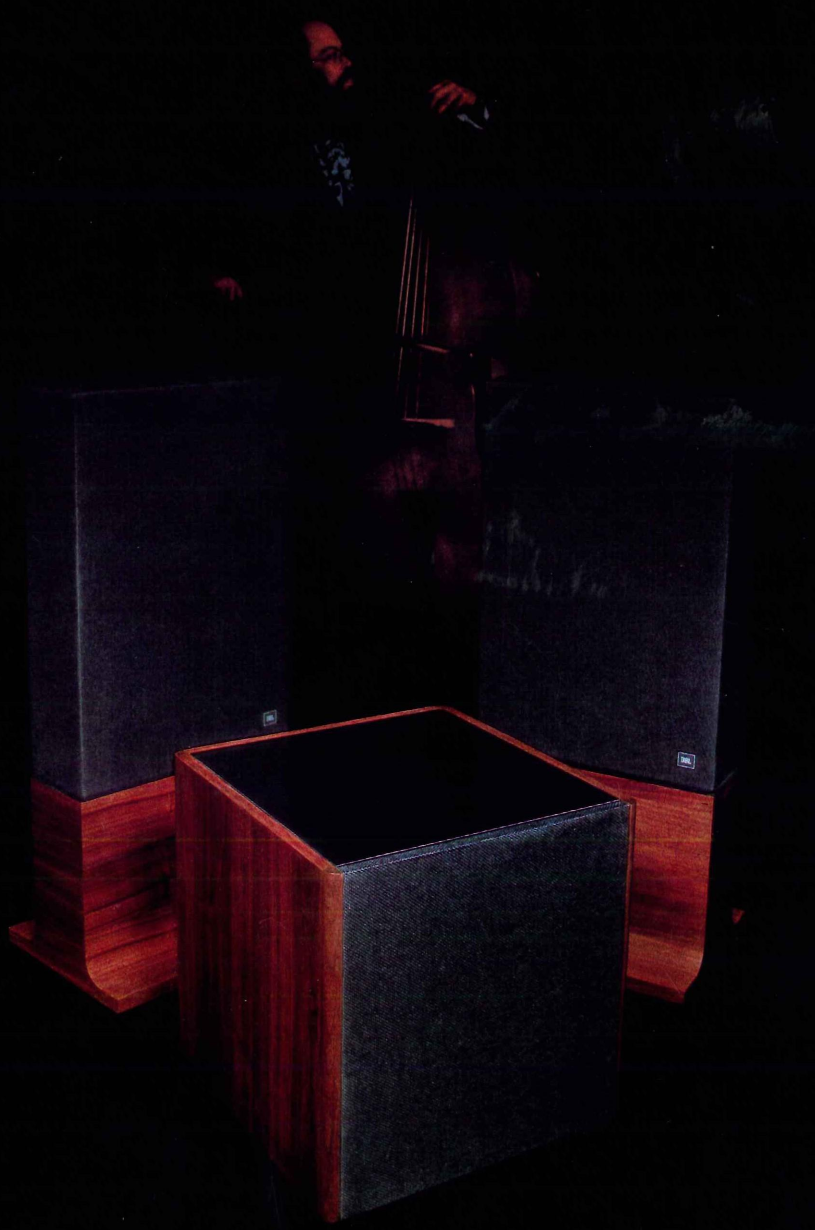
JBL changes the picture of sound




JBL

L212

JBL gave its engineers and designers this challenge: create a completely new loudspeaker system that must be: (1) more accurate and better sounding than any system JBL, or anyone else, had built before; and (2) a product that would fit comfortably into the physical and aesthetic realities of any home environment.

These goals seem incompatible; they seem to invite serious compromise. But both goals were pursued in an uncompromising way, and, three years of engineering, design, and development later, the reward is a rare and special congruence of form and function, the L212. We believe it is a definitive restatement of what high fidelity can be.

The L212 is designed to do more than reproduce test signals accurately under test conditions (which it does with great success). Good recordings contain more information than just high and low, left and right. They contain all the ingredients necessary to reconstruct an image in sound that can seem startlingly three-dimensional. These ingredients constitute the most fragile of subtleties; the most painstakingly detailed design is required to achieve a loudspeaker system that preserves a sound's delicate structure, sending it into a room intact. The L212 is such a system.

