INTRODUCTION TO PATCHBAYS

Douglas Reynolds

What are Patchbays?

Patchbays are used to connect one piece of equipment to another. It is important to understand how they work in order to achieve your desired signal flow. Once you have your head wrapped around this, setting up your signal path routing will become greatly simplified and incredibly flexible.
In any professional studio with outboard gear and a patchbay installation, everything is connected to the patchbay (mic preamps are an exception). Mic preamps are either connected to their own dedicated patchbay or not patched into the bay at all. This is due to the danger of introducing phantom power into signal processing equipment.

A patchbay allows you to quickly connect different pieces of gear together without having to access the back of the rack and physically run cables from one unit to the other. Additionally, it eliminates the need for doing this each time you want to create a new signal path route. This can happen many times in a single recording, mixing, or mastering session and it will quickly become apparent that not having a better routing solution creates a great deal of additional work and severely impedes any chance of a creative process using outboard effects processing. Patchbays are an excellent option for solving this problem and allowing an engineer to create signal paths quickly, make creative changes, and experiment with different combinations and orders of effects processing gear.

Patchbays are a series of I/O sockets, they should be balanced in 99% of all use-cases, they are normally made up of Tip Ring Sleeve (TRS), Tiny Telephone (TT), or External Line Return (XLR) connectors. A three conductor balanced connector is made up of a shield/ground, positive, and negative conductors. In a TRS and TT connector the tip is the positive, the ring (center section of plug) is the negative, and the sleeve is the shield/ground. In a three pin XLR connector, pin one is the shield/ground, pin two is the positive, and pin three is negative. Sometimes the rear of patchbays use DB25 (DSUB) connectors to save space. You may be familiar with these from their use as parallel port connectors. Other times the rear connections are made up as solder points which allow you to create custom permanent patch installations. In a typical patchbay there will normally be 24 channels with an I/O for each channel for a total

of 48 patch points. These points are organized in two stacked rows. Each column consists of two points. It is easiest to conceive of the vertical columns as a single channel, however, depending on how you wish to use a patchbay your channel configuration may differ. The flexibility of patchbays allows you to set up your channel routing configuration in many different ways depending upon your needs.

Visualizing the signal flow

There are 2 rows in a typical patchbay. By convention the top row is always outputs and the bottom row is always inputs. It is easiest to think about the outputs and inputs in relation to the gear that is being connected, rather than with respect to input and output of the patchbay itself. For example, the signal flows out of your device into the top row of the back of the patchbay and then into your device from the bottom row of the back of the patchbay. There's often a waterfall analogy applied here that the output signal flows through the top of the patchbay from back to front and then like a waterfall, flows to the desired bottom row point and continues through the patchbay from front to back and on to the input of the connected device.
Signal should never flow from the output of a device and immediately be routed back to the input of the same device. Any small signal disturbance will result in a feedback loop. You always want the signal going somewhere else prior to returning to the signal's origination point. This is where we get into the different typologies of patchbays, which are defined by their type of normalization mode: Normal, Half-Normal, and Thru (Non-Normal) are the 3 types of patchbay topologies which will now be described.

What is Normalling?

Consider that you would like for your studio gear to have default routes, two or more pieces that are always connected to make up a signal chain that you use consistently. Normalling provides a means of creating such default connections and patchbays come with different types, some even allow you to have multiple types within the same patchbay. These types are important to get a grasp of so you can really understand the power and versatility of a patchbay.
Normalling comes in three basic types. Normal, Half-Normal, and Thru (Non-Normal). Each type is defined by how the signal passes through the patchbay channel and is dependent upon whether or not a connector is inserted into none, one, or both front jacks in the channel. In other words, Normalling refers to the specific way that the internal wiring of the patchbay is switched and routed to create a signal path and how it is affected by available insert jack pattern scenarios.

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Normal Mode

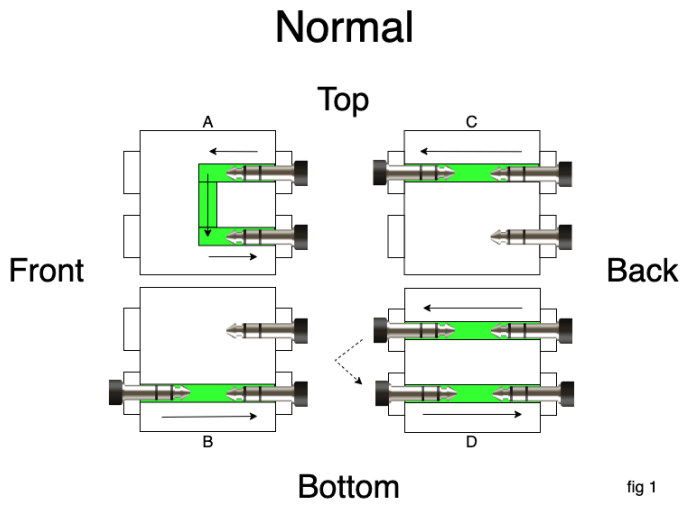

fig 1

The Normal mode type of connection default allows the signal to pass from the outputs to the inputs without the need for any type of cable connection on the front of the patchbay (fig 1 A). However, the signal from output to input is broken whenever a cable is plugged in to either the output or input points on the front of the patchbay (fig 1 B-D). This creates four possible patch configurations as illustrated in fig 1. Consider that you always want a default route from the output of one piece of gear to another but would like the option to break that route by inserting a cable to redirect the signal to a different path. In this example, you would connect the first piece of equipment's left and right outputs to two top row points in your patchbay, one column being the left channel and the other being right. Then the other piece of gear's left and right inputs would be connected in the bottom row, within the same vertical patchbay channels (columns). In this configuration the output signal of the first piece of gear will always flow into the input of the second piece of gear without needing to insert any cables into the front of the patchbay.

