

Mixing Boards (Mixing Consoles, Mixers) – Analog Basics



“Analog Mixing Board”

Mixing Boards are also referred to as Mixing Consoles and Mixers – these three names are commonly used “interchangeably.” There are literally a thousand different Mixing Boards on the market today. There are Analog Mixing Boards (pictured left) and Digital Mixing Boards (pictured right). No matter which type of Mixing Board you use, you should understand that the essential functions are the same on either kind of Mixing Board.



“Digital Mixing Board”

Let’s review some basic functions on a Mixing Board. We will use an “Analog” type Mixing Board for our demonstrations. Typical Mixing Boards can be thought of as having “3 Main Sections.” The Channel / Input Section, The Sub-Group / Sub-Mix Section, and The Mains / Master / Output Section.

1. Channel / Input Section

Analog Mixing Boards "Part 1"

First, you will need to plug in to either the Microphone (MIC) input or the Line (LINE IN) input.

MIC Input – Uses a Pre-Amp to bring the Mic Level up to Line Level

LINE Input – For stronger audio levels, does not use a Pre-Amp



Second, you will need to adjust the Gain (also called Trim) – This is where you will adjust the incoming signals to an optimal (usable) level.

Note: For Line level inputs – a common starting point is to start lower than “U” (Unity) and closer to the “0” and adjust from there.

For Mic level inputs – start at “U” (Unity) and adjust from there.



Important Note: Remember to NEVER plug a Line Level device into the Microphone Input – This will cause distortion and over-drive the input. [Video Clip!](#)

AUX Sends – These are just more level controls for other mixes (auxiliary mixes), such as reverb, delay, monitors, etc. AUX sends when routed to outboard effects are used in conjunction with the AUX Returns to complete the signal path. AUX 1 and AUX 2 are commonly used as “Monitor” sends. Ex: AUX 1 for Vocals, AUX 2 for Instruments.



EQ – Used to increase or decrease the amplitudes of certain frequencies used in the signal. Equalization is a little tricky to get used to. Use only as needed or not at all. For example, if the signal has a lot of “high end” present, do not add “Low end” to the mix – turn down the “Highs.” This is called “subtractive” equalization.



[Video Clip!](#)

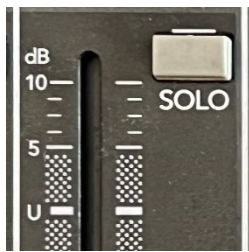


Pan Control – This control allows you to either “Pan” the signal to the Left only, to the Right only, or stay in the “Center” position (which allows the signal to flow equally to the Left and Right at the same time. Also used with routing Channels to Sub-Groups.



Mute Button – This button is exactly what it sounds like, press the Mute button, and the signal turns off. Usually, Mute buttons will start flashing when active to remind the user that a channel has been muted (and is still muted).

Channel Faders – These are the individual channel level controls on mixers (shown right). Allows you to adjust signals for each channel (that route to a “Sub-Group” or “Main” Mix).



SOLO Button

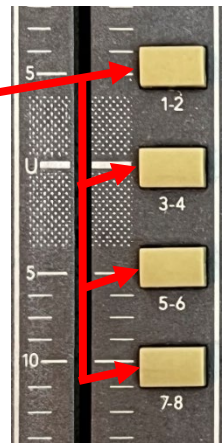
SOLO Button – When you press this button you can “monitor” a single channel through your headphones or external monitors. If you press more than one SOLO button all selected channels will be monitored. The “Main” SOLO indicator usually flashes after a SOLO button has been pressed to remind users that it’s active on one of the channels.



Channel Faders

Channel Assignment Buttons

These buttons allow you to route (assign) individual channels to Sub-Groups (covered in more detail below).



Signal Routing Note – Signal Routing includes the Pan control (left / right), Mute button, Solo (Monitor button), Channel Assignment buttons, AUX Sends controls, and the Main Fader (slide control).

