4425 Bi-Radial® Studio Monitor

Professional Series

Key Features:

- Smooth, accurate response from 40 Hz to 16 kHz
- 200 watts continuous program power capacity
- Sensitivity: 91 dB SPL, 1 W at 1m
- Flat power response Bi-Radial® horn[1]
- High-frequency transducer: pure titanium diaphragm compression driver with edge-wound aluminum ribbon voice coil, copper-plated pole piece, and diamond pattern diaphragm suspension[2]
- Low-frequency transducer: 300 mm (12 in) driver with 76 mm (3 in) edge-wound copper ribbon voice coil

The model 4425 Bi-Radial® studio monitor is designed for use in smaller studios and for a variety of demanding audio production applications.

As in the case of the larger Bi-Radial monitors, the 4425 maintains a 100-degree-by-loo-degree coverage pattern from its crossover frequency (1200 Hz) up to 16 kHz. Smooth power response is ensured from the lowest frequencies up to 1200 Hz, and flat power response is maintained above that frequency At the same time, axial response is remarkably smooth, and the combination of controlled power and axial response ensures that the reflected sound field in the control room will be free of coloration.

Accurate stereophonic imaging is achieved by creating an absolute symmetrical sound field, the result of mirror-image design. There is no lobing for normal off-axis listening positions in the horizontal plane, and vertical lobing is minimized over the preferred listening arc.

The model 4425 can handle program power inputs of 200 watts, more than enough to accommodate the high acoustical levels demanded in critical listening to todays’ digital recordings.

High-Frequency Horn and Driver

The Bi-Radial horn is made of high-impact structural foam and is acoustically inert. The high-frequency compression driver design makes use of a computer-machined phasing plug. Tolerances are held to a high degree, and unit-to-unit variation is small. The diaphragm assembly is JBIs’ unique titanium design, with its advantages of extended frequency response relative freedom from mechnical fatigue, and high acoustical output capability. A copper shorting ring plated on the pole piece controls high-frequency impedance and improves high-frequency response.

Precisely aligned phase response is maintained by the 4425 system over a forty-degree wide arc in the horizontal plane. The preferred listening arc in the vertical plane is between zero (on-axis) and ten degrees up. See Figures 3 and 4 for details of off-axis response of the system.

Low-Frequency Transducer

The model 2214H, 300 mm (12 in) driver, incorporates JBIs’ symmetrical field geometry (SFG) magnet structure for low distortion. The 76 mm (3 in) voice coil is made of edge-wound copper ribbon wire for highest sensitivity and power handling. The inner suspension of this transducer has been designed to exhibit a progressive increase in restoring force with increasing displacement. This controls dynamic offset for low-frequency, large excursion signals, and results in reduced distortion at low frequencies. A composite coating on the cone optimizes both damping and stiffness, resulting in smoother response and lower distortion.

Frequency Dividing Network

In addition to the normal function of frequency division, the network in the 4425 provides power response compensation for the high-frequency driver. Two controls allow the user to contour both mid and high frequencies to match various room characteristics. While the network slopes are 12 dB/octave, the combination of inherent roll-off characteristics in both high- and low-frequency components of the system with the electrical characteristics yields quite rapid transitions in the crossover frequency.

Network components are the most rugged, low-loss type, and high-quality bypass capacitors are placed in parallel with the larger capacitors in the signal path for increasing linearity.

1. U.S. Patent #4,308,932 Foreign parents pending.
2. U.S. Patent #4,324,312. Foreign patents pending.

4425 Bi-Radial® Studio Monitor

Specifications:

