



FreeSpace® DS 16F Loudspeaker

Product Overview

The Bose® FreeSpace® DS 16F loudspeaker is a high-performance, flush-mount loudspeaker designed for background music and speech reproduction in a wide range of commercial applications, including retail, restaurant and hospitality establishments. Clean, sleek styling visually blends into ceilings. The DS 16F loudspeaker meets numerous standards for combination music and evacuation systems around the world.

Product Information

The FreeSpace DS 16F flush-mount loudspeaker is engineered for installation in ceilings up to 20ft (6.1m) high. An optional pendant-mount kit allows the loudspeaker to be hung from open ceilings.

The FreeSpace DS 16F loudspeaker can be used as an 8-ohm, 16-watt loudspeaker or as a 70/100V loudspeaker. Transformer taps can be set by using an innovative thumb wheel, accessible from the front of the loudspeaker underneath the grille.

Performance of the FreeSpace DS 16F loudspeaker can be maximized through the use of the recommended Bose loudspeaker equalization resident in select Bose electronics or by using other equipment with parametric equalization. The loudspeaker can be used out of the box with an 80-Hz high-pass filter when recommended loudspeaker equalization is not used.

The DS 16F loudspeaker is acoustically compatible with the DS 16S (indoor) and DS 16SE (outdoor) surface-mount loudspeakers and can be integrated on the same loudspeaker line.

The FreeSpace DS 16F loudspeaker meets numerous standards for combination music and evacuation systems around the world. A ceramic connector and thermal fuse are included and can be used when required.



Key Features

- Clear, intelligible music and speech reproduction
- Full-range response from 90 Hz to 16 kHz
- Wide, even 140° conical coverage pattern
- Single 2.25" (57mm) full-range driver
- Integrated multi-tap transformer provides easy-to-change tap settings that are accessible underneath the loudspeaker grille:
70V – 1W, 2W, 4W, 8W, 16W
100V – 2W, 4W, 8W, 16W
- Can be used as an 8Ω, 16W loudspeaker
- Can be combined with the FreeSpace DS 16S (indoor) and DS 16SE (outdoor) surface-mount loudspeakers on the same line
- Mounting hardware permits fast and easy ceiling installation
- Elegant, modern styling that blends with décor; available in black or white and can be painted
- Combine with FreeSpace 3 Acoustimass® bass module for extended range applications
- Listed to ANSI/UL 1480-2005
- Suitable for use in air handling (plenum) spaces with the use of the PC-16 accessory

Applications

The FreeSpace DS 16F loudspeaker is well-suited for permanent installations in:

- Retail stores
- Transportation facilities
- Hospitality venues
- Concourses
- Restaurants
- Houses of worship

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Detailed Product Specifications

Power handling ¹	16W
Nominal Impedance (transformer bypass)	8Ω
Sensitivity ² (at 1W @ 1m)	84 dB-SPL
Maximum SPL ³ (pink noise @ 1m @ rated power)	96 dB-SPL 102 dB-SPL (Peak)
Frequency range ⁴ (-3 dB)	90 Hz – 16 kHz
Beamwidth (-6 dB point, average 1 – 4 kHz)	140° conical

¹⁻⁴ See “How our Loudspeakers are Measured” on page 8.

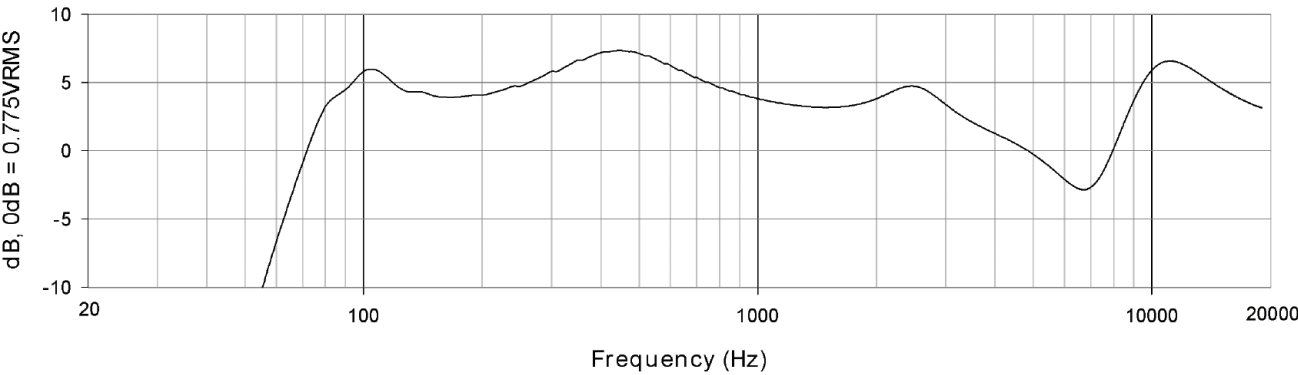
Additional Product Information

Performance of the FreeSpace® DS 16F loudspeaker can be maximized through the use of the recommended Bose® loudspeaker equalization resident in select Bose electronics or by using other equipment with parametric equalization.