The L212 is composed of three elements. The third, called the Ultrabass, reproduces the lowest bass of both channels. This design approach was taken because sound behaves in fundamentally different ways at high frequencies and at low frequencies, placing distinctly different demands on a loudspeaker system. In the L212, each frequency range is assigned to a reproducer optimized for its individual task. The Ultrabass represents a solution to the unique problems of low frequency reproduction, physically separate but thoroughly integrated into the overall L212 concept.

The left and right channel wide range systems

TOTAL ENERGY RESPONSE

The L212 responds to the full audio frequency spectrum with extreme consistency, rolling off only 2 decibels at 25 hertz and at 30 kilohertz.

However, extended, smooth frequency response is not enough.

In the home, we often listen from a position not directly in front of, or on axis with, the loudspeakers. Consequently, the dispersion characteristics of loudspeakers are important —how well they perform over a wide listening angle. Loudspeaker engineering has usually concentrated on the particular problems of high frequency dispersion, because, given a loudspeaker of a specific diameter, the angle of sound dispersed grows narrower with higher frequencies. Thus the greatest dispersion problems occur at the highest frequencies. In the L212, high frequency dispersion is outstanding: 150° at 15 kilohertz.

However, wide high frequency dispersion is not enough.

A loudspeaker system should disperse sound effectively, not just at a single high frequency, but evenly over its entire range of frequencies. In practice, dispersion is wide at the low frequency limit of each individual loudspeaker, growing increasingly narrow until the high frequency limit of the driver is reached. Then the signal is crossed over to a smaller loudspeaker designed for higher frequencies, and dispersion is wide again, growing increasingly narrow up to the next crossover frequency, and so on. Dispersion in most loudspeaker systems thus tends to vary considerably with frequency, and response off axis varies considerably from response on axis.

The extent to which a loudspeaker system maintains constant dispersion throughout its frequency range establishes the system's total energy response—how accurately the system reproduces sound in all directions at all frequencies. Why is total energy response important? It isn't, outdoors. But in a room, sound radiated at any angle from a loudspeaker system is significant, because it interacts with the listening environment. We never listen to a loudspeaker alone, but to the combination of loudspeaker and room. The off-axis reverberant energy a loudspeaker system casts into a room should be nearly as smooth as the response of the system on axis. For natural image and perspective characteristics, the total energy radiated from a loudspeaker system should mirror, as closely as possible, any input.

It seems a subtle concept at first, until you hear it and experience the precision and depth of the sound image that results.

The L212 achieves superb total energy response. To visualize how good the system is in this respect, examine the chart on the back cover. It is a polar plot, drawn by measuring instruments, of dispersion at three different frequencies: a graphic

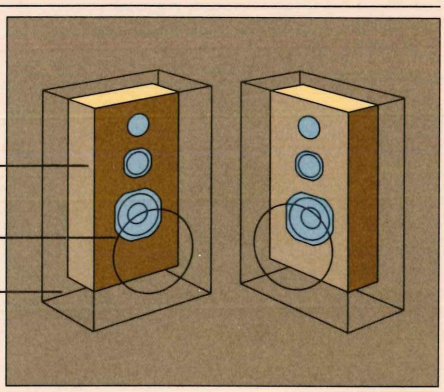
L212

Enclosure volume

L212 wide range system, actual enclosure volume

18-inch low frequency loudspeaker necessary if there were no separate Ultrabass

Enclosure volume necessary if there were no separate Ultrabass



representation of how sound is radiated from a loudspeaker. One of the two wide range systems of the L212 is represented at the center of the chart, viewed from the top. A semi-circular pattern at one frequency would represent perfect dispersion. Identical curves measured at all frequencies would represent perfect total energy response. The frequencies shown are 400 hertz (upper bass), 2 kilohertz (midrange), and 10 kilohertz (high frequency), chosen specifically because they are far apart on the frequency spectrum. Notice the near-semicircular patterns and the extremely close correspondence among the three curves. Many other frequencies have been measured in this way on the L212, and they too correspond closely in radiation pattern to the ones illustrated.

