

Comrex Mix-Minus Bridge: One of Radio's Best Kept Secrets

On the air, telephone or remote audio is an essential ingredient to making the programming immediate and important. Through this technology we can take the listener just about everywhere.

To achieve this, the Chief Engineer is always looking for that "magical box" that can make life less stressful during those critical broadcasts and to configure his studios so they are as foolproof and bulletproof as possible.

EARLY PHONE PATCHING

The early days of mixing telephone audio with broadcast audio usually involved connecting a line transformer to the output of a Bell System-provided speakerphone. The caller could hear the audio through a small Bell-provided switch with a built-in microphone that picked up ambient studio audio. If you remember them, they rather felt like a paperweight with a padded bottom.

The clunky device usually sat somewhere near the audio console; the on-off switch on top seized or dropped the line selected on a mechanical phone control panel. If you worked with these prior to the 1980s, you even may have experienced the version with a rotary dial.

Some engineers would tap the output of a microphone pre-amp of the console and feed that audio into the telco speakerphone, but that did not resolve the annoying automatic gain riding of the phone equipment.

Advanced broadcast hybrids would soon solve the problem of separating single pair, bidirectional audio into separate and isolated "send" and "receive" audio. The trick was to feed these hybrids correctly to avoid creating a feedback loop within the phone system.

LESS THAN OPTIMAL

The basic problem with the old speakerphone system basically was that audio could travel in only one direction at a time, or simplex. They were also voice-operated devices (VOX).

In a hot talk format, that could be an advantage because the host of the show simply talked (or shouted) and the phone system automatically and effectively (and abruptly) muted the audio from the caller. However, with the bothersome manner in which these primitive devices rode gain, an extended telephone segment could be very tiresome to execute, and even less pleasant for the listener. The word "fatigue" comes to mind.

As talk radio became the mainstay of the AM broadcast band, better methods to improve the quality (notably, to interface the broadcast studio with the telephone company) were needed and developed.

MIX-MINUS

The concept of Mix-Minus is a technical term mostly thrown around by broadcast engineers. It usually is discussed only during studio design or construction, or on the day that all-important remote occurs in the midst of a sports play-by-play ("and by the way so-and-so guest is going to be calling in"). Meanwhile, the traffic guy is going to be on the ISDN line as usual.

This type of situation demands the availability of multiple Mix-Minus feeds. The typical board operator or on-air talent does not have the time, inclination or understanding to be forced into manually setting up Mix-Minus feeds for each of these situations. Ideally, the station would have assigned their most experienced board operator to handle the task.

In some stations, the Chief Engineer may have to make a special effort to be available during those crucial moments. On the other hand, as we all know, sometimes those "moments" come unexpectedly. Then what happens? Embarrassing over-the-air problems everyone would prefer to avoid.

The ideal solution is to design the studio so all the needed Mix-Minus feeds are available on all the right inputs *all* the time! The Mix-Minus Plus from Comrex makes this easily achievable and simplifies the design process for a new studio.



Comrex Mix-Minus Plus

KEEPING THE AUDIO FEEDS SEPARATE

Traditionally, the talent at the remote site would use one phone line to send audio, monitoring the station via a radio or other receiver, and communicate with the studio via separate phone line or a business band two-way radio. However, the newest generation of remote equipment makes this method of executing a remote somewhat obsolete.

On the other hand, the complexity of modern talk shows requires a lot of effort and planning to produce a glitch-free program that sounds good to the listener.

For example, in the case of a connection to a telephone hybrid, the caller or phone guest obviously needs to hear the host or other callers during the course of the conversation. It may seem logical to merely feed the straight program audio back to the caller. If this is done, however, due to the nature of the phone system, feedback or at minimum, very distorted or hollow audio will occur due to the feedback loop created in the phone system itself.

In the case of a remote broadcast, the host at the remote site needs to get off-air program cues, as well as a possible feed for a PA system at his remote. Over an ISDN codec and especially over POTS line codecs, there are transmission delays by milliseconds. Without a proper Mix-Minus feed, those pesky delays turn into over-the-air echos which will drive both drive your talent crazy and listeners away.