SMALL SIGNAL RESPONSE AND DIRECTIVITY:	
Frequency Response:	40 Hz - 16 kHz, ± 3 dB
Sensitivity (1 W @ 1m):	91 dB SPL
Efficiency (Half-space reference):	0.8%
Dispersion Angle (Included by 6 dB down points, averaged between 1.25 and 16 kHz).	
Horizontal:	100° (+ 10°, – 30°)
Vertical:	100° (+ 0°, – 30°)
Directivity (Averaged over 800 Hz to 16 kHz)	
Directivity Index (DI):	9 dB (+ 3, – 2)
Directivity Factor (Q):	8 (+ 8, – 3)
Group Delay Characteristics[1]	See figure 5
300 Hz to 1.6 kHz:	400 µS (± 100 µs)
smoothly changing to 2.5 kHz to 20 kHz:	0 µs (0, ± 50 µs)
Controls	
Mid Frequency:	– 11 to + 2 dB @ 2 kHz
High Frequency:	– 8 to 0 dB @ 12 kHz
Nominal Impedance:	8 ohms
Minimum Impedance:	> 6 ohms (see Figure 8)
LARGE SIGNAL, INPUT AND OUTPUT CHARACTERISTICS:	
Maximum Power Input[2]:	200 W
Short-Term Peak3 (<10 ms):	1 kw
Continuous Sine Wave[3]:	See Figure 9
Maximum Sound Pressure Level (SPL)[4]	
Continuous Program:	114 dB
Continuous Sine Wave:	See Figure 10
Power Linearity	
1 W to 100 W Continuous input: (see Figure 11):	<2 dB compression of SPL output
Distortion:	
At 100 dB SPL on-axis 1 meter:	(10 W input)
Second Harmonic:	
Low Frequencies (40-100 Hz):	< 4%
Mid Frequencies (100-1000 Hz):	< 1%
High Frequencies (1000-8000 Hz):	< 2%
Third Harmonic:	
Low Frequencies:	< 1%
Mid Frequencies:	< 0.4%
High Frequencies:	< 0.4%
At 107 dB SPL on-axis 1 meter:	(50 W input)
Second Harmonic:	
Low Frequencies:	< 3%
Mid Frequencies:	< 1.5%
High Frequencies:	< 6%
Third Harmonic:	
Low Frequencies:	< 1.5%
Mid Frequencies:	< 0.5%
High Freaquencies:	< 0.5%

GENERAL:	
Crossover Frequency:	1.2 kHz
Driver Complement	
Low Frequency:	2214H
Compression Driver:	2416H
Horn:	2342
Dimensions:	635 mm high x 406 mm wide x 311 mm deep (375 mm deep w/horn) 25 in high x 16 in wide x 12¼ in deep (14¾ in deep w/horn)
Enclosure Volume (net):	53.8 l(1.9 cu. ft.)
Resonance Frequency:	34 Hz
Finish:	Oiled Walnut
Grille Color:	Dark Blue
Net weight:	26 kg (57 lb)
Shipping weight:	29.5 kg (65 lb)

[1] The high and low frequency transducers of the system are aligned vertically and thus are on the same acoustic source plane The indicated group delay characteristics for the sysrem (Fie. 51 is entirely due to the gradually changing phase characteristic of the sharp-skirted even-order allpass crossover network used in the system (a). The smooth delay response exhibited by the system is well below audibility thresholds as shown in (b-d).

[2] Rating based on test signal of IEC filtered random noise with a peak-to-peak average ratio of 6 dB, two hours duration.

[3] The graph of maximum input power (Fig. 9) indicates, at each frequency, the maximum continuous electrical input before 1) the systems thermal ratings are exceeded, or 2) mechanical ratings such as maximum woofer excursion are exceeded, whichever occurs first The system can handle short term (less than 10 ms) peaks of some 8-10 dB above the indicated values as long as the long term average remains below the curve. If appreciable subsonic energy below 15 Hz is expected in the program material, second-order or higher high-pass filtering should be used ahead of the power amplifier

[4] SPL in dB ref 20 µ Pa. These SPLs are measured in the reverberant field of a reference room of 85 m^3 (3000 ft^3) with an absorption of 18.6 metric Sabins (200 ft^2). The continuous program maximum SPL is based on the noise spectrum and power listed in the specification for maximum continuous program power input (see note 2). The graph of maximum continuous sine wave SPL (Fig. 10) shows the maximum SPL the system can generate at each frequency when the input levels of Fig. 11 are applied.