The total energy response of the L212 ensures that, whatever the material, whatever the instruments, the sound image radiates naturally, almost tangibly.

A VERY SPECIAL NETWORK

The achievement of good total energy response and natural sound requires not only individual drivers of excellent quality, but closely controlled interaction among them. Each of the two left and right channel wide range systems of the L212 contains three drivers: an 8-inch low frequency loudspeaker, a 5-inch midrange loudspeaker, and a 1-inch hemispherical radiator. Each is an outstanding performer in its own right. And in control of their collective efforts stands the most sophisticated frequency dividing network JBL has ever built.

The frequency dividing network receives the incoming signal from the amplifier and divides it into low, middle, and high frequency ranges, assigning each range to the appropriate driver in the system. In the L212, the transition between drivers is gentle, with considerable overlap: roll-off at the crossover frequencies occurs at a rate of 6 decibels per octave, compared with the more common and abrupt 12 or 18. This is possible because each of the drivers in the L212 system is capable of good performance over a far wider spectrum than its primary operating range. It is desirable because it affords the smoothest possible transition between drivers, with no audible gaps or discontinuities. It allows adjacent drivers to work together near the crossover frequency to maintain consistent dispersion. And it provides optimum phase characteristics.

Ideally, a frequency dividing network should execute crossovers between drivers with perfect smoothness. In practice, however, a major factor interferes. The action of a network on a driver depends on the impedance of the driver. Loudspeakers have nominal impedance ratings as guidelines — 8 ohms is typical — but in reality the impedance of a loudspeaker mounted in an enclosure varies considerably at different frequencies. Consequently, crossover action varies from the smooth curve desired.

Special circuitry in the frequency dividing network of the L212 (conjugate circuits) compensates for impedance variations in the mounted drivers. The crossovers function as if the drivers presented constant impedances — a situation closely approaching the theoretical ideal.

The midrange impedance graph illustrates the effective impedance of the midrange loudspeaker in the L212, with and without compensation. The other loudspeakers in the system are similarly compensated. Smooth impedance translates directly into smooth crossover performance.

In the L212, crossover action is imperceptible and utterly transparent.

THE DRIVERS

The striking, slim dimensions of the left and right wide range systems of the L212 are possible because they are not called upon to reproduce the lowest octaves of bass, which would dictate a significant increase in enclosure size. Nonetheless, these enclosures, like the Ultrabass, derive their form from functional requirements. The 5- and 8-inch loudspeakers are mounted in smaller subchambers within the overall enclosure, precisely scaled to their acoustic requirements. The width of the cabinet is designed to create a front baffle surface that is effectively infinite for the high frequency radiator, and substantially large for the 5- and 8-inch loudspeakers, to minimize diffraction effects that could cause phase and imaging problems. The three drivers are mounted as close as possible in a tight vertical array for smoothest crossover transitions, wideband dispersion, and left-to-right channel symmetry, all resulting in superb imaging characteristics.

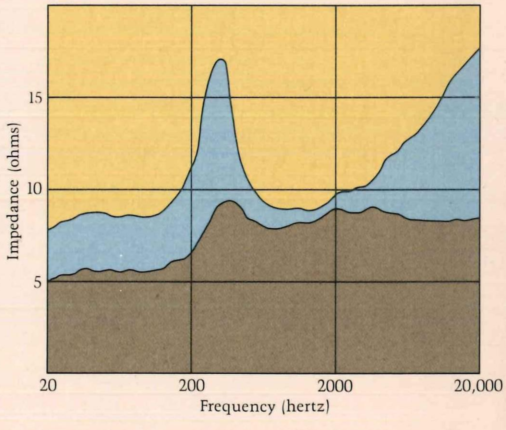
The 8-inch low frequency loudspeaker operates primarily over the range from 70 to 800 hertz, the

L212

Midrange impedance

Upper curve:
Normal impedance of midrange loudspeaker in enclosure

Lower curve:
Impedance of midrange loudspeaker in L212 with compensation



critical mid/bass region often neglected in less accurate loudspeaker systems. It is an 8-inch driver unlike any other. Its 7½-pound magnetic assembly with 3-inch voice coil derives from an assembly originally developed for a 12-inch loudspeaker. The cone is extremely hard and stiff to avoid break up at high volume, and the magnetic gap is extra long. The pole piece in the magnetic assembly is plated with silver to a precisely calculated thickness, controlling inductance for best transient response and lowest distortion.

