



## Confidential Conversations

It is often assumed by planners, architects, and designers that reducing "conversational distractions" requires developing and specifying "quiet" workspaces. **However, workspaces that are designed to be "quiet" result in conditions where "conversational distractions" are increased and "conversational privacy" is decreased.**

Most offices today have been designed to be too quiet. It's like the old adage, "it's so quiet you can hear a pin drop." It isn't the absolute "loudness" of the pin drop but rather the absolute "quiet" of the environment. **Much of what can be overheard between enclosed offices, in hallways, waiting rooms, and open areas outside of conference rooms and enclosed offices is not "absolutely loud" but "relatively loud."**

In other words, the confidential conversation is louder than everything else in the surrounding environment at that time. In fact, in quiet workplace conditions, "conversational privacy" may only be achievable by increasing the levels of background sound.



## A Common Misconception

The use of a speech privacy system prevents people in adjoining offices, hallways, or other common areas from overhearing potentially sensitive information through the walls or doorways.

The most common misconception with regard to protecting confidential conversations is placement of the emitters or speakers. It is assumed by most that the "source" of the conversation should be treated (i.e., background noise added where the conversation originates) when in fact the "destination" to which the conversation travels must be treated (i.e., background noise added to adjoining offices, hallways, or common areas).

A speech privacy system "fills in" the sound spectrum in these areas with a **barely perceptible** low-level background noise so the incoming speech is rendered unintelligible. The masking sound does not "cancel" but rather "covers over" intruding voices.

In some workplaces, adjoining offices may be both a "source" and a "destination" of confidential conversations, which requires both areas to be treated.



## What is Disruptive Technology?

Disruptive technologies are broadly defined as those innovations that represent such a fundamentally radical change in accepted practices that they have the potential to render entire industries obsolete.

It's happened more in our lifetime than in any other period, as the vacuum tube, LP record, mainframe computers, and countless other technologies have been swept from homes and offices into museums.

The innovative **VoiceArrest™ Speech Privacy System** represents just such technology. It sets an entirely new standard for the sound masking industry.

- Low Voltage, Plug-&-Play System.
- Quieter and less intrusive, yet significantly improves speech privacy.
- Multi-channel system accurately simulates the sound of a high quality HVAC system.
- Provides a sound spectrum that delivers uniformly throughout the coverage area.
- Truly independent control of sound-masking level in open and closed office areas.
- Simple, less disruptive installation into existing facilities.



**The VoiceArrest™ System is a ceiling tile-mounted solution capable of treating multiple offices or areas.**

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## How Confidential Privacy Is Achieved

To achieve "confidential privacy" in office environments, acoustical engineers and consultants traditionally use a method called "the A, B, C's." This convenient acronym literally describes the three factors that need to be controlled to achieve "speech privacy," i.e.:

- **absorption** of sound waves (such as by using a high-**NRC**-rated ceiling tile),
- **blocking** (such as by using high-**STC**-rated panels, partitions, walls, windows, etc.),
- **covering** (such as adding a source of unstructured [i.e., not music, which is "information and is therefore distracting], low-level background sound).

Systems that produce this type of background sound (which typically sound like **HVAC** noise) have been in wide use since the 1970s and are generically described as "speech privacy systems" or "white-noise systems" or "pink-noise systems" ("white" and "pink" are often used but highly inaccurate terms), or "sound-masking systems."

"A, B, C's" is a convenient and memorable acronym of three components that must usually be combined in some form to achieve an acceptable level of "speech privacy" to improve workplace productivity. But in terms of the **relative effectiveness** of these three components (absorption, blocking, and covering), the acronym should be spelled "C.A.B's". This is because the **most gain can be achieved least expensively, most quickly, and with the least disruption by starting with "C"- i.e., employing a low-voltage electro-acoustic background sound system**

## Achieving Conversational Privacy and Acoustical Comfort when using a Background Sound System

It should be obvious that adequate confidential privacy can be obtained if the background sound level is high enough. If a secretary is seated under a particularly noisy return air grille, she may well not be aware of intruding speech from the CEO's adjoining office and, therefore, the CEO clearly has adequate speech privacy, even if the secretary is annoyed by the excessive noise.

