ENGINEERING STAFF REPORT

The JBL Model L112 Loudspeaker System

Authors: John Eargle, Vice President, Market Planning

Greg Timbers, Design Engineer

INTRODUCTION

The L112 loudspeaker system addresses the requirements of flat response, low distortion and accurate stereophonic imaging more thoroughly than any previous JBL bookshelf system. In this paper, we will discuss these and other aspects of its performance in detail.

STEREOPHONIC IMAGING

It is generally felt that a symmetrical array of components is essential for accurate stereophonic imaging. Recent JBL designs such as the L110, L50 and L212 achieved this through the use of an in-line vertical array, as shown in Figure 1. The vertical in-line array has the advantage of requiring only one model for both left and right channels. When used in the vertical mode, imaging is excellent; interferences between components are restricted to the vertical plane and are not likely to be troublesome to the listener. The drawback of the in-line array occurs when the loudspeakers are placed horizontally, as on a bookshelf. In this mode, maximum interferences will take place in the horizontal plane, and this will inhibit accurate stereophonic imaging.

When a tighter cluster of components on the baffle is used, more flexibility in mounting the systems, vertically or horizontally, is realized. However, the systems must be mirror-imaged, and two models, left and right, will be required. As shown in Figure 2, the mirror-imaged pair will result in a precise phantom center image, since a listener located in the middle will be equidistant from all the transducers. The mirror-imaged pair also affords additional flexibility in accommodating wide or narrow spacings as may be required by conditions in the individual listening room, as shown in Figure 3.

FREQUENCY AND POWER RESPONSE

On-axis frequency response of the L112 system is shown in Figure 4. Note that the low-frequency response is maximally flat for free-space (4π) mounting of the system. When the system is placed flush against a wall (2π condition), the low-frequency response rises by 3 dB in the frequency range between 50 and 100 Hz. Since most bookshelf-type systems are mounted out in the listening room and slightly elevated, the flat free-space response will generally result in a better overall balance between LF and HF response.

The power response of a loudspeaker system has to do with the total output over its frequency range. The measurement we present here is the system's directivity index (DI). DI is measured in decibels and represents the system's overall energy output relative to its on-axis response. Figure 5 shows the DI of the L112 system. Note that it is flat within $\pm$ 2.5 dB over the frequency range from 600 Hz to 16 kHz. The maintenance of a fairly flat DI over such a large range ensures that the reverberant sound field in the listening room will be smooth.

Another view of the system's power response may be seen in the polar plots of Figure 6. Here, we note that the horizontal dispersion of the system at 400 Hz, 1.6 kHz and 8 kHz is quite uniform.

DISTORTION

The L112 system uses the same LF transducer (128H) as is used in the L150 system which JBL introduced in 1979. The 128H LF transducer was JBL's first design to make use of the symmetrical field geometry (SFG) concept. Technical reviews of the L150 have consistently mentioned its superlative low-distortion low-frequency performance, and it is JBL's intention in the L112 to introduce an order of LF performance in bookshelf system design not previously known. The L112's performance at 10 watts input is better than that of many systems with 1-watt input! Figure 7 shows the second and third harmonic distortion with a 1-watt input, while Figure 8 shows the performance with a 10-watt input.

IMPEDANCE AND DIVIDING NETWORK RESPONSE

The modulus of impedance of the L112 system is shown in Figure 9, and the voltage drives to the individual components are shown in Figure 10.

TIME DOMAIN CONSIDERATIONS

Time domain considerations have to do with the proper alignment of acoustical centers of the transducers on the baffle so that time errors are minimized or at least reduced to some acceptable value. Most bookshelf systems consisting of cone or dome transducers are inherently well aligned according to the criteria developed by Blauert and Laws (Journal of the Acoustical Society of America, vol. 63, no. 5, May 1978). Figure 11 shows the limits of audible time misalignment, as determined by Blauert and Laws, along with the characteristics of the L112 components. Note that the L112 is well within the Blauert and Laws criteria.

SPECIFICATIONS

System

Maximum Recommended Amplifier Power	300 watts per channel
Nominal Impedance	8 ohms
Crossover Frequencies	1.1 kHz, 3.7 kHz
System Sensitivity	89 dB SPL, 1 W, 1 m (3.3 ft)

Low Frequency Loudspeaker 128H

Nominal Diameter	300 mm 12 in
Voice Coil	76 mm (3 in) copper
Magnetic Assembly Weight	4.7 kg 10¼ lb
Flux Density	1.05 tesla (10,500 gauss)
Sensitivity[1]	89 dB SPL, 1 W, 1 m (3.3 ft)

Midrange Loudspeaker LE5-12

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[2]	91 dB SPL, 1 W, 1 m (3.3 ft)

High Frequency Dome Radiator 044

Nominal Diameter	25 mm 1 in
Voice Coil	25 mm (1 in) copper
Magnetic Assembly Weight	0.9 kg 2 lb
Flux Density	1.4 tesla (14,000 gauss)
Sensitivity[3]	89 dB SPL, 1 W, 1 m (3.3 ft)