References
(a) P. Garde, "All-Pass Crossover System,"JAudio Eng. Soc, vol. 28 pp. 575-584 (Sept 1980).
(b) J. Blauert, P. Laws 'Group Delay Distortions in Electroacoustical Systems:' J. Acoust. Soc, Am, vol. 63 pp 1478-1483 (May 1978).
(c)H. Suzuki S Monta, T Shinco, 'On the Perception of Phase Distortion," J. Audio Eng. Soc, vol. 28, pp 570-574 (Sept. 1980).
(d) R. Lee 'Is Linear Phase Worthwhile," presented at the 68th Convention of the Audio Eng. Soc., Preprint 1732 (F-41, (Mar. 1981).

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.

Further information on Bi-Radial monitor loudspeaker design can be found in a paper by D. Smith, D. Keele, Jr., and J. Eargle, 'Improvements in Monitor Loudspeaker Systems:'published in the Journal of the Audio Engineering Society, Vol. 31, No. 6, June 1983. Copies are available from JBL Professional.

Figure 1. Beamwidth (horizontal and vertical) vs. Frequency

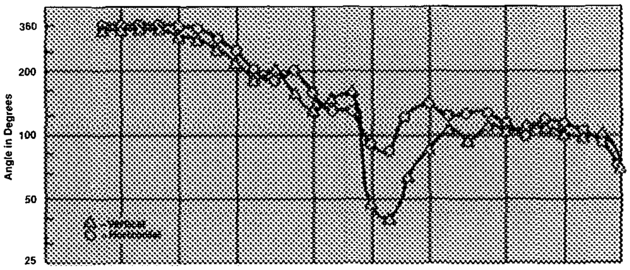


Figure 2. Directivity vs. Frequency

Figure 3. Horizontal Off-axis Response (normalized):

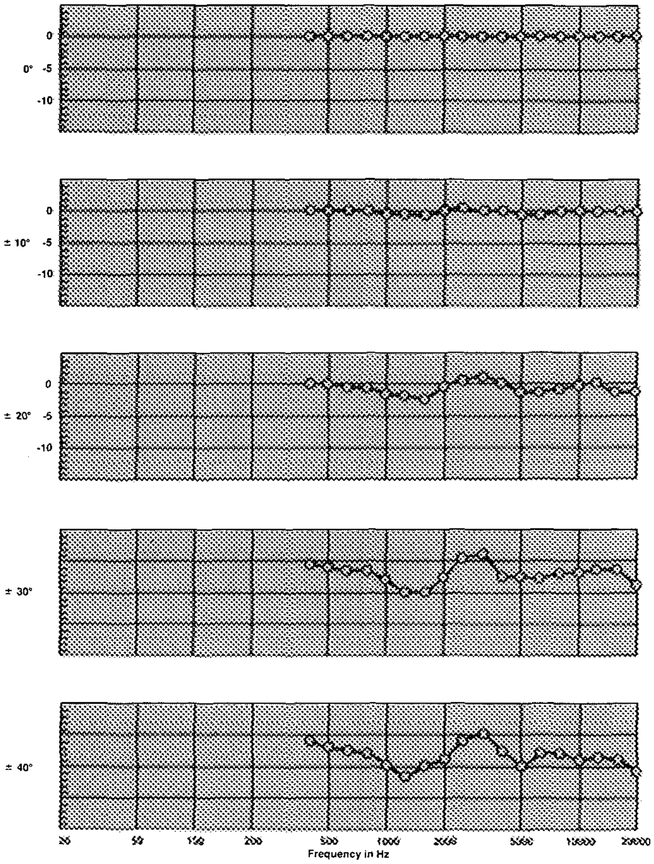


Figure 4. Vertical Off-axis Response (normalized):

