



FreeSpace® DS 100SE



Overview

This application note covers the basic concepts for the application of the FreeSpace DS 100SE loudspeakers in business music systems.

The FreeSpace DS 100SE loudspeakers are ideally suited to background music, foreground music and paging applications with mounting heights between 8 and 32ft (2.4 to 10m). The Articulated Array™, composed of two 2.25 inch drivers, delivers consistent response across the entire 180° coverage area. The 5.25 inch driver, mounted in a ported enclosure, provides the additional bandwidth required for today's foreground music applications. The FreeSpace DS 100SE loudspeakers are compatible with 70V, 100V and low impedance amplifiers and are capable of delivering up to 95 dB_{SPL} in a typical application with a 15ft (4.8m), mounting height.

All system designs begin with a set of requirements. The system requirements can be as simple as "it has to sound great," or as detailed as "it must have an output level of 100 dB_{SPL}." In either case, the challenge is to gather the right set of requirements and convert them into a set of design criteria to use in creating your design.

The three key requirements that you need to identify in order to deliver the right business music sound system are:

LOUDNESS What sound pressure level is required for this application?

RESPONSE What bandwidth is required for the type of program material that will be used?

COVERAGE How consistent must the sound be across the entire coverage area?

Product Specifications

Frequency Range	65 Hz – 16 kHz ± 3 dB
Long Term Power Handling	100 watts continuous
Sensitivity	85 dB-SPL @ 1W/1m (pink noise)
Impedance	70/100V or 8 Ohm
Maximum Acoustic Output	105 dB-SPL @ 1m (pink noise) 111 dB-SPL peak @ 1m (pink noise)
Dispersion	180° x 75° (Horizontal x Vertical)

Each of these requirements can be easily converted into a specification that we can use to create our system design. If we understand the customer's needs in these three areas, we can deliver a design that will, at a minimum, meet their needs, and at best, exceed their expectations.

For the purposes of this application note, we will assume that you are familiar with the system requirements for a business music system and are ready to focus on the creation of a speaker layout using the FreeSpace DS 100SE loudspeakers.

Design Guidelines

When creating a design that uses the FreeSpace DS 100SE loudspeakers, you should consider the following:

- The FreeSpace DS 100SE loudspeakers are ideally suited to background music, foreground music and paging applications.
- Recommended mounting height for the FreeSpace DS 100SE is between 8 and 32ft (2.4 and 10.0m).
- Provide at least 20ft (6.1m) of space between adjacent loudspeakers for typical applications.
- In outdoor applications do not space the loudspeakers by more than 50ft (15.2m).
- Generally, the FreeSpace DS 100SE should be pitched downward between 0° and 15°.
- Maximum SPL for a typical application is between 89 and 98 dB_{SPL}.
- Always add 25% headroom to your amplifier to accommodate various types of program material.

Design Worksheet

Use the following worksheet to create a design using the FreeSpace DS 100SE loudspeakers.

STEP 1 Using the graph paper on the last page, create a sketch or drawing of the room.

STEP 2 Confirm that the FreeSpace DS 100SE loudspeaker will meet your loudness requirement.

- A. On the chart below, locate the loudspeaker mounting height for this design.
- B. Draw a line down to the desired maximum SPL.
- C. Draw a horizontal line across the chart at your desired SPL level.
- D. All of the loudspeakers listed below the line will meet your loudness requirement.

		Maximum Continuous Output Level												
Loudspeaker Mounting Height	m	2.4	3.0	3.6	4.2	4.8	5.5	6.1	6.7	7.3	8.0	10.0		
	ft	8	10	12	14	16	18	20	22	24	26	32		
LOUDSPEAKER	DS 16S / SE	90	89	89	88	87	86	85						
	360P-II	94	93	92	90	89	88	87						
	FreeSpace 3	96	95	95	94	93								
	Model 32SE	96	96	95	94	93	92	91	90					
	DS 100SE	98	97	97	96	95	94	93	92	92	91	89		
	FreeSpace 203	98	97	97	96	95								
	DS 16F	99	97	94	91	90	88	87						
	102F	105	100	98	95	94	92	91	90	89	88			
	DS 100F	107	103	102	99	98	96	95	94	93	92	89		
	Model 32	107	103	100	97	96	94	93	92	91	90			

dB_{SPL}

STEP 3 Confirm that the FreeSpace DS 100SE loudspeaker will meet your Response Requirement.

