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Anatomy of a Mixer

A mixer is designed to combine (or mix) acoustic and electronic audio signals captured by microphones. Along with mixing the signals together, mixers have features that are designed to adjust the relative volume of each signal, adjust the tonal quality of the signal, and place the sound within a certain physical space. Mixers also have the capability to route any or all of the signals to other audio gear for additional processing.

by Norman Weinberg

Most mixers can easily be divided into three main components: the input section, the channel strips, and the output section. The inputs are often located directly above the channel strips, and the output section is usually located on the right side of the mixer.

The Input Section. The input section of a mixer serves two functions: it routes microphone and instrument out-

puts into the mixer and adjusts the signal to its optimum strength. Depending on how your mixer is designed, it may include several different styles of inputs. Microphone inputs are most often female XLR-style jacks. Instrument signals enter the mixer by way of standard 1/4" jacks. The input section of your mixer may also include inputs for a tape recorder (often RCA-style jacks), and inputs that are labeled as auxiliary inputs or auxiliary returns. (We'll go into more detail about aux inputs later).

In order for the mixer to do the best possible job, it's critical for the inputs to be adjusted properly. The signal from a microphone is pretty weak in comparison to the signal from an electronic drum kit or a sampler. Microphone inputs are much more sensitive than line-level inputs, and

plugging a microphone into a mixer passes the signal through a preamp that boosts its strength. Since some signals may be stronger or weaker than others, most mixers also have a "trim" adjustment that is used to fine-tune the strength of the signal for optimum performance. Once the microphone or instrument signal has entered the mixer it is routed to a particular channel of the mixer.

The Channel Strip. The channel strip can be further reduced to its components. On most mixers, there will be three main sections: auxiliary sends, equalization and pan, and level controls.

Auxiliary Send. In just about every mixer, aux send controls are rotary knobs that grab a portion of the signal from that input and send it in another direction. In most cases, the signal is sent to auxiliary outputs that are then connected to some type of outboard processor like a reverb, echo, or multi-effects unit for modification. The outputs of the processor are then connect-

ed back into the mixer through the auxiliary inputs. These inputs have a control that determines how much of this return signal is allowed to come back into the mixer. Depending on the flexibility of your mixer, you may have one, two, or several separate sends and return inputs. It's also common that the aux send outputs are monophonic while the aux returns are stereo. If you don't use any type of outboard processor, you can use the aux returns as another set of stereo inputs. While they aren't as flexible as channel inputs, they will often come in handy.

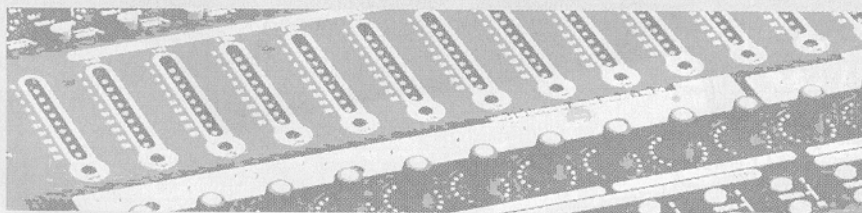
EQ and Pan. The term "EQ" is an abbreviation for "equalization." The EQ sections of a mixer can be basic or sophisticated, but they all do the same thing — they offer a set of tonal controls that boost (strengthen) or attenuate (weaken) certain frequencies in the sound. A basic mixer might offer two controls of "treble" and "bass." More flexible mixers may have three controls labeled "hi," "mid," and "low." Very elaborate mixers could have five or more controls for each channel.

On mid-line mixers, the high and low EQ controls are usually "shelving" filters. This type of filter begins taking effect at a particular frequency (such as 80Hz for the low filter or 12,000Hz for the high filter) and continues to alter frequencies below or above the given frequency. The rotary knobs that control EQ can either boost or cut the value by up to 15dB.

