ZYCOO Speaker Placement Guide

www.zycoo.com

zycoo@zycoo.com

Contents

1. Preface

1.1 Audience

This manual provides a general overview of basic audio, how sound is measured. It also introduces the different types of speakers, calculates the number of speakers needed for a project, and optimal placement for an audio installation.
This manual is intended to provide clear operating instructions for those who will install ZYCOO speakers.

1.2 Revision History

Document Version	Applicable Firmware Version	Update Content	Update Date
1.1.0	Any version	Updated new chapters and related content.	Apr,2024
1.0.0	Any version	Added speaker deployment instructions.	Nov,2023

2. Introduction

2.1 Overview

The ideal situation for the speaker installation is to provide the listeners with a higher, clearer sound than the background noise as well as provide a wider frequency response, more uniform sound pressure level, and better sound quality.
However, the audio quality is impacted by a number of factors, such as the quality of the speaker and its components and the placement of the speaker. Also, the size and shape of the room, furniture, and other objects inside it, the materials used from the walls to the couches, all affect how sound travels and cause sound reflection, absorption, and refraction.
Therefore, we can only try our best to satisfy the sound effect. The following description will provide some effective suggestions as much as possible.

2.2 Measures of Sound

Speakers are rated at a specific sound level measured in dB or decibels, at a specific power level 1 Watt, and at a specific distance 1M away from the speaker. Decibel is a relative measurement that starts at 0 dB, the lowest sound level that a healthy ear can discern. For example, 60dB is the sound level of normal conversation, 100dB is the sound level of factory noise, 190dB is the loudest possible sound. Watt is the electric power that comes from the power supply like an amplifier. Sound travels through a medium such as air or water to be heard; that’s why we can’t hear anything in a vacuum.

To increase the volume, it increases the audio power to the speaker. The rule of thumb is that every time you double the power, it gets an additional 3 dB of sound out. For example, you have the ZYCOO SC15 Network Ceiling Speaker, which has a specification of 85dB/1m/1W, and you double the power to 2 watts, it increases the sound level to 88dB. If you double the power again to 4 watts, it gets another 3dB or 91dB of sound out.

2.3 Type of Speakers Being Used

There are many kinds of speakers, some are designed for music playing, and some are for general paging purposes. In certain cases, you need a louder speaker, for instance, in a warehouse with a high ceiling or in a noisy environment with a loud ambient dB SPL. Each loudspeaker combines a set of complex parts, the speaker driver unit is one of them. In order to maintain sound quality, each speaker driver is specialized within the frequency band so that it does not need to reproduce too many sounds at the same time, causing sound distortion. Therefore, it is very important to choose the right speaker type based on the needs of your project and consider different factors.

3. Placement of the Speakers

3.1 Overview

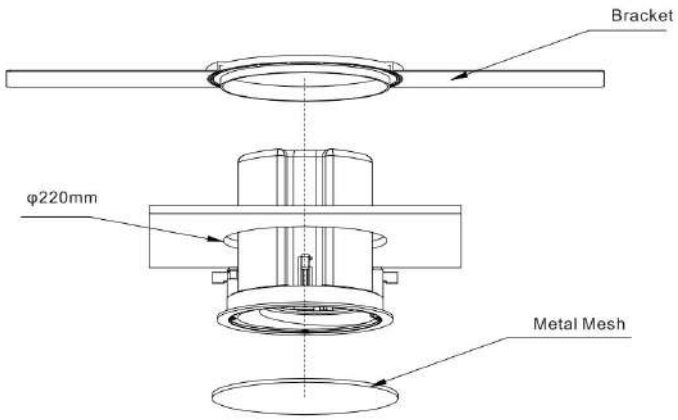
There are many possible speaker placement methods, such as placing on the ceiling or the wall in a classroom.

Here ZYCOO have provided with you two solutions based on both **Economy** and **Optimal** situations systems for suggestions.

- The Economy system will give you the minimum number of speakers needed to cover an area at a lower cost; speaker numbers below the suggested number are not recommended. For paging or announcements, the economy system will be enough for most scenarios. For businesses that would choose the Economy system could be a supermarket, factory, park, etc.
- The Optimal system gives you the number of speakers that can provide the best solution; For a better experience of background music playback, the optimal system will be better. you may go above the suggested number. Businesses that would choose the Optimal system could be a school, fashion store, office, etc.

