

Let's Get Normal - All About Patchbays

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“Do I need a patchbay?” Though we don't hear that very much any more, it used to be a pretty common question from new studio owners. Nearly everyone who's been around a studio has heard about patchbays, but not everyone knows what they're about or useful one can be. Since I frequently refer to patchbays in my articles about studios and studio gear, it's time to explain them in detail

A patchbay is a collection of conveniently mounted jacks (sometimes known as a “jackfield”) that bring much (or all) of your studio's signal wiring together in one place, making it easy to re-route signals when your work calls for something out of the ordinary connections. Patchbays are traditionally used for analog signals, but in today's studios, there are also digital connections that need to be switched around from time, so now we have digital patchbays as well.

As with many things in our studios, we can thank The Telephone Company for patchbays. In the days before automated call routing, a telephone operator sat in front of a patchbay and connected one of the relatively few available telephone lines to whoever needed one at the time by plugging cables into jacks.

The term “patch” as applied to a synthesizer or effect processor dates back to the day when a synth was constructed of a rack of individual oscillators, gates, controllers and modulators. You created a sound by interconnecting them using patch cables.

Certain connections in our studios are essentially permanent (at least until you add or remove a piece of equipment), but others can change with the task at hand. Like the telephone operator, we can use a patchbay to easily connect the inputs and outputs of our limited resources to where they're needed at any given time. The vintage compressor that you used when recording the vocal on Track 3 last week might be needed on Track 6 for today's mixdown session. While you could reach behind the mixing console and move a couple of plugs, it's easier if you have a patchbay to bring the mixer's channel inserts and signal processor inputs and outputs out to jacks conveniently located on a front panel. Not only is it easier to make the connection that you need, but it's easy to see just what's connected to what.

Ideally, every connection point in your studio should run through the patchbay, and in a large professional studio, that's pretty much how it's done – every trip around to the back of the rack costs money. Smaller studios generally make compromises in the interest of economy, but even a modest sound card based studio can benefit from a patchbay. Patchbays scale and re-configure easily. You can start small, and once you get the hang of patching, you'll recognize when and where you need to expand and what connections you use most frequently.

Before getting too deep into the nitty-gritty of patchbay configuration, I'll concede that there are studio setups that don't really need a patchbay. One obvious such setup is the DAW-based studio where the sound card or audio I/O box has few inputs and outputs. Inputs go directly to the computer and outputs go directly to monitor speakers or headphones, with all signal processing, recording, and mixing performed in software or with integral hardware. In such a system, there's often one or more software control panels that serve the same function as a patchbay, either as part of the DAW program or as control software for the interface hardware. This gives you some I/O routing flexibility without changing connections to the outside world. There are also setups that never need to be re-configured because your work is limited to what you can do with everything directly wired. However, if you bring in outboard equipment to fill special needs, you'll probably eventually decide that a patchbay will save you some time or confusion.

Jack Soup

Audio equipment utilizes several common (as well as uncommon) types of connectors. One thing that a patchbay provides is a standard connector type for all of your changing connections. No matter what type of connectors are on your gear, you'll make all of your connections with the same type of patch cable.

There are a few different type of connectors used on patchbays, too. On the front or "business" side, you'll find standard headphone-style ¼" jacks, long frame telephone switchboard style jacks, RCA phono jacks, or a miniature long frame jack called Bantam or Tiny Tel(ephone). On the wiring side, you'll find solder or wire-wrap terminals, multi-pin connectors, punchdown terminals, or individual ¼" or RCA jacks. Occasionally you'll see an XLR patchbay or one for multi-pin connectors such as the DB-25, but those are often custom-built for special purposes.

With all those options, which one should you choose? The choice is usually dictated by your budget, your wiring skill and patience, and how much you value your time.

The Balancing Act

Audio patchbays can be wired either for unbalanced or balanced connections, meaning that the jacks carry, respectively, one or two signal wires plus a shield. While audio equipment with unbalanced inputs and outputs was fairly common in the early days of the personal or project studio, today, you'll most often find balanced connections.