General

Finish	Oiled walnut
Grille Color	Brown[4]
Dimensions	622 mm x 362 mm x 333 mm deep 24½ in x 14¼ in x 13 in deep
Shipping Weight	25 kg 55 lb

1. Averaged from 100 to 500 Hz, within 1 dB.

2. Averaged from 1 kHz to 3 kHz, within 1 dB.

3. Averaged above 5 kHz, within 1 dB.

4. Red and tan grilles are available separately.

Source for phantom center

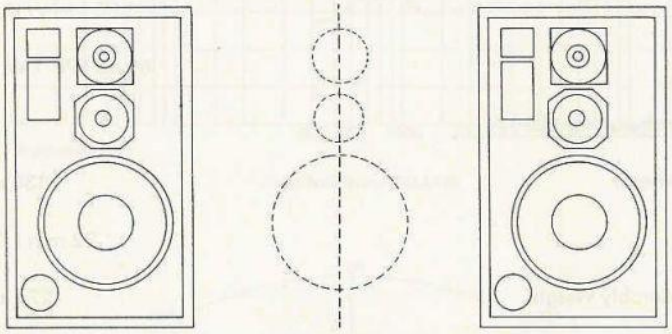

Figure 1

In-line Vertical Array

Source for phantom center

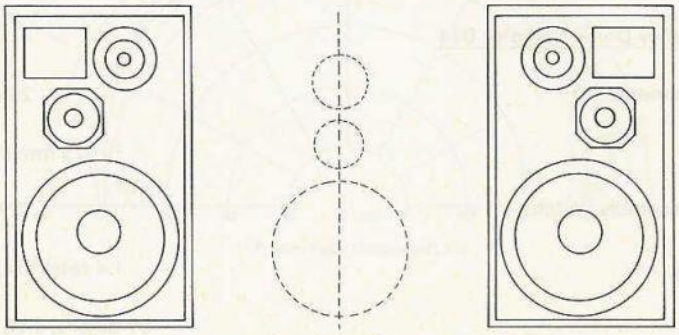

Figure 2

Mirror-imaged Array


Wide spacing: HF units inboard
Narrow spacing:
HF units outboard
Wide spacing: HF units inboard
Narrow spacing:
HF units outboard