The loudspeakers can be used out of the box with an 80-Hz high-pass filter when recommended loudspeaker equalization is not used.

TECHNICAL DATA SHEET

Recommended Loudspeaker Equalization Curve



FreeSpace® DS 16F

Loudspeaker



Driver complement:

One 2.25" (57mm) full-range driver

Construction features:

- Enclosure: PC/ABS rated at UL94 5VA
- Grille: Powder-coated steel
- Integral quick-install mounting features
- Three mounting points at the rear of the housing for pendant mounting

Dimensions:

Outer flange diameter: 9.4" (239mm)

Ceiling hole diameter: 8" (203mm)

Height to top of housing: 6.2" (158mm)

Weight:

Product: 4.4lb (1.9kg)

Shipping: 6lb (2.7kg)

Package contents:

Loudspeaker, installation guide

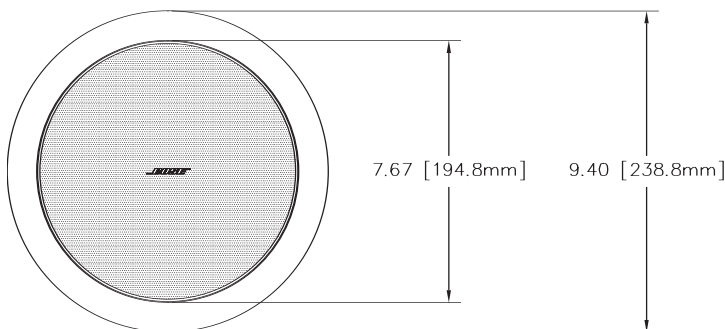
Finish:

Textured black or white finish with a contoured, powder-coated steel grille. Both the enclosure and grille can be painted.

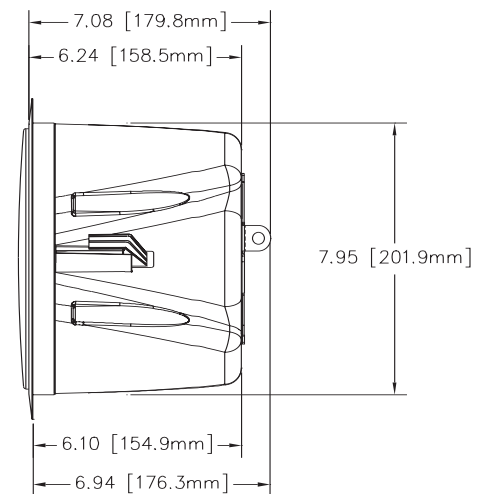
Connectors:

Three-terminal barrier strip with a pre-wired ceramic connector.

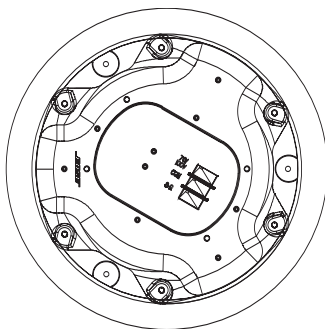
Mechanical diagrams:



Front View



Side View



Rear View
(cover removed)

