



The Mark of the Professional...

TECH NOTE: Distributed Sound Systems - Part 1 of 2

Overhead distributed sound systems are capable of delivering outstanding music and paging audio performance. Unfortunately, many do not attain their potential due to the installer's failure to provide adequate coverage. This problem can be avoided in most instances by following the minimum guidelines suggested below.

First, do not assume that the **speaker coverage** will exceed a 90° angle. While some speaker systems do give greater coverage, these are exceptions that should be carefully documented by independent tests for their validity.

Second, a rough "rule of thumb" method of estimating **speaker spacing** is to determine the ceiling height, subtract 4' to allow for the height of the listener, and multiply by 2. For example, the space between speakers in a room with a ceiling height of 14' would be 20' ($14 - 4 \times 2$).

Third, the hexagonal **spacing pattern** shown in Figure 1 is a good compromise between end-to-end and overlapping patterns. Increasing the volume to compensate for an inadequate number of speakers will raise the loudness level but only at the expense of losing intelligibility and clean music reproduction.

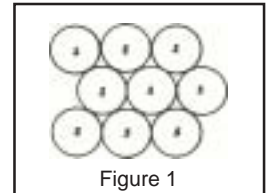


Figure 1

Fourth, to find the **coverage area** of each speaker, determine the ceiling height, subtract 4' for the height of the listener, multiply that number by itself and then multiply the result by 3.1416. For example, if the ceiling height is 14', subtract 4' for the listener's height ($14 - 4 = 10$), multiply 10×10 (100) then multiply by 3.1416 to find 314 square feet speaker coverage (πr^2 , the area of a circle).

Fifth, after finding the coverage area of each speaker, calculate **the number of required speakers** by dividing the size of the room by the coverage area of an individual speaker. For example, a 40' by 40' room (1,600 sq. ft.) with an individual speaker coverage of 314 square feet would require 5 speakers (1600 divided by 314).

Sixth, **the sound level** of the speakers should be set to exceed the normal room noise level at least 3dB for music and 6dB for paging.

Seventh, adequate **amplifier power** is essential to produce satisfactory sound reproduction. This may be determined in 25V and 70V systems by simply adding the value of the taps on each of the transformers in the system and multiplying the sum by 1.43 for "headroom" to allow for line and transformer power losses. In the example above, assuming that each transformer was tapped at 5 watts, this would be 37.75 watts ($5 \times 5 \times 1.43$). Therefore, a 40 watt amplifier would be the proper selection.

NOTE: Larger, more complex installations with special circumstances such as ceilings over 30' or under 10' require more detailed information than is provided here. For additional assistance, call J. W. Davis & Company Customer Service or for comprehensive technical information see *Sound Systems Engineering* written by Don and Carolyn Davis published by Howard W. Sams & Company.

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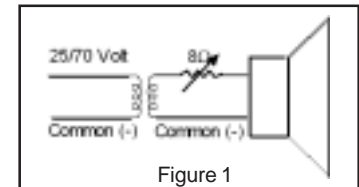
TECH NOTE: Distributed Sound Systems - Part 2 Of 2

Simplicity of installation and modification are major benefits of 25/70 volt overhead sound systems. Several options are available to control the volume level of a single speaker or a group of speakers, either at the speaker or on a wall.

JWD transformers provide various taps for setting power consumption and speaker volume control (For instance, the JWD TR-705 5 watt transformer has 5, 2.5, 1.25, .625 and .31 watt taps). Connecting to taps of lower value reduces the highest possible sound level from the speaker. Due to its inflexibility, this method is primarily used for system-wide control.

In speaker systems that include individual speaker sound level controls, J. W. Davis uses L-Pad volume controls (“pads”) exclusively. Unlike less expensive potentiometers (“pots”), L-Pads contain dual offsetting elements that provide a constant impedance to the system. In addition, smooth linearity is afforded throughout the volume range and reliability is superior. However, care should be taken to (1) match the impedance of pads to loudspeaker impedance (An 8Ω loudspeaker should be wired to the 8Ω secondary taps of the line transformer.) and (2) be sure that the wattage of the L-pad is equal to or greater than the wattage of the loudspeaker.

The wiring diagram in Figure 1 shows the circuitry of a speaker system with a transformer and an L-Pad installed. The transformer on the speaker steps down the power from the incoming 25V or 70V line to the 8Ω volume control or speaker connections.



If wall-mounted volume controls are desired, autotransformers should be used. These attenuators will control the volume level of groups of speakers as well as a single speaker. Although autotransformers have a “transparent” load, and should not be counted when determining the amplifier load for the system, the maximum power that they will pass through is limited by their wattage rating. Therefore, assuming that 3 speakers with 10 watt line transformers are to be controlled, the autotransformer must have a rated capacity of at least 30 watts.

To provide the necessary power ranges, JWD 20 watt (AT-20), 40 watt (AT-40) and 100 watt (AT-100) autotransformers are available with either stainless steel or white plastic face plates.

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