XAP Virtual Reference Setup

Introduction
This document details the principles behind setting up virtual references for echo cancellation in multiple output or systems with local reinforcement of microphones. It also discusses setting up output level tracking and its function.

What is a Virtual Reference?
The virtual reference in the XAP products provides a solution for echo cancellation in systems where multiple channels of audio are fed to the room or in sound reinforcement systems where no output contains the proper audio for echo cancellation. The virtual reference allows for the configuration of an echo cancellation reference that is outside of the standard single channel reference of a basic audio conferencing system. Before the virtual reference was developed, an unused output on the unit had to be designated as the "dummy" or "phantom" reference. This creates problems in more complex systems where all the outputs may be required to support the audio routing and distribution. The virtual reference allows for the use of all the outputs on the system because it does not need a specific physical output as its' reference point.
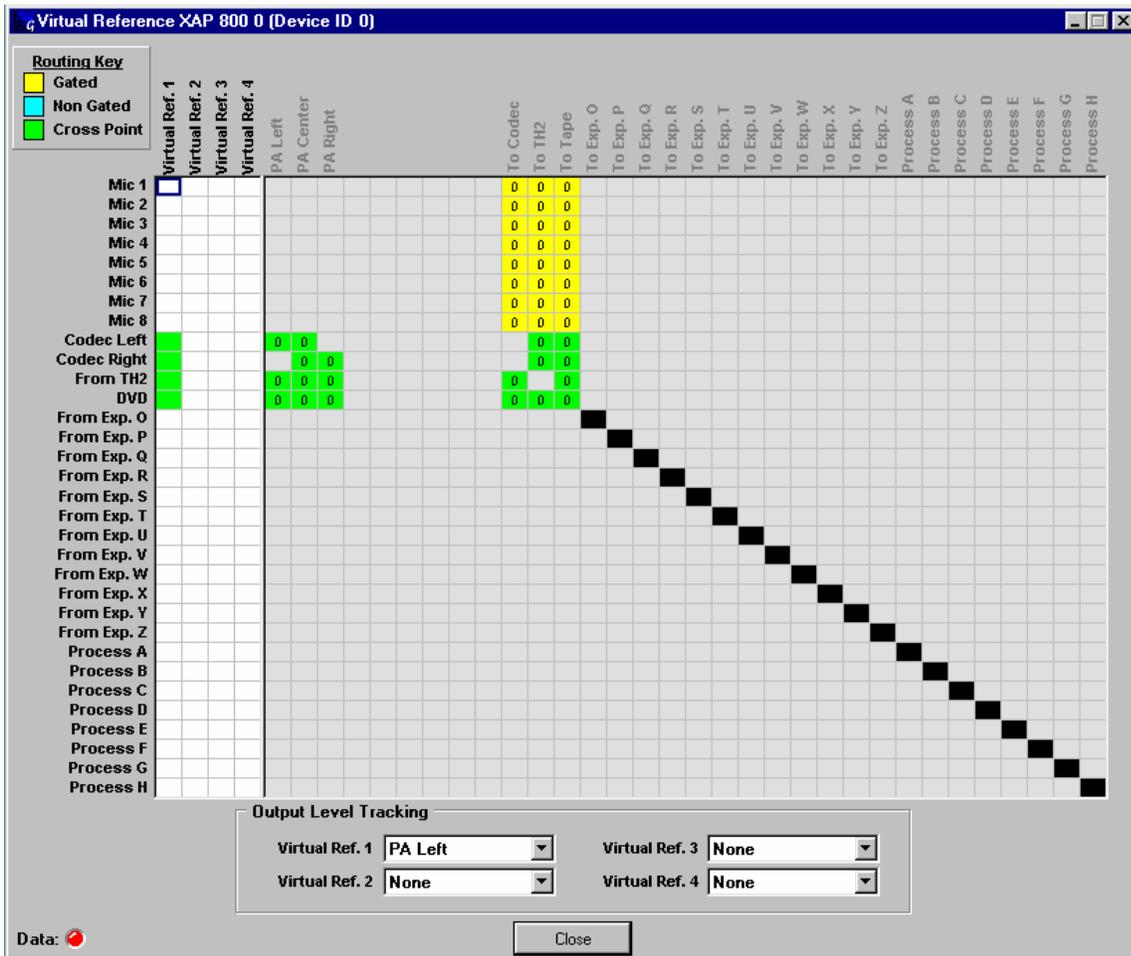
Virtual Reference Setup Options
Virtual References allow for microphone or line level inputs as well as expansion bus or processing channel sources to be included or excluded from an echo cancellation configuration based on the system design. There are 4 Virtual References available for echo cancellation and up to 4 can be used in the same system. A microphone can reference any 1 of the 4 Virtual References. Also, Virtual References can be placed on the expansion bus to allow microphones on another unit or group of units to also share that reference. This allows for greater flexibility in configuring the correct echo cancellation reference for a system to support a multi-channel speaker array or local reinforcement of microphones including the ability to have a microphone or group of microphones echo cancel another microphone in reinforcement applications. The virtual reference is accessible in the microphone input section. The AEC button will open a setup screen with a drop down menu to select which output channel, Virtual Reference or Expansion Bus reference the microphone should be using. When the Virtual Reference is selected it will display a grayed out version of the configuration matrix showing the system design and configuration labeling with 4 white columns on the left side labeled Virtual Reference 1 through 4. These columns allow you to place cross-points for the input audio you want to include in the reference.

Another part of the virtual reference setup is a drop down menu to select Output Level Tracking. This needs to be set up to refer to one of the outputs being used for the distributed PA system. Output Level Tracking helps the echo cancellers track any changes to levels sent to the PA to maintain a consistent performance of the AEC. Without this function the echo cancellers will not be updated with the changing levels, which can create the potential for echo.

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Example 1 Multiple Output Speaker System
In the example below the configuration is designed to have three outputs. It is also supporting stereo audio from a video codec, as well as audio from a TH2 phone hybrid and a DVD player. Virtual Reference 1 has all the line level inputs summed together for echo cancellation. In the microphone input section of G Ware the AEC reference is selected to use Virtual Reference 1 instead of any of the outputs 1 through 12. In an application using multiple outputs but no microphone reinforcement in the room, the virtual reference will include all the line level sources that will be routed to the distributed PA system. This allows the microphones to have an accurate reference of all the incoming audio the will be present across the three outputs in this system design.

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Example 2 Multiple Outputs with Local Reinforcement

In an application that includes microphones for local reinforcement, the configuration will depend on the type of reinforcement the system is designed to support. For a system with overall reinforcement of all the microphones to all the speakers the Virtual Reference setup is the same as the reference in the previous example. The difference here is that while the microphones are routed to the local outputs for the room they are not included in the AEC Virtual Reference. This allows the microphones to be heard in the room without the echo canceller interfering or trying to remove the microphones from the audio feed.

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Example 3 Single Microphone Reinforcement

In the example below there are two virtual references configured to support reinforcement of a podium microphone into the room. The podium microphone will reference Virtual Reference 2 which does not contain its' own audio and microphones 2 through 8 will reference Virtual Reference 1 which does contain the podium microphones audio. This allows microphones 2 through 8 to echo cancel the podium microphones audio into the room without interfering with its' transmission to another site or recording device. It also can allow for more gain before feedback on the podium microphone.

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