

OPTIMAL AUDIO FOR CONFERENCE ROOMS

White Paper

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Introduction

Goals and Scope

This white paper is designed to help you create exceptional business conferencing environments. To help you achieve this goal, we will provide some basic guidelines for evaluating your conferencing setting, identifying your communications objectives, and understanding the tools available in audio equipment. We'll also offer a basic framework for evaluating products to ensure an optimal communication environment based on your business requirements. This is not a recommendation of what to buy and install; rather, it is an overview of the options available to you and some smart questions to ask in your evaluation process.

Optimal Communication

Optimal communication allows all participants, regardless of location, to exchange ideas, share documents, and focus on the business at hand, rather than on the technology involved. It is the result of creating the best conferencing environment possible – one where the technology supports, rather than works against, your business goals and processes.

To optimize your conferencing room, you must first establish what type of communications will take place. Here are some basic questions that can start to paint an important picture of your conferencing needs:

- How many people are generally involved in conferencing?
- How many off-site participants and how many locations are included?
- What kind of collaborative work needs to take place?
- Are meetings generally more formal or informal?
- Are your users comfortable with technology?

It's important to work through this exercise because optimizing is simply developing the best solution for your particular setting and/or application. An optimal conference room is one that helps you work in the way you need to work – as effectively and productively as possible.

Overall Environmental Considerations

Another fundamental element in the creation of a conferencing environment is the environment itself. Whether your conference room already exists or if you have the luxury of planning a room under construction, many of the same variables and considerations apply. A consultant or integrator will often lead you through this process.

Things you need to define from the start of your planning include:

- Room size
- Number of minimum and maximum meeting participants
- Acoustics
- Lighting
- Who will use the room
- What types of technologies are likely to be attractive and functional for your users

As we continue into a discussion of different conferencing components, we will expand on environmental considerations specific to audio applications.

Creating a Plan

Having established the two key fundamental elements of understanding your communications objectives and evaluating the environment where conferencing will take place, you can start to create a plan for your conferencing installation. This plan should incorporate implementation, training, and subsequent usage tracking of the conferencing solution.

Your plan may include conducting user interviews both before and after the installation to determine what's working, what's not working, and how you can better support your users in the future.

The specific mix of technology will depend on how you intend to address your user requirements and the level of sophistication of the technologies you choose to deploy. The following sections address these and other issues and should help you in determining how to create the conferencing environment best suited to your conferencing goals.

Guidelines for Good Audio

Quality Audio

Audio is the single most important aspect to successful conferencing. It has a profound impact on keeping communications effortless and productive. Audio should ensure clear, natural conversation as if you are in the same room. To achieve this, quality audio must eliminate echo, background noise, and unintelligible speech.

Regular telephone equipment and many tabletop conference phones don't deliver on this goal. Standard speakerphones may only provide half-duplex audio, which produces "clipping" when more than one person speaks. Traditional tabletop conference phones have some full-duplex capabilities and can be appropriate for a small room with only a few participants. If audio demands extend beyond the tabletop conference phone's capabilities, echo and noise may dramatically compromise your ability to communicate.

Installed audio products have the processing capacity for eliminating echo and ambient noise as well as the ability to add microphones based on the number of participants. They also provide greater flexibility in room design, allowing you more choices in your conference room configuration.

Perfect audio is a difficult science. Look for a vendor that can offer the technologies you need to achieve the audio quality you want, but also one that has industry experience and a broad selection of audio offerings. The importance of high-quality audio cannot be emphasized enough.

To create an environment conducive to quality audio you must consider room acoustics and how those acoustics will dictate the equipment needed. You should take into consideration acoustics at the remote location as well as local site acoustics.

Room Acoustics

A conferencing professional should be able to help you with the technical aspects of assessing your conference room acoustics such as measuring reverberation, the degree of echo generated in a room, and the additional sources of extraneous noise that may require compensation. A professional audio/video integrator should be able to offer these services. This is an important step in the process and should not be overlooked.



Assessing the conference room acoustics will involve answering such questions as:

- Have you selected a noise-free location with sound-absorbent carpet and window materials?
- Are the walls and ceiling tiles well insulated?
- Are there windows or walls that are “hard” and likely to reflect sound?
- Have you chosen a room away from noisy equipment such as generators, elevators, or Heating/Ventilation/Air Conditioning (HVAC) equipment and away from lobbies, breakrooms, or other places where people congregate?
- Are the furniture and other accoutrements likely to absorb sound or reflect it?
- Will you be using flexible or modular rooms that have changing configurations? (In some facilities rooms are constructed to divide into separate, smaller meeting rooms through the use of moveable walls.)

Note that you won't always be able to control these factors. Budget and timing often necessitate compromise. But fortunately the right equipment will help you overcome less-than-optimal acoustics. For example:

- If you can't adjust some of the factors that improve room acoustics, such as having insulated tiles or sound-absorbent carpet, you can compensate for that limitation with the right equipment and the best equipment placement.
- If the room surfaces are hard (i.e., windows or whiteboards), you can place microphones closer to people to prevent echo from occurring and to prevent multiple reflections (echo) of local audio being sent to the distant site.
- If your room suffers from computer or fan background noise, an audio conferencing system with noise cancellation capabilities can eliminate some of this problem.
- Certain audio conferencing systems are ideally suited to adapt to changing room configurations.