Figure 3

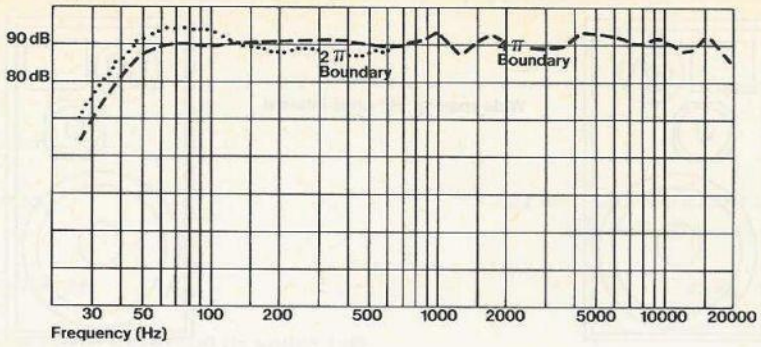

Figure 4 On-axis Frequency Response, L112

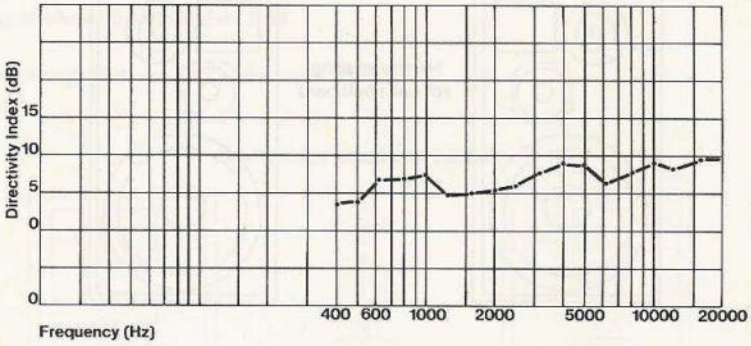

Figure 5 Directivity Index (DI), L112

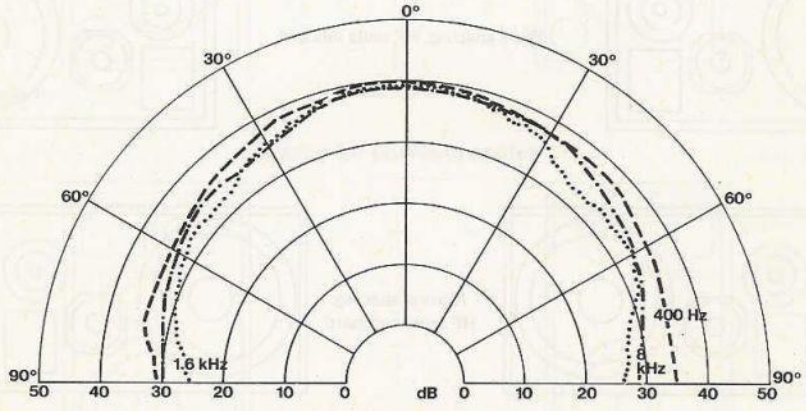

Figure 6 Typical Polar Response, L112

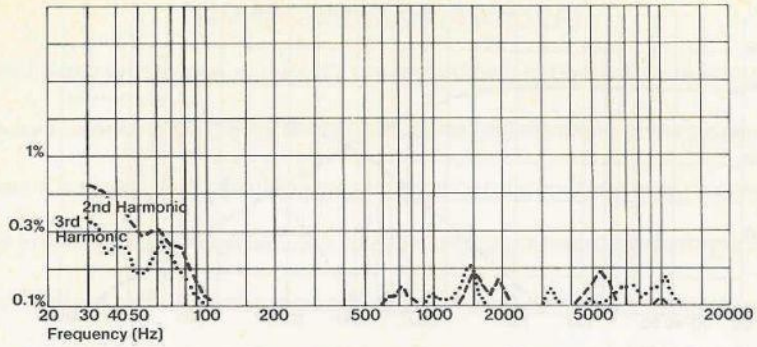

Figure 7 Harmonic Distortion, L112, 1-watt Input

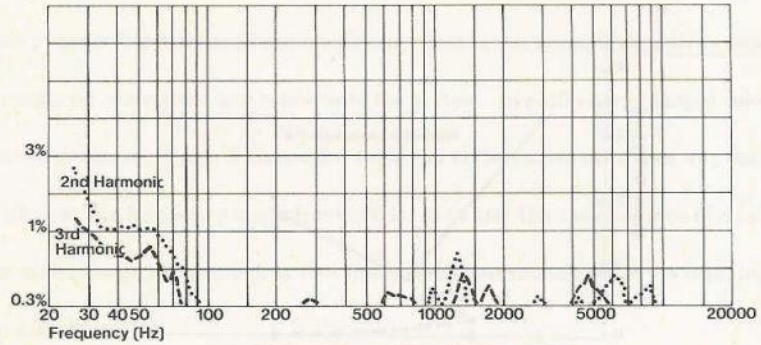

Figure 8 Harmonic Distortion, L112, 10-watt Input

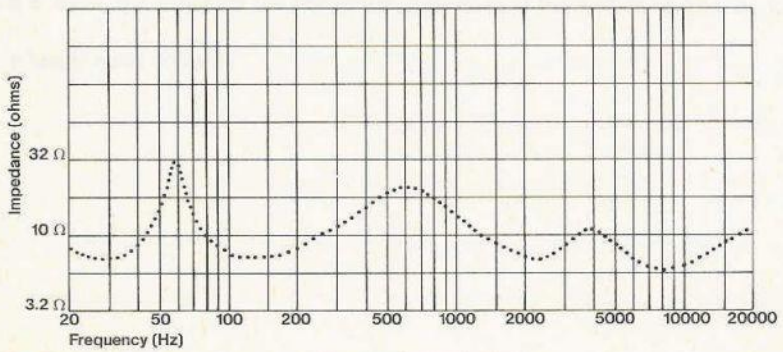

Figure 9 Modulus of Impedance, L112

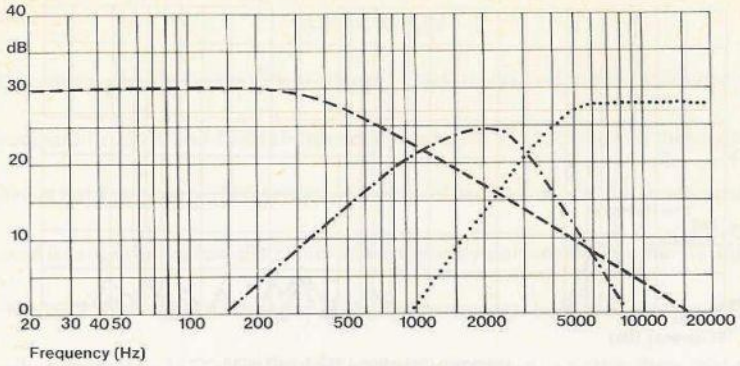

Figure 10 Dividing Network Response, L112

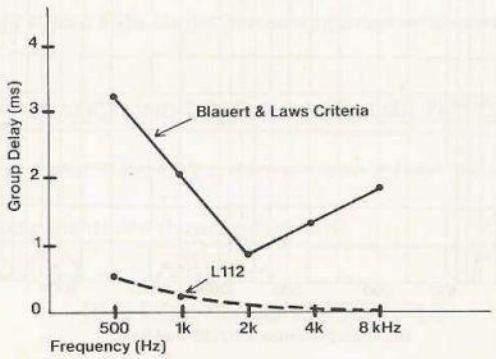

Figure 11 Time Domain Response, L112

James B. Lansing Sound, Inc., 8500 Balboa Boulevard, Northridge, California 91329 U.S.A.