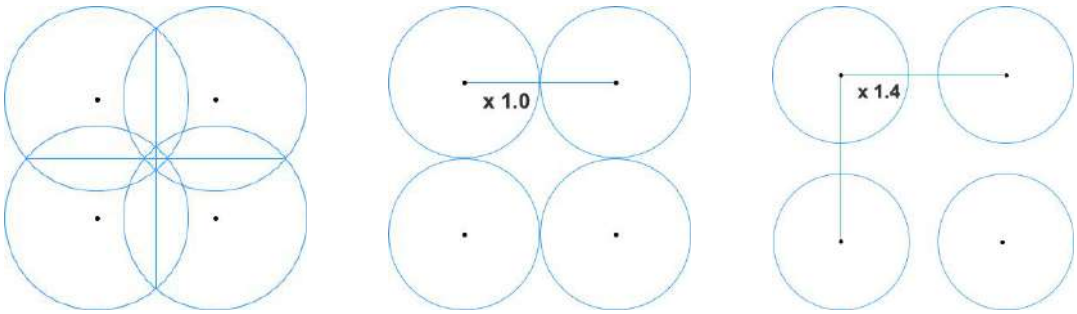
3.2 Indoor Ceiling-mounted

Ceiling placement is more than likely to apply to ceiling speakers, such as ZYCOO SC10 Network Ceiling Speaker and ZYCOO SC15 Network Ceiling Speaker. However, we need to be aware that the lower the ceiling, the more speakers will be required. When the distance between the ceiling and the person decreases, the coverage triangle diameter decreases, requiring more speakers to cover the area.



3.2.1 Placement Layout & Recommended Speaker Quantity

According to the different needs of customers, ZYCOO provides the following ceiling speaker placement layouts:



Minimum Overlap **Edge-to-Edge** **1.4 x Edge-to-Edge**

- **Minimum Overlap:** A minimum overlap layout will be helpful with effectively eliminating coverage gaps, ZYCOO recommends Optimal system use this layout to ensure performance, using this layout will provide a good performance and medium to high cost. Moreover, If the customer wants greater sound pressure, the overlap area can be expanded to make the layout a maximum overlap layout.
- **Edge-to-Edge:** An Edge-to Edge layout aligns the effective coverage of adjacent speakers (90 ° coverage). It will provide a more balanced effect at an acceptable cost. ZYCOO recommends an "Edge-to-Edge" layout when the customer's needs are relatively balanced.

- **1.4 x Edge-to-Edge:** 1.4 x Edge-to-Edge layout provides a placement with 1.4 times further apart than in the standard Edge-to-Edge layout. ZYCOO recommends Economy system use this layout to reduce the number of speakers used. It will provide a basic performance at a lower cost.

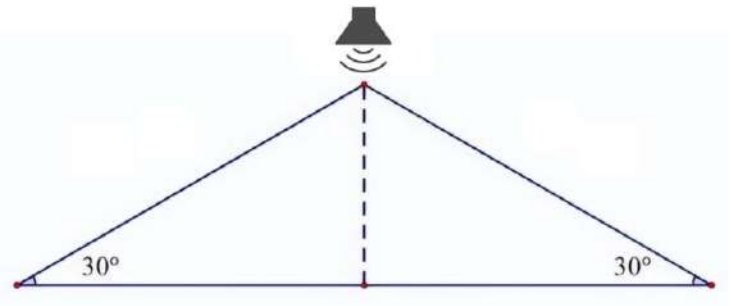
After understanding the speaker placement layout, we can calculate the number of speakers required in the scene based on the formula. In the calculations below, we will only consider the Economy system solution, using a sound coverage angle of 120°. If you want to use the Optimal system, then the number of speakers will be larger to provide better sound coverage.