The 5-inch midrange loudspeaker operates over the range from 800 hertz to 3 kilohertz. Based on the classic JBL 5-inch design, this loudspeaker utilizes a cone that is 25% thicker and effectively twice as stiff as that in any previous JBL 5-inch loudspeaker. It is mounted in a subchamber designed for optimum cone loading and roll-off characteristics.

High frequencies, from 3 kilohertz up to and beyond the limits of human hearing, are reproduced by a 1-inch hemispherical radiator. The dome is constructed of resin-impregnated linen; a thin film of aluminum is vapor-deposited on the outer surface of the dome, resulting in its unusual metallic appearance. The finished dome is extremely hard, and the entire area of the dome acts as a radiating surface. It has much greater efficiency than typical soft domes, which can have equally large voice coils but considerably greater diaphragm mass. And it has both greater efficiency and power handling capacity than cone radiators of the same diameter, which can offer equal radiating area but necessarily have much smaller voice coils. The dome produces a remarkable dispersion pattern of 150° horizontal and vertical at 15 kilohertz, ensuring accurate high frequency reproduction in the L212 over a broad listening area.

The Ultrabass

THE ENERGIZED SOLUTION

In designing a low frequency loudspeaker, an engineer is faced with a choice between efficiency and extended performance into deep bass. Very low frequencies are a fundamental part of music and of accurate sound reproduction. Bass efficiency is also particularly important, because the bass loudspeaker is usually the least efficient component in a loudspeaker system. The bass driver is the limiting factor, establishing the efficiency level to which the midrange and high frequency drivers must be restrained.

In designing the L212, JBL engineers insisted on frequency response virtually linear to 25 hertz, yet were unwilling to sacrifice the extra dynamic performance that depends on efficiency. The desire to create a system of practical dimensions for the home further complicated the problem, because very large drivers in very large enclosures—one approach to greater efficiency—would be cumbersome at best.

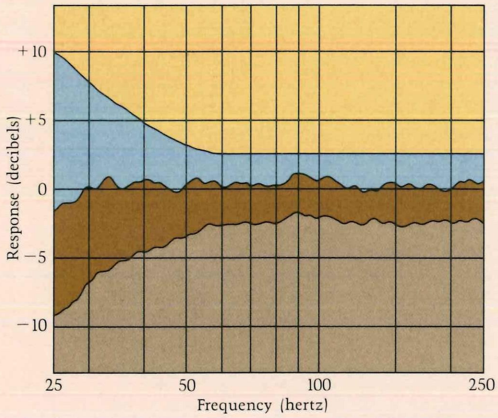
JBL solved the efficiency/response/size problem by designing an internal bass amplifier, or Bass Energizer, as an integral part of the Ultrabass. The very lowest, most power-hungry frequencies are given their own power source. The other sytem components—upper bass, midrange, and high frequency—are free to operate at their own collective efficiency level, using the power of the main amplifier or receiver to greatest advantage. As a result, the L212 has high system efficiency and outstanding dynamics.

The Bass Energizer minimizes the need for efficiency in the Ultrabass loudspeaker, making it possible to design that driver singlemindedly for extended low frequency response. The remarkable performance of the Ultrabass is attributable to the parallel and complementary design of loudspeaker, energizer, and enclosure. The qualities of each are tied to the characteristics of the others—precisely. The enclosure dimensions are derived from the acoustic requirements of the loudspeaker. The Bass Energizer provides equalization to optimize the response of the loudspeaker down to the threshold of subsonic frequencies.

The Ultrabass response graph illustrates how the equalization works. The bottom curve represents the frequency response of the Ultrabass loudspeaker in its enclosure. The top curve represents equalization provided by the Bass Energizer—a complementary curve. When the Bass Energizer and Ultrabass loudspeaker are mated, the top and bottom curves combine to form the middle curve, representing outstandingly smooth, extended low frequency response: −2 decibels at 25 hertz.

The result is superlative bass performance that is immediately obvious, whether appreciated by graph or by audition.

