Technical Notes Vol. 1, No. 1

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 3 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 theater 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 6 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.

Parameter 7, the half-space reference efficiency of the system, assumes that the system will be placed next to a single reflecting surface.

In Parameter 9, 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 m^2 or 200 ft^2. These ratings may easily be manipulated to give the reverberant SPL in rooms with other values of R using the following equation:

New SPL=Reference SPL-10 log (R/18.6),
where R is the new room constant in m^2.

The beamwidth data of Parameter 12 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 factory (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 low-mid horn (systems 18 through 21), 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 5234A 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 Po				
	1	2	3	4	5
1. Enclosure	4507	4508	4518	4518	4518x2
2. Transducer					
Model	2225H	2225J	2240H	2245H	2245H
Diameter	380 mm (15″)	380 mm (15″)	460 mm (18″)	460 mm (18″)	460 mm (18″)
Quantity	1	2	1	1	2
3. System Application	Reinforcement	Reinforcement	Reinforcement	Monitor LF; Theater VLF	Monitor LF; Theater VLF
4. System Impedance (ohms)					
Nominal	8	8	8	8	4
Minimum	7.3	7.0	7.3	7.1	3.6
5. Sensitivity (1 W @ 1 m)	97 dB	100 dB	98 dB	95 dB	98 dB
6. Continuous Power Rating, watts	200 W	400 W	300 W	300 W	600 W
7. Half-space Efficiency	3.5%	7%	5%	2.1%	4.2%
8. Maximum Continuous Acoustical Power	7 W	28 W	15 W	6.2 W	24.8 W
9. Maximum Continuous SPL					
Free Field @ 3 m (10′)	110 dB	116 dB	113 dB	110 dB	116 dB
Free Field @ 30 m (100′)	90 dB	96 dB	93 dB	90 dB	96 dB
Reverberant Field, R = 18.6 m² (200 ft²)	122 dB	128 dB	125 dB	122 dB	128 dB
10. Lower Frequency Limits					
−3 dB	45 Hz	45 Hz	50 Hz	35 Hz	35 Hz
−10 dB	35 Hz	35 Hz	30 Hz	25 Hz	25 Hz
11. Recommended Upper Crossover Frequency	1200 Hz	800 Hz	800 Hz	100 Hz	100 Hz
12. Beamwidth (−6 dB)					
500 Hz (Hor.)	140°	140°	125°	—	—
500 Hz (Vert.)	140°	100°	125°	—	—
DI (Q) @ 500 Hz	6 dB (4)	8 dB (6)	7 dB (5)	—	—
800 Hz (Hor.)	90°	90°	75°	—	—
800 Hz (Vert.)	90°	50°	75°	—	—
DI (Q) @ 800 Hz	9 dB (8)	10 dB (10)	13 dB (20)	—	—
1200 Hz (Hor.)	70°	—	—	—	—
1200 Hz (Vert.)	70°	—	—	—	—
DI (Q) @ 1200 Hz	10 dB (10)	—	—	—	—
13. Enclosure Data					
Volume, L (ft³)	145 (5)	225 (8)	225 (8)	225 (8)	—
HxWxD, mm (in)	775 x 546 x 448 (30½ x 21½ x 17⅝)	1060x667x464 (39¾x26½x17¼)	1060x667x464 (39¾x26½x17¼)	1060x667x464 (39¾x26½x17¼)	— —
Weight, kg (lb)	36 (80)	69 (152)	63 (138)	63 (138)	—

ted Systems

6	7	8	9	10	11	12
4518x4	4625	4695	Sub-woofer 340 L (12 ft³)	4560	4560	4560
2245H	E140-8	E155-8	2245H	2220H	2225H	E140-8
460 mm (18″)	380 mm (15″)	460 mm (18″)	460 mm (18″)	380 mm (15″)	380 mm (15″)	380 mm (15″)
4	1	1	1	1	1	1
Monitor LF; Theater VLF	MI	MI	Theater VLF; Monitor LF	Reinforcement	Reinforcement	MI
8	8	8	8	8	8	8
7.1	6.5	7.3	7.1	7.3	7.3	6.5
101 dB	100 dB	100 dB	95 dB	107 dB	103 dB	104 dB
1200 W	200 W	300 W	300 W	100 W	200 W	200 W
8.4%	4.9%	4.9%	2.1%	16%	6.4%	12.8%
99.2 W	9.8 W	14.7 W	6.3 W	16 W	12.8 W	25.6 W
122 dB	113 dB	115 dB	110 dB	117 dB	116 dB	117 dB
102 dB	93 dB	95 dB	90 dB	97 dB	96 dB	97 dB
134 dB	123 dB	125 dB	122 dB	125 dB	124 dB	127 dB
30 Hz	—	—	25 (20) Hz	120 Hz	120 Hz	120 Hz
20 Hz	—	—	18 (15) Hz	45 Hz	45 Hz	45 Hz
100 Hz	N/A	N/A	50 Hz	800 Hz	800 Hz	800 Hz
—	140°	125°	—	90°	90°	90°
—	140°	125°	—	70°	70°	70°
—	6 dB (4)	7 dB (5)	—	9 dB (8.5)	9 dB (8.5)	9 dB (8.5)
—	90°	75°	—	90°	90°	90°
—	90°	75°	—	60°	60°	60°
—	9 dB (8)	13 dB (20)	—	11 dB (12)	11 dB (12)	11 dB (12)
—	70°	65°	—	—	—	—
—	70°	65°	—	—	—	—
—	10 dB (10)	12 dB (16)	—	—	—	—
—	127 (4.5)	283 (10)	338 (12)	—	—	—
—	767x512x478 (30 3/16x20 1/8x18 13/16)	1021x751x478 (40 3/16x29 9/16x18 13/16)	533x1117x737 (21x44x29)	914x762x606 (36x30x23 7/8)	914x762x606 (36x30x23 7/8)	914x762x606 (36x30x23 7/8)
—	28 (61.5)	36.6 (80.5)	69 (152)	51.4 (113)	51.1 (112)	51.1 (112)