### Understanding the Levels of Speech Privacy

An **Articulation Index (AI)** is a measure of the **intelligibility of speech**, expressed as a percentage of speech that is understood by the listener when heard out of context. It is expressed as a number between 0 and 1.

The **American Society for Testing and Materials (ASTM) E1130-90** precisely defines the levels of Speech or "Oral Privacy" as:

- **"Confidential Privacy"** - "Speech privacy may be described as 'confidential' when speech cannot be understood. This degree of speech privacy is indicated at Articulation Index values at or below 0.05."
- **"Normal Privacy"** - "At Articulation Index values between 0.05 and 0.20, 'normal' speech privacy is indicated. In this range, concentrated effort is required to understand intruding speech."
- **"Unacceptable Privacy"** - "Speech becomes more readily understood at Articulation Index values greater than 0.20. Some describe 'unacceptable' privacy as values above 0.30."
- **"No Privacy"** - At Articulation Index values above 0.40 there is essentially no privacy

The **Privacy Index (PI)** is a measure for rating the speech privacy performance of an architectural space (or lack of speech intelligibility) where the PI is calculated from the Articulation Index according to the following:

- **"Confidential Privacy" = PI > 95%**
- **"Normal Privacy" = PI between 95 - 80%**
- **"Unacceptable Privacy" = PI between 80 - 60%**
- **"No Privacy" = PI < 60%**

Similarly, a background sound system can be turned up very loud until "confidential" speech privacy is achieved, but this also results in annoyance. However, it is possible to design a system in which both requirements are met - "confidential privacy" and "freedom from annoyance" for

#### **NRC** - Noise Reduction Coefficient

The measure of acoustical absorption calculated at specific mid-range frequencies.

#### **STC** - Sound Transmission Coefficient

A classification of the sound insulating properties of a material or structure.

#### **HVAC** - Heat, Ventilating, & Air Conditioning

**Achieving Conversational Privacy**

The first requirement is proper *tonal quality* or balance of frequencies in the background sound. A second requirement is that the background *sound level should not exceed*

*approximately 45 dBA*, as demonstrated by recent research studies carried out by the Canadian Research Council. Many background sound systems are adjusted for levels well above 45 dBA. This is probably because a majority of the population tolerates higher levels without serious complaint, even though they find it annoying. Finally, the sound must be *spatially uniform*, in both tonality and sound level, at the listener's ear elevation so

The importance of this last requirement, spatial uniformity, is not well understood even by some vendors of background sound systems. It is unusual to find systems that achieve uniformity of better than 4 or 5 dB in the important speech frequencies. Variances of this magnitude result in dramatic changes in speech privacy levels throughout the office if the system is properly adjusted so that the highest levels do not exceed 45 dBA.

As a result, most systems (attempting to maintain minimum levels of 45dBA) are adjusted for average levels of about 48 dBA to 51 dBA at many locations, causing annoyance to a significant percentage of users in order to ensure "speech confidentiality." Alternatively, the system is adjusted to a lower average level, compromising confidential conversations. These factors, unfortunately, have contributed to the opinion among some users that

The **VoiceArrest™ Speech Privacy System with QT™ Quiet Technology** delivers adequate speech privacy and freedom from annoyance at 45 dBA.

**dBA** - Relationship of perceived sound levels to dBA:  
A 10 dBA increase in sound energy is perceived as a doubling in loudness.

**Indirect Field Technology**

**Until recently**, virtually all speech privacy systems were designed and installed into the **plenum**. A typical speech privacy system uses loudspeakers *above* the suspended acoustical ceiling that *must be individually adjustable* to provide the correct frequency distribution and precise operating level of ambient sound, *at least if considered on an average basis throughout the space*.

However, achieving adequate spatial uniformity of ambient sound is a serious challenge faced by masking system designers, and it is a challenge that few are able to provide consistently using loudspeakers above the ceiling.