L212



Ultrabass response

Upper curve:
Bass Energizer equalization

Middle curve:
Combined response of Ultrabass loudspeaker and Bass Energizer

Lower curve:
Normal response of Ultrabass loudspeaker in enclosure

The Ultrabass obtains its deep, palpable bass performance from a single 12-inch driver—a testament to the structural integrity of the loudspeaker, a JBL tradition. The loudspeaker is completely new and remarkably massive. (Magnet: Alnico V in 12-pound assembly. Voice coil: edgewound copper ribbon, 4-inch diameter.) It may be difficult to believe, but it is virtually impossible to overdrive the Ultrabass with musical material even at the loudest listening levels.

ONLY A SINGLE CHANNEL

The Ultrabass is used primarily below 70 hertz. The ear cannot sense direction in this very low range; as a result, the Ultrabass can be positioned without regard to the other elements in the system. Instead, its placement can be dictated by the needs of the room—acoustic and visual. (The Ultrabass grille can even face the wall. The enclosure is finished in walnut on three sides and can easily go completely unrecognized as a loudspeaker.)

The nondirectionality of the Ultrabass is also the reason that it is possible to combine left and right into a single bass channel with no adverse effect on the stereo image. And there is an important advantage to this summing of channels.

Many problems encountered in playing phonograph records represent a continuing strain on amplifiers and loudspeakers. Warps, acoustic feedback, and turntable rumble are examples of frequent sources of noise in the low bass-to-subsonic range. These effects, whether audible or not, present formidable inputs to an amplifier. They are amplified, at great expense of power, and in turn cause excessive movement of loudspeaker cones. At best, amplifiers and speakers so occupied are not capable of devoting their full potential to the music. At worst, both can be damaged.

These imperfections, unlike music, cause a phonograph stylus to move only in the vertical direction. Because of the way stereo records are cut and played back, vertical stylus motion is interpreted by a phonograph cartridge as a signal that has been recorded equally in the left and right channels, 180° out of phase. When the left and right channels are summed in the Ultrabass, most of the undesirable low frequency noise disappears. Power in the Ultrabass is conserved for its intended purpose: music.

Power capacity

The specified power capacity indicates the continuous program power level that can be accepted by a JBL loudspeaker system without damage. Its peak power capacity is considerably greater than the continuous rated value, as indicated by the remarkable transient response of JBL loudspeaker system components. The L212 will reproduce clean sound at comfortable listening levels when driven by an amplifier having an output of as little as 10 watts continuous sine wave per channel.[1]

1. The continuous sine wave rating of amplifier power is the most stringent method currently used in the audio industry. It should be noted that many amplifier manufacturers use the term "watts rms" as a direct equivalent to the more meaningful "watts continuous sine wave."

However, for reproduction of the full dynamic range of contemporary recordings at high volume, a high quality amplifier delivering up to 200 watts 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.

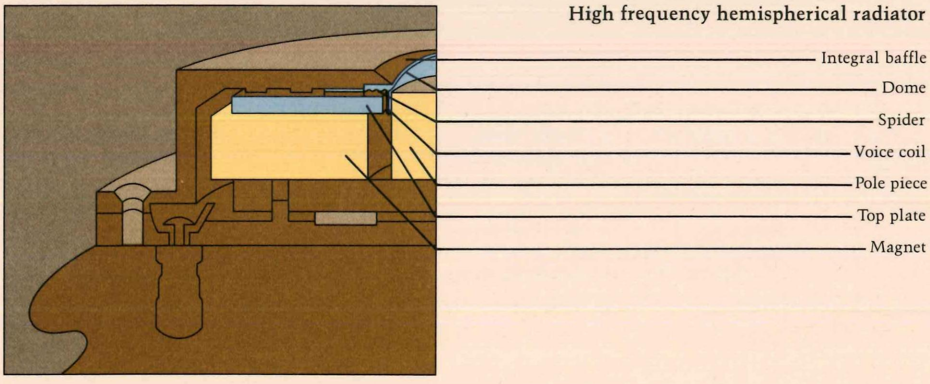
Listening to the L212

Some of the qualities of the L212 are immediately evident on first listening—the dynamic performance and the solidity of the bass, for example. Other, more subtle qualities are best appreciated on extended listening—the imaging, the unparalleled smoothness of response. The L212 has none of those aberrations that may sound exciting at first, only to become fatiguing over hours or over years.

