

Section Five

Mixers, Power Amps and Signal Processors

The sound mixer is the center of everything that goes on in an audio system. A mixer can be very simple or very complex. A very basic mixer could do no more than control volume and tone.

A more complex mixer however has many more features. It is capable of taking more than one source (microphone, tape deck, compact disc) and combining them into one signal that is sent to the speakers.

Mackie 16 Channel Mixer



The mixer can be divided into sections to aid in its understanding. The first part we will look at is the Channel Strip. On a 16 channel mixer there will be 16 channel strips that look identical. Each strip is used to control one source (microphone, D.I., etc.).

The channel strip has different sections to it and most sound consoles have different color knobs to designate these different sections.

The first knob at the top is the input gain. This is a volume adjustment used to make the source audible.

The next section of knobs is the auxiliary sends section of the channel strip. On this sound console there are four auxiliary sends.

The next section of knobs is the Equalizer section. This is the section that has the low, mid and high equalizer adjustment. It also has a low cut. A low cut will reduce the level of the sound below the frequency level it is set to.

Directly below this is the Pan knob. This sends the signal to either the left or right output. Below the Pan knob is the Mute Button. This mutes or silences this channel.

At the bottom of this mixer on the left is the channel volume fader. You use this fader and the gain knob at the top to get the volume you need.

To the right of the channel fader is a set of four buttons. The top button is the solo button. When this button is pushed in the soundboard operator can hear this channel in his headphones. The next two buttons below this are the group assignment buttons. The first button assigns the signal to groups 1 and 2. The next button assigns the signal to groups 3 and 4. The bottom button assigns the signal to either the left or right master output.

The Channel Strip



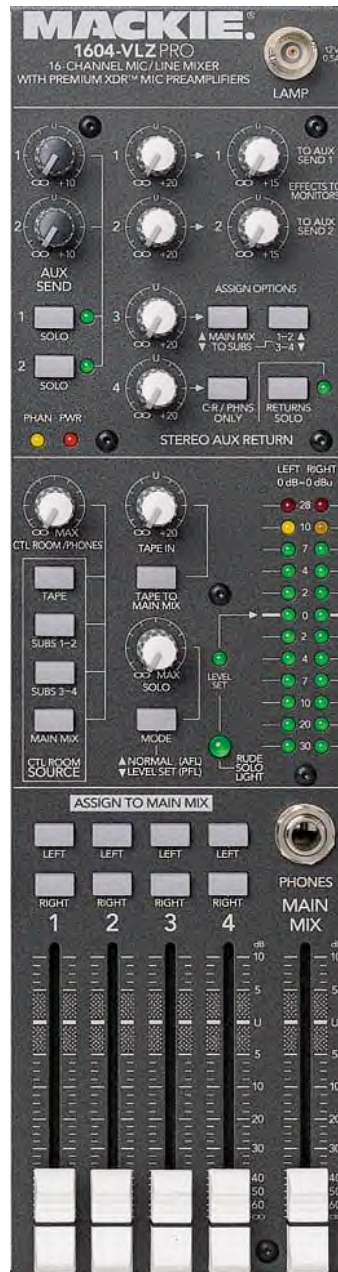
On the right hand side of this console is the master section. For now we will only look at a few of the features of this section.

The master output left and right is on the bottom right hand corner of the mixer. It has a fader. On the left of this are four other faders. Each one of these faders controls the volume of the group assignments 1,2,3,4.

Above the master fader is the output meter. This has two rows of green, yellow and red lights.

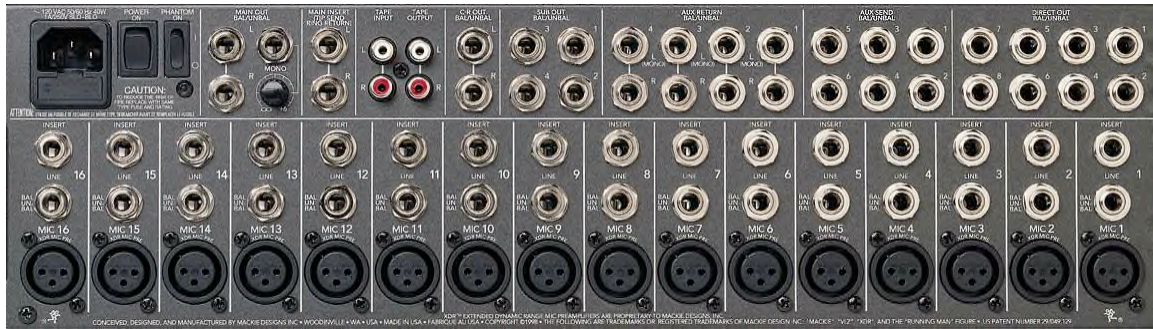
Near the top of the master section is the auxiliary sends knobs.