Audio Equipment Options

Choosing the right audio equipment will depend on the size and purpose of the room, and whether your intended use is for audio conferencing only or in combination with video conferencing. What follows is an initial look at a variety of audio conferencing equipment options, their capabilities, and some of the settings for which each is well suited.



Conference Phones: These are important for holding audio calls in small to medium conference rooms. These phones can also be great in larger conference rooms where budget is a concern and integration with video is not required. You should still require high-quality, full-duplex audio for even the smallest conference rooms.

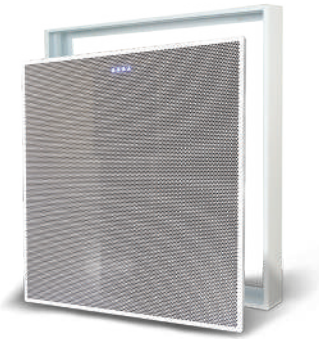


You may need an installed system to support audio conferencing and video conferencing for larger rooms or when audio quality is critical. In general, any installed audio system should incorporate the following:

- Automatic mic mixers to manage incoming microphone audio, limiting the number of active mics and reducing unwanted background noise.
- Echo cancellation prevents a location from hearing an echo of its own audio. The added feature of distributed echo cancellation can deliver this audio processing capability where it's needed most – at each individual microphone.
- Automatic gain control automatically increases or decreases audio levels to maintain a constant level to the far site.
- A routing matrix allows audio to be distributed to appropriate systems (video conference system, speakers, telephone lines).
- Filters and equalizers to improve overall audio. These are important to enhance voice or audio quality.
- Noise cancellation for reducing extraneous, constant-state background noise such as from projection fans.

Additional features you should also consider:

- Built-in telephone interface or support for an external telephone interface device.
- Chair control that can allow a particular mic to have “override” capability.
- Scalability and expansion capacity so that additional mics can be added without requiring a complete system replacement.
- High-quality installation and management software with remote management capabilities.



Microphones and microphone placement are important considerations for quality audio. Many types of microphones are available. Your choice will depend on the particular room equipment, acoustics, and number of people you are supporting. Microphones should be selected based on the number of maximum meeting participants you are likely to support. You will have to make some decisions regarding tabletop mics and ceiling mics; each type has its distinctive advantages and disadvantages.

- Tabletop mics are a reliable choice in a conference room because people usually face the table as they speak, and the mics can be placed in sufficient quantities and in appropriate locations to pick up everyone's audio. These provide a clear, direct pick-up pattern that produces good sound quality.
- Ceiling mics can be effective if placed in sufficient quantities and at appropriate angles and locations, but they can add unnecessary ambient noise and because they are further away from the participants they may make it more difficult to pick up all audio. Ceiling mics often work best if placed in combination with tabletop mics. This allows better coverage of the main meeting participants as well as additional participants that may sit away from the table.
- Push-to-talk mics can be effective in some settings, but because they require the person speaking to interact with the mic to enable far-site audio reception, they tend to interface with the "naturalness" of a meeting.

When conferencing needs extend beyond a few participants and microphones, a larger, integrated system should be considered. There are a few good choices available for installed systems with multiple microphone modules that provide echo cancellation, noise cancellation and audio processing for greatly improved audio and sound quality.

Audio is the very foundation for your conferencing. Take the time to determine the right equipment for your needs. Many vendors offer complete lines of audio equipment, making it easier to build a system initially, and even easier to upgrade and/or expand your solution.

Next Steps

Working With a Professional

With these considerations, you should be well equipped to continue your investigation into building your optimal conferencing environment. It is highly recommended that you work closely with a conferencing professional that can help you create an environment that meets your needs. A professional can also help you determine goals and help you evaluate the success of your installation. With measurement, you'll be certain you're getting the most bang for the buck – and you'll be clear on where improvements can be made.

Depending on your stage of development, working with a conferencing professional may also be a wise investment as you design your room configuration and plan your network design.

Room Configuration

Whatever the overall design, it is most critical that your room design takes into consideration how people will interact in meetings. Table and seating areas should be planned with user comfort in mind in relation to the technological components. Is sufficient square footage per meeting participant being taken into account? Are all participants able to see one another comfortably? Is the placement of peripheral and multimedia tools effective in terms of access and good taste? In other words, can participants easily reach these devices, without the devices being made so obtrusive that they take over the meeting space? These are all choices you will need to make based on your user requirements.

For More Information

At ClearOne, we pride ourselves on being a reliable resource for you. We've spent many years working closely with industry experts to identify and understand the most important factors in building exceptional audio conferencing environments. We work extremely hard to make sure our own products satisfy these needs and exceed expectations.

ClearOne provides a complete line of audio conferencing products . We've designed our products to seamlessly work together to allow you to create the combinations that work best for you.

The ClearOne legacy for conferencing perfection is built on more than a decade of relentless research, unfailing service and support, and keen attention to customer needs. Perfecting the technology behind the scenes is what we do, so you can focus on the business at hand. With any of ClearOne's conferencing solutions you can be sure that above all else, the science will be extraordinary and the service will be outstanding.

We are always available to answer any questions you might have about any of our products or services. Send us an e-mail at sales@clearone.com, give us a call at 1-800-945-7730, or contact your ClearOne dealer.