Balanced patchbays use TRS (tip-ring-sleeve) jacks. Since they have more parts, they're a bit more expensive than unbalanced (TS) jacks but a balanced patchbay is nearly always a worthwhile investment. It won't compromise balanced signal paths, and most of the time, patching between balanced and unbalanced inputs and outputs will work. Even if you have some unbalanced gear, if you start out with a balanced patchbay, it'll be ready when you upgrade an unbalanced piece of gear to one with balanced connections. I've covered the various tricks and traps when mixing balanced and unbalanced connections in another article so I won't dwell on the subject here. Read up on it or simply take it as good advice to go with a balanced patchbay.

Channel inserts, one of the most common connections that you'll want to patch, can be a bit of a head-scratcher. Nearly all inserts are unbalanced connections using TRS jacks with the send (output) connected to the jack tip contact and the return (input) connected to the jack ring contact. This is a pretty standard arrangement, but occasionally you'll run into something with the send and return connections reversed at the jack. Since most of today's signal processors have balanced inputs and outputs, connecting them via a common TRS insert send/return jack will result in an unbalanced connection. This is a necessary evil, but in practice, it's rarely a problem. Occasionally you'll find a piece of gear that offers balanced inserts (typically using separate jacks for the send and return) which of course a balanced patchbay will accommodate without compromising the balanced connections.

Occasionally you'll run into a piece of balanced gear that doesn't like being unbalanced and you'll find yourself patching in hum, distortion, or silence (no signal getting through the patch cable). This is a fairly uncommon situation which you can usually work out on a case-by-case basis. The best approach is to use balanced jacks and cables, use balanced wiring as you can, and when you're done, test every possible combination of inputs and outputs so you won't be surprised in a session.

Being Normal

The basic patchbay layout consists of two parallel horizontal rows of jacks. Convention is to put outputs on the top row and inputs on the bottom row so that normal signal flow is from the top down.

Using a patch cable for every connection is not only awkward and messy, but it can get expensive, too. One of the things that make a patchbay practical is the use of "normal" connections between top and bottom jack pairs. In a normal-wired patchbay, a signal that comes into the top row jack of a pair is automatically connected to the jack directly below it without the need for a patch cable. A well thought out patchbay will pair up outputs and inputs that are normally (hence the name) connected most of the time, eliminating the need for

patch cables until you need to re-route your normal signal flow or add another device in the signal path.

Why waste all those patchbay jacks on things that are normally connected if it involves more cable, more possible points of failure, and more cost? Well, because life in an active studio doesn't stay normal for very long. There are many reasons to reconfigure things. Suppose the outputs of your 16-track recorder (remember those?) are normalled through the patchbay to console line inputs 1 through 16. As a result of some unplanned tracking, you ended up with a lead vocal on Track 2, backing vocals on Tracks 5 and 11, bass on Track 3, drums on Tracks 1, 7, 8, and 10, with guitars and keyboards scattered among the remaining tracks. We've all been there, all too often.

During mixdown, rearranging the console inputs in a more musically oriented manner can help preserve your sanity. For example, you might want to put the bass on Channel 1, the kick on Channel 2 where it's handy to balance with the bass, other drums on channels 3 through 5, group the guitars together on a set of consecutive channels, same with the keyboards, and put the lead and backing vocals on adjacent channels. Grab a few patch cables and it's done.

With most DAWs, you can record tracks as they come along and simply drag them around to get them into an order that makes sense for mixing, so you've probably done just that sort of reorganization if you work "in the box." If your virtual multitrack recorder has only a single pair of inputs and outputs (a stereo sound card, for example), you're no doubt familiar with the concept. But a patchbay, albeit a small one, can still come in handy so you can easily choose the right mic preamp for a track, or patch a compressor between the preamp output and A/D converter input.