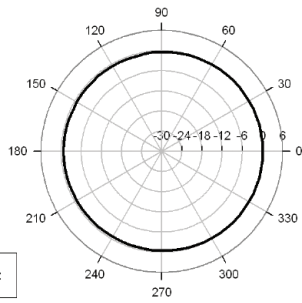
FreeSpace® DS 16F Loudspeaker



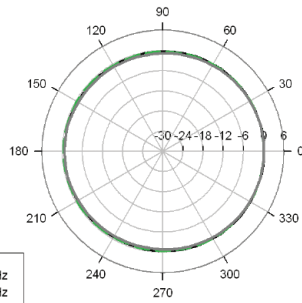
Polar Plots 1/3 Octave Horizontal

TECHNICAL DATA SHEET

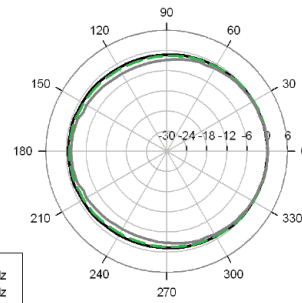
63 Hz Octave Band



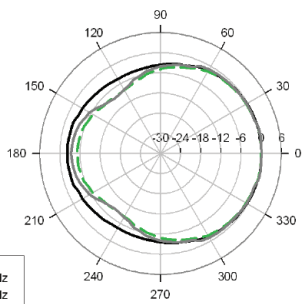
125 Hz Octave Band



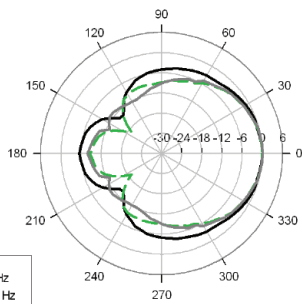
250 Hz Octave Band



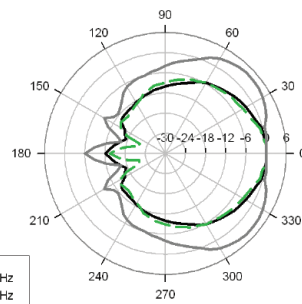
500 Hz Octave Band



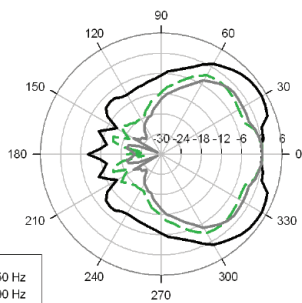
1000 Hz Octave Band



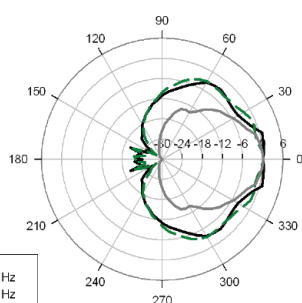
2000 Hz Octave Band



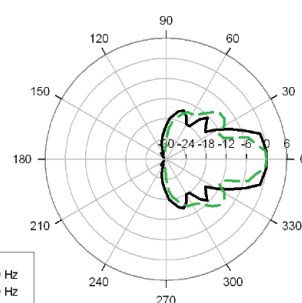
4000 Hz Octave Band



8000 Hz Octave Band



16000 Hz Octave Band

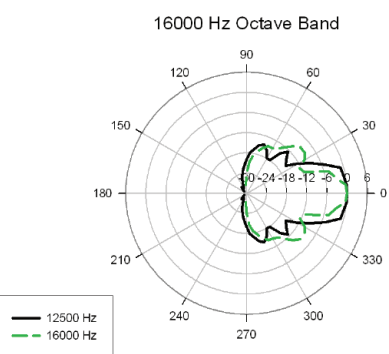
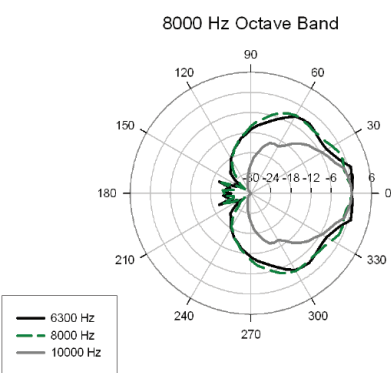
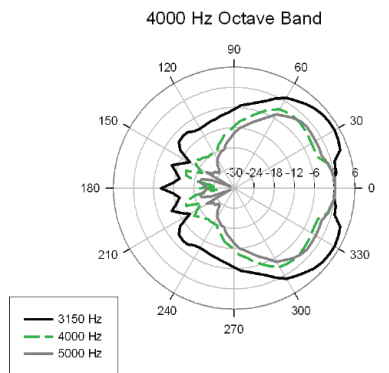
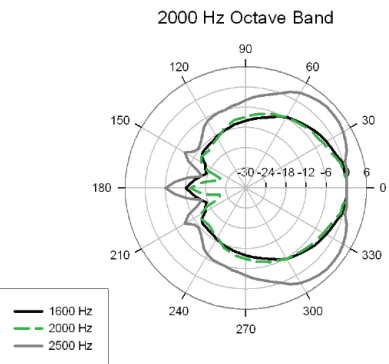
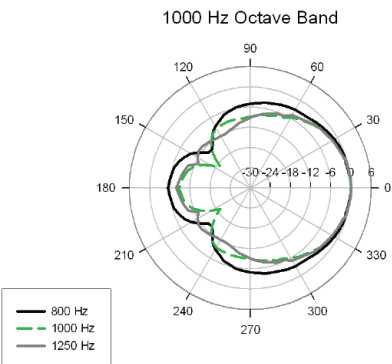
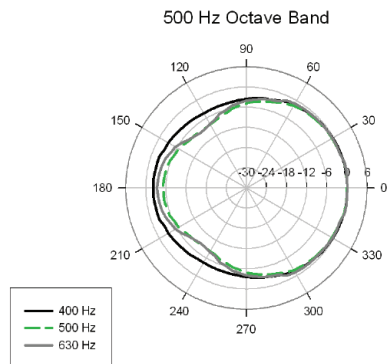
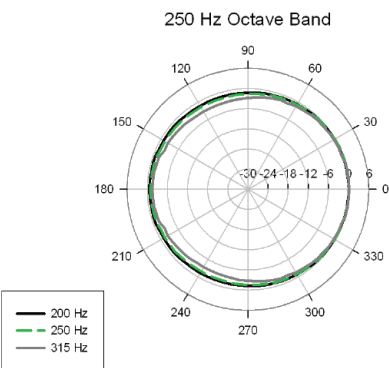
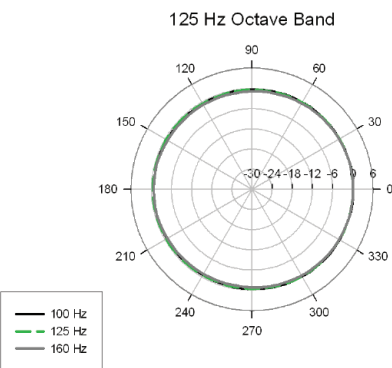
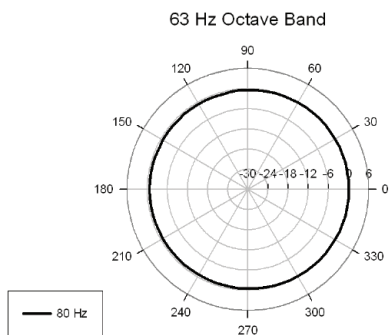


