

Chapter 4 - Mixers (part 1)

We have talked about acoustic sound, its transduction into electricity via a microphone, and finally its transportation through the cable. Now we will discuss the place where much of the hands-on action will take place - the mixer.

Mixer names and issues

There are a few names and variations of the term 'mixer' so we need to have an idea of what we are talking about. While most people have heard the name 'mixer', there are a variety of other names that are sometimes used interchangeably and other time erroneously. While many terms exist using the noun 'board' (mixing board, sound board, audio board), two of the popular terms that add a sense of prestige are console or desk. These names are usually reserved for a large format board (24 plus channels) that has an extensive master section. This master section would provide a variety of monitoring sources and routing schemes not provided by smaller boards. The term *desk* is taken primarily from the United Kingdom whereas the name *console* is used in the United States. Sometimes they are referred to a mixing desks and other variations. Smaller boards with less input channels are usually just called mixers. Consoles and desks usually are part mixer and part furniture with special wooden rails, sometimes big enough to serve a buffet from if desired. While you can call your mixer anything you like, referring to your 14 channel, wall-wart powered, Behringer box as a console, will probably only make those in the know roll their eyes. When you are sitting behind a real desk or console, you'll know it.

While all mixers (consoles, desks, etc) all share a similar DNA in the input / output schematic, there are two types of mixers that have special functions; the **Line Mixer** and the **Powered Mixer**. A line mixer is usually loaded with ¼ inch inputs designed to take signals from keyboards, samplers, and other active devices. They may have a few XLR inputs to be flexible, but this is not their primary concern. Line mixers usually have a basic EQ and AUX sends, however they lack a master section and many times do not use faders at the bottom of each channel, opting for knobs instead. This keeps the physical size smaller. They are used for submixing channels, especially banks of MIDI tone modules. The other type of

specialized beast is the powered mixer. The powered mixer is designed exclusively for live sound reinforcement and is a combination of mixer and power amplifier in one housing. There are pluses and minuses to this system in that one can drive the speaker cabinets from the outputs of the mixer, but at the cost of greatly increased weight to haul around. To have everything but the speakers in one device can be very appealing to some, but others will find the inability to mix and match components to inflexible. The powered mixer will usually have all of the features discussed in this chapter and is a full-fledged mixer.

Mixer History

In the first few chapters it was mentioned that we owe a lot to the physicists and scientists that have come before us. The mixing desk is no exception. There were no recording consoles or mixers like we are used to today until the early 1960s. Before then, the fledgling recording industry used gear designed for radio broadcasts. Some of these were modified to make them work better in the new recording medium but most of the time, it was just plug one device into another, into another, into another, etc. It was an American named Bill Putnam who started to put the devices together into a functional unit. He later owned the company Universal Audio which manufactured the legendary LA-2A optical compressor and the 1176 solid state limiter – both highly sought ‘classic’ pieces of gear. While the materials and methods used have changed slightly, Putnam put all of the gear into a single chassis and made it ergonomical for the engineer to use. From putting the inputs at the top of the mixer to locating the faders (then big knobs) at the bottom closest to the engineer was his came from Putnam.

What does a mixer do?

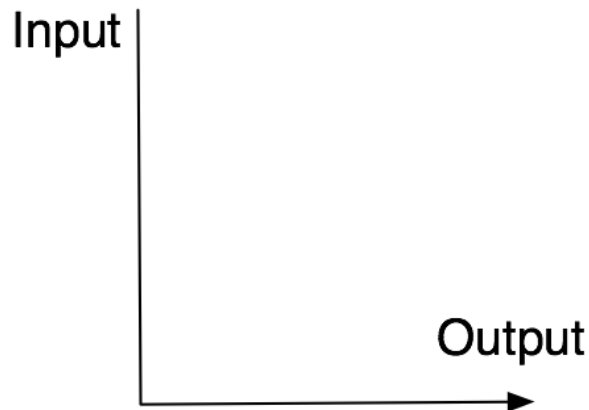
This is a loaded question since many mixers have vast differences in ability but one that needs to be addressed to understand the functionality. The four primary things mixers do are:

- 1) Present a variety of input types incoming signals.
- 2) Present a variety of output types and sources.
- 3) Present the opportunity to change the timbre of the input signal.
- 4) Allow the engineer to sum or mix multiple signals down to two channels.

Del Mar owns an extremely small 4 channel mixer and it will do all the things above. The school also owns a 48 channel Allen and Heath which will also do the above – it can just do more of it, and with more flexibility.

