EF1210TEC ADDENDUM TO THE EF1210 USER MANUAL

Since the EF1210TEC is largely based on the EF1210, most of the information in the EF1210 User Manual applies to the EF1210TEC. This document describes the TEC features, and the difference between the operation and configureation of the EF1210TEC and the standard EF1210.

INTRODUCTION

The EF1210TEC is a unique product that is designed to cancel echoes caused by the transmission network as well as acoustic echoes in the local room. There are a total of eight echo cancellation channels on the EF1210TEC. Seven channels of the EF1210TEC behave as normal Acoustic Echo Cancellation (AEC) channels. One channel is a Transmission Echo Cancellation (TEC) channel.

The TEC is based on two components. The Transmission Delay Compensator (TDC) determines the amount of delay in the echo signal. The echo canceller does the actual filtering to remove the echo, and is based on the same technology that is in all of ASPI Digital's acoustic echo cancellers. The TDC essentially moves the echo canceller to the right delay, so that the TEC (the combination of the TDC and the echo canceller) can cancel looped back echoes over a much longer time period than the tail length of an echo canceller would normally allow.

It should be noted that the TEC is designed to handle looped back echoes created by the trasnmission network, and not acoustic echoes caused by remote sites. The tail length of the echo canceller in the TEC is not as long as the AEC channels, because it is designed to cancel only clean looped back echoes. Also, the TEC will not cancel multiple echoes if they are separated by more than a few milliseconds.

CONNECTING THE EF1210TEC

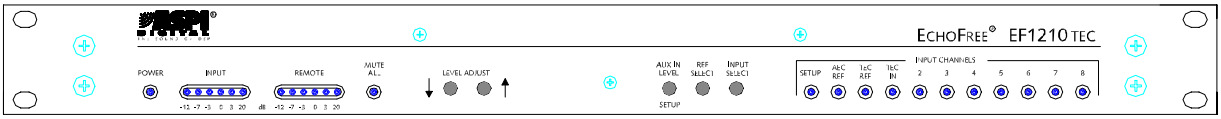

Figure 1a: EF1210TEC Front Panel

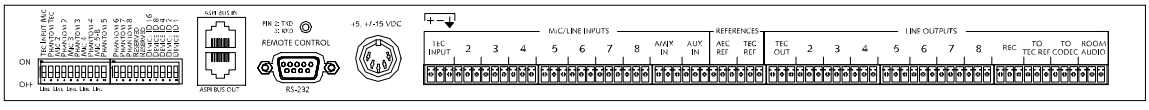

Figure 1b: EF1210TEC Rear Panel

The connections required for the EF1210TEC are fairly application specific. The two most common applications for the EF1210TEC will be described below.

Generating Mix Minus with the EF1210TEC

A system using an EF1210TEC can be configured to generate a mix minus. This may be necessary if the system is used with a bridge or MCU that does not have mix minus. That is, if the bridge sends the local site's audio back to itself. When the EF1210 is used in this type of application, it will remove its own audio from the incoming signal, while allowing audio from other sites to come through.

To generate a mix minus, send the mix of all transmitted audio (including all local microphones) to the TEC Reference input. Then connect the To CODEC output to the video codec. This will send local audio to the remote sites, and give the TEC a reference. Bring the output of the video codec into the TEC Input. The TEC will cancel any delayed echo from the codec signal and pass it on to the TEC Out. This can be sent to the AEC Reference (this signal now contains audio from the remote sites) and out into the room. The other AEC channels will use this reference to prevent acoustic echo from being sent back out onto the network.

