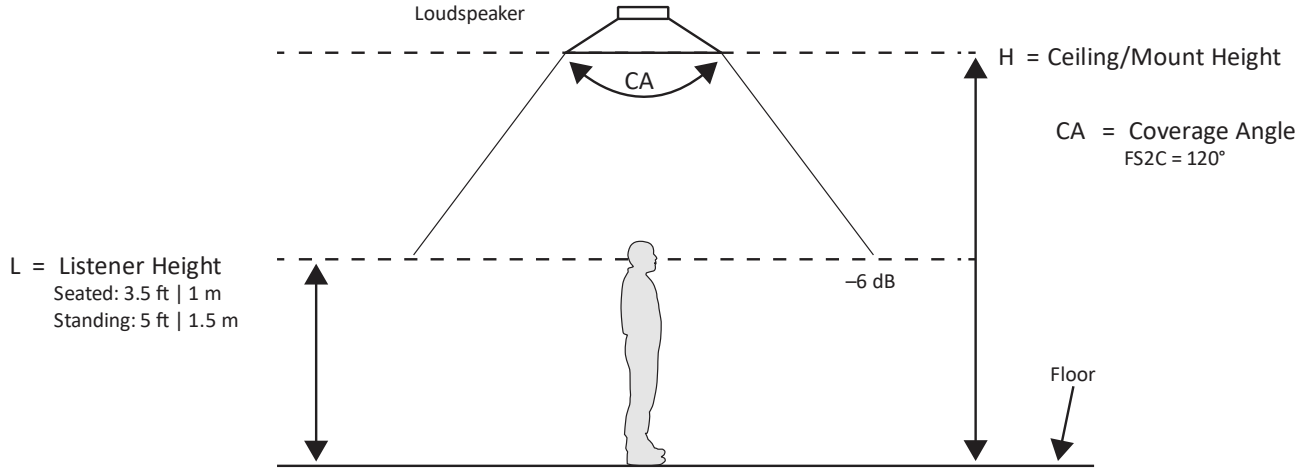


Determining Loudspeaker Quantity and Spacing

The goal is to evenly distribute loudspeakers in the room to provide consistent sound throughout. It may be helpful to sketch this out on paper. Start by creating a sketch layout of the room. Using your sketch of the room, follow the steps below to create a layout with the loudspeaker spacing that meets your coverage requirement.

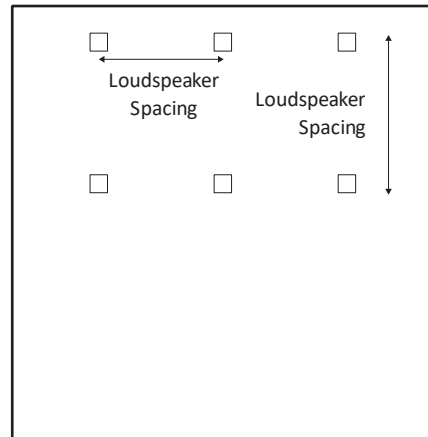
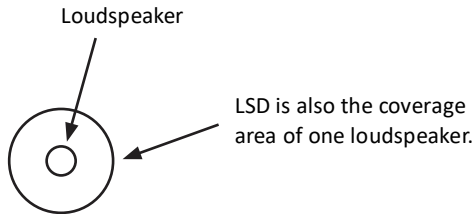
A. Calculate the Loudspeaker Spacing Distance (LSD)



LSD = Loudspeaker Spacing Distance

M = Multiplier

$$LSD = (H - L) \times M$$

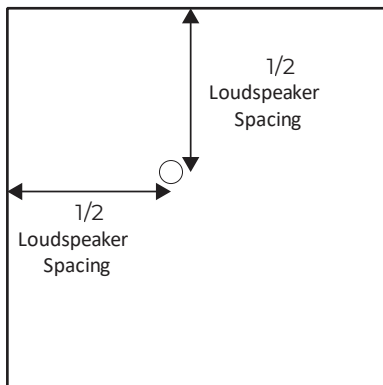


2.25" Woofer Coverage	M (multiplier)	Models
Edge-to-edge	3.46	FS2C DM2C-LP
Minimum Overlap	2.45	