Even a 3 decibel variation from one workspace to another can have a dramatic effect on speech privacy. However, the performance of most systems varies by more than that primarily because of the sound attenuation characteristics of typical ceiling and plenum materials and openings that vary substantially from point to point.

Figure 1 illustrates the difficulty in achieving good uniformity with an above-ceiling system. The conventional wisdom is that the ceiling will "spread out" the sound in the plenum, improving the uniformity. What actually happens is that **the plenum typically causes a lack of**

Practical plenums hide large structural elements, such as HVAC ductwork or structural beams, which effectively compartmentalize the sound. Even if the plenum is atypical and contains no large elements, openings in the ceiling for air returns and lighting fixtures permit proportionately more sound to be emitted below them.

**Plenum** - The space above the suspended acoustical ceiling.



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**Figure 1.** Typical plenum and suspended ceiling acoustical variations cause non-uniformity in the background sound below. Ductwork and building beams compartmentalize the sound; acoustically absorbent fireproofing in some areas and not in others causes non-uniformity above, and openings for return air in the ceiling or light fixtures further deteriorate uniformity below. Typical variability below is 4 or 5 decibels.

## Direct Field Technology

**Recent innovations** have now made it possible to use a ceiling-mounted speech privacy system that is able to provide much better uniformity of masking sound throughout typical open plan offices. This system uses **Direct Field Technology** with loudspeakers that radiate sound directly into the occupied space below rather than into the above-ceiling plenum.

The principal advantage of emitting the sound directly into the space below is that the non-uniformity caused by HVAC openings in the ceiling, or ventilation slots in lighting fixtures, or by building structural, fireproofing, large ducts or other mechanical components in the plenum no longer have any significant effect on the spatial distribution of masking sound.

By contrast with an above-ceiling system, the uniform gray in Figure 2 illustrates the good uniformity possible with an in-ceiling background sound system. By properly choosing emitters or speakers with ultra-wide dispersion, the background sound is very uniform at the listener's ear elevation. This *spatial and tonal uniformity* ensures consistent confidential privacy at lower and less intrusive volume levels.

**Direct Field Technology** - The use of ultra-wide angle dispersion emitters (speakers), radiating sound directly into the designated listening space below.



[Click Here for Animated Illustration](#)

**Figure 2.** Ultra-wide dispersion emitters radiating directly into the listening space below results in spatial variability of less than 1 decibel throughout the office.

## Features of the VoiceArrest™ Direct Field Speech Privacy System

- **Multi-Channel Technology**

**VoiceArrest™** is a true four-channel speech privacy system utilizing patented **Qt™ Quiet Technology**. It comprises four separate incoherent channels all the way from the digital-generating source to the last emitter (speaker). Four channels accurately simulate the turbulent air eddies characteristic of HVAC system air movement sound generation. This allows the **VoiceArrest™**

Hearing the **VoiceArrest™ System** is like listening to quadraphonic surround-sound. The sound is full, yet you can't pinpoint exactly where it's coming from even if you're standing beneath one of the emitters. This allows the system to uniformly blend into the office background virtually unnoticed. Few, if any, visitors will even notice the **VoiceArrest™ System** running, and those who do will think they are hearing the HVAC

- **Optimum Spectrum**

The **VoiceArrest™ Speech Privacy System** provides a sound spectrum that delivers uniformly throughout the coverage area. Direct field technology means the spectrum is not **distorted by** the ceiling assembly or obstructions and variances in the plenum space above.

The **VoiceArrest™ System** is the only system whose coverage meets the ASTM E1041 requirements for spatial variation and temporal uniformity.

**Amazingly, the variation in the spectral balance at any office or cubicle is typically within 1 decibel of optimum at any octave band over the entire critical voice frequency range of 250 Hz to 4,000**

Although typical plenum-masking systems may appear to exhibit fair uniformity as measured by an **A-Weighted Sound Pressure Level Meter**, their variation within the critical speech bands far exceeds that routinely provided by the **VoiceArrest™ Speech Privacy System**.

