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**THORBURN ASSOCIATES INC.**  
**Acoustic and Technology Consultants**  
**Newsletter**

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**Summer 1995**

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Welcome to this year's Summer issue of our newsletter. Our latest news is that we're proud to say we've gone on-line! TA has jumped onto the Internet! Our World Wide Web page is at <http://www.ta-inc.com>. This Web page and e-mail address, [ta@ta-inc.com](mailto:ta@ta-inc.com), provides our regional, national and international clients with a more efficient way to communicate with the principals and staff at TA, and a convenient way to keep abreast of emerging acoustical, audiovisual and presentation technologies.

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**Audio Considerations in Teleconferencing – "Can You Hear Me?"**

Teleconferencing, holding meetings by an electronic means, is one of the fastest growing industries in the world. The word "teleconferencing" means different things to different people. Teleconferencing can range from a conference call with speaker phones to a system with installed overhead speakers and tabletop microphones, to a full scale audio for video conferencing system with satellite feeds.

Regardless of the type of teleconferencing, how the audio portion of your conference is handled will ultimately determine the success of the system and satisfaction with the event. Every meeting starts with "can you hear me?" or thud, thud, thud as a person taps a hand on the microphone.

Remember the last time you went to a movie where the theater had problems with the soundtrack? It's the same with teleconferencing. Even if you have perfect video, audio problems will destroy the conference. One of the biggest problems in teleconferencing is background noise. When you are in a conference or meeting room and you hear background noise such as duct rumble, diffuser noise, or a computer fan, you for example, individually, tend to block out or ignore the noise because you have been able to identify its source. In a teleconference, however, this background noise is transmitted to the distant location along with the sound of your voice. There is no longer a method for the listeners at the other end to distinguish where that noise came from. The noise becomes distracting and masks over the spoken word.

The proper acoustical treatment of any room with teleconferencing is extremely important to the success of that conference. If more than one microphone is used, it is also very beneficial to have an automatic microphone mixer that limits the number of microphones that are active and turns on the microphone nearest to the person speaking. If the only active microphone is the one closest to the person speaking, the intelligibility of the conference will be much higher. Ceiling-mounted microphones contribute to the attractiveness of the conference room, but at the other side of the conference, it sounds like the participants are not talking into the microphone.

The further someone is from the mic, the greater the chance that background noise will drown them out. The best idea is to place the microphones close to the people speaking.

Another source of trouble in teleconferencing is the phenomenon known as "acoustic echo". Acoustic echo appears when the conference room is operating with open mics and loudspeakers in full duplex conference mode. A full duplex conference mode is when you and the distant room can have a one-on-one communication without having to wait for the other room to stop talking.

Electronic audio signals are sent in both directions simultaneously. In this situation, your audio goes over the transmission media to the speakers in the distant room. The audio is then picked up by the open

Page 1



microphones in that room and retransmitted to you. The result is that you will hear your own voice coming back to you from the far room, thus the echo. This effect is similar to talking over a public address system in a stadium -- highly confusing.

Fortunately, acoustic echo can be minimized. It is very easy to remedy the problem by installing an acoustic echo canceler. An echo canceler looks at the audio coming into the room from the loudspeakers, and compares it to the audio from the microphone. Any audio that "matches" is removed from the transmission. However, to keep your installed in the distant room. This means that you will need an echo canceler in every room that is part of your conference. Remember, an echo canceler compares the audio from the loudspeakers to the audio from the microphones. Your best bet is to put an echo canceler in each room. This will assure that none of the rooms can create an echo condition.

Teleconference equipment can be easily installed in existing conference rooms. The best test for proper operation will be made with everyone's ears. And don't forget the audio.

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### **What Exactly Is Sound?**

If a tree falls in the woods and nobody is there to hear it does it make any sound? Does it make a noise? If you were there in the woods and heard the tree fall, what could you distinguish from those noises? It's an age old theory, but one that's important to examine.

Sound is a physical disturbance in a medium (air), and is a combination of two components, loudness and frequency. Speech, music, and most of the things we hear, such as the tree falling, are made up of complex sounds created by loudness and frequency. These are the two different things we would be able to distinguish if we were near the tree. In terms of loudness, the farther we were from the tree, the quieter it would be. The closer we were to the tree, the louder it would be.

The standard measurement of sound, or loudness can be expressed in several ways. A pascal, or actual measurement of pressure due to the passage of sound waves is often used, although the measurement of loudness levels, or decibel (dB) rating, is a bit less complex and easier to understand. For instance, threshold of hearing at 0 dB would be equal to 2.0E-5 pascals and the threshold of pain at 140 dB would equal 200 pascals. The loudness of a typical conversation in a conference room would range from 2.0E-2 to 3.56E-2 pascals or 60 to 65 dB.

The human ear is a remarkable item in that it can hear a dynamic range from 0 to 140 dB, although severe physical damage would occur if the sound was any louder than 140 decibels. A common audio tape has a range of 50 decibels and a compact disc has a range of a little over 90 decibels.

The second thing we would notice as we stood in the woods, are the different tones or frequencies created by the tree falling. The crack of the branches, the rustle of the leaves, and the thud of the trunk hitting the ground are all sounds or noises which are made-up of many tones. Think of a piano keyboard...every key has a different tone or pitch. The tone or pitch of the key that is played is heard as a frequency. The higher the pitch, the greater the frequency. Frequency is the number of cycles or oscillations that a tone makes in one second. The lowest frequency that we hear is 20 cycles per second or 20 Hertz (Hz). The highest frequency that we would be able to here as a young child is 20,000 cycles per second or 20,000 Hertz (Hz). (As we get older, our ability to hear high frequencies diminishes.)

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### **You Wanna Golf Shirt? We'll Send You One...**

Take a guess at answering our first question, "if a tree falls in the woods and nobody is there to hear it does it make a sound?" and send your thoughts to our Marketing Coordinator, via e-mail ([ta@ta-inc.com](mailto:ta@ta-inc.com))

Page 2



or fax (510-886-7828). All correct answers will be placed in a drawing on 1 August 1995. We will draw 4 winners and send each of them a golf shirt (be sure to give us your size). The winners and the answer to the question will be announced in the Fall edition of our newsletter.

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