FreeSpace® DS 16F

Loudspeaker



Polar Plots 1/3 Octave Vertical



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Design Recommendations

When creating a design that uses FreeSpace® DS 16F loudspeakers, you should consider the following:

- The FreeSpace DS 16F loudspeaker is ideally suited to background music and paging applications. If your customer's requirement is for a foreground music system, consider the FreeSpace DS 100F loudspeaker.
- Recommended mounting height for the FreeSpace DS 16F loudspeaker is between 8 and 20ft (2.4 and 6.1m).
- Maximum SPL for a typical application is between 87 and 99 dB-SPL.
- Always add 25% headroom to your amplifier to accommodate various types of program material.

Coverage requirements vary for each application, and the loudspeaker spacing will vary based on mounting height and listener height. Use the following two steps to calculate the required loudspeaker spacing distance for your application.

1

Calculate the loudspeaker throw distance.

Loudspeaker Throw Distance
(Loudspeaker Mounting Height - Listener Height)

2

Calculate the loudspeaker spacing distance by multiplying the loudspeaker throw distance by the desired coverage multiplier.

Coverage	Multiplier
Premium	2.0
Standard	2.5
Minimum	3.0

Loudspeaker throw distance x Coverage multiplier = Spacing

_____ X _____ = _____
(Loudspeaker throw distance) (Coverage multiplier) (Spacing)

Total system sound pressure level varies based on the mounting height, loudspeaker tap and room acoustics. For typical applications, use the chart below to determine the total sound pressure level that will be achieved using the DS 16F loudspeakers.

DS 16F									
Mount Height	m	2.4	3.0	3.6	4.2	4.8	5.5	6.1	
	ft	8	10	12	14	16	18	20	
TAP (W)	1 *	87	84	82	79	78	76	75	dB _{SPL}
	2	90	87	85	82	81	79	78	
	4	93	90	88	85	84	82	81	
	8	96	94	91	88	87	85	84	
	16	99	97	94	91	90	88	87	

*1-watt tap available only in 70V mode.

For more detailed information, refer to the FreeSpace DS 16F loudspeaker Design Guide.

FreeSpace® DS 16F

Loudspeaker



Engineers' and Architects' Specifications

The loudspeaker shall be a 16-watt, ported loudspeaker system utilizing one 2.25" (57mm) full-range driver. The loudspeaker shall be designed for installation in ceilings up to 20ft (6.1m) high. An optional pendant-mount accessory allows the loudspeaker to be hung from open ceilings.

The loudspeaker shall have a nominal rated impedance of 8 ohms and shall be wired in parallel with a line voltage matching (step-down) transformer with a selector switch appropriate for various output taps. The loudspeaker input connections will allow for direct connection to either 70V, 100V or low-impedance amplifiers.

