

# Overhead Paging Systems

Whether they originate at a phone or a microphone, paging systems are increasingly required for communicating information in an emergency.

## OVERHEAD PAGING PRIMER

Overhead paging, sometimes referred to as a PA system, allows users to broadcast voice messages or audio programming across a network of loudspeakers. In addition to broadcast paging, a PA system can also provide:

- › Two-way talkback paging, in which the pager can talk and then listen for a response from the loudspeaker
- › Multiple zone coverage, so certain areas of a building can be paged separately
- › Group call, in which multiple areas or zones can be paged at once
- › All call, where all areas or zones are paged at once
- › Background music
- › Night ringing
- › Time clock or class change tones
- › Alert or alarm tones

## CONSTANT CURRENT VS. CONSTANT VOLTAGE

**Constant current systems** are more common in smaller installations. They also require more planning because the loudspeakers need to be balanced, based on load rating, typically 4 or 8 ohms.

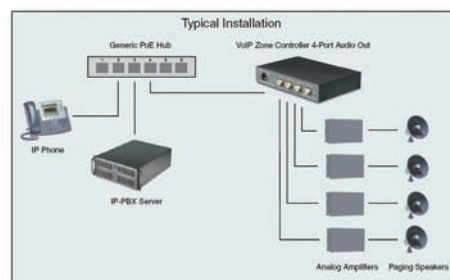
**Constant voltage systems** are better for PA designs that require more than a few loudspeakers. They provide a voltage of up to 140V (typically 25V, 70V, or 100V), eliminating the need to calculate and balance loads. Constant voltage is more common in modern installations and can be easily expanded.

In both constant current and constant voltage systems, the cable is usually 18 American wire gauge (AWG) [1 mm (0.039 in)] or larger, and may be shielded to prevent emissions of the higher voltage level signals into other lower voltage level voice and data systems. In some localities, conduit may be required due to the voltages (70V or 100V). Check before you wire.

## ON THE NET

In offices that currently have a Voice over IP (VoIP) communications infrastructure, an overhead paging system can be integrated fairly easily. Moreover, in a large enterprise, end-to-end VoIP allows for paging to phones or speakers across multiple offices or locations.

Typically the VoIP paging system plugs into the company IP PBX or voice server. It can include VoIP-specific amplifiers and speakers (often powered via Power over Ethernet), or it can interface with existing analog paging equipment while enabling pages to originate from newer VoIP phones (see an example below).



## TWO MAIN TYPES OF PA SYSTEMS

**Centrally Amplified System:** The line-level signal from a telephone system or the low-level signal from a microphone is first amplified then fed at a higher level through various types of cable to loudspeakers and horns. Two types of amplifiers/loudspeakers typically used in these system are constant current and constant voltage (see box, left middle).

With the centrally amplified system, one or more amplifiers are usually mounted in racks and connected at the head end to amplify the voice or audio signal.

**Distributed Amplifier System:** Connects to a telephone system using a control unit located at the head end. The control

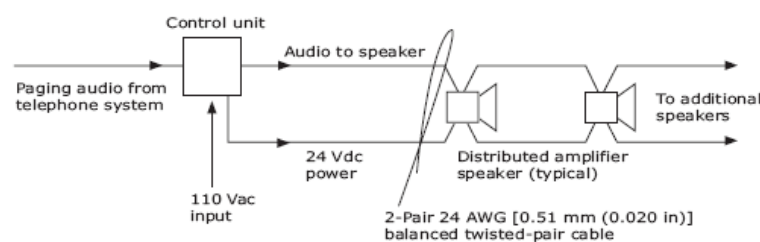
unit sends a lower voltage level voice signal, along with a direct current (DC) voltage (typically 24V) through two-pair twisted-pair cable to loudspeakers. Each loudspeaker or horn contains a separate amplifier circuit and volume control.

Distributed amplifier systems also may use voice grade or data grade cabling, allowing the designer to integrate the design of the PA system into the structured cabling network.

When deciding on which system to use, integrators should consider:

- › Cost
- › Cable type
- › Future expandability
- › Interface requirements
- › Source requirements
- › AV room or rack space availability

Distributed amplifier system



AWG = American wire gauge  
in = Inch  
mm = Millimeter  
Vac = Volt alternate current  
Vdc = Volt direct current

## PA LOUDSPEAKER CONSIDERATIONS

When installing speakers for a PA system, you want the reproduced direct sound to be as low as possible. Rooms with hard surfaces can cause reverberant sound that might make direct sound unintelligible. In contrast, rooms with absorptive surfaces may require higher output levels or additional loudspeakers.

The right PA system provides even coverage at the lowest wattage possible. It will also deliver an SPL for the voice page that's at least 6 dB, but no more than 20 dB above the ambient noise level. Below 6 dB, pages may be lost in ambient noise; above 20 dB they'll be too loud in areas closest to the speakers.

**Ceiling loudspeakers:** In areas with less than 70 dB noise level, the distance between ceiling loudspeakers in a row should be approximately twice the ceiling height. In areas with a noise level greater than 70 dB, the distance between loudspeakers should be decreased.

**Wall-mounted loudspeakers:** For appropriate sound coverage, wall-mounted loudspeakers should be mounted 8 to 12 feet above the floor. They should not be directed toward each other.



**Hallway loudspeakers:** For heavily trafficked hallways, use ceiling-mounted loudspeakers placed along the center of the hallway at 8-foot intervals. Remember to place a ceiling loudspeaker at hall junctions. In a normal-traffic hallway, place loudspeakers at intervals equal to twice the ceiling height.

In hallways where ceiling loudspeakers can't be used, use wall-mounted bidirectional loudspeakers placed at intervals of about 26 feet on alternating sides of the hallway. Place the first bidirectional loudspeaker 20 feet from the end of the hall and work toward the other end.



**Horn loudspeakers:** Because they have a directional projection pattern, horns are appropriate for environments with more than 70 dB of noise. Deciding on a horn depends on ambient noise level, mounting height, angle of projection, and obstructions. Typically, one 15 watt horn mounted 16 feet above the floor and adjusted to a 60-degree angle of projection will cover the following areas under the given noise levels:

SPL of ambient noise	Square feet of coverage
Up to 74 dB	4,000
75 to 89 dB	2,500
90 dB and above	1,200