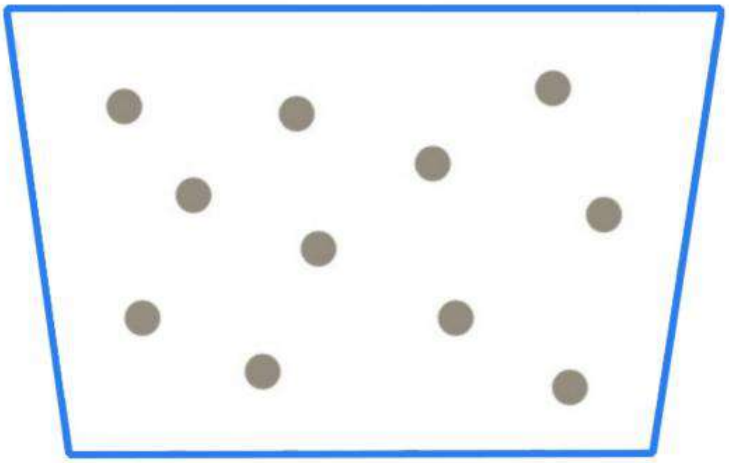
When using SC10 and SC15 ceiling speakers and Economy system solution: The ceiling speaker's coverage area is considered a circular area with a diameter approximately three times the hanging height.

The coverage area formula can be obtained:

Area= π * (height*3/ 2)^2

For example, if the height is 3m, the single cover area will be π * (height*3/ 2)^2≈64m^2. If the room floor area is 600 m^2, the speaker amount will be about 9. (The amount is calculated by dividing the floor area to be covered by the area covered by a single loudspeaker.)

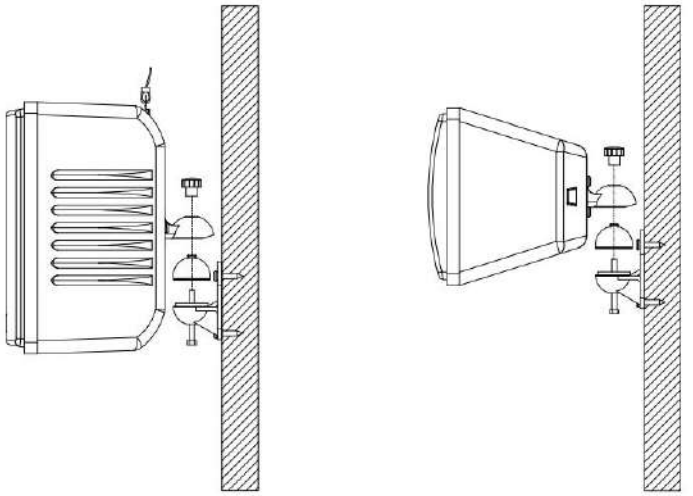




In actual installation, it can be considered in conjunction with the layout diagrams. For example, if you use Edge-to-Edge or 1.4 x Edge-to-Edge deployment, the actual number of installations may be less than the number calculated by the formula. (If it is not installed against the wall, the sound effect in the corners of the room will become worse, but it will not have much impact. In this way, some expenses can be saved too.)
At the same time, in the real installation environment, some other factors should also be taken into consideration, such as the surrounding environment (noise level), wall materials, etc.

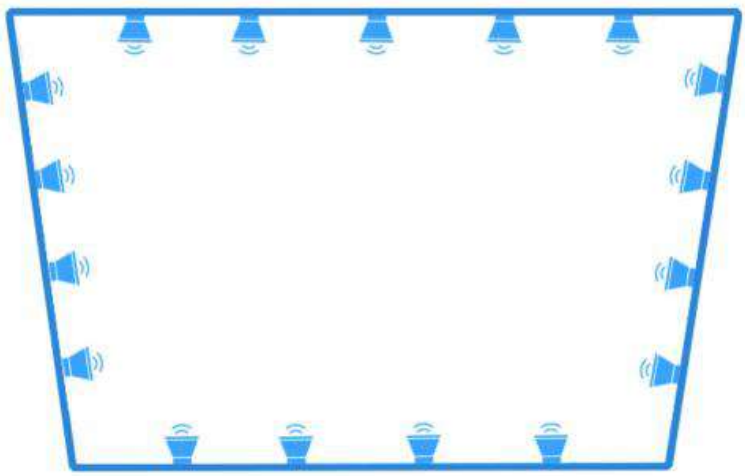
3.3 Indoor Wall-mounted

Placing speakers on the wall is one of the most common placements. For example, ZYCOO SW15 Network Cabinet Speaker, SQ10 Square Speaker, SL30 Network Column Speaker, and SH30 Network Horn Speaker can be deployed on the wall.
For 10W and 15W Wall-mounted speakers, ZYCOO recommends installing them at a height of 2 to 2.5m for the most effective sound distribution, and it is not recommended to place a speaker in the corner. At an installation height of 2.5m, ZYCOO recommends that the distance between two speakers be kept at 10m. If used in a larger room, to ensure audio coverage in the middle area, it is recommended to deploy more speakers.
At the same time, wall-mounted speakers support fine-adjustment of the angle, and ZYCOO recommends fine-adjustment the tilt angle of the wall-mounted speakers to achieve the best flexibility.