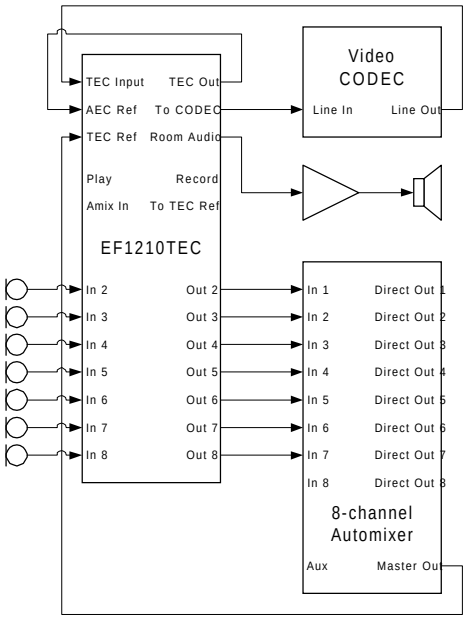

Figure 2a: Mix Minus Configuration

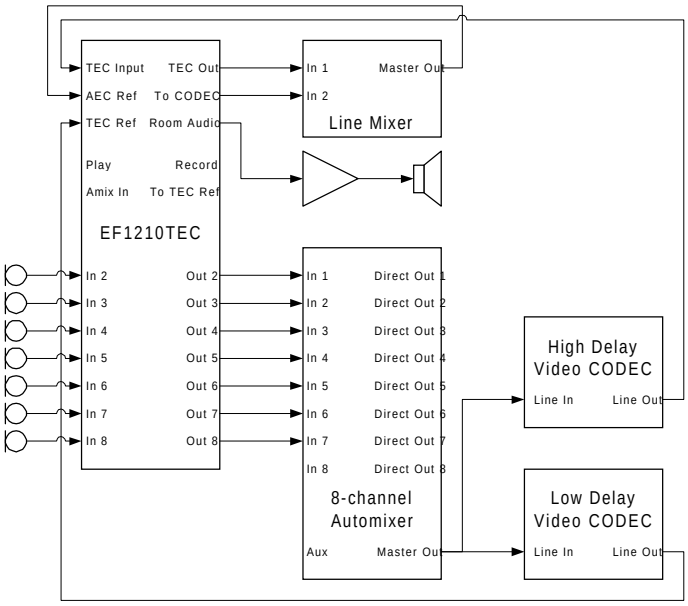

Figure 2b: High/Low Delay Configuration

Using the EF1210TEC in High/Low Delay Applications

In some applications, the signal from another site may arrive from two different paths with different delays. This is not a typical echo problem in which local talkers hear themselves return through the system. Rather, they will hear talkers from another site twice, possibly separated by several hundred milliseconds. This may occur if some sites are communicating with each other over wide bandwidth connections, and also with a larger number of sites on a low bandwidth bridge. The high bandwidth sites may communicate with each other over both the wide bandwidth and narrow bandwidth networks. Figure 2b shows how this type of system may be connected.

Systems with More Than Seven Microphones

If more than seven microphones are needed, one or more EF1210s may be added to the system to provide echo cancellation on each microphone channel. In general, only one EF1210TEC is needed in the room, and standard EF1210s may be used for additional microphones.

CONFIGURING THE TEC

The AEC channels of the EF1210TEC can be calibrated and configured as described in the EF1210 User Manual.

The EF1210TEC may be configured as a standard EF1210 by setting the DIP switch labelled "Reserved" next to the Device ID 16 DIP switch. When in the off position, the EF1210TEC behavior will be selected. In the on position, the standard EF1210 behavior is selected.

COMMAND SET CHANGES

There are three new RS-232 commands in the EF1210TEC. They are TDCD, TDCMIN, and TDCMAX (the acronym TDC is used because these commands deal with the properties of the Transmission Delay Compensator as described in the introduction to this addendum). As with the EF1210, the device type of the EF1210TEC is C.

The TDCD command queries the delay detected by the Transmission Delay Compensator. This command is used for queries only. For example, the command C00TDCD? queries the delay detected by the EF1210TEC with device ID 0. The command response contains a delay value in milliseconds (accurate to within a few milliseconds). If the EF1210TEC were to return C00TDCD500, the delay detected by the Transmission Delay Compensator is about 500 milliseconds.

The TDCMIN and TDCMAX commands set the minimum and maximum delay over which the Transmission Delay Compensator will search fo r echoes. Reducing the search range may cause echoes to be found and cancelled more quickly. For instance, if you know the echo is delayed somewhere between 600-800 milliseconds, you can set TDCMIN to 500 ms, and TDCMAX to 1000 ms. This will allow echoes to be found more quickly than if the Transmission Delay Compensator had to search over the entire 2 second range. It is important not to set the range too narrowly, because if the delay falls outside of the search range, the TEC will not be able to cancel echoes. The delay is set in milliseconds. Examples of commands are C00TDCMIN250 and COOTDCMAX750. The current settings can be queried with a question mark as the argument.