Normaling comes in two flavors, full-normal and half-normal. With a full-normal jack pair, inserting a plug in either the top or bottom jack of the pair breaks the normally connected signal path between them. With a half-normal jack pair, inserting a plug in the bottom jack breaks the normal connection, but inserting a plug in the top jack leaves the normal output-to-input connection intact.

A half-normal configuration is most commonly used for studio patchbays. With a half-normal configuration, you can conveniently split the output and send it to two inputs – the one to which it's normalled and another to which you patch it.

One example of how this works is to split a guitar track to two channels of the console, one with EQ and effects for lead playing the other set up for rhythm playing. When mixing, it's easier to just mute one channel and unmute the other rather than changing all of those knobs. The DAW equivalent, given the unlimited number of tracks and mixer channels in a modern DAW, is to make a copy of the track and process the original and the copy differently.

Since most modern studio gear operates at “line” level (typically +4 dBu with 16 to 20 dB of headroom above that), with a low impedance output and a moderate input impedance, putting a double load on a source is rarely a problem. You need to keep your wits about you with half-normal patching, however. If you patch an output somewhere without patching something into its corresponding input (as you’d do when splitting an input) you might wonder why you’re hearing that track when you think you’ve turned its fader down. You need to remember to mute the normalled path when you don’t need it.

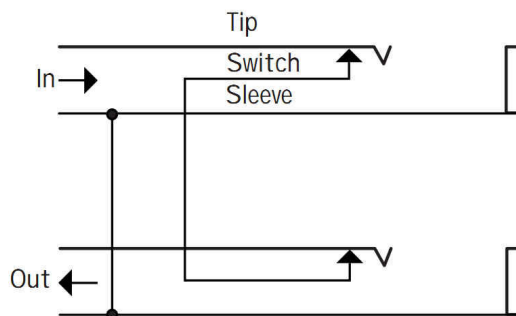
A full-normal configuration eliminates that source of confusion, but it also precludes this simple “mult” connection path. One useful application of a full-normal patchbay is for patching microphones (which isn’t always advisable due to the low signal levels and phantom power). Since the load impedance is a significant factor in determining the sound of a microphone, and since most mic preamps have a fairly low input impedance, the mic may sound different when connected to two inputs than when connected to a single input. In a full-normal configuration, inserting a cable in the top (mic output) jack disconnects it from its normal preamp input, eliminating the “double load” problem. However, patching microphones is fairly rare other than in multi-room studios, so quite possibly you will never have need for a full-normalled patchbay.

What makes normalizing tick? A phone jack has a springy metal finger that makes its electrical connection by pressing against the tip or ring section of the plug. A normalled jack has an additional contact point positioned so that without a plug inserted, the finger touches this contact, making an electrical connection and passes whatever is connected to the tip contact on to the normalizing contact..

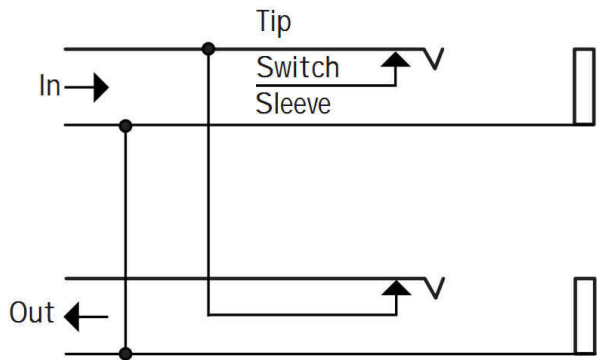


When a plug is inserted, the finger is pushed away so it no longer touches the normalizing contact. This acts like a switch, breaking the normal connection.

The diagram to the right shows a pair of jacks wired in the full normal configuration. Unbalanced (tip-sleeve) jacks are shown for simplicity. Balanced jacks work the same way only with two sets of contacts, one for the tip and one for the ring. Without a plug inserted in either jack, the signal comes in through the terminals for the upper jack, flows through both sets of normalizing switch contacts, and goes out the lower jack’s terminals.