Vocal Range	Full Range	Extended Range
DS 16S & SE	203	FreeSpace 3
DS 16F	360P-II	
Model 32	DS 100SE	Any vocal range loudspeaker combined with a FreeSpace 3 bass module.
Model 32SE	DS 100F	
102F		

NOTE: If the loudspeaker that meets your response and loudness requirement does not meet your mounting needs, select one that provides more bandwidth, and also meets your mounting needs.

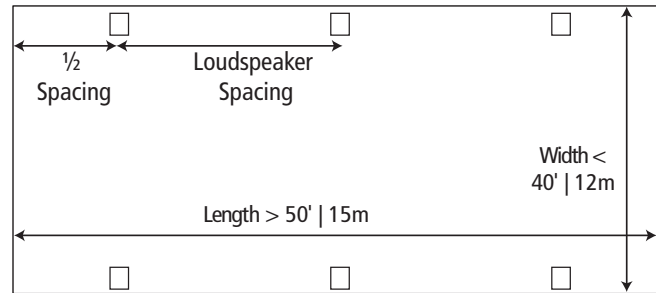
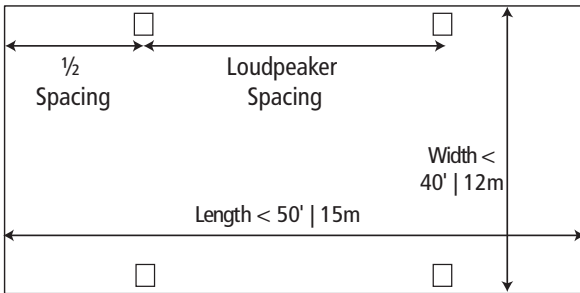
STEP 4 Using your sketch of the room, create a loudspeaker layout using a Loudspeaker Spacing from the table below that meets your coverage requirement.

Coverage	Loudspeaker Spacing Distance
Premium	40ft 12.0m
Standard	50ft 15.0m
Minimum	55ft 17.0m

A. If room is less than 50ft (15m) wide, place one DS 100SE ½ the Loudspeaker Spacing distance in from each corner of the room.

OR

B. If the room length exceeds 50ft (15m), install additional DS 100SE loudspeakers using the required speaker spacing distance.



STEP 5 Calculate the required amplifier size. Use the Tap Chart below to determine which loudspeaker tap is required for this design.

- Locate the loudspeaker mounting height for this design.
- Draw a line down to the desired maximum SPL.
- Draw a horizontal line across the chart to read the required loudspeaker tap.

Mount Height	m	2.4	3.0	3.6	4.2	4.8	5.5	6.1	6.7	7.3	8.0	10.0	dB _{SPL}
	ft	8	10	12	14	16	18	20	22	24	26	32	
T	12.5	89	88	88	87	86	85	84	83	83	82	80	
A	25	92	91	91	90	89	88	87	86	86	85	83	
	50	95	94	94	93	92	91	90	89	89	88	86	
P	100	98	97	97	96	95	94	93	92	92	91	89	

Note: 12.5 watt tap is not available for 100V operation.

