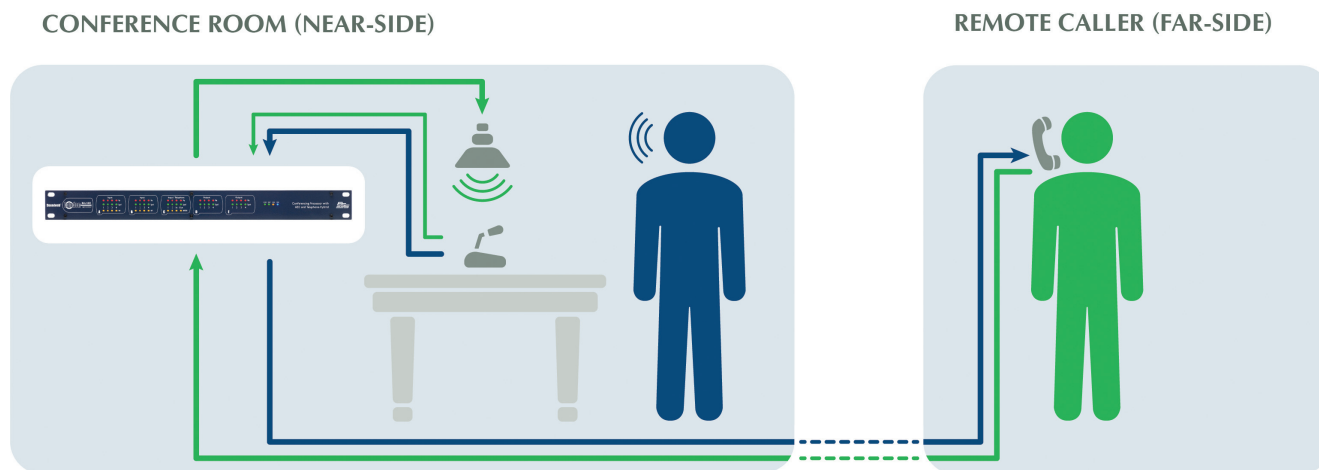


Whether audio conferencing, video conferencing or telepresence it doesn't matter how sophisticated your video is, if the audio isn't up to scratch, the meeting will fail. Justin Hankey, application engineer for Harman Professional and Ed Manwaring, of integrator EM Communications provide some tips on Acoustic Echo Cancellation (AEC).

# Loud and clear



Source:  
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## Glossary

**Near-Side:** The local side of a conference call with loudspeaker(s) and microphone(s), where the AEC device is found.

**Far-Side:** The remote side of a conference call with the remote talker that will be heard through the near-side speakers.

**Convergence Rate:** A measure of how fast the AEC algorithm can identify and remove echo from the incoming signal.

**AEC Reference:** Determines what signal/s must be removed from the near-side microphone, preventing an echo being experienced at the far-side.

**Echo Return Loss (ERL):** A measure of the room's natural attenuation of the far side signal as it leaves the near-side speaker and enters the microphone.

**Echo Return Loss Enhancement (ERLE):** A measure of how much echo is being removed from the signal as a result of the linear AEC algorithm.

**Tail Time:** The longest echo that can be removed by the AEC algorithm.

**Double Talk:** When the near-side and far-side talk simultaneously, which creates the most challenging scenario for the AEC algorithm. Also called "duplex" or "full-duplex".

**Automatic Gain Control (AGC):** Designed to compensate for varying distances between the conference attendee and the microphone as well as speech level variances at the near-side.

**Noise Cancellation (NC):** Used to remove steady-state noise such as air conditioning, projector fans, computer fans from the near-side, improving the clarity of signal being sent to the far-side.

**Linear Processing (LP):** The component of the AEC algorithm that removes the deterministic portion of the echo, i.e. the signal transferring direct between speaker to microphone.

**Non-Linear Processing (NLP):** The component of the AEC algorithm that removes the residual echo (long tail length) not removed by the linear part of the AEC algorithm.

## Why do you need AEC?

When a remote caller on the far-side speaks, their voice travels through the phone system and is heard through the loudspeakers by the conference room attendees on the near-side. In addition to reaching the conference room attendees' ears, the remote caller's voice also enters the conference room microphones, both directly and as reflections from the conference room surfaces. This direct and indirect far-side audio is mixed in with the voices of the conference room attendees.

The Acoustic Echo Cancellation algorithms remove the unwanted direct and indirect far-side audio from the conference room microphone signals. The result, which is simply the voices of the conference room attendees, is transmitted through the phone system to the remote caller. Without Acoustic Echo Cancellation, the remote caller would hear an echo of their own voice, with a delay caused by the round trip through the phone system and audio artifacts caused by the room reflections.

## What to consider when specifying a system?

The first technical consideration is whether the conferencing processor will be interfacing with an analogue or a digital phone system. Different hardware is required for each scenario.

A primary goal for any conferencing system is to provide a familiar user interface, suitable for non-

technical users. There are many different control options available but understanding who will be using the system and how they intend to use it is crucial to providing appropriate control.

Some conferencing devices offer multiple AEC references and can therefore be split across multiple conference rooms. A conferencing system may also be integrated with background music or paging systems.

Larger conference rooms may require local sound reinforcement so all attendees can be heard when speaking at normal levels. These types of systems often employ mix-minus where each microphone is sent to all near-side loudspeakers except the one closest to the microphone itself. In order to help manage a larger conference, gated automixers may also be used, allowing microphone priorities to be set and limits placed on how many microphones can be open at any one time.

## The benefits

The use of Acoustic Echo Cancellation (AEC) along with other powerful processing tools such as Noise Cancellation (NC) and Automatic Gain Control (AGC), creates a more relaxed and comfortable listening experience for the remote caller. This enables them to focus on the conversation in hand without having to hear themselves a fraction of a second later, also ensuring they can hear the near-side talkers clearly, at good levels and without background noise. The near-side callers will also benefit by having a full-duplex system, resulting in a more natural conference call. ☺