

USING DELAY TO LOCALIZE SOUND ON STAGE

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To prevent feedback with floor mics, it really helps to place the PA system's loudspeakers close to the audience, for example on the side walls near the front of the audience. There is a drawback: listeners hear the sound coming from the loudspeakers rather than from the stage. Some people would say that's a small price to pay in return for hearing all the words clearly.

A simple solution: Insert an audio delay unit between the sound mixer and power amplifier. This little gizmo delays the sound from the loudspeakers, and our ears are fooled into hearing the sound only from the stage, which is the first sound arriving at the listener. In this article we'll describe how to connect a delay unit to your sound system and set it up.

Insert Jacks

There are several ways to connect a delay unit into your sound system. One method is to plug the unit into your mixer's insert jacks. Let's explain what those are.

On the back of most large mixers are some jacks labeled INSERT (Figure 1). They are 1/4" phone jacks, either TS (tip-sleeve) or TRS (tip-ring-sleeve). One or two insert jacks might be in each input module, each group module, and each master output module.

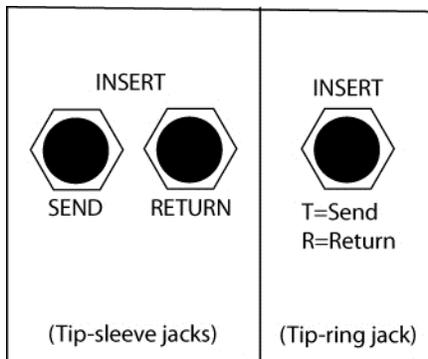


Figure 1. Two types of insert jacks.

In each module, insert jacks are jacks that allow access to points in the signal path for connecting an external device. The jacks might be labeled INSERT SEND and INSERT RETURN. Inside the mixer, the send is connected to the return so that the signal passes through to the mixer output. But if you plug into the insert jack(s), you break the signal path so you can insert an external device there in series with the module's signal.

In some mixers, each module has a single insert jack, a TRS (tip-ring-sleeve) type. The tip terminal is the send signal and the ring terminal is the return signal.

In Figure 2 below, on the top, no device is plugged into the insert jack, so the signal from the group or master bus goes all the way to the output jack. On the

bottom, an external device is plugged into the insert jack. So the signal is diverted to and from that device . then it goes out the output jack.

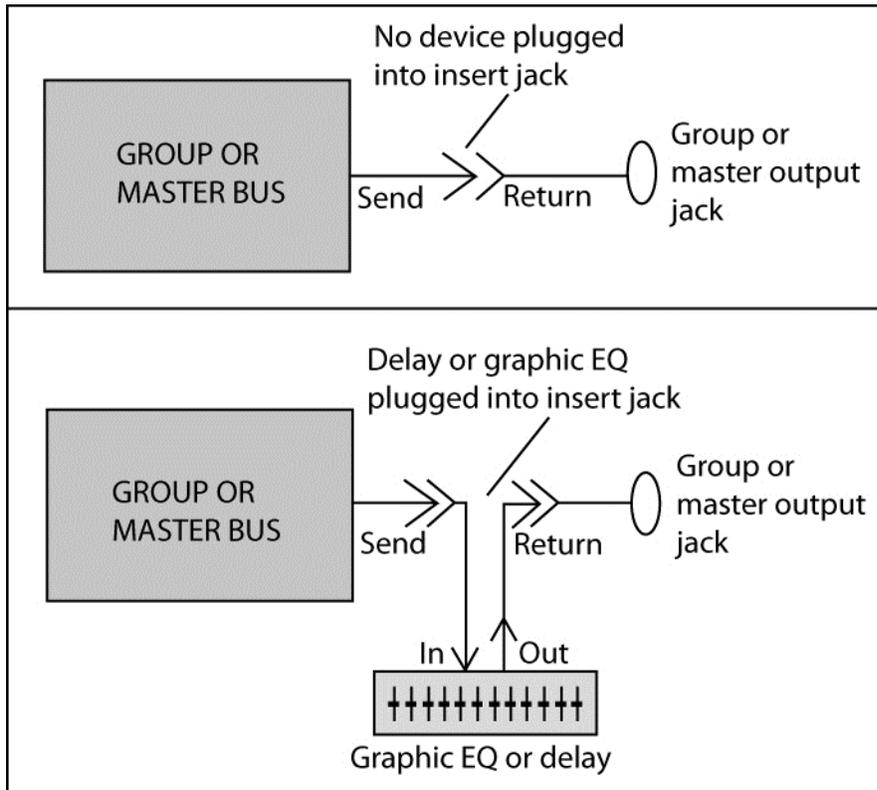


Figure 2. Plugging a device into an insert jack diverts the signal to and from the device.