D. Calculate the required amplifier power:

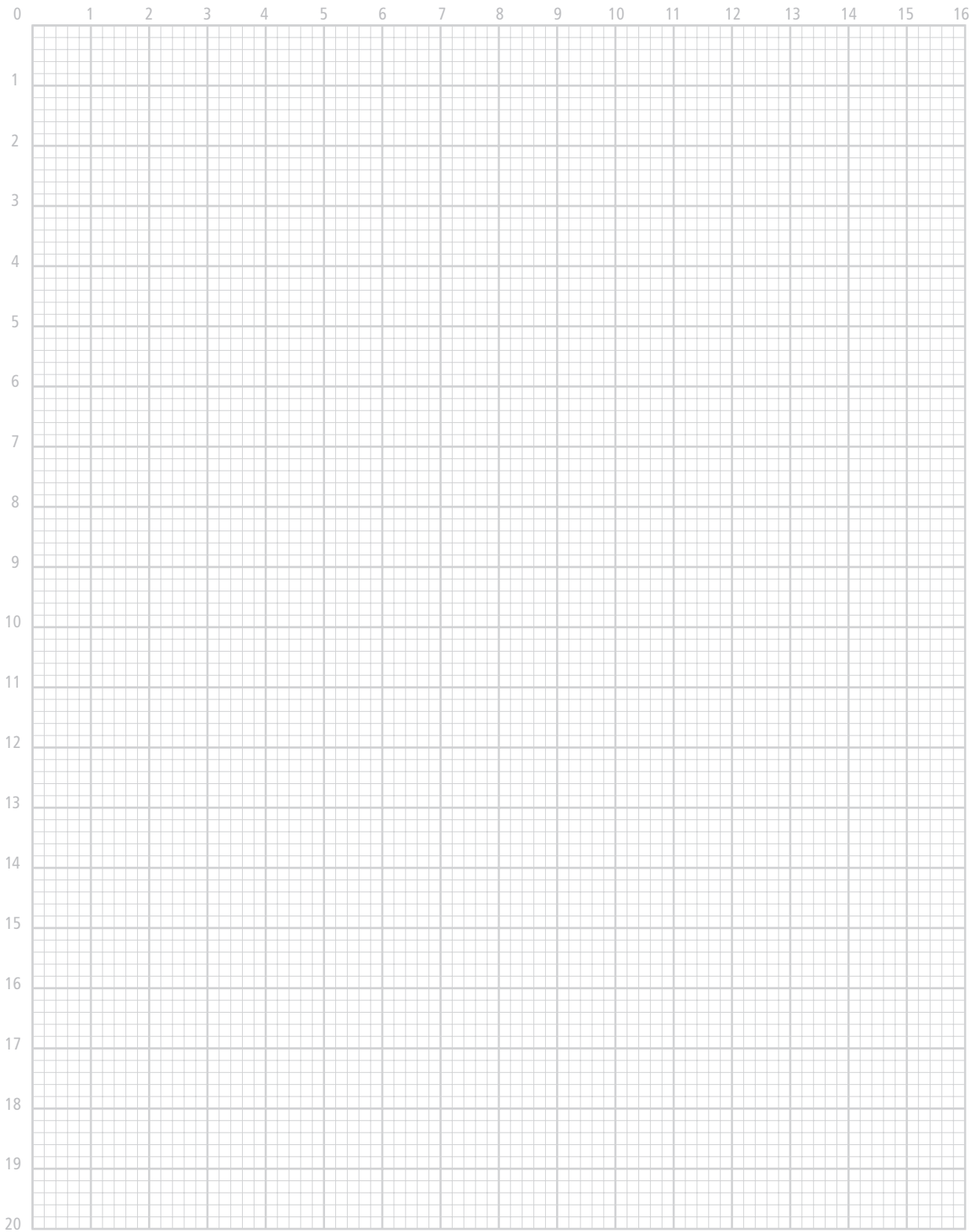
E. Calculate the required amplifier size:

$$\text{Number of Loudspeakers} \times \text{Required Loudspeaker Tap} = \text{Power Required}$$

$$\text{Power Required} \times 1.25 = \text{Amplifier Size}$$

FreeSpace® DS 100SE

DESIGN GUIDE



Project Name: _____

Contact: _____ Date: _____



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