



Technical Notes Vol. 1, No. 1A

Performance Parameters of JBL Low-Frequency Systems

Introduction

This technical note will enable sound contractors and consultants to specify JBL LF enclosures, transducers and packaged systems to fit particular requirements. While most of the listed parameters are straightforward, some of them deserve special comment.

Parameter 4 states the primary use of the system. Those indicated for reinforcement are to be used primarily for fixed-installation speech reinforcement applications. Those indicated for monitor LF or cinema VLF are to be used for high-level LF performance in recording studio control rooms or motion picture theaters, for response down to 25 Hz. The general term MI means that the system is intended for electronic musical instrument or amplified instrument use. Those systems indicated for high-level music reinforcement are intended for upper-bass or lower mid-range in those applications where HF horn components must be crossed over in the 1200-to-1500 Hz range.

Parameter 7 is the JBL traditionally conservative sine wave power rating. Program ratings are easily 3 dB greater, and transient program peaks up to 10 dB above the steady-state rating can be tolerated, provided that displacement limits are not exceeded.

Parameter 8, the half-space reference efficiency of the system, assumes that the system will be placed next to a single reflecting surface.

In Parameter 10, free-field ratings averaged over the system bandwidths are given. The bandwidth of a system extends from its 3 dB down point up to its recommended crossover frequency. An additional rating gives the maximum output to be expected in a reference reverberant environment with a room constant (R) of 18.6 m² or 200 ft². These ratings may easily be manipulated to give the reverberant SPL in rooms with other values of R using the following equation:

$$\text{New SPL} = \text{Reference SPL} - 10 \log (R/18.6),$$

where R is the new room constant in m².

The beamwidth data of Parameter 13 gives the 6-dB down included angle in both horizontal and vertical planes at the usual crossover frequencies of 500, 800 and 1200 Hz. Both directivity index (DI) in dB and directivity factor (Q) are given at those frequencies.

The Systems

In addition to standard JBL systems, we present a number which are based on enclosures that JBL does not build, but for which JBL supplies construction plans. These are the special horn systems (*), which make use of either 300 mm (12") or 380 mm (15") drivers, depending on the application. The "W" horn is intended for music reinforcement applications, and the 340 L Sub-woofer is intended for theater use. Note for this system that there are two values of lower frequency limits. Those values given in parentheses require a different enclosure tuning and an appropriate electrical boost in the LF cut-off region, which can be provided by the JBL Model 5235 Electronic Dividing Network. Details of this are included in the plans.

Finally, we present data on the models 4520 and 4530 rear-loading horns no longer made by JBL.

Parameters

Direct Radiator

	4646	4647	4648	4648-8	—
1. Model	4646	4647	4648	4648-8	—
2. Enclosure	4512	4507	4508	4508	4518
3. Transducer					
Model	2204H	2225H	2225H	2225J	2240H
Diameter	300mm (12")	380mm (15")	380mm (15")	380mm (15")	460mm (18")
Quantity	1	1	2	2	1
4. System Application	Reinforcement	Reinforcement	Reinforcement	Reinforcement	Reinforcement
5. System Impedance (ohms)					
Nominal	8	8	4	8	8
Minimum	7	7.3	3.7	7.0	7.3
6. Sensitivity (1W @ 1m)	96 dB	97 dB	100 dB	100 dB	98 dB
7. Continuous Power Rating, watts	150 W	200 W	400 W	400 W	300 W
8. Half-space Efficiency	1.7%	3.5%	7%	7%	5%
9. Maximum Continuous Acoustical Power	2.6 W	7 W	28 W	28 W	15 W
10. Maximum Continuous SPL					
Free Field @ 3 m (10')	108 dB	110 dB	116 dB	116 dB	113 dB
Free Field @ 30 m (100')	88 dB	90 dB	96 dB	96 dB	93 dB
Reverberant Field, R = 18.6 m ² (200 ft ²)	117 dB	122 dB	128 dB	128 dB	125 dB
11. Lower Frequency Limits					
- 3 dB	70 Hz	45 Hz	45 Hz	45 Hz	50 Hz
- 10 dB	50 Hz	35 Hz	35 Hz	35 Hz	30 Hz
12. Recommended Upper Crossover Frequency	1200 Hz	1200 Hz	800 Hz	800 Hz	800 Hz
13. Beamwidth (- 6 dB)					
500 Hz (Hor.)	180°	140°	140°	140°	125°
500 Hz (Vert.)	180°	140°	100°	100°	125°
DI (Q) @ 500 Hz	4 dB (2.5)	6 dB (4)	8 dB (6)	8 dB (6)	7 dB (5)
800 Hz (Hor.)	140°	90°	90°	90°	75°
800 Hz (Vert.)	140°	90°	50°	50°	75°
DI (Q) @ 800 Hz	6 dB (4)	9 dB (8)	10 dB (10)	10 dB (10)	13 dB (20)
1200 Hz (Hor.)	90°	70°	—	—	—
1200 Hz (Vert.)	90°	70°	—	—	—
DI (Q) @ 1200 Hz	10 dB (10)	10 dB (10)	—	—	—
14. Enclosure Data					
Volume, L (ft ³)	34 (1.2)	145 (5)	225 (8)	225 (8)	225 (8)
HxWxD, mm (in)	406 x 470 x 273 (16 x 18½ x 10¾)	775 x 546 x 448 (30½ x 21½ x 17⅝)	1010 x 667 x 438 (39¾ x 26¼ x 17¼)	1010 x 667 x 438 (39¾ x 26¼ x 17¼)	1010 x 667 x 438 (39¾ x 26¼ x 17¼)
Weight, kg (lb)	18 (40)	36 (80)	69 (152)	69 (152)	63 (138)

