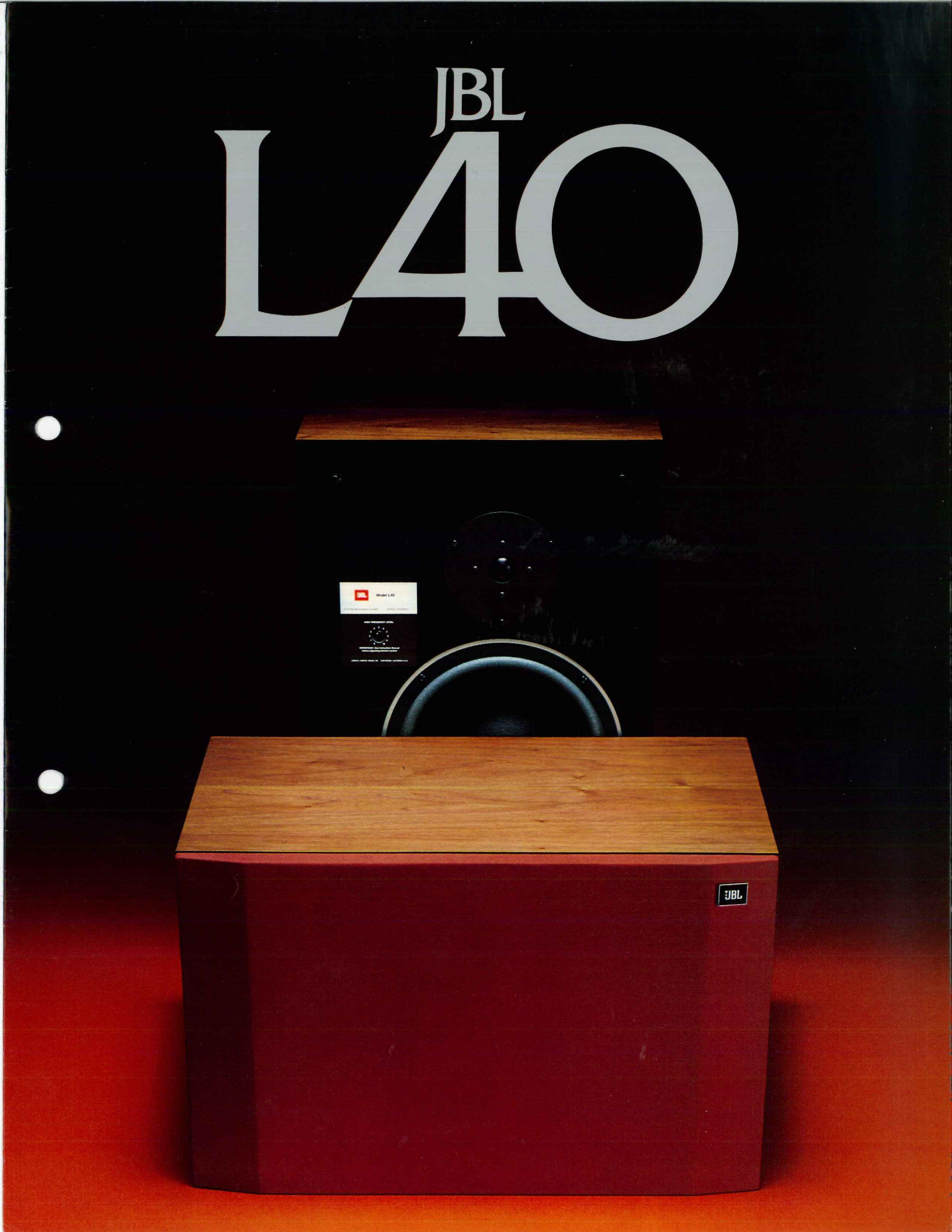
JBL L40



L40

A Practical Application Of Technology

The L40 represents a practical application of data acquired designing sophisticated products for home, recording studio, musical instrument and professional applications. JBL engineers explored dozens of possibilities with the ultimate goal of creating an extremely accurate, moderately priced bookshelf loudspeaker system. In some instances, the performance compromises were not acceptable. In others, methods were found to improve the product and still effect cost reductions. When all the research was complete, the engineers remained adamant about one essential point. They demonstrated, beyond all question, that an extremely sophisticated frequency dividing network more than justified its nominally higher cost by providing audibly improved performance.