WHAT IT IS

A Mix-Minus feed essentially is return audio to a remote source containing what is being fed over the air except the audio being sent from that remote source. The engineer who fed the microphone pre-amp output into the speakerphone was in fact employing a form of Mix-Minus.

If all remotes, phone calls and program segments could exist as one way feeds, there would be no need for Mix-Minus.

In the control room, however, the importance or necessity of a Mix Minus feed, and in particular, *multiple* Mix-Minus feeds, is critical.

USING THE CONSOLE

A typical broadcast console can easily be set up for a simple, single Mix-Minus if it has the capability of feeding both Program and Audition busses at the same time.

The Mix-Minus feed is taken from the Audition bus. Both Program and Audition are selected for all inputs *except* the channel from which the phone or remote audio is being fed. (Some consoles also have a Mono or Alternate bus; this can also be used.) Other consoles have special configuration options for Mix-Minus feeds.

The complications arise when more than one Mix-Minus is needed and moves beyond the capabilities of the console.

One solution is an inexpensive Mackie mixer. There are at least two "send" feeds normally used for effects boxes which will also work well when setting up Mix-Minus. But what if you need *three* Mix-Minus?

One of my solutions for the third Mix-Minus was to use a product from Henry Engineering which inverts the phase of the caller audio. The success of this product, however, is very dependant on the phase stability and other charac-

teristics of the console itself. It is not foolproof. Mackie mixers may be great for remote sites, but not for broadcast control rooms for this very reason.

ANOTHER APPROACH

A very basic Audioarts R-17 console is installed in my syndication control room. The audio from the host always arrives via an ISDN codec. The callers and guests are conferenced through an older Gentner TS-612 system. Any additional feeds are set up on an as-needed basis.

The host hears the callers and other program elements via the return audio on his ISDN connection. This situation is the same whether it is a sports play-by-play, a standard remote or any other out-of-studio event.

Many syndicated talk show hosts originate their programs from home, on the beach or just about anywhere using this method.

I use the Comrex Mix-Minus Bridge to tie everything together. Everyone can hear everyone, and the Talk-Back button on the console is wired to control a relay in the Mix-Minus bridge to communicate off-air with the host or anyone else on the system, either individually or as a group.

In an existing studio, it may be more cumbersome to wire the Mix-Minus Bridge, but in any well-organized studio, it is straightforward. Comrex recommends someone with experience do the installation, but they imply if you wire it exactly as they suggest, it will work just fine.

A SOLUTION ON HAND

I found this to be true. The feeds from each device to the console are looped through Molex connectors on the back of the Mix-Minus Bridge. Another connector takes the feed from the console Audition bus. More Molex connectors for additional functions are also provided.



The Mix-Minus Bridge may be best located in a rack room, although it can also be situated in a control room. The front panel is not flashy, but very functional. There is no power switch and that is probably a good thing. It features a series of buttons that control which sources are fed the audio.

A small screwdriver adjustment individually controls the level of each feed. (During set-up, it might be more convenient if they were actual small rotary knobs rather than require a "greenie" screwdriver, but this is a fairly minor whine.)

A front-mounted microphone jack can be used for a gooseneck mounted IFB microphone. A button feeds the microphone audio to all of the sources. Depending on how it is wired, the previously mentioned hard-wired Talk-Back can feed any of the sources individually or collectively.

The problem with putting the Mix-Minus Bridge in a separate rack room (which the gooseneck mounted microphone invites) is there is no "built-in" means for the tech person using that microphone to hear the talent at the remote site (off air). A headphone jack, or even a tiny panel-mounted speaker would be a welcome addition with a rotary selector to control the monitored source. In the control room, those sources could easily be monitored through the console by putting the associated channels in cue.

I found installation completely straight-forward. A slender but well-written printed manual expedited matters. Thank you, Comrex, for not forcing me to print out the documentation from a CD. I realize that we tend not to bother with manuals until the equipment breaks, but on the more complex – or at least trickier – designs I enjoy not having to run to a computer just to see what makes it tick or how to make it work with other equipment.

The Mix-Minus Bridge is not an inexpensive piece of gear. Yet, if you compare what you save in time and costs relative to cobbling together some sort of home-brew contraption you may well find the Mix-Minus Bridge worth the investment.

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