Mid EQ is a different type of filter. It's commonly called a peak filter because it has a peak at some pre-defined mid-range frequency (perhaps 2,500Hz). As this center frequency is boosted or attenuated, other nearby frequencies are also affected. Again, mixers can usually boost or cut this frequency range by up to 15dB.

Next on the input strip is a pan control. The term "pan" comes from panoramic potentiometer. It's a control that determines the relative strength of the input's channel in terms of the main left and right outputs. The ear is a wonderful mechanism that is capable of determining a sound's position within a lateral space. If the sound from an input is sent in equal amounts to both the left and right outputs, then the sound will appear to come from the center of the stereo field. If the pan control is set to full left or full right, then all the sound will come from a single

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a memo about meters

Output meters are critical for getting a good sound out of your mixer. Signals that are too strong will distort, and that distortion will pass through the mixer and amplifier right into your speakers. When your meters read at a level of 0 you've still got some room left. In fact, it's perfectly okay if the signal peaks (for example, the initial crack from your snare drum) between 0 and +7.

Getting the signal to the optimum level when it first enters the mixer is essential for a high-quality mix. Here's a simple way to set the input levels correctly. Perform these steps on every channel of your mixer:

- 1) Turn the trim to its minimum setting, turn off all aux sends, set all EQ to flat, and set the master output to 0 (also called "unity gain").
- 2) Set the channel level to 0 (unity gain) and bring all other channel levels all the way down (minus infinity).
- 3) Begin sending a signal to the channel and gradually adjust the trim knob until the continuous signal is at around the 0 level and peaks don't go above +7.
- 4) To add EQ to the signal you may need to adjust the trim settings.

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speaker and that will seem to be the location of the sound. As the pan knob is twirled from left to right, the sound will seem to move locations. It's possible to position a channel's signal very accurately.

Level Controls. The fader is used to control a signal's relative volume in the mix. If your inputs are adjusted correctly, the signal is neither boosted nor cut when the fader is at the value of 0. Even though it is called a fader, these sliders or knobs can be used to boost the signal as well as attenuate it. Most mixers have a boost of up to 10 or 15dB.

The solo button is used to quickly hear that channel's signal and that signal only. It's a little like taking all the other channel faders down to their lowest position. It's possible to solo more than one channel at a time. For example, you can solo the drums even though they might use four channels of the mixer.

When a channel's mute button in en-


gaged, the entire signal from that channel is removed from the mix. Muting is the same as pulling a fader all the way down, but it's faster and doesn't require you to move the fader's position (which possibly could mess up a perfectly good balance). Like the solo button, it's possible to mute more than one channel at a time.

Output Section. Every mixer will provide a set of outputs that are labeled "main" outputs. These outputs are labeled for left and right channels, which are sent to a power amplifier and then to speakers to produce the main sound. These outputs can be either phone-style jacks, or XLR-style jacks. Some mixers may have a set of main outputs with RCA-style jacks called "tape out." Depending on the flexibility of your machine, it may offer all three types. Many mixers have additional outputs that offer a few additional uses.

Monitor Outputs. These are typically mixes that are slightly different than the main mix. To best understand the differences between a main mix and a monitor

mix, imagine this situation: You're performing a tune that requires you to play along with a click track. You want to hear the click clearly in your monitors — either earphones, headphones, or monitor speakers — but you certainly don't want the click coming out of the main speakers to the audience. In this situation, the click track's signal would be fed to the monitor outputs, but not the main outs. Big mixers have the ability to offer several discrete monitor mixers, such as when the lead singer wants more vocals in the mix and the bass player doesn't want any vocals at all!

Headphone Outputs. All mixers offer a stereo headphone output. Your mixer may be able to select having the main mix, a monitor mix, or some other output routed to the phones.

Now that you know the basic concepts of how mixers operate, you should have a better idea of how these tools can help you in your musical pursuits. Keep in mind that mixing is an art, and practice, experience, and experimentation are some of the best teachers to help you learn a particular piece of equipment. 

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