The Master Section



The mixer rear panel is where all the connections are made. The bottom row has the XLR female inputs for each microphone or the multi-channel snake. Above the XLR inputs are the Hi Z inputs and the insert points for effects. On the top left hand corner is the AC power plug. Next to this is the on/off switch. Next to this is the phantom power switch. Beside that are the outputs for left and right master.

Mackie 1604 Rear Panel



Power Amplifiers

The Power Amplifier is used to amplify the signal that comes from the mixer. Most power amplifiers have two gain (volume) controls on the front. This is a stereo amplifier. There are mono amplifiers but they are not as common.

The rear panel of the power amp is where the signal inputs and the speaker outputs are made. The inputs are made with either XLR or 1/4" connectors. The outputs can be made by either Banana plug or Heavy Duty 1/4" phone plug. On the Crown below the 1/4" speaker outputs are not present.

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Crown Power Amp Front Panel



Crown Power Amp Rear Panel



Equalizers



The Equalizer is a signal-processing device that affects the overall sound system. This is perhaps the most crucial piece of equipment in a sound system. By adjusting the different frequencies of the equalizer you can eliminate the harsh sounds and feedback that may occur during setup.

The equalizer we will be talking about is the 1/3 octave equalizer. An easy way to understand what this means is by thinking about a piano. If you play middle 'C' on a piano and then play the next 'C' above it you have played an octave. What the equalizer does is divide this sound distance of an octave into three frequency ranges to give the soundboard operator more control.

Crossovers



The Crossover is used to divide the output signal from the mixing console into two, three, four or five different signals. This allows for more control over your sound system. For example, a two-way system the crossover would have a low and high signal. In a three-way system the crossover would have a low, mid and high signal.

Each of these signals is then sent to a separate power amp. A three-way system would have three power amps. Amp one would be for the lows, Amp two would be for the mids and amp three would be for the highs.

Each amp would then send the signal to different speakers. Amp One which is the low would send the output signal to an 18" speaker. Amp Two which is the mids would send the output signal to a 12" speaker. Amp Three which is the highs would then send the output signal to a 2" high frequency compression driver.

Compressors/Limiters



Compressors are used to protect your sound system. They are used to level the input from the person or musical device that is sending a signal to them. Imagine you are doing a variety show and all day you have had smooth singers. Then this guy gets up and starts screaming in the microphone and throwing it around. This could lead to spikes in the levels that cause damage to your equipment. The compressor will stop these peak spikes and level them down to a manageable volume.

Compressors many times have a noise gate on them. The noise gate is used to keep out unwanted sound. The input has to be loud enough to trigger the switch that allows the sound to pass through. The noise gate is especially useful on drum kits. The reason being there is usually a large number of microphones in a small area. Each microphone picks up sound from the other parts of the drum at times causing a bleed over effect. The noise gate reduces this effect.

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Signal Processors

Signal processors can create a variety of changes to the way a source audio signal can sound. We have already discussed a few signal processors. They were the Equalizer, Compressor, Noise Gate and the Crossover. These were all signal processors that are quite often found in the drive rack located at front of house.

The next signal processors to discuss are usually found in another rack at front of house. This rack is called the effects rack.

The effects rack would most likely have at minimum one multi-effects processor in it. A multi-effects processor can have a number of effects housed in one rack unit.

To understand this better we will now take a look at two different types of effects that are standard to the industry, Reverb and Delay.

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Yamaha Multi-Effects Processor



Reverb

The Reverb Unit takes the signal and can create an environment with it that simulates environments found in nature. For example, a vocalist is singing in a small room. You want the voice to sound fuller. You can use reverb to simulate that the same vocalist is now singing inside a large concert hall. This is called the Reverb Type. The Reverb type may be Room, Hall, Large Hall, Plate and a number of other types used by various manufactures.

Not only does the reverb adjust the size of the room, it also can change what the walls of the room are made of. This is referred to as the reflectivity.

Delay

Delay is the term used to make the sound of the echo. The Delay has controllable features such as time, feedback, mix, rate and depth.

The delay time is set in increments called milliseconds. Once the input signal passes through the delay unit it is repeated at the desired interval. For example if wanted to repeat one word at a one second interval, you would set the time to 1000 milliseconds (In reality I believe it comes out to 1024 milliseconds).

The feedback tells how many times you would want the word to repeat. For example use the word “check”. If the feedback were placed at one you would hear the word “check” two times. The first time would be the original source and the second would be the one created by the delay.

The mix adjusts how strong the volume of the source is in contrast to the volume of the delays.

The Depth and Rate are features that you use at very low millisecond settings. At these low settings it is possible to create more sound effects called Chorus, Flange and Double.