	Ported Horn Systems				Special Horn Systems	
	13	14	15	16	17	18
	4560	4550	4550	4550	4550	Low/mid Horn
	E145-8	2220H/J	2225H/J	E140-8/16	E145-8/16	E120-8
	380 mm (15″)	380 mm (15″)	380 mm (15″)	380 mm (15″)	380 mm (15″)	300 mm (12″)
	1	2	2	2	2	1
	MI	Reinforcement	Reinforcement	MI	MI	High-level music reinforcement
	8	4/8	4/8	4/8	4/8	8
	7.0	3.7/7.5	3.7/7.3	3.3/6.5	3.3/6.5	7.5
	103 dB	108 dB	106 dB	107 dB	106 dB	107 dB
	150 W	200 W	400 W	400 W	300 W	150 W
	8%	20%	8%	16%	10%	20%
	12 W	40 W	32 W	64 W	30 W	30 W
	115 dB	121 dB	122 dB	123 dB	121 dB	119 dB
	95 dB	101 dB	102 dB	103 dB	101 dB	99 dB
	124 dB	129 dB	128 dB	131 dB	128 dB	128 dB
	120 Hz	80 Hz	80 Hz	80 Hz	80 Hz	140 Hz
	45 Hz	40 Hz	40 Hz	40 Hz	40 Hz	60 Hz
	800 Hz	800 Hz	800 Hz	800 Hz	800 Hz	1500 Hz
	90°	80°	80°	80°	80°	70°
	70°	100°	100°	100°	100°	90°
	9 dB (8.5)	11 dB (12)	11 dB (12)	11 dB (12)	11 dB (12)	9 dB (8.5)
	90°	75°	75°	75°	75°	60°
	60°	30°	30°	30°	30°	90°
	11 dB (12)	14 dB (25)	14 dB (25)	14 dB (25)	14 dB (25)	11 dB (12)
	–	–	–	–	–	50°
	–	–	–	–	–	60°
	–	–	–	–	–	12 dB (15)
	–	–	–	–	–	–
	914x762x606 (36x30x23⅞)	914x1524x825 (36x60x32½)	914x1524x825 (36x60x32½)	914x1524x825 (36x60x32½)	914x1524x825 (36x60x32½)	609x429x762 (17½x24x30)
	62 (136)	109 (240)	108 (238)	108 (238)	114 (251)	38.6 (85)

	Special Horn Systems				Rear Loading Horns	
19	20	21	22	23	24	25
Low/mid Horn	Low/mid Horn	Low/mid Horn	"W" Horn	"W" Horn	4520	4530
2202H	E145-8	2225H	E155-8	2240H	E140-8/16	E140-8
300 mm (12″)	380 mm (15″)	380 mm (15″)	460 mm (18″)	460 mm (18″)	380 mm (15″)	380 mm (15″)
1	1	1	1	1	2	1
High-level music reinforcement	High-level music reinforcement	High-level music reinforcement	MI	MI	MI	MI
8	8	8	8	8	4/8	8
6.5	6.7	7.3	7.3	7.3	3.3/6.5	6.5
106 dB	103 dB	103 dB	104 dB	104 dB	107 dB	104 dB
150 W	150 W	200 W	300 W	300 W	400 W	200 W
16%	8%	8%	15%	15%	16%	12.8%
24 W	12 W	16 W	45 W	45 W	64 W	25 W
120 dB	114 dB	115 dB	119 dB	117 dB	123 dB	117 dB
100 dB	94 dB	95 dB	99 dB	99 dB	103 dB	97 dB
127 dB	124 dB	125 dB	130 dB	130 dB	131 dB	127 dB
110 Hz	100 Hz	100 Hz	60 Hz	60 Hz	60 Hz	60 Hz
60 Hz	60 Hz	60 Hz	35 Hz	35 Hz	40 Hz	45 Hz
1200 Hz	800 Hz	800 Hz	300 Hz	300 Hz	800 Hz, or Full-Range MI	800 Hz, or Full-Range MI
70°	70°	70°	60°	60°	100°	140°
90°	90°	90°	45°	45°	140°	140°
9 dB (8.5)	9 dB (8.5)	9 dB (8.5)	13 dB (20)	13 dB (20)	8 dB (6)	6 dB (4)
60°	60°	60°	–	–	50°	90°
90°	90°	90°	–	–	90°	90°
11 dB (12)	11 dB (12)	11 dB (12)	–	–	10 dB (10)	9 dB (8)
50°	50°	50°	–	–	–	–
60°	60°	60°	–	–	–	–
12 dB (15)	12 dB (15)	12 dB (15)	–	–	–	–
–	–	–	–	–	–	–
609x429x762 (17½x24x30)	609x429x762 (17½x24x30)	609x429x762 (17½x24x30)	610x1220x610 (24x48x30)	610x1220x610 (24x48x30)	1276x908x756 (50¼x35¾x29¾)	1213x603x603 (47¾x23¾x23¾)
38.6 (85)	39.6 (87)	41.8 (92)	82.4 (180)	82.4 (180)	118 (260)	64 (141)

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