The Big L

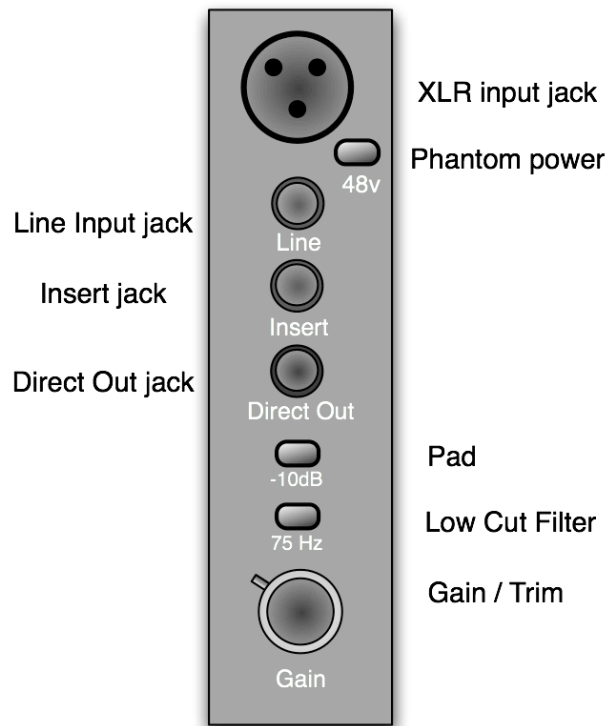
As mentioned in the preface to this chapter, all mixers share the same DNA in terms of signal flow. When viewed from the engineer’s perspective behind the board, one will see this layout as a big letter “L”.



Example 11 - “The Big L”

All mixers have this design. The signal comes into the board at the top (and most always starting on the left), moves down the channel, “turns” right and is mixed in with other signals. Sound is output on the lower right side of the board. The jacks for the outputs may be on the back of the mixer, but the last controls the engineer has access to are in this lower right hand location. Let’s start at the left-most point of the mixer. These are called **channels** or **channel strips**. These will be mono channels – in fact, most things on a mixer are mono. If the mixer has stereo channels, they will be further to the ‘right’ and will always be marked as two channel numbers. For example, a single channel may be marked; 9-10 or 13-14, etc. It will always be an odd number followed by an even number. At the top of these channels is the input section. This is the place that one connects the various pieces of gear (microphones, synthesizers, etc.) and we start the signal flow of the audio through the mixer. While every mixer is different, here are the possibilities of items you will find in the input section: XLR input (mic level), 1/4 input (line level), Phantom power switch, Low Cut filter, Pad, Gain/Trim knob (mic pre-amp), “Phase” switch, Insert jack, Direct Out jack. Note the word *phase* is parentheses.

You know why this is not actually a phase switch, right? If not, you should probably re-read the end of chapter 1.



Example 12 - The input section for a single mixer channel

You should already know about the majority of these items seen above. The XLR and Line In jacks are obvious, those are the XLR and 1/4 inch input jacks. The phantom power in this example is the place to turn on or off phantom power (48 volts) to this channel and power a condenser microphone. Finally, the low cut filter and pad are the same options that are found on some microphones as discussed in chapter 2. That leaves three items we haven't talked about: the insert and direct out jacks, and the gain / trim knob.

Before we go into new territory however, let's flesh out a little about the phantom power switch. There are three basic ways to engage phantom power on the microphone. The first is seen above as a switch on a single channel. This is actually the most rare to find as it costs the most to produce. If you have a 32 channel board, there would have to be 32 separate 48volt switches. You may never find this option in your working environment depending on the make and model of the mixer you use. The second option is grouped. In this configuration, there will be one switch

for every 8 or so channels. Thus, hitting the first switch will engage phantom power on channels 1-8, the second would power 9-16, etc. The last option and the one you will see on most small format mixers is a single master switch that turns phantom power on for all the microphone channels contained on the mixer. Even though one is found on expensive boards and the last is on the least expensive boards, the electricity they provide is the same. The single or grouped option is needed in case one has an old ribbon microphone that will be damaged by the 48volt charge sent up the cable. As mentioned before, most modern ribbon microphones do not have this liability.

On to new things. We will start with the gain or trim knob and then follow the signal around the “L”. Once again, depending on the manufacturer, the name for the pre-amp knob may be called **gain or trim**. This is the microphone pre-amplifier and is the place that the minuscule output of a microphone is brought up 50 to 70dB so that it can be mixed at the same level with other inputs in the mixer. The important thing to remember is that this is the place designed to *boost* a signal. There is no other place in the whole signal path designed to increase a signal to this degree. To get the correct setting for the gain knob, have the artist play or sing at the loudest section of the song. If the channel has its own dedicated meter, turn the gain knob until the signal is about 70-80% to the top dynamic. If the channel does not have its own meter, one can push the solo button on the channel (discussed later) and that will usually reassign the master meters to show the signal in the soloed channel. Give some headroom for safety – if the signal is pushed too high at this point and distorts, there is nothing you can do later to fix it. It is very important to capture the signal at a healthy level, but not to allow it to be distorted or clipped. If the trim is set too low, the signal will be weak and tough to mix in with other signals.

At the bottom of each channel (at the lower left part of the “L”) is a channel fader. A fader is the same thing as a knob but is designed to give the engineer a better visual and ergonomic device to manipulate the final output for the channel. Where the gain/trim knob is designed to bring the input up to the level of the mixer, the channel fader is designed to blend this signal with all the others on mixer. For example, if the guitar on channel 3 is too loud, use the channel fader to turn it down a little bit until it sounds right in the mix.