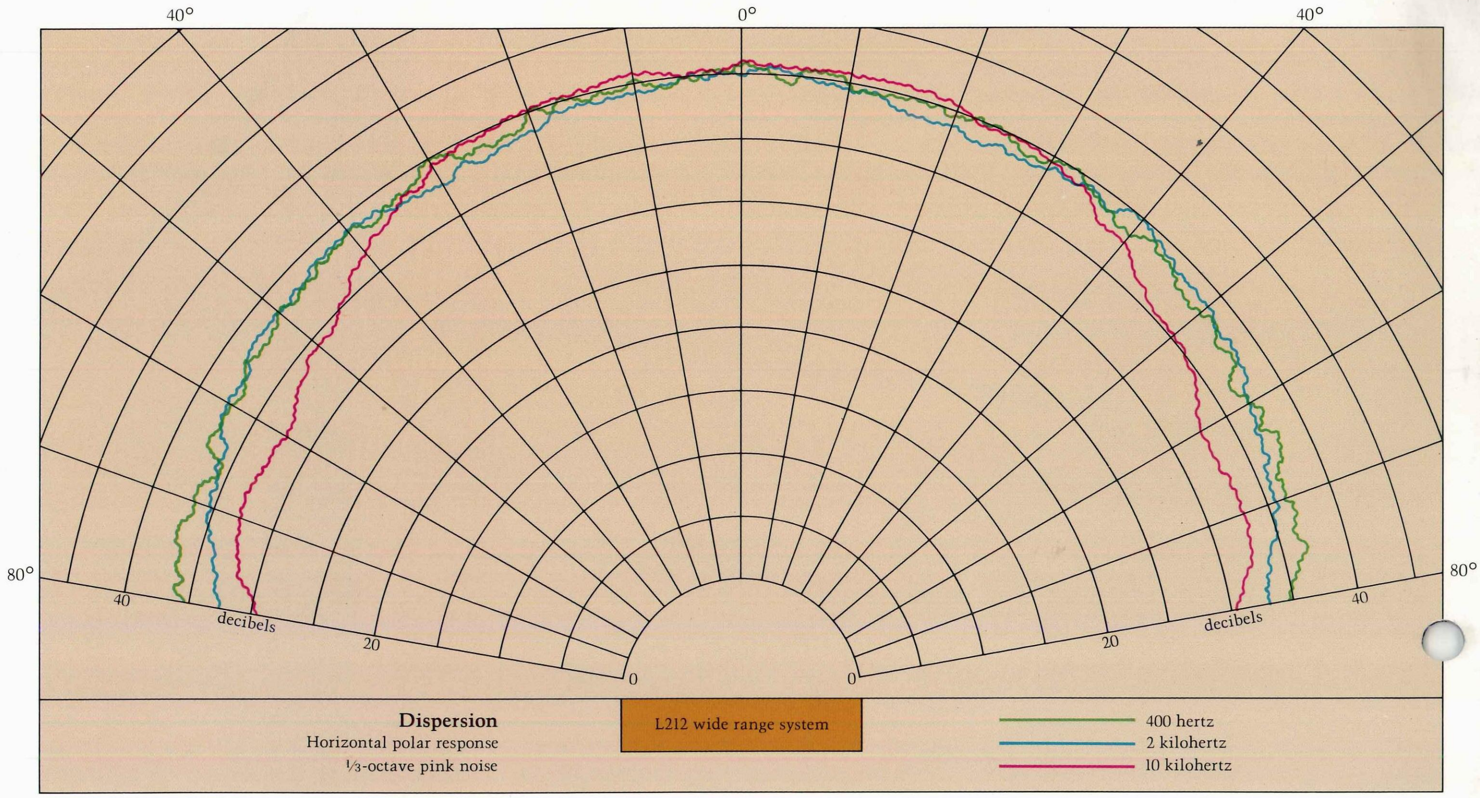
Give the L212 your unhurried time. Listen to a wide variety of musical material. Listen from different points in the room and notice how the character of the sound remains unchanged. Finally, listen at length, uninterrupted, to a favorite recording; listen to the dimension and detail, the totality of the sonic image in space.