A Good Computer, But Can It Hear?

JBL engineers programmed a computer with a very accurate mathematical model of the acoustic interaction between a low frequency loudspeaker and its enclosure. Several sets of physical parameters for low frequency loudspeakers and enclosures were entered into the program. The computer performed the appropriate calculations and produced theoretical plots of impedance and frequency response for each set of conditions. The computer, however, is not a substitute for creative engineering; it cannot think and it cannot hear. It can provide a great deal of theoretical information in a very short period of time, significantly contributing to the efficiency of the research and development effort. Laboratory samples of the most promising computer simulations were built; actual performance measurements were compared with the computer simulations. Complete prototype systems comprised of the low frequency loudspeaker, dome radiator, frequency dividing network and enclosure were built and extensively evaluated by a listening panel. The final loudspeaker system was then developed by JBL engineers in response to these subjective listening tests.

Technical Information

Each component of every JBL loudspeaker system is designed and produced by JBL personnel to the most rigorous standards in the industry. JBL loudspeaker frames are massive cast structures, produced to exacting tolerances. Magnetic assemblies are precisely manufactured of low-reluctance iron, energized by large, high grade magnets. Voice coils are held to within one turn of design specifications. Stamped frames and mass-produced voice coils would be less expensive; however, the resultant loss of structural integrity, magnetic force and acoustic efficiency would tend to degrade low-distortion performance and transient response—qualities that have become JBL hallmarks.

Low Frequency

Extensive research resulted in a significant refinement of a 10-inch loudspeaker proven through several years of use in JBL bookshelf loudspeaker systems. Of particular importance are the performance characteristics at the upper limit of the transducer's range. Experimentation with various cone materials and center dome configurations yielded an optimum combination for smoothest frequency response and widest sound dispersion. The loudspeaker utilizes a 2-inch voice coil and 2½-pound magnetic assembly energized by a powerful Alnico V magnet. The voice coil and magnetic assembly are large in comparison to most other 10-inch loudspeakers, resulting in increased efficiency and improved transient response. At higher frequencies, energy is coupled to the 4-inch center dome; radiation from the dome's smaller area (relative to the area of the loudspeaker cone) maintains wide sound dispersion and smooth response to 1800 Hz, essential for smooth transition to the high frequency dome radiator.

The low frequency loudspeaker is surrounded by a unique acoustic resistance shell which matches the loudspeaker's performance characteristics to the internal volume of the enclosure. The shell consists of fiberglass formed into a basket behind the loudspeaker and provides damping without restricting normal cone movement. The effectiveness of the shell is demonstrated by the smoother loudspeaker impedance curve and its audible counterpart—smoother frequency response throughout the bass region.

High Frequency

The new 1-inch dome radiator combines accuracy, power handling capacity and wide sound dispersion. Its hardened phenolic-impregnated linen dome was engineered to optimize mass, radiating area and stiffness—parameters which directly affect performance. The 1-inch voice coil is equal in diameter to the dome itself, which, along with a large magnetic structure, permits excellent transient response and power handling capacity. The small diameter of the dome results in wide sound dispersion to beyond the limits of audibility.

Frequency Dividing Network

The signal from the amplifier consists of a wide range of sound frequencies. The frequency dividing network allocates each portion of the audio spectrum to the appropriate component of the loudspeaker system. Smooth, imperceptible operation of the network is vitally important; otherwise, the listener would perceive the performance of individual components rather than that of a blended loudspeaker system.

Through research programs devoted to developing sophisticated networks for use in recording studio monitors, JBL engineers devised the circuit installed in the L40. Beginning with computed theoretical values, experimental work resulted in a network that integrates the acoustic and electrical characteristics of the individual components of the loudspeaker system. The network maintains smooth frequency response and correct phase relationships through the transition frequencies, deriving the full potential from each of the loudspeaker system components. The network is fitted with a continuously variable high frequency level control that allows adjustment of the system to accommodate differences in listening environments and individual preferences.