Ported Systems

4645	4645x2	4645x4	4625B	4695B	—
4518	4518x2	4518x4	—	—	Sub-woofer 340 L (12 ft ³)
2245H	2245H	2245H	E140-8	E155-8	2245H
460 mm (18")	460 mm (18")	460 mm (18")	380 mm (15")	460 mm (18")	460 mm (18")
1	2	4	1	1	1
Monitor LF; Cinema VLF	Monitor LF; Cinema VLF	Monitor LF; Cinema VLF	MI	MI	Cinema VLF; Monitor LF
8	4	8	8	8	8
7.1	3.6	7.1	6.5	7.3	7.1
95 dB	98 dB	101 dB	100 dB	100 dB	95 dB
300 W	600 W	1200 W	200 W	300 W	300 W
2.1%	4.2%	8.4%	4.9%	4.9%	2.1%
6.3 W	25.2 W	100.8 W	9.8 W	14.7 W	6.3 W
110 dB	116 dB	122 dB	113 dB	115 dB	110 dB
90 dB	96 dB	102 dB	93 dB	95 dB	90 dB
121 dB	127 dB	133 dB	123 dB	125 dB	121 dB
35 Hz	35 Hz	30 Hz	—	—	25 (20) Hz
25 Hz	25 Hz	20 Hz	—	—	18 (15) Hz
100 Hz	100 Hz	100 Hz	N/A	N/A	50 Hz
—	—	—	140°	125°	—
—	—	—	140°	125°	—
—	—	—	6 dB (4)	7 dB (5)	—
—	—	—	90°	75°	—
—	—	—	90°	75°	—
—	—	—	9 dB (8)	13 dB (20)	—
—	—	—	70°	65°	—
—	—	—	70°	65°	—
—	—	—	10 dB (10)	12 dB (16)	—
225 (8)	—	—	127 (4.5)	283 (10)	338 (12)
1010 x 667 x 438	—	—	767x512x478	1021x751x478	533x1117x737
(39 ³ / ₄ x 26 ¹ / ₄ x 17 ¹ / ₄)	—	—	(30 ³ / ₁₆ x20 ¹ / ₈ x18 ¹ / ₁₆)	(40 ³ / ₁₆ x29 ⁹ / ₁₆ x18 ¹ / ₁₆)	(21x44x29)
63 (138)	—	—	28 (61.5)	36.6 (80.5)	69 (152)