Inserting a plug in either jack breaks the normal in-to-out connection. The input signal is connected to the plug that's inserted into the top jack, flows through the patch cable, and out of the jack at the other end of the patch cable.



The diagram to the left illustrates a pair of half-normal wired jacks. In this configuration, the switch for the upper jack isn't used. The incoming signal, in addition to being connected to the jack's tip contact, is connected to the switch contact on the lower jack. With no plugs inserted, like the full-normal configuration, the signal flows from the input of the pair to the

output. Inserting a plug in the upper jack doesn't break the connection from input to output, but inserting a plug in the lower jack pushes its switch open. This replaces the normal output to the bottom jack with the signal carried by the patch cable.

You don't necessarily want all of the jack pairs on your patchbay to be normalled. For example, it's conventional to have the output and input of a signal processor wired to a pair of jacks, but you don't want its input connected to its output when it's not patched. Most patchbay jacks can be configured to be either normalled or not either by wiring or some means of switching, though some jacks have a permanently-built normal connection that requires some surgery with a hacksaw to un-do. These are probably best avoided unless you find yourself stuck with one that was a really good deal (or so you thought) on eBay.

Jacks of All Trades

If you go patchbay shopping at your local dealer or the many "big box" on-line music retailers, you'll most often see patchbays with front panel jacks that accommodate 1/4" phone plugs for either balanced (TRS jacks) or unbalanced (TS jacks) connections. Most of the patchbays sold through MI dealers are what we call "pre-wired," with jacks on the rear as well as the front. This is a convenience feature, allowing you to add a patchbay to your system using off-the-shelf cables or "snakes" with no soldering or special tools required. The extra set of jacks on the rear adds another potential point of failure (jacks can corrode, or a cable might get pulled loose), but, particularly if you don't have a very large setup or you're not skilled at soldering and assembling cables, the convenience is worth the risk.

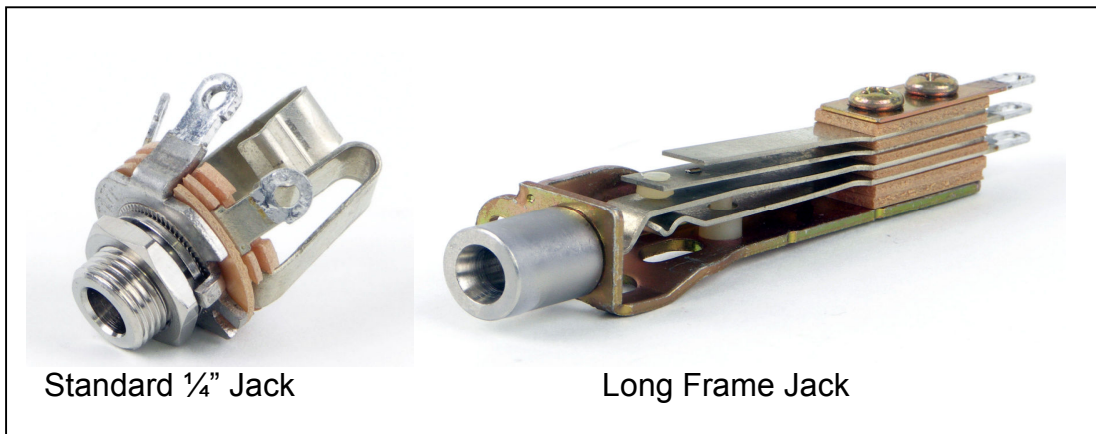
There are a couple of variations on the pre-wired patchbay that, if they are applicable in your setup, can save you some wiring time and errors. One type of pre-wired patchbay is equipped with multi-pin connectors on the rear side

such as the common D-subminiature DB-25 or Elco connector (used on ADAT recorders). These connectors are wired to groups of eight jacks on the front panel and are convenient for connecting inputs or outputs of a multitrack recorder or multi-channel audio interface to the patchbay using a pre-wired snake. Nearly all of the patchbays with DB-25s on the rear use the TASCAM analog wiring convention or Elcos that match up with the ADAT recorder wiring.