2. Sub-Group / Sub-Mix Section [Analog Mixing Boards "Part 2"](#)

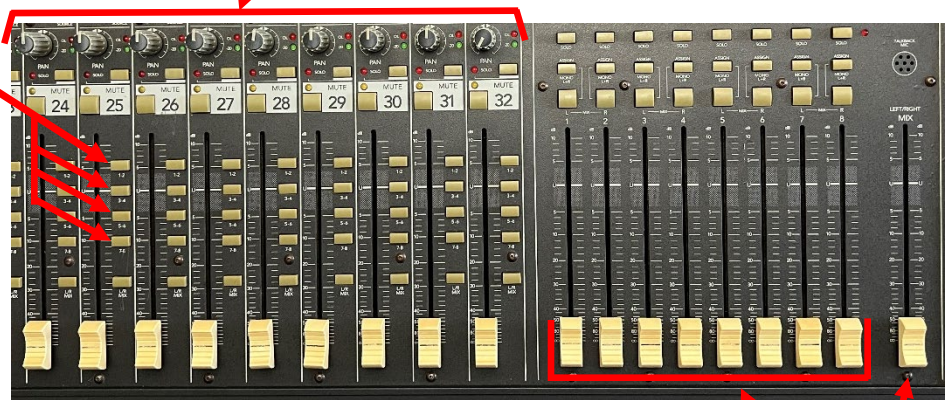
Sub-Groups – Provide a way to “Group” specific mixes together. Example: You have four vocalists and want to turn them all up at once during certain songs. You can create a Sub-Mix by assigning the channels to a “Sub-Group” using the “Channel Assignment” buttons. This allows control of all four microphones simultaneously (using “one” Sub-Group Fader). Sub-Groups are a very common practice for sound board operators.

Channel Assignment Buttons

These buttons allow you to route (assign) channels to Sub-Groups (Sub Mixes). Each of the Channel Assignment buttons (shown right) are designated two numbers. The first button is numbered 1-2, the second 3-4, then 5-6, and the last button is numbered 7-8. A button must be pressed (energized) in order to assign a Channel to a Sub-Group.

Pan Controls for Channels 24-32

[Video Clip!](#)



Mixer Channels 24-32

Sub-Groups 1-8

Main

Sub-Group / Channel Assignment Example – Using Channel 24: Let’s say that you want to assign Channel 24 to Sub-Group 1. First, press Channel Assignment button “1-2” on Channel 24, then turn the Pan Control on Channel 24 all the way to the left (which assigns the channel to Sub-Group 1). All done! If you want Channel 24 to go to Sub-Group 2 only – you would turn the Pan Control all the way to the right. Turning the Pan control to the center with the Channel Assignment engaged would assign Channel 24 to both Sub-Groups (1 and 2).

Phantom Power: Phantom Power is used for “Active” Condenser Microphones. Phantom Power buttons are not always located in the same place on Mixing Boards. Some Mixing Boards have a single Phantom Power button for each input channel, the button can be found on the top or in the rear of the mixer, and there can also be only one Phantom Power button that affects all the channels (or just a certain number of channels – see below).



Multiple Channels



Front of Mixer



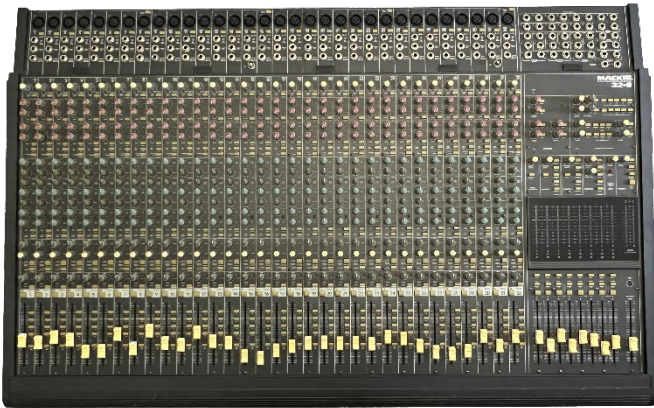
Rear Panel

Tech Note:
Phantom Power does not affect Dynamic type microphones. You can find more information regarding Phantom Power on our Website - See Handout.

3. Mains / Master / Output Section

Analog Mixing Boards "Part 3"

The Mains / Master Section is much more than just one or two faders that control the final output. Most mixers include some combination of AUX Sends and Returns, Submaster Outputs for Recording, Monitoring Levels / Meters, a Talkback Mic, Headphone Jack, Main Mix Outputs, Control Room Outputs, Submaster Inserts, and various AUX Mix Outputs. Of course, only some mixers will have all these features, and we will not cover them all in this booklet. Typically, the larger the Mixer, the more features it will likely have. In my experience, having all the options and features available on our larger Mixing Boards was nice, but I didn't find a use for most of these features during the performances I was using the Mixer for. Again, whether you are working with an "Analog" or "Digital" Mixer – the "basic functions" are the same. Let's take a look at some of the features.



As you can see the larger mixing boards have more Faders, Knobs, Outputs, AUX Sends, and Returns, and much more. If you are just starting out this may appear to be quite intimidating, but it's actually easy to learn and understand once you get a little "Hands-On" training and experience.



Note: We'll continue to use the smaller mixer (also referred to as a mixing board, mixing console) for our demonstration purposes in this booklet, but will reference the larger mixing board as needed.