Power Capacity

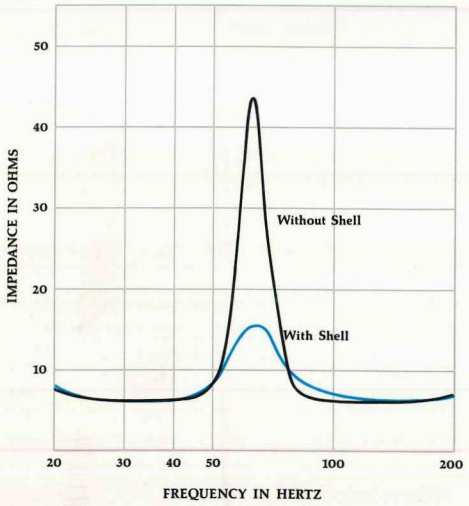
The specified power capacity indicates the continuous program power level that can be accepted by a JBL loudspeaker system without damage. Its peak power capacity is considerably greater than the continuous rated value, as indicated by the remarkable transient response of JBL loudspeaker system components. The L40 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] However, for reproduction of the full dynamic range of contemporary recordings at high volume, a quality amplifier delivering up to 60 watts continuous sine wave 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.

A number of loudspeaker systems can handle large amounts of power; others are highly efficient. JBL products are unique in their ability to combine both attributes. The L40, for example, will convert a 1-watt input into a sound pressure level of 75 dB measured at a distance of 15 feet. This is approximately twice as loud as ordinary conversation and represents a comfortable listening level, demonstrating that the system delivers substantial sound output from very little input power.

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."*

Enclosure

The L40 enclosure complements the acoustic characteristics of the loudspeaker system. It utilizes a ducted port extending through the baffle panel to provide the proper load on the loudspeaker cone for improved efficiency and dynamic range. Enclosure panels are constructed of dense compressed wood. This material, also known as particle board, is preferred to solid wood for its acoustic properties. The finish veneer on the four side panels is solid American Black Walnut, hand rubbed to a rich lustrous finish enhancing the natural beauty of individual grain structure and color. To achieve maximum strength and resistance to vibration, all panels are constructed of ¾-inch stock; side and back panels are lined with acoustic damping material to attenuate standing waves within the enclosure.



Effect Of The Acoustic Resistance Shell
Impedance curves of the low frequency loudspeaker mounted in the L40 enclosure were taken under standard laboratory test conditions. The effect of the shell can be seen by comparing curves. Impedance is the electrical load the loudspeaker presents to the amplifier; current is the force required to drive the loudspeaker. Amplifiers provide considerably less current at high impedances than at low impedances. Therefore, the amplifier has less control of the loudspeaker through those frequencies corresponding to the sharp peak in the impedance curve. The shell considerably reduces the magnitude of the peak. The smoother impedance enables the amplifier to maintain consistent control of the loudspeaker through its entire operating range, resulting in corresponding improvement of its frequency response.

Specifications

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.

Power Capacity[1]	35 watts continuous program
Nominal Impedance	8 ohms
Dispersion[2]	150° at 15 kHz, 90° at 20 kHz
Crossover Frequency	1800 Hz
System Sensitivity[3]	1 watt produces 75 dB sound pressure level at a distance of 4.6 m (15 ft) (Note: 75-80 dB is a comfortable listening level.)
Low Frequency Loudspeaker	
Nominal Diameter	250 mm 10 in
Voice Coil	50-mm (2 in) copper
Magnetic Assembly Weight	1.1 kg 2.5 lb
Flux Density	0.85 tesla (8500 gauss)
Sensitivity[4]	39 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 1.5 lb
Flux Density	1.4 tesla (14,000 gauss)
Sensitivity[5]	41 dB SPL
General	
Finish	Oiled Walnut
Grille	Stretch fabric
Grille Color Options	Brown, Rust or Tan
Dimensions	584 mm x 381 mm x 302 mm deep 23 in x 15 in x 11⅞ in deep
Shipping Weight	20 kg 44 lb

1. Based on a laboratory test signal. See Power Capacity section for amplifier power recommendations.
2. The angle through which system output is diminished by no more than 6 dB relative to system output measured directly on-axis.
3. System sensitivity can also be expressed as 88 dB SPL at 1 metre (3.3 ft). All sensitivities are measured under hemispherical free-field conditions. In a room, an additional 1 to 3 dB SPL would be achieved.
4. Since the major portion of the energy reproduced by the low frequency loudspeaker lies below 800 Hz, this specification represents the sensitivity, within 1 dB, at 30 feet (9.1 m) using a 1-mW 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.
5. Averaged above 2 kHz, within 1 dB, measured at 30 feet (9.1 m) with a 1-mW input.

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.

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