If you wanted to run a different signal path without having to change any of the cables on the back of the patchbay, or inside your rack, for that matter, you can simply insert a cable into the top row outputs on the patchbay to route that signal, breaking the default flow to the input, and send the signal to the input points of an alternate signal processor. Then, from the alternate gear you would run from the output patch points to the input points of the next desired processor, effectively rerouting your chain path however you wish. You can repeat this pattern as many times as you need to create your processing chain. In fig 1 B a signal is being returned to an input that is connected to the back of the same column. In fig 1 C a signal is being taken from the output where it can be routed as desired, and in fig 1 D, a signal is being taken from the output, routed somewhere, and then returned to the input that is connected to the back of that channel. One of the most important things to note about Normal mode is that any time a connection is made to the front, the default signal (fig 1 A) from output to input in that channel is broken (fig 1 B-D).

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Half-Normal Mode

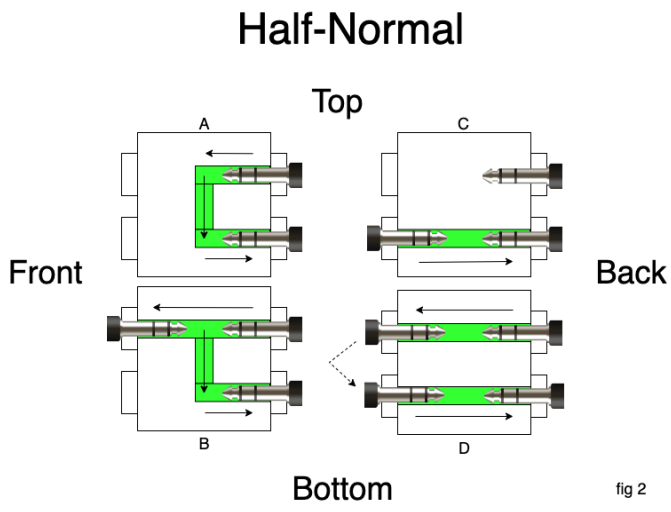

fig 2

Half-Normal mode is exactly the same as Normal with one distinct difference. Where inserting a cable in either output or input points breaks the default signal flow in a Normal connection type, only inserting into the input point (bottom) of a Half-Normal connection breaks the flow (fig 2 C-D). When inserting into the top (output) point (fig 2 B), the signal is not broken and you get a duplicated signal flowing through the cable inserted in the output. This is called “multing” a signal and is useful for inserting monitoring points at specific positions in the signal flow. You could set up parallel processing paths because the original signal continues to travel down the default path while the multed signal is routed to a different destination. In effect, you can create a virtual y-cable. Once you insert a cable into the bottom input of a channel though you will effectively break the normal connection, this is why the mode is named half-normal. The functionality of half-normal is the same in all other respects as that of the normal mode.

Non-Normal

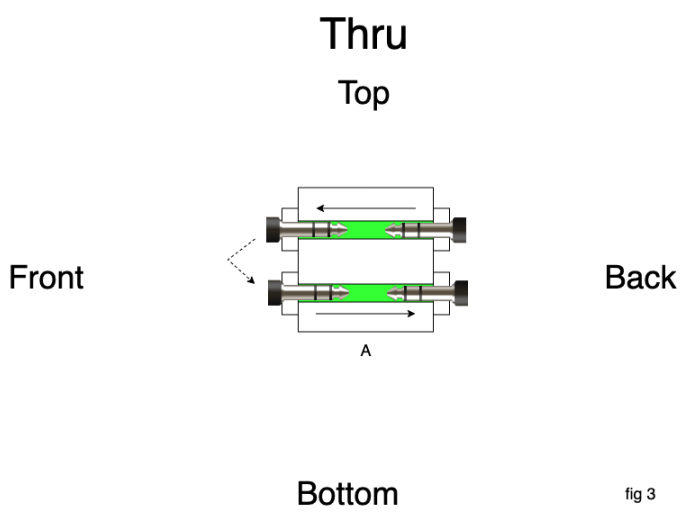

fig 3

Unlike Normal mode or Half-Normal mode, Non-Normal mode never has a default flow of signal from output to input. Only when you insert a cable and route it somewhere does the signal flow. The most common use-case for non-normal is when the output and input are not intended to flow together directly, for instance, the mixbus outputs and inputs could be stacked vertically in a Non-Normal patchbay channel and not have concern for creating a feedback

loop from a default internal connection made by the patchbay channel.

Conclusion

Patchbays allow you to create default connections. When used in Normal and Half-Normal modes, no additional cable routing is required to direct signals from and to intended default routes. In these cases, it is not necessary to physically rewire the components from behind the audio rack. Normal and Half-Normal types allow you to break default connections and create new routes by using patch cables from the front of the patchbay. Non-Normal patchbays prevent default routes, allowing you to stack connections that you do not want to be routed directly together. Patchbays allow instant creative freedom to try different routing configurations all the while maintaining a default configuration to return to. In every case, modifications of routing eliminate the need to get into the back of your rack to change cable configurations.
So do you need a patchbay? That's something you'll need to decide for yourself, determined by having outboard gear, the need for modification of routes, complex routing scenarios, and if you feel your creative flow is often blocked by time being taken to reroute cable connections.

Douglas Reynolds
Chief Mastering Engineer
Resonance Mastering
https://resonance-mastering.com

RESONANCE

MASTERING

Douglas works with client artists, studios, and businesses, providing audio mastering services for any genre, broadcast sync, radio, VO, podcasts, and advertising. Douglas has been working with sound and audio engineering since 1989.

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