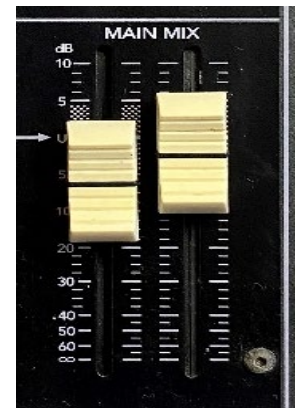
Main / Master Faders

These are the final level controls (faders) that provide the combined "Mixed" channel signals to the Main Outputs. The Sub-Groups are assigned to the Main Fader as well. There is commonly only "One" Main Fader (with a Pan control) on most of the larger Mixing Boards, but of course, this depends on the manufacturer of the board. You will also encounter many Mixing Boards with both "Left and Right" Main Faders.

The Main Faders "combine" the "final" output signal that will go directly to sound processors (for Equalization / Delay, etc.), to recording gear, or directly to the power amplifier inputs.



One Main Fader on a larger Mixing Board with Left / Right Mix. When there is only one Main Fader there is most certainly going to be a Pan Control knob. (Pan Control not shown).



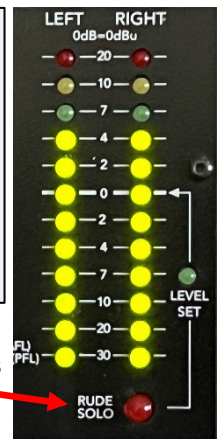
Two Main Faders on a smaller Mixing Board with "Left and Right" Faders.

Monitoring – There are level controls for monitoring what is heard in your headphones. On most Mixing Boards, you will have options to monitor signals going to external powered Studio Monitor Speakers, AUX and Sub-Group Outputs, etc. Each of these will likely have its own level control as well.



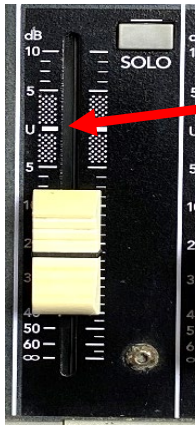
Every mixing board (large or small) will have a headphone jack and volume control. Make sure you get a good quality set of headphones and learn your way around the board so you can listen to everything happening!

Meters (pictured right) are there for a reason. It's ok for the signal to hit "Yellow" occasionally, but make sure that you never stay consistently in the "Red." This is never good, as Clipping will occur, and the signal will be distorted.



SOLO Indicator – When this is on (or flashing) this means that a SOLO button is engaged.

What is Unity Gain?



What does the "U" stand for?

You guessed it! The "U" stands for "Unity." This is the defined area that assists with creating and keeping the perfect "balance" and "mix" consistent.

You will find that all Mixing Boards (large or small) will have a Unity Gain marker on the individual channels, the Sub-Group channels, and the Main Faders as well.

This is very important for mixing sound accurately!



Unity Gain is essential for ensuring that the audio signals passing through a signal chain can be controlled without flashes of unplanned peaks, distortion, and random gains. Basically, you are looking for the "input signal levels" to equal the "output signal levels," and when this is achieved – this is called "Unity Gain." As long as the signals coming into the Mixing Board are clean – the "Signal Balance" (Unity Gain) will result in an overall "Quality" mix. Establishing unity gain can also help with keeping feedback under control as well.

These are the basic steps in setting up Unity Gain on a Mixing Board Channel:

- ➔ With the Individual Channel Gain all the way down – Plug the Microphone in to the Channel.
- ➔ Next turn the Channel Fader and the Main Fader to "U" (Unity).
- ➔ Have someone talk or sing into the Microphone (or play the Instrument).
- ➔ Adjust the Individual Channel Gain until the "Main Fader" Meter signal reaches "0." Once you start adding more Microphones / Instruments you will need to keep adjusting the Individual Channel Gains as needed.

Note: This is a fundamental way of setting up Unity Gain on a Mixer. Once you gain more experience and "hands-on" training, you can make more advanced adjustments to ensure "precise" Unity Gain is achieved.

Channel Inserts

Utilizes a special "Y" cable that acts as both the "Input and Output" going into a single channel on the Mixing Board. The cable consists of 2 each – 1/4" TS Connectors (one for the input and one for the output of the outboard gear – such as a Digital Delay unit). On the other end, 1 – 1/4" TRS. The TRS "Ring" serves as the input (Returns Signal from the Digital Delay), and the "Tip" serves as the Output (Sends Signal to the Input of the Digital Delay).