Connections

Now that you understand insert jacks, we can describe three ways to connect a delay unit into your sound system:

- “ Between the mixer main output and the power amplifier input
- “ Plugged into the insert jack(s) of the master output bus
- “ Plugged into the insert jack(s) of the actorsqmic group

In Figure 3-A below, the mixer master output connects to the delay unit input. The delay output goes to the power amp. With this connection, everything going through the mixer -- mic signals and sound effects -- is delayed by the same amount.

Figure 3-B shows another way to accomplish the same thing. In the master bus is an insert jack. At that jack, the master bus signal is sent to and from the delay unit, then goes out the master output jack to the power amp.

As we said, plugging an external device into an insert jack breaks the signal path, and routes the signal to and from an external device, such as a delay unit. The

insert-jack SEND goes to the delay unit's input; and the delay unit's output (the delayed signal) goes to the insert-jack RETURN.

In Figure 3-C, only the actors' mics are delayed. We assigned all the actors' mics to the same group (say, Group 1) and plugged a delay unit into the Group 1 insert jack(s). This is also the correct way to connect a graphic equalizer: it lets you remove feedback frequencies only from the actors' mics, not from sound effects or other sound sources.

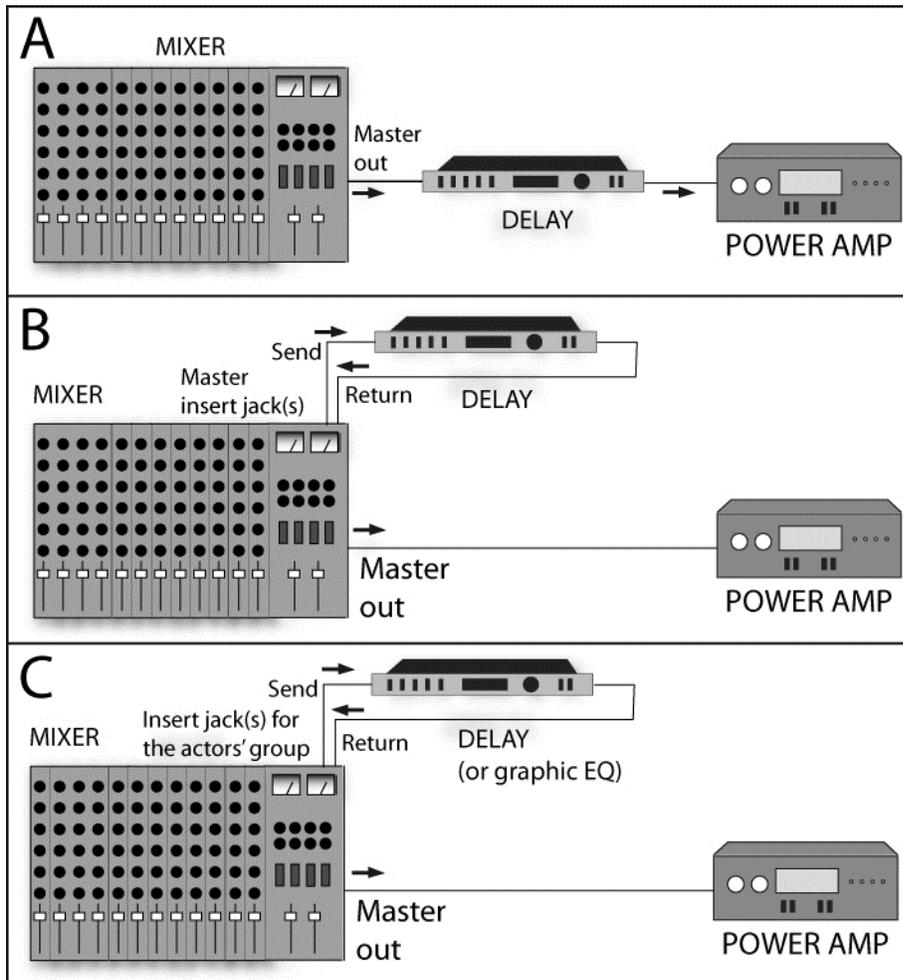


Figure 3. Three ways to connect a delay unit to a sound system.

Operation

Now that the delay unit is connected, we can set it up. Turn on the sound system and ask an actor to speak. While listening in the audience area near a loudspeaker, gradually turn up the delay time until you no longer hear the loudspeaker. That is, all the sound appears to come from on stage, even though you are actually hearing the loud, clear sound from the loudspeaker. It's a psychoacoustic trick called the Haas Effect or the Precedence Effect.

Examples of affordable audio delays are the Sabine GRQ3121 (\$640, includes feedback suppression), RDL Pro Audio Delay Controller (\$543), and Behringer Shark DSP110 Signal Processor (\$88, includes feedback suppression).



Figure 3. An example of an audio delay unit.