**Distorted by** the frequency-dependent acoustical transmission loss characteristics of the ceiling assembly or the acoustical spatial variance in the above-ceiling plenum space.

**A-Weighted** - A-Weighted Sound Pressure Level  
The standard measure of sound pressure level that approximates the sensitivity of the human ear at moderate sound levels. A-Weighted Sound Pressure Level de-emphasizes high and low frequencies because the ear poorly perceives these.

• **Lower Operating Level**

The spatial and spectral uniformity delivered by the **VoiceArrest™ Speech Privacy System** permits its operation at substantially lower sound levels than competitive systems while maintaining masking effectiveness. While other masking systems must be operated at 48-51 dB in a well-designed open plan office in order to provide acceptable privacy conditions for most occupants, the **VoiceArrest™ Speech Privacy System** is normally operated at 45 dB under the same

A frequent comment by users experienced with plenum-masking systems is that the **VoiceArrest™ Speech Privacy System** "is not loud enough" to provide good speech privacy. Yet objective comparative standard measurements of the **Articulation Index\*** clearly demonstrate that **VoiceArrest™** is at least as effective as louder plenum-based systems. The result is **dramatically reduced acoustical obtrusiveness and user**

• **Truly Independent Control of Sound Levels in Open and Closed Office Areas**

A common issue in many offices is that the above-ceiling air plenum is shared by both open and closed offices areas. For reasons of economy, the separating walls often do not extend more than an inch or two above the suspended acoustical tile ceiling. Therefore, when masking is delivered to the open area at an appropriate level, sound in a enclosed office typically builds up to excessive levels, even if there are no masking loudspeakers above it. Until now, the only solution was to "starve" the adjacent open areas. While this does reduce excessive build up in enclosed offices, it also compromises sensitive conversations.

**Direct Field Technology** used by the **VoiceArrest™ System** means the masking sound intended for the open office area is entirely restricted to the open area. There is no unwanted bleed over effect into enclosed offices or conference rooms.

If masking is desired in the enclosed space, a separate zone can be provided, and its level is controlled independently.

• **Cost Effectiveness**

The **VoiceArrest™ Speech Privacy System** meets a compelling need by providing state-of-the-art speech privacy at a modest price. Configuring and installing does not require hiring engineering consultants, and since it's a low-voltage system, there's no need to run electrical power service to each emitter. Therefore, speech privacy now becomes cost-effective, even for the smallest of office spaces.

The cost-effectiveness of the **VoiceArrest™ Speech Privacy System** is even more dramatic in larger spaces where a single Control Module can be used to treat up to 30,000 square feet. For areas larger than 30,000 square feet or where zone volume control is desired, simply use additional Control Modules.

With the **VoiceArrest™ Speech Privacy System**, you receive the highest quality system available, while saving over plenum-based systems.

**Articulation Index (AI)** is defined by ASTM Standard E1130 [2002], Standard Test Method for Objective Measurement of Speech Privacy in Open Offices Using Articulation Index.

• **Determining Specific Needs**

Using **VoiceArrest™** "Direct Field Speech Privacy Technology" eliminating the need for on site engineering analysis since the system isn't affected by distortions created by ceiling assemblies, or acoustical spatial

We begin by gathering information about the area(s) in which the system is to be installed. Then by using a "floor plan", and if possible a "**reflected ceiling plan**", we determine the number and placement for the

If you decide to proceed with the project, we have installers nationwide ready to implement your new speech privacy system, or we will assist your own facilities group should they decide to do the

Once installed, the **VoiceArrest™ Speech Privacy System** provides the proper tonal quality and sound levels with unsurpassed spatial uniformity into the designated areas without the need for time-consuming, costly tuning adjustments to compensate for acoustical effects.

**reflected ceiling plan** - A layout showing the positioning of the acoustic ceiling grid, and the location of light fixtures, air return grilles, sprinkler heads, or any other elements located on the acoustic ceiling tiles.