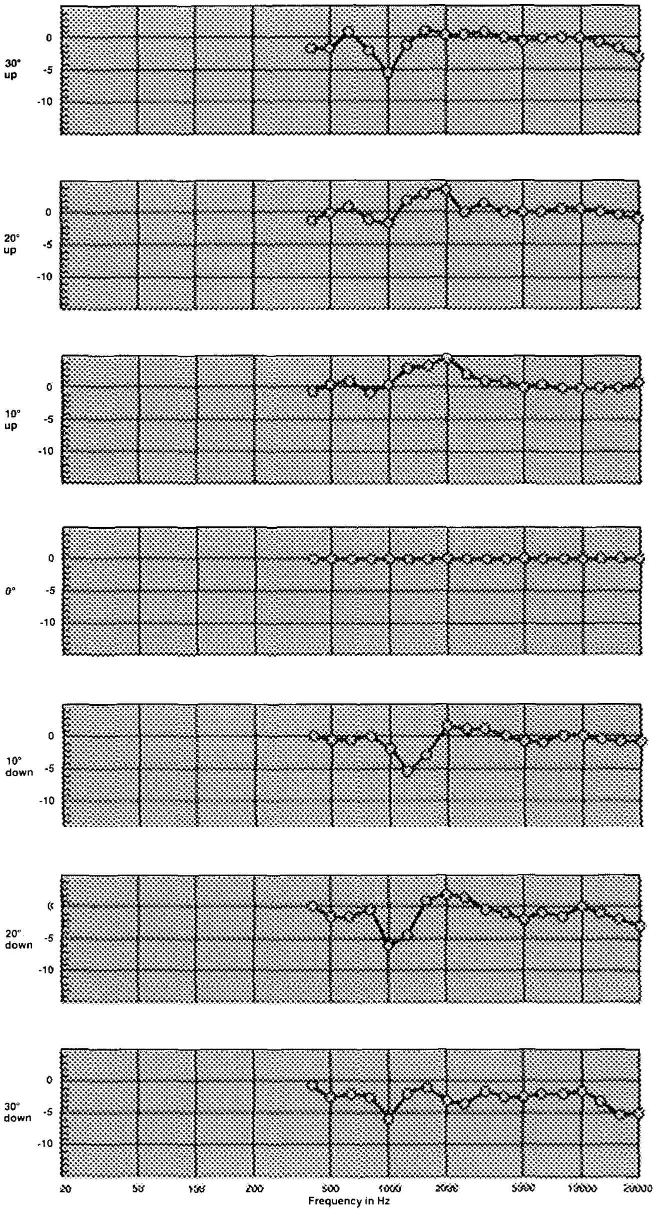


Figure 5. Group Delay vs. Frequency

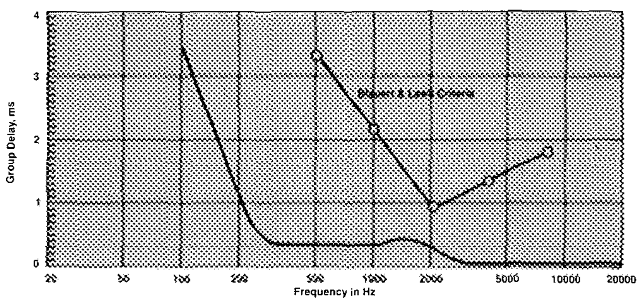


Figure 6. Control Range, Mid

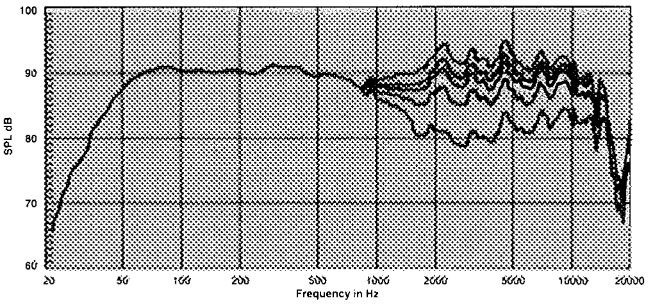


Figure 7. Control Range, High

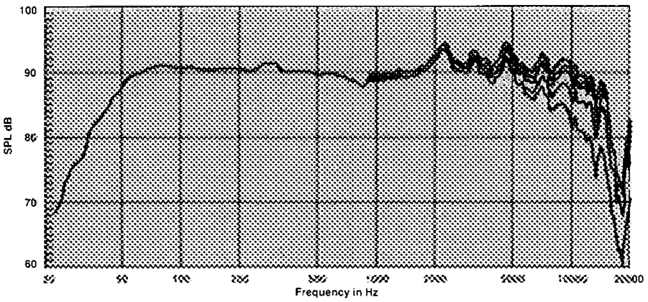


Figure 8. Impedance and On-axis Response

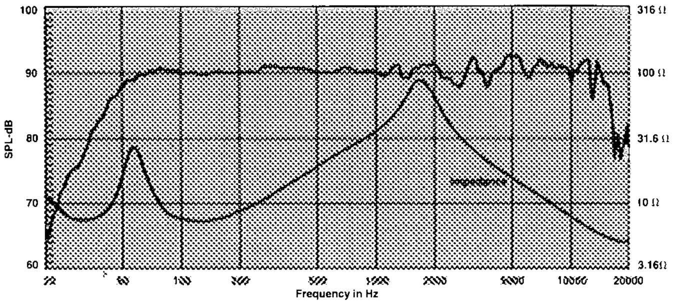


