

Mix-Minus and Eliminating Echo

WHY why DO do I i HEAR hear MYSELF myself

Even the simplest remotes are a two-way process. The remote site must send its audio to the studio, and receive a return feed to monitor the programming. This return feed may be done over a radio station's regular transmitter (with an AM or FM radio at the remote), over a special radio link, or over a telephone circuit. This feed may just go to headphones at the remote, and also be put on speakers for any spectators.

The problem comes when there is a time delay in getting audio to and/or from the studio. In this case, the remote "talent" hears a delayed version of their voice in the headphones, and finds this very distracting. Even a remote done with simple equipment or a frequency extender on plain phone lines may have this problem on a long-distance call. All remotes using ISDN, Switched-56, and POTS codecs will have delays each way as signals are processed from analog to digital, compressed, uncompressed, and converted back to analog audio. Some digital compression schemes, such as G.722, result in shorter delay times, but there will still be a "reverb" effect in headphones at the remote site if their audio is sent back from the studio. In any of these cases, it may not be possible for the remote people to listen to an off-air or program channel feed.

The solution is mix-minus. A mix-minus feed has a mix of all of the programming on the radio station (or network) minus the audio from the remote. In other words, the station or network doesn't send the remote audio back to the remote.

At the remote end, this mix-minus feed is converted back to an "air monitor" by mixing in the local audio from the remote. This is easily done on the Comrex Nexus, and Envoy ISDN codecs as well as the Vector and HotLine POTS codecs by using the "local" volume control. If you are using a portable Matrix or BlueBox, turn the "Output Mix" knob counterclockwise to mix in the local audio.

For radio stations, in addition to fixing the time delay problem, using a mix-minus feed has two other advantages to using an off-the-air monitor. First, if the station uses a 6-7 second delay to allow editing of phone calls, pre-delay audio can be sent to the remote site. Second, if there is a PA system at the remote, they will be able to run the speaker levels higher with the mix-minus audio. This is because the remote microphone audio is not running through the station's audio processing, and the levels stay under the control of the remote operator.

The simplest way to do one mix-minus feed in a typical radio studio is to use the Audition or second program channel. On many audio consoles, each fader's output may be sent to both Program and Audition. If your board will allow those feeds simultaneously, just set all of the modules to Program and Audition, with the exception of the one carrying the remote audio. Set that one to Program only. The Audition channel will then be a mix of everything on the console except the remote. That will be your mix-minus, and should be sent to the remote site. One caution - make sure that audio is being sent to and from any telephone modules you may have in the console. They may have been designed to work with only one channel at a time - either Program or Audition, but not both. If so, you will have to check with your "tech guy" or the board manufacturer for advice.

If you use multiple audio codecs, you should investigate the Comrex Mix-Minus Bridge. This will allow you to expand one Program/Audition setup to handle five codecs or other remote audio devices. It also provides IFB (talkback) to remote sites.

I'm Using Mix-Minus and I Still Hear an Echo!

If you are using a Comrex HotLine, Portable Vector or Nexus at the studio, check the "Local" knob. It should be turned completely off. If you are using a portable Matrix or BlueBox at the studio, check the "Output Mix" knob. It should be turned all the way to the right. If it is turned up, audio from the studio board will be sent back to the board, and funny effects will result.

If you are doing a call-in talk show on the road, the remote people may complain of hearing an echo when a caller is put on the air. With the telephone pot down, everything is OK. The culprit is the telephone hybrid being used to put callers on the air. Some of the remote audio is "leaking" through the hybrid and mixing with the caller audio. Modern digital hybrids do a much better job of preventing this than the older units that had to be manually "tweaked" for each call. If you are using a digital hybrid and having this problem, dig out the manual and re-do the hybrid's initial setup.

Some stations do not feed regular audio back to the remote, particularly for sports broadcasts. Instead, they send a continuous feed of the board operator's microphone out to the game. In this case, the board op must remember to wear headphones and keep the studio speakers off. His mike would pick up the remote audio from the speakers, and the crew at the game would hear themselves in delayed form.