Insert Cable
TRS to Dual TS
Connectors

Whirlwind #STWY



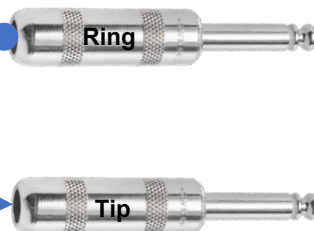
Insert Example: Below is a Digital Delay unit on a single Vocal Channel (Ch-6). The TRS connector of the Y-Cable plugs into Channel Insert #6, and the TS (Send Connector – TRS Tip) plugs into the Input Side of the Delay Unit. The TS (Return Connector – TRS Ring) plugs into the Output Side of the Delay Unit. Now you have a Digital Delay Unit that you can fully control on Channel #6. Sub-Groups also have individual Inserts as well. It is common to use a Delay or other Effect on an Analog Mixing Board Sub-Group Channel that has Vocal Channels assigned to it.



Plug In Here!



Tip = Send Ring = Return
Pre-Made cables are color coded
for easier connectivity.



Output

Digital Delay

Input

AUX Returns / Sends, AUX / Main Outputs / Other

AUX Returns provide a way to adjust signals being “returned” to the Mixing Board from outboard gear (such as a reverb or delay). The AUX Send controls how much signal is “sent” to the outboard gear (from the mixing board), and the AUX Return controls how much signal is “returned” back to the Mixing Board to complete the process. Besides using outboard effects and processors, the AUX Returns can also be used as extra inputs to your Mixing Board. You can hook up line-level devices such as CD Players, Digital Playback units, iPhones / iPads, etc.

Example of AUX 1 used as a Vocal Monitor Feed:

First - Turn up AUX 1 on any of the individual Vocal Channels you want to send to the Stage Monitors.

Second – Turn up / adjust the AUX 1 Master (Send) on the Mixing Boards Main / Masters Section. This will be the main gain control for the stage monitors in this example.



Pre means “Before” the Channel Fader (signal routes directly to AUX 1) and Post means “After” the Channel Fader (Channel Fader will affect AUX 1 signal level when turned up and down).

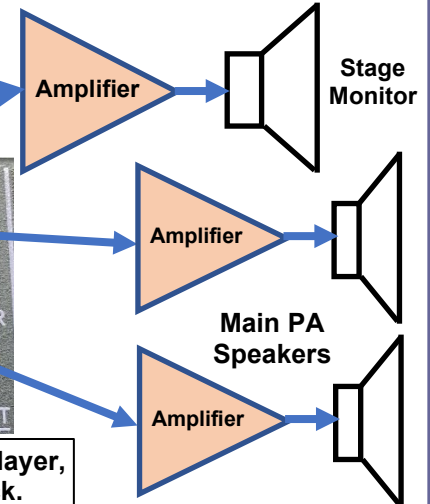


AUX 1 / AUX 2



Output
Input
Digital Delay

TAPE IN – Connect a CD Player, iPhone, iPad for playback.
TAPE OUT – Can be used for recording live performances.



Example of connecting a Digital Delay: In this example, AUX Send 2 will feed the Input of the Digital Delay, and the Output of the Delay will feed Stereo Return 2 (L / Mono = Left Channel only). The Delay will now feed all individual Channels when you turn up AUX 2 on the channel and AUX 2 Master.

MAIN OUT – Final Output stage. This is where you feed the main output signal directly to your Amplifiers or other sound processing first (and then to the Amplifiers). Use the Left and Right outputs as shown, or just the Left output for Mono operation.

Notes / Tips on Learning how to use a Mixing Board: [Analog Mixing Boards – Part 1](#) [Part 2](#) [Part 3](#)

The best way to gain experience using a Mixing Board is by getting “hands-on” training. You don’t have to go to a school to learn how to run a Mixing Board, but you will need access to a Mixing Board (small or large, it doesn’t matter at this point). You will need to spend a reasonable amount of time “practicing” on your Mixing Board in order to develop knowledge and experience. Once you feel you got the basics down – evaluate what you know and what you need to spend more time working on to ensure that you completely understand the essential functions.

- First, learn your way around the board – get familiar with all the knobs, inputs and outputs, where are they located, etc. Make sure you know the difference between a Line Input and a Microphone Input.
- Second, hook up the board to an amplifier and speakers – make sure to get some signal flow going through the system. I suggest using an iPhone, Laptop, or any Digital playback unit to start with.
- Third, once you have sound flowing through system you will want to spend a lot of time working with the EQ. This is very important. Experiment, try each knob (slider), and listen carefully to what happens to the signal as you adjust each of the knobs (or slider) around. Test with different “Stems” (Tracks / Music).
- Fourth, practice with AUX Sends / Returns, Solo (Headphones), Mute buttons, and assigning Sub Groups.

A Quick Note: “Audio Operators” (the persons that mix live shows) must be experienced and proficient with operating Mixing Boards in order to properly “Mix” a quality show. As an “Audio Technician,” you need to be familiar with how the Mixing Board functions, its set-up, connections, and all associated rack equipment the board is connected to in order to troubleshoot and repair any issues when called upon.