Figure 9. Maximum Electrical Input

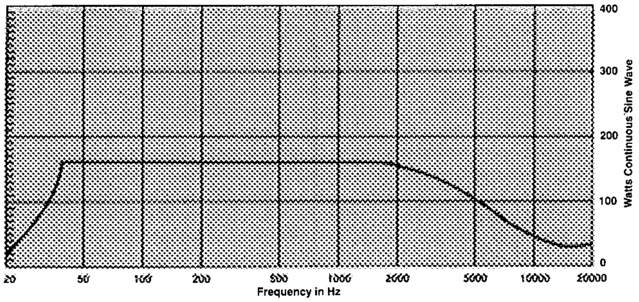


Figure 10. Maximum Continuous Output

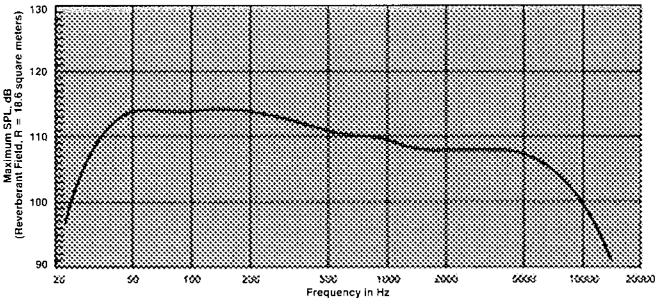


Figure 11. Power Linearity (1 W, 10 W, 100 W)

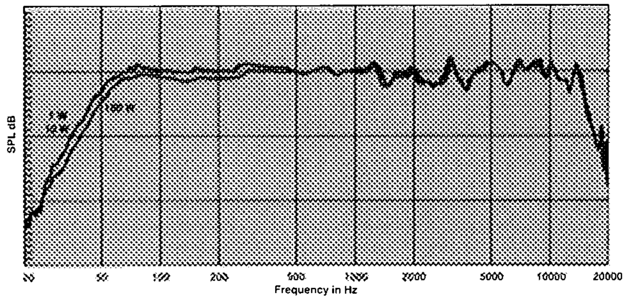
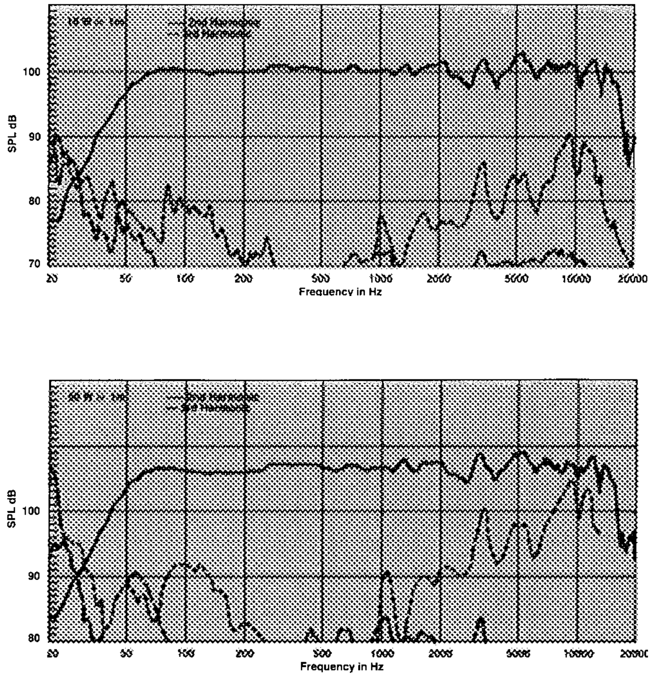


Figure 12. Distortion vs. Frequency



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