Another pre-wired variation is specifically for patching unbalanced channel insert sends and returns. Each TRS jack on the rear panel breaks out to a pair of half-normalled jacks on the front. When the rear jack is connected to the console's insert jack using a "balanced" (TRS on both ends) cable, the normalling contacts on the front jacks maintain the signal flow through the channel until you plug something into the bottom (return) jack. The top row of jacks also can serve as direct outputs, though just how "direct" depends on the device. With most new gear, insert sends are fed directly from the mic preamp output, but on some, particularly older, consoles, it might come after the EQ section or even after the channel fader.

A popular way of building a pre-wired patchbay is to mount each set of four (or three if it's an "insert" patchbay) jacks on its own circuit card, with the patchbay frame serving as a rack for the cards. Clever wiring of the card allows it to be reversed front-to back and turned upside down two switch from full-normal to half-normal, or to make the insert send jack always be on the top row regardless of whether the send is on the tip or the ring of the insert jack.

The type of jacks used in the original telephone patchbays are called long frame jacks for the obvious reason that they extend further beyond the panel than a common headphone or panel jack. In Europe, they're called B gauge. The heavy supporting frame and long contact fingers makes these jacks more sturdy and reliable, but also more expensive than the more common 1/4" jacks. Long frame jacks are also designed to take a slightly different shaped plug.



Standard 1/4" Jack

Long Frame Jack

The body of the long frame plug is $\frac{1}{4}$ " in diameter but the tip and ring are slightly smaller in diameter than the main body. This is so the two signal leads make contact simultaneously after the shield is connected, and the plug tip doesn't momentarily touch the ring contact on its way in. This was important to the telephone company (and if you're patching phantom powered mics) to avoid putting a DC voltage where it shouldn't be. All long frame jacks that I've seen have been of the TRS configuration, though some designed for special purposes are built with only a tip contact.

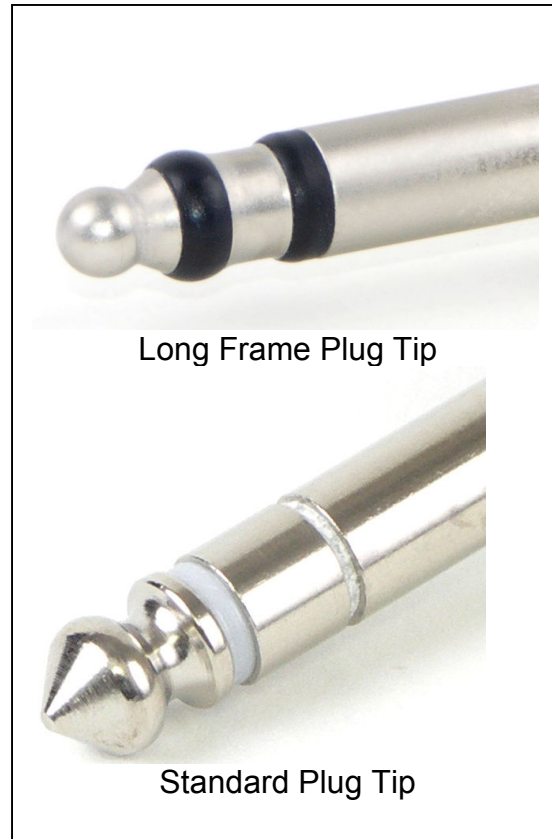
Long frame patchbays are expensive when purchased new, but can sometimes be found for \$10 - \$20 at hamfests or electronic surplus stores. They might be in need of a

good cleaning, but they rarely wear out. Long frame patchbays are what the pros use, but there are some caveats. See the sidebar for the gory details.