L212

High frequency hemispherical radiator




JBL
Model L212
Ultrabass



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 will always equal or exceed the original design specifications unless otherwise stated.

Power Capacity[1]	75 watts continuous program	
Nominal Impedance	8 ohms	
Dispersion[2]	150° at 15 kHz, 90° at 20 kHz	
Crossover Frequencies[3]	70, 800 and 3000 Hz	
System Sensitivity[4]	1 watt input produces 77 dB sound pressure level at a distance of 4.6 m (15 ft)	
(Note: 75-80 dB is a comfortable listening level.)		
Ultrabass Loudspeaker		
Nominal Diameter	300 mm	12 in
Voice Coil	102-mm (4 in) edgewound copper ribbon	
Magnetic Assembly Weight	5.4 kg	12 lb
Flux Density	1.2 tesla (12,000 gauss)	
Sensitivity[5]	37 dB SPL	
Low Frequency Loudspeaker		
Nominal Diameter	200 mm	8 in
Voice Coil	76-mm (3 in) edgewound copper ribbon	
Magnetic Assembly Weight	3.5 kg	7¾ lb
Flux Density	0.93 tesla (9300 gauss)	
Sensitivity[5]	42 dB SPL	
Midrange Transducer		
Nominal Diameter	130 mm	5 in
Voice Coil	22-mm (⅞ in) copper	
Magnetic Assembly Weight	0.74 kg	1⅝ lb
Flux Density	1.4 tesla (14,000 gauss)	
Sensitivity[6]	45 dB SPL	
High Frequency Hemispherical Radiator		
Hemisphere Diameter	25 mm	1 in
Voice Coil	25-mm (1 in) aluminum	
Magnetic Assembly Weight	0.68 kg	1½ lb
Flux Density	1.4 tesla (14,000 gauss)	
Sensitivity[7]	41 dB SPL	
Bass Energizer		
Primary Operating Range	20 to 100 Hz, equalized	
Signal-To-Noise Ratio	Better than 85 dB at full output	

Damping Factor	Greater than 80	
Power Requirement[8]	120 volts AC, 50/60 Hz	
Maximum Power Consumption		
Quiescent	15 watts	
⅓ power output	65 watts	
Full power output	125 watts	
General		
Finish	Oiled Walnut	
Grilles	Black fabric	
Ultrabass Top Surface	6-mm (¼ in) gray plate glass with ground and seamed edges; black foam cushioning 430 mm x 430 mm, ± 1.5 mm 16 15/16 in x 16 15/16 in, ± 1/16 in	
Dimensions		
Ultrabass	486 mm x 470 mm x 470 mm deep 19⅛ in x 18½ in x 18½ in deep	
Wide range systems	981 mm x 432 mm x 330 mm deep 38⅝ in x 17 in x 13 in deep	
Shipping Weight	102 kg	225 lb

1. Based on a laboratory test signal. See Power Capacity section for amplifier power recommendation.
2. The angle through which system output is diminished by no more than 6 dB relative to system output measured directly on axis.
3. The 70-Hz transition, between the Ultrabass and the wide range loudspeaker systems, is controlled by the Bass Energizer and by the acoustic characteristics of the 8-in low frequency loudspeaker. The 800-Hz and 3-kHz transitions are controlled by the frequency dividing networks contained in each wide range system.
4. System sensitivity can also be expressed as 90 dB SPL at 1 m (3.3 ft).
5. Since the major portion of the energy reproduced by the Ultrabass and low frequency loudspeakers lies below 800 Hz, this specification represents the sensitivity, within 1 dB, at 30 ft (9.1 m) using a 1-milliwatt test signal swept from 100 to 500 Hz, rather than the 1-kHz sine wave test signal on which the conventional EIA sensitivity rating is based.
6. Averaged from 1 to 3 kHz, within 1 dB, measured at 30 ft (9.1 m) with a 1-milliwatt input.
7. Averaged from 5 to 20 kHz, within 1 dB, measured at 30 ft (9.1 m) with a 1-milliwatt input.
8. Can be converted for 240-volt AC, 50/60-Hz operation by qualified service technicians.

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