Parameters

Direct Radiator Ported Systems

	4842	4845	4847	4560BKA	4560BKA
1. Model	4842	4845	4847	4560BKA	4560BKA
2. Enclosure	—	—	—	—	—
3. Transducer					
Model	2245H	2245H	2225H	2220H	2225H
Diameter	460 mm (18")	460 mm (18")	380 mm (15")	380 mm (15")	380 mm (15")
Quantity	2	1	1	1	1
4. System Application	Reinforcement VLF	Reinforcement VLP	Reinforcement	Reinforcement	Reinforcement
5. System Impedance (ohms)					
Nominal	4	8	8	8	8
Minimum			7.3	7.3	7.3
6. Sensitivity (1W @ 1m)	98 dB	95 dB	97	107 dB	103 dB
7. Continuous Power Rating, watts	600 W	300 W	200 W	100 W	200 W
8. Half-space Efficiency	4.2%	2.1%	3.5%	16%	6.4%
9. Maximum Continuous Acoustical Power	25.2 W	6.3 W	7 W	16 W	12.8 W
10. Maximum Continuous SPL					
Free Field @ 3 m (10')	116 dB	110 dB	111 dB	117 dB	116 dB
Free Field @ 30 m (100')	96 dB	90 dB	91 dB	97 dB	96 dB
Reverberant Field, R = 18.6 m ² (200 ft ²)	127 dB	121 dB	122 dB	125 dB	124 dB
11. Lower Frequency Limits					
- 3 dB	28 Hz	25 Hz	40 Hz	120 Hz	120 Hz
- 10 dB	20 Hz	20 Hz	35 Hz	45 Hz	45 Hz
12. Recommended Upper Crossover Frequency	125 Hz	250 Hz	630 Hz	800 Hz	800 Hz
13. Beamwidth (- 6 dB)					
500 Hz (Hor.)	—	—	—	90°	90°
500 Hz (Vert.)	—	—	—	70°	70°
DI (Q) @ 500 Hz	—	—	—	9 dB (8.5)	9 dB (8.5)
800 Hz (Hor.)	—	—	—	90°	90°
800 Hz (Vert.)	—	—	—	60°	60°
DI (Q) @ 800 Hz	—	—	—	11 dB (12)	11 dB (12)
1200 Hz (Hor.)	—	—	—	—	—
1200 Hz (Vert.)	—	—	—	—	—
DI (Q) @ 1200 Hz	—	—	—	—	—
14. Enclosure Data					
Volume, L (ft ³)				—	—
HxWxD, mm (in)	126cmx75cmx62cm (49½x29½x24½)	126cmx75cmx50cm (49½x29½x19¾)	63cmx75cmx54cm (24¾x29½x21¼)	914x762x606 (36x30x23⅞)	914x762x606 (36x30x23⅞)
Weight, kg (lb)	129 (285)	80 (176)	43 (95)	51.4 (113)	51.1 (112)

Ported Horn Systems

4560BKA	4560BKA	4550BKA	4550BKA	4550BKA	4550BKA
—	—	—	—	—	—
E140-8 380 mm (15") 1 MI	E145-8 380 mm (15") 1 MI	2220H/J 380 mm (15") 2 Reinforcement	2225H/J 380 mm (15") 2 Reinforcement	E140-8/16 380 mm (15") 2 MI	E145-8/16 380 mm (15") 2 MI
8 6.5 106 dB	8 7.0 104 dB	4/8 3.7/7.5 107 dB	4/8 3.7/7.3 106 dB	4/8 3.3/6.5 106 dB	4/8 3.3/6.5 104 dB
200 W 9.8%	150 W 8%	200 W 20%	400 W 8%	400 W 12%	300 W 10%
19.6 W	12 W	40 W	32 W	48 W	30 W
119 dB 99 dB	116 dB 96 dB	120 dB 100 dB	122 dB 102 dB	122 dB 102 dB	119 dB 99 dB
126 dB	124 dB	129 dB	128 dB	130 dB	128 dB
120 Hz 45 Hz	120 Hz 45 Hz	80 Hz 40 Hz	80 Hz 40 Hz	80 Hz 40 Hz	80 Hz 40 Hz
800 Hz	800 Hz	800 Hz	800 Hz	800 Hz	800 Hz
90° 70° 9 dB (8.5) 90° 60° 11 dB (12)	90° 70° 9 dB (8.5) 90° 60° 11 dB (12)	80° 100° 11 dB (12) 75° 30° 14 dB (25)	80° 100° 11 dB (12) 75° 30° 14 dB (25)	80° 100° 11 dB (12) 75° 30° 14 dB (25)	80° 100° 11 dB (12) 75° 30° 14 dB (25)
— — —	— — —	—	— — —	— — —	— — —
914x762x606 (36x30x23 ⁷ / ₈) 51.1 (112)	914x762x606 (36x30x23 ⁷ / ₈) 62 (136)	914x1524x825 (36x60x32 ¹ / ₂) 109 (240)	914x1524x825 (36x60x32 ¹ / ₂) 108 (238)	914x1524x825 (36x60x32 ¹ / ₂) 108 (238)	914x1524x825 (36x60x32 ¹ / ₂) 114 (251)