Exposed cosmetic surfaces of the loudspeaker shall be paintable, and the acoustically transparent grille component shall be formed of powder-coated steel.

Each loudspeaker shall have a bandwidth of 90 Hz – 16 kHz and a maximum continuous acoustic output of 96 dB-SPL, referenced to a full bandwidth pink noise input at 1 meter at the loudspeaker's rated power. The input connection shall consist of a three-position barrier connector with a pre-wired ceramic connector. The loudspeaker shall meet numerous standards for combination music and evacuation systems around the world.

Power settings available shall be: 1W, 2W, 4W, 8W, 16W @ 70V; 2W, 4W, 8W, 16W @ 100V; and 16W @ 8Ω (when referenced to IEC noise for 100 hours). The nominal dispersion shall be 140° conical coverage pattern at -6 dB (average 1 – 4 kHz).

The loudspeaker shall be the Bose® FreeSpace® DS 16F loudspeaker.

Safety and Regulatory Compliance

The FreeSpace DS 16F loudspeaker has passed extensive testing and complies with the following specifications and uses:

Listed to ANSI/UL 1480-2005

- Fire Protective Signaling Use – UL Category UUMW, File Number S 3241. Control Number 42S9. Not for use with DC-supervised systems.
- General-Purpose Use – UL Category UEAY, File Number S 5591 Control Number 3N89.
- Suitable for use indoors in damp locations.
- Suitable for installation using Class 1, Class 2 or Class 3 wiring methods in accordance with NFPA 70, *National Electric Code*, 2002, Article 640.
- Suitable for use with fire alarm circuit wiring methods in accordance with NFPA 70, *National Electric Code*, 2002, Article 760.
- Suitable for use in air handling plenum spaces with a model PC-16 Plenum Cover installed.
- UL-2043, *Fire Test and Visible Smoke Release for Discrete Products and their Accessories Installed in Air Handling Spaces*.
- NFPA 70, *National Electric Code*, 2002, Article 300-22 (c).
- NFPA 90-A, 2002, *Installation of Air Conditioning and Ventilation Systems*, Paragraph 4.3.10.2.6.5.
- EMC Directive 89/336/EEC and Article 10 (1) of the directive, EN50081-1 and EN50082-1 as signified by the CE mark.

The DS 16F also has been designed to the requirements defined in the following European regulatory specifications for combination systems:

- British Standard Code of Practice BS 5839, Part 8 (with PC-16).
- Tested to IEC60268-5.

Limited Warranty

The FreeSpace DS 16F loudspeaker is covered by a five-year transferable limited warranty.

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Product Codes

FreeSpace DS 16F loudspeaker-Blk	PC 043053
FreeSpace DS 16F loudspeaker-Wht	PC 043054

Accessories

Model 16 tile bridge (6 pack)	PC 029830
Model 16 rough-in pan (6 pack)	PC 029831
Model 16 retrofit kit (6 pack)	PC 030096
PC-16 plenum cover (6 pack)	PC 031144
Model 16 pendant-mount kit-Wht	PC 030095
Model 16 pendant-mount kit-Blk	PC 030094

Replacement Parts

Grille-Blk	PN 296711
Grille-Wht	PN 296712
Logo-Wht	PN 303895
Logo-Blk	PN 303977
2.25" (57mm) driver (indoor)	PN 298081

How our Loudspeakers are Measured

1. Power handling

Full-bandwidth pink noise, meeting the IEC Standard #268-5, is applied to the loudspeaker and amplified to a level at the loudspeaker terminals corresponding to the power handling of the loudspeaker. The loudspeaker must show no visible damage or measurable loss of performance after 100 hours of continuous testing.

2. Sensitivity

Full-bandwidth pink noise is applied to the loudspeaker with its active equalization curve and amplified to a level at the loudspeaker terminals corresponding to 1 watt, as referenced to the nominal impedance. The average sound pressure level (dB-SPL) is measured at 1 meter from the speaker in an anechoic environment.

3. Maximum SPL

Full-bandwidth pink noise is applied to the loudspeaker with its active equalization curve and amplified to a level at the loudspeaker terminals corresponding to the long-term rated power handling of the speaker. The average sound pressure level (dB-SPL) is measured at 1 meter from the speaker in an anechoic environment.

4. Frequency range

Sine waves are injected into the loudspeaker and the level is adjusted to 1 watt, as referenced to the nominal impedance, and the level measured at 1 meter. Resulting graph is smoothed by 0.05 octave-band.