

SIGNAL FLOW in the STUDIO

The journey that an audio signal takes throughout the recording or mixing process is called the **signal path**. Here is a simple signal path diagram:

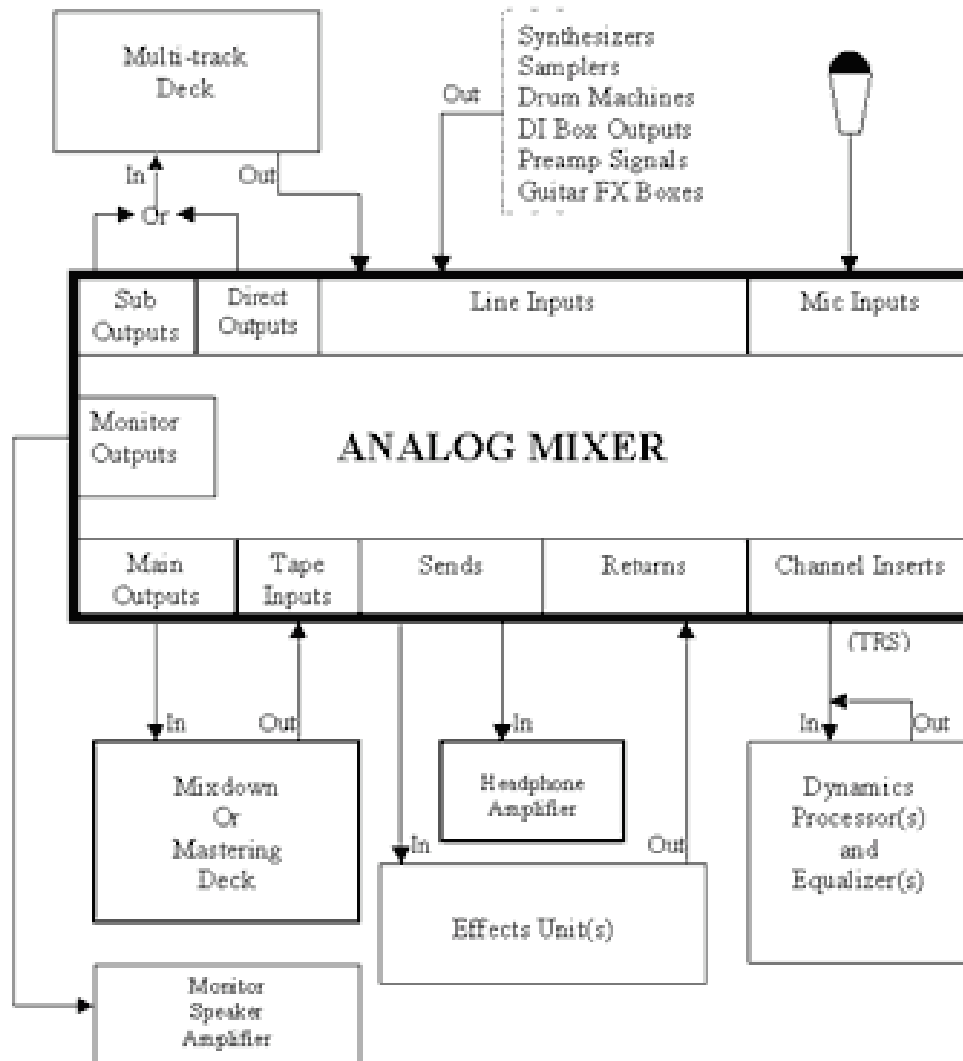


Figure 8: Typical Analog Mixer Connections

The signal path begins with the microphones or instruments. The outputs of these devices are connected to inputs on the back of the mixer.

If a multitrack recorder (MTR) is being used, there may be normalised connections from the inputs and outputs of the recorder to the inputs and outputs of the mixer.

GETTING IN TO THE MIXER

The first point of entry into the mixer is usually an **XLR input**. This is the input to a preamp. Each input will have **trim controls**. Trim, sometimes called **gain**, is like an input volume control. It's used to balance the levels of all the different inputs. Strong signals can be softened by reducing the gain. Weak signals can be strengthened by increasing the gain.

Many mixers also have **line inputs**. These are usually ¼" inputs. Keyboards and guitars can be plugged directly into the mixer without using direct boxes.

