil, massive magnetic assembly, and large Alnico V magnet. The cone is straight-sided and ribbed for additional stiffness. A die cast, concentric ring on the voice coil provides center mass to prevent unwanted reverberations and avoid distortion of the cone at transitional frequencies. A tuned port in the enclosure is employed to optimize bass efficiency and dynamic range.

Midrange—The 5-inch transducer reproduces midrange program material which encompasses most of the vocal range. A 7/8-inch voice coil and the massive magnetic assembly give outstanding transient response and greater undistorted acoustic output than any other small cone loudspeaker.

High frequency—The 077 operates from 6500 Hz and continues past the upper range of human hearing. A ring radiator that is powered by a 3¼-pound Alnico V magnetic assembly, the 077 high frequency driver couples with the air through a unique exponential/diffraction horn. The horn assembly is die cast of solid aluminum with a transparent acrylic internal dispersion element. Internally, the voice coil diaphragm is pneumatically formed of fatigue-resistant aluminum alloy. The 077 offers an unprecedented combination of extended frequency response, high efficiency and wide dispersion pattern.

Dividing network—The tolerances of JBL network components are much more stringent than normal industry practices, since JBL well realizes the complexity of a frequency dividing network's function. A properly designed network does far more than direct low, midrange and high frequency information to the appropriate reproducer. Vitally important to the sound of a loudspeaker system is precise control of the drivers through the transition frequencies. The network of the Jubal L65 is designed for optimum cross-overs which give a smooth response curve from lowest to highest frequencies reproduced.

Art for Art's Sake

JBL has used art to achieve art. By employing the arts of design and craftsmanship, the art of sound reproduction is heightened.

The most relevant criteria for a loudspeaker system are four: efficiency, frequency response, distortion and dispersion. In each of these, Jubal L65 is superior. But those are objective measurements when only a subjective judgement is necessary. Listening is all that's needed.

The Jubal L65 is a JBL advance into a cleaner, highly sensitive, more open sound with better bass and improved frequency response across the entire audio bandwidth. Articulation, the ability to resolve complex musical passages into individual instruments, is demonstrably better in the L65.

With the Jubal L65 reproduction is literal. Reproduction is rebirth. The art has been refined.

Power handling capacity—The specified power handling capacity indicates the continuous program level that can be accepted by a JBL loudspeaker system without damage. Its peak power handling capacity is considerably greater than the continuous rated value, as reflected in the remarkable transient response of JBL loudspeaker system components. The L65 will produce clean sound at comfortable listening levels when driven by an amplifier having an output of as little as 10 Watts RMS per channel. However, for reproduction of the full dynamic range of contemporary recordings at high volume, a quality amplifier delivering up to 150 Watts RMS per channel will provide optimum performance. Such an amplifier has the reserve power necessary for accurate reproduction of transients, which can reach momentary peaks equivalent to ten times the average power level. In almost all cases, the volume level generated by a JBL loudspeaker will become noticeably discomforting to the ear before the loudspeaker can be damaged by excessive power from the amplifier.

James B. Lansing Sound, Inc.
3249 Casitas Avenue
Los Angeles, California 90039

Power Capacity[1]	75 Watts continuous program	
Nominal Impedance	8 ohms	
Crossover Frequencies	1,000 and 6,500 Hz	
Efficiency	1 Watt input produces 78 dB Sound Pressure Level at a distance of 15'	
(Note: 75-80 dB is a comfortable listening level.)		
Low Frequency Loudspeaker		
Nominal Diameter	12 inches	30 cm
Voice Coil	3-inch (7.6 cm) edgewound copper ribbon	
Magnetic Assembly Weight	6¾ pounds	3.1 kg
Flux Density	10,400 gauss	
Sensitivity[2]	42 dB	
Midrange Transducer		
Nominal Diameter	5 inches	13 cm
Voice Coil	7/8-inch (2.2 cm) edgewound copper ribbon	
Magnetic Assembly Weight	1⅝ pounds	0.7 kg
Flux Density	15,000 gauss	
Sensitivity[3]	46 dB	
Ultra-High Frequency Transducer		
Horn Mouth	3.125 x 0.725 inches 7.9 x 1.8 cm	
Dispersion	130° horizontal x 40° vertical at 15 kHz 110° horizontal x 40° vertical at 20 kHz	
Voice Coil	1.75-inch (4.4 cm) edgewound aluminum ribbon	
Magnetic Assembly Weight	3¼ pounds	1.5 kg
Flux Density	16,500 gauss	
Sensitivity[4]	56 dB	
Finish	Oiled Walnut	
Grille	Three-dimensional, stretch fabric	
Grille Color Options	Midnight Blue, Earth Brown or Rust Red	
Dimensions	24½" x 17½" x 13⅛" deep 61 x 44 x 33 cm deep	
Shipping Weight	67 lbs	30 kg

1. Based on a laboratory test signal. See Power Capacity section for amplifier power recommendation.
2. Since the major portion of the energy reproduced by the low frequency loudspeaker lies below 800 Hz, this specification has been developed by using a test signal warbled from 100 to 500 Hz, rather than the 1-kHz sine wave test signal on which the conventional EIA Sensitivity rating is based.
3. Averaged from 1 to 3 kHz.
4. Warbled from 7 to 20 kHz.

Enclosure—Only furniture hardwoods, hardwood veneers, and compressed woods are used. Tight, wood-welded joints eliminate undesirable resonance and warpage. Scaled specifically for today's smaller living areas, the oiled-walnut enclosure is highlighted by a smoked glass top and a dimensional stretched cloth grille in Midnight Blue, Earth Brown and Rust Red.

Rather than repeat the ambiguity of most technical specifications, JBL has traditionally refrained from listing data for which no widely-accepted test procedure has been established. In the absence of such standards any well-equipped laboratory can legitimately produce a variety of frequency response curves for a loudspeaker, depending on the conditions selected. At JBL the final analyses are comprised of extensive listening sessions. Although laboratory data are an integral part of the process, the trained ear is the ultimate criterion. The success of this philosophy is reflected in the enthusiastic acceptance of JBL systems by recording studio engineers, producers and performers—professionals whose artistic achievements are closely related to the equipment they use.

JBL continually engages in research related to product improvement. New materials, production methods and design refinements are introduced into existing products without notice as a routine expression of that philosophy. For this reason, any current JBL product may differ in some respect from its published description but is always warranted to equal or exceed the original design specifications unless otherwise stated.

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