Bantam or Tiny Tel(ephone) patchbays use a half-size version of the long frame jack and matching plug. They tend to be popular in studios because you can fit twice as many jacks in the same size panel as with $\frac{1}{4}$ " jacks, but they tend to be outside the budget for most personal or project studios. They require plugs that you aren't likely to have laying around the studio. If you use Bantam patchbays, prepare yourself for "visitors" by buying or building a few longer cables with a Bantam plug on one end and standard $\frac{1}{4}$ " plug on the other.

What's Normal?

When planning your patchbay, you must decide which connections will be normalled, which will regularly be patched, and which will never be changed and therefore need not go through the patchbay. Even two identically equipped studios may have their patchbays set up differently because of the work that they do, but there are certain things that nearly always make good sense to bring into the patchbay. The following suggestions are by no means comprehensive or "must-haves" but they will get you thinking in the right direction.



Insert jacks on a mixing console or computer audio I/O box are good candidates for your patchbay since you usually have many more channels with inserts than things to patch in line with the channel. Also, what you patch into the signal path depends on what's going through the channel at the time. You may want one compressor if you're recording a vocal through that channel and a different one if you're mixing a bass. Since insert jacks are always normalled in the mixer, when you'll want to break these out to a pair of normalled jacks on the patchbay in order to preserve the signal flow when you're not patching in a piece of outboard gear.

Since most 1/4" patchbays have 24 or 26 jacks per row, one possible layout for a 16-channel console is to connect the inserts to normalled jack pairs 1-16, then use the remaining eight jacks pairs in those rows for the inputs and outputs of the processors that you're most likely to use in the channel paths. You don't want the the processor I/O jacks normalled, so be sure your patchbay can be configured for normalling or not. In keeping with the Golden Rule of Patchbays, insert sends and processor outputs go on the top row of the pair, insert returns and processor inputs go on the bottom row.

Since I'm always mixing through my console – for monitoring during tracking and mixing during mixdown, I have one auxiliary send normalled to the input of a reverb and another normalled to the input of a delay. The outputs of those processors are normalled to console effect returns. Since I frequently use a little reverb while tracking, even though it may not be the reverb I'll use when mixing, having it available without patching is convenient. If I want to use a different reverb during mixdown, I have easy patching access to the sends and returns.

It's fairly common to normal multitrack recorder outputs to console line or tape return inputs, but sometimes it's difficult to decide what, if anything, to normal to the multitrack recorder or I/O box inputs. If the console has subgroup bus outputs, those are good candidates for normalling to multitrack recorder inputs. This will allow you to route a mix of a few inputs, for example, keyboards or toms, to a single or pair of tracks by using a combination of the mixer's bus assignment switches and pan pots.

Alternatively, and most common today, you can patch a mic preamp or channel direct output to a recording input, bypassing some of the console's electronics. This is a bit of an old-school vs. new-school thing. Subgroups were frequently used when tracking a full-band session since with a finite number of tracks available, it was necessary to submix some sources live. With today's DAW's unlimited track count, the limit to how many sources you can record to individual track in a pass is determined by the number of inputs on your audio I/O hardware, which may be as few as two, and not very often more than eight.

If you use outboard mic preamps, putting their outputs on the patchbay will allow you to connect them directly to recording inputs. Same for channel direct outputs, so you may be tempted to normal direct outputs to recorder inputs. That can work for some applications, but it can also mean that you'll end up patching a lot.

A place where normalizing direct outputs or outboard preamps to inputs works fairly well is, as is often the case today, when using a multi-channel I/O box as the front end to a DAW setup. Since in the DAW, you can select any audio stream from the I/O box as the source for any track, you can think of the track input source selection in the DAW as a sort of a patchbay. If you have a mic connected to Channel 1 of the I/O box, you can "patch" that mic/preamp combination to any track simply by selecting that channel as the source for the track you're recording. If, for example, you have four "flavors" of mic preamp, you could normal those to four inputs of an 8-channel I/O box and use any of those preamps for recording to any track without using a patch cable. You might want to normal one or two keyboards that you use all the time so they'll always be available without patching.