Each input may have a **pad**. This is a 'damper' that reduces the gain of loud sources, like hot keyboard or microphones signals. For example, a 20dB pad would reduce the gain on the preamp input by 20 decibels. This can prevent clipping on the input of the preamp.

Each input may have a **phase invert** switch. This switch inverts the incoming signal 180 degrees. For example, you mic a drumkit with two overhead mics, but one of them is wired incorrectly, so it's out of phase with the other. The phase invert switch can solve this problem.

Each input may have a **phantom power** switch. The phantom power switch provides a 48v DC supply to the microphone.

Now that we've got a healthy signal into the mixer, it's time to move on to some of the mixer functions.

EQUALIZATION

Equalization options are different from mixer to mixer. There should be at least two **bands** of EQ (HI and LOW) and preferably more. The EQ may be fixed or parametric. It may be a shelving EQ or a low-cut filter.

The EQ is connected '**inline**', which means that the audio signal passes through the EQ circuitry even if the EQ is set to a flat setting. This may be a problem if the EQ adds noise or phase shifts to the signal. A good quality mixer might allow you to bypass the EQ with an EQ In/Out switch.

AUX SENDS

Aux(iliary) Sends are most often used to create Effects Send/Return settings. Most mixers have at least 2 Aux Sends per channel, but the more, the merrier! The Send carries the audio signal from a channel out of the mixer to an effect unit (**sending**) and then brings the effected sound back

into the mixer (**returning**) There should be a knob to control how much of the effect is returned (Aux Return), probably near the master volume fader.

Sidenote: Pre-Fader and Post-Fader

The Aux sends may have a pushbutton to choose between Pre and Post. We can choose whether or not the Send signal is taken from BEFORE (pre) the main fader of the channel, or AFTER (post) the main fader.

If the signal is sent Pre-Fader, it means that the main signal fader could be brought down to any level, even zero, and the sound would still go out the Aux Send, possibly to a reverb unit. This would allow you to use a pure reverb sound, with none of the dry signal included. If the Aux Send is Post Fader, it means that if you turn down the main channel fader, the amount of signal sent out the Aux Send will also be turned down.

Aux Sends can also be used to create a **monitor mix**, with a different track blend than the main fader settings. This makes it possible, for example, to supply a singer with a headphone mix that has more piano in it than normal. Or a mix to the drummer that contains no drums! If you were using Aux sends to create a monitor mix, the corresponding Aux return wouldn't be used.

INSERTS

Another way of processing the audio signal is to use an **Insert**. It puts the effect, often a compressor, directly in the audio signal path, so the audio is completely changed. Dynamics processing such as compressors, noise gates, expanders, and limiters is most often used in this way. There is no Send or Return involved with an Insert. An Insert may use a special kind of TRS cable called an Insert Cable.

PAN and BALANCE

After these stages, the signal passes onto the **pan** controls. Panning a signal means moving the signal from left to right in the stereo field. Pan is short for 'panorama', which means an image of the horizon.

You might also find **balance**, which has a slightly different meaning than pan. Pan is usually done to a mono signal. Balance is usually done to a stereo signal. A balance set in the centre would mean the stereo sound is equally loud in the left and right speakers. Turning the balance knob to the left would mean the volume of the right side would be reduced, and the stereo sound would feel tilted to the left.

FADERS

At the bottom of the mixer, closest to the engineer, you find the **faders**. Each channel will have a dedicated fader. Faders are long-throw sliders, meaning there's lots of room to travel up and down. The faders send a mix of the different channels or tracks to a common stereo output, probably the Mix Out.

GROUPS and BUSSES

Next to the faders you'll often find a group of pushbuttons, grouped into pairs (1-2, 3-4, L-R, etc). These are called **Groups**, or **Busses**. A group can be used as a submix, and the submixed material (several channels of drums in a kit, for example) can then be routed into the main outputs along with rest of the mix. Or a group can be used to create a customized monitor mix for the musicians.

MIX OUT

Finally, the mixed signals are combined (or summed) at the **Mix Output**. There will usually be a dedicated VU meter to show the strength of the main output signal. And there may even be an Insert available on the Mix Output, where you could insert a compressor to smooth out your final mix.

DIRECT OUTS

When you connect a multitrack recording device (MTR) to the mixer, you need to get the incoming sounds from your instruments into the recorder. You can do this by 'reflecting' the incoming sounds to Direct Outputs. For example, an incoming mic signal on Channel 1 of the mixer is 'reflected' out of the mixer and in to the MTR.