Parameters

Special Horn Systems

	Low/mid Horn*	Low/mid Horn*	Low/mid Horn*	Low/mid Horn*	"W" Horn*
1. Model					
2. Enclosure	—	—	—	—	—
3. Transducer					
Model	E120-8	2202H	E145-8	2225H	E155-8
Diameter	300 mm (12")	300 mm (12")	380 mm (15")	380 mm (15")	460 mm (18")
Quantity	1	1	1	1	1
4. System Application	High-level music reinforcement	High-level music reinforcement	High-level music reinforcement	High-level music reinforcement	MI
5. System Impedance (ohms)					
Nominal	8	8	8	8	8
Minimum	7.5	6.5	6.7	7.3	7.3
6. Sensitivity (1W @ 1m)	107 dB	106 dB	103 dB	103 dB	104 dB
7. Continuous Power Rating, watts	150 W	150 W	150 W	200 W	300 W
8. Half-space Efficiency	20%	16%	8%	8%	15%
9. Maximum Continuous Acoustical Power	30 W	24 W	12 W	16 W	45 W
10. Maximum Continuous SPL					
Free Field @ 3 m (10')	119 dB	118 dB	115 dB	116 dB	119 dB
Free Field @ 30 m (100')	99 dB	98 dB	95 dB	96 dB	99 dB
Reverberant Field, R = 18.6 m ² (200 ft ²)	128 dB	127 dB	124 dB	125 dB	130 dB
11. Lower Frequency Limits					
- 3 dB	140 Hz	110 Hz	100 Hz	100 Hz	60 Hz
- 10 dB	60 Hz	60 Hz	60 Hz	60 Hz	35 Hz
12. Recommended Upper Crossover Frequency	1500 Hz	1200 Hz	800 Hz	800 Hz	300 Hz
13. Beamwidth (- 6 dB)					
500 Hz (Hor.)	70°	70°	70°	70°	60°
500 Hz (Vert.)	90°	90°	90°	90°	45°
DI (Q) @ 500 Hz	9 dB (8.5)	9 dB (8.5)	9 dB (8.5)	9 dB (8.5)	13 dB (20)
800 Hz (Hor.)	60°	60°	60°	60°	—
800 Hz (Vert.)	90°	90°	90°	90°	—
DI (Q) @ 800 Hz	11 dB (12)	11 dB (12)	11 dB (12)	11 dB (12)	—
1200 Hz (Hor.)	50°	50°	50°	50°	—
1200 Hz (Vert.)	60°	60°	60°	60°	—
DI (Q) @ 1200 Hz	12 dB (15)	12 dB (15)	12 dB (15)	12 dB (15)	—
14. Enclosure Data					
Volume, L (ft ³)	—	—	—	—	—
HxWxD, mm (in)	609x429x762 (17½x24x30)	609x429x762 (17½x24x30)	609x429x762 (17½x24x30)	609x429x762 (17½x24x30)	610x1220x762 (24x48x30)
Weight, kg (lb)	38.6 (85)	38.6 (85)	39.6 (87)	41.8 (92)	82.4 (180)

*JBL provides plans for these enclosures.

**Rear
Loading Horns**

"W" Horn*	4520	4530
—	—	—
2240H	E140-8/16	E140-8
460 mm (18")	380 mm (15")	380 mm (15")
1	2	1
MI	MI	MI
8	4/8	8
7.3	3.3/6.5	6.5
104 dB	107 dB	104 dB
300 W	400 W	200 W
15%	12%	9.8%
45 W	48 W	19.6 W
119 dB	123 dB	117 dB
99 dB	103 dB	97 dB
130 dB	130 dB	126 dB
60 Hz	60 Hz	60 Hz
35 Hz	40 Hz	45 Hz
300 Hz	800 Hz, or Full-Range MI	800 Hz, or Full-Range MI
60°	100°	140°
45°	140°	140°
13 dB (20)	8 dB (6)	6 dB (4)
—	50°	90°
—	90°	90°
—	10 dB (10)	9 dB (8)
—	—	—
—	—	—
—	—	—
610x1220x762 (24x48x30)	1276x908x756 (50¼x35¾x29¾)	1213x603x603 (47¾x23¾x23¾)
82.4 (180)	118 (260)	64 (141)