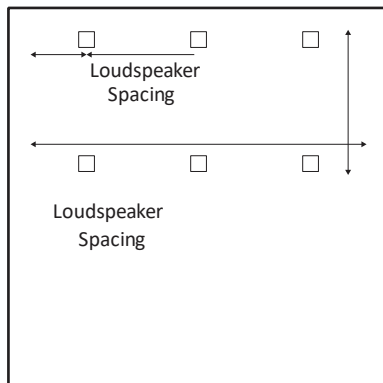
Multipliers are created from Coverage Angles (CA). These are multipliers we have found to work for most applications. For more precise results, and to adjust for obstructions, use a software design tool, such as Bose Professional Modeler, EASE, EASE Address, or EASE Evac.

Edge-to-edge coverage generally works well in fixed-location seating/standing scenarios and for installations on a tighter budget. It is appropriate for low-level background music. Minimum overlap coverage provides more consistent sound quality throughout the space and will also produce an overall louder music level. If additional loudspeakers are required beyond what is included with the AudioPack Pro additional FS2C loudspeakers can be added to the system, however, the loudspeakers will need to be set at a lower power level.

Place the first loudspeaker at 1/2 LSD from any corner of the room.



The remaining loudspeakers are arranged on a square grid pattern using the LSD. If a loudspeaker would be placed on or beyond the perimeter of the room, delete that row/column of loudspeakers.



Calculate Loudspeaker Tap Values

The FreeSpace FS loudspeakers are compatible with 70-volt, 100-volt amplifiers like the IZA 190-HZ.

Use the Tap Charts to determine which loudspeaker tap is required for this design A. Locate the loudspeaker tap chart and find the column for mounting height for this design.

- B. Follow the column to the desired maximum SPL.
- C. Follow the row across the chart to determine the required loudspeaker tap.
- D. Calculate the required amplifier power:

$$\begin{array}{ccc}
 \times & & = \\
 \hline
 \text{Number of Loudspeakers} & \times & \text{Required Loudspeaker Tap} & = & \text{Power Required} \\
 \text{Required} & & & & \\
 \hline
 \end{array}$$

E. Calculate the required amplifier size:

$$\frac{\text{Power Required}}{\text{Headroom}} \times 1.10 = \text{Amplifier Size}$$

FreeSpace FS2C Loudspeaker Amplifier Example	Maximum Loudspeakers at Higher Tap Settings	EQ Preset	Average SPL *
FreeSpace IZA 190-HZ	5 at 16W, 10 at 8W tap	FS2C/SE/P	87 dB at 16W, 84 dB at 8W

* 3 meter (10 foot) ceiling height room with edge-to-edge density, standing listener, 12 dB crest factor of pink noise/compressed music, direct-field, no room gain.

Tap Charts

Individual Loudspeaker Continuous Output Level

Note: The following tap charts assume standing ear height at 1.5 meters (5 feet) in minimum overlap spacing. Room reverberation could add as much as 4 dB system gain, which is not factored into the measurements. Designing without room gain will ensure you don't under-plan your design, and amp attenuation is possible at the job site if you exceed the average room SPL target during measurement. Values below 70 dB are omitted, select a higher tap.

FS2C

FS2C (standing listener height)															
Ceiling Height		m	2.4	2.7	3	3.7	4	4.3	5	5.5	6	6.7	8	9.8	
		ft	8	9	10	12	13	14	16	18	20	22	26	32	
TAP	1W		87	84	82	79	78	77	75	74	73	72	—	—	dB-SPL
	2W		90	87	85	82	81	80	78	77	76	75	73	75	
	4W		93	90	88	85	84	83	81	80	79	78	76	78	
	8W		96	93	91	88	87	86	84	83	82	81	79	81	
	16W		99	96	94	91	90	89	87	86	85	84	82	84	
	8Ω		99	96	94	91	90	89	87	86	85	84	82	80	

Graph Paper