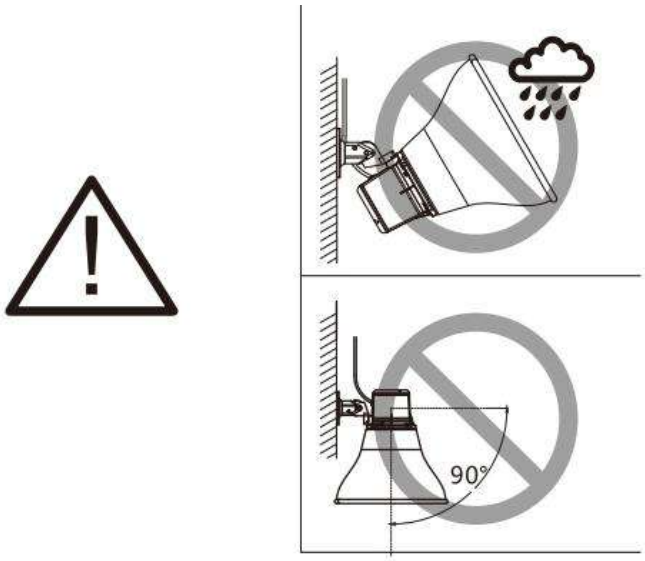
Vertical Installation

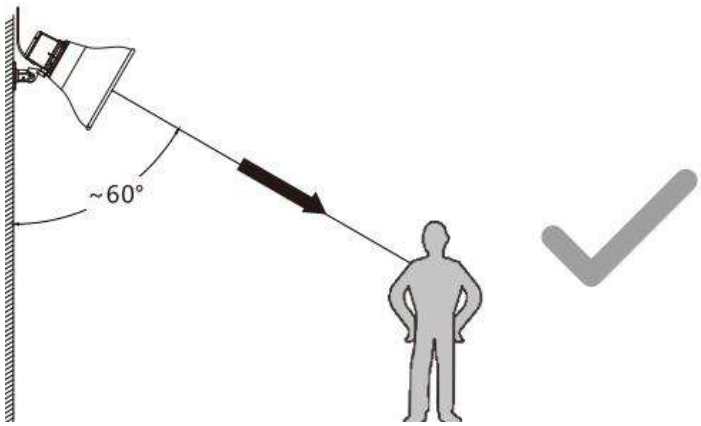
Transverse Installation

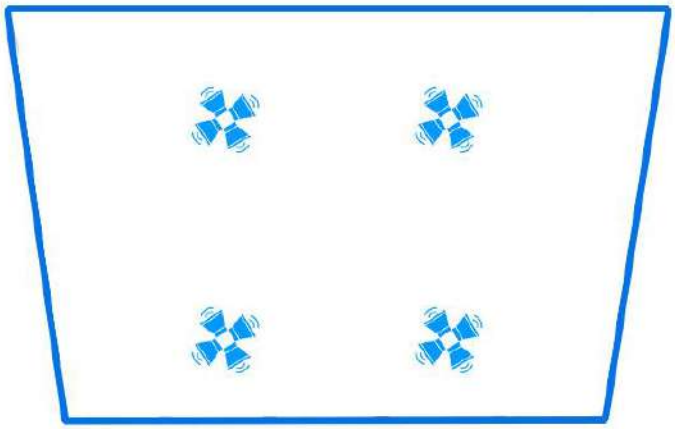


3.4 Outdoor Cluster

The cluster placement is more often used in outdoor environments such as outdoor parking lots, national parks, or playgrounds. For example, ZYCOO SL30 Network Column Speaker and SH30 Network Horn Speaker are water & dust proof outdoor speakers and they need to be installed on a pillar/column. Since the SH30 uses one mid-range speaker unit and directs all sound in one direction, in some cases, you could cluster multiple (1-4) horn speakers facing different directions on one pillar. At the same time, you also need to consider the weight of the speakers and the load-bearing capacity of the pillar/column.


90°


~60°



www.zycoo.com
zycoo@zycoo.com