One thing to be aware of is that many of this generation's I/O boxes and even mixing consoles that have built-in mic preamps (and most do, at least for some of the input channels) don't have switches to select mic or line input for the channels. This is one of the design compromises that makes these gadgets so affordable. Some use XLR-TRS combo jacks, allowing you to plug in either a mic or line level source, but there's only one hole so you can't have both connected and switch between them. Others have separate connectors for mic and line inputs, but connecting to one disables or cripples the other. This can be a real nuisance in a complex setup and unfortunately it's something for which a patchbay can provide only a partial solution. Consider how you most frequently make use of the inputs you have. If you never use more than two mic inputs on your I/O box because you have a bunch of outboard preamps, then connect six line inputs to your patchbay and use the other two channels for the mic inputs. Or it could be the other way around.

If your studio is based on a simple stereo in/out sound card and you don't have a hardware mixer at all, is it worth using a patchbay? Sometimes yes, sometimes no. If you have a lot of sources to connect to those two inputs, a patchbay is convenient. If you do everything with one mic and one guitar, you can probably live without the capability to freely patch inputs. You might want to be able to patch the outputs to a headphone amplifier for tracking and speakers for mixing, so maybe just a little bitty patchbay? Though the class of device known as a Monitor Controller could do the trick.

Patchbays are essentially modular, that is, they're nearly all built as two-row strips of 24 or 26 jacks each (or typically 48 jacks for Bantam patchbays), so you can start with one strip of jack to handle your inputs and input sources and build it up as you find the need. While not everything needs to be normalled, some

things logically go together, so you'll want to wire them to groups of jacks which are physically close together. For example, you might want to put all of your compressors on adjacent (and not normalled) jack pairs.

Since not every device has the same number of inputs and outputs, nor will every source be normalled to a destination, you may have something connected to a top row jack with nothing connected to its corresponding bottom row jack, or vice versa. This is OK. You can use some of those orphan jacks to create "mults" for splitting an output to more than one destination by connecting them together on the wiring side. Another use for orphan pairs is to make polarity inverters by tying the tip of one jack to the ring of the other. But be sure to label them clearly as such, and remember that polarity inverters wired in this manner will only work with balanced connections.

Wiring

Adding a patchbay to your system involves much more than simply opening the carton and plugging in a few cables. It's a real installation and requires quite a bit of additional wiring. Some folks who have learned that short wiring paths are important for a noise-free system have reservations about adding a patchbay due to the added cable lengths in the signal path. Most modern studio gear, even "semi-pro" gear with -10 dBV unbalanced connections, has a sufficiently low output impedance to be able to drive any reasonable length of cable. Your only concern is the possibility of greater sensitivity to EMI fields due to long unbalanced cable runs, but decent quality cable can mitigate this risk. Balanced connections at +4 dBu nominal operating level, or even microphone cabling, almost never suffers from extending cables to include a patchbay.

Most jack contacts are very reliable. At least they used to be, but some jacks, have been showing up, mostly on gear rather than patchbays, and mostly offshore-made, that tend to be less robust. Quality has its price, and it's worth avoiding the cheapest construction. As long as you keep jacks clean with a little routine maintenance, noise, hum, or distortion through a patchbay won't be a problem. Cost for patchbays (you'll probably need more than one bay) as well as the added cabling, can be significant, though. You'll have to decide when the convenience becomes worthwhile for you.

The simplest patchbays to install are the pre-wired ones with ¼" jacks on the front and rear. Just plug cables into jacks, set up each jack pair for normaling or not, and you're ready to start patching. Because there's no soldering or tools involved in making connections, this type of patchbay is also the easiest to re-configure, which you may want to do after living with your arrangement for a while, or when adding new gear. Figure that installing a 48-jack (24 in/out pairs) patchbay including pre-made cables will cost about \$300.

You can still occasionally find bargains on the surplus market, though most surplus patchbays will have solder, wire-wrap, punchdown, or multi-pin connections. Some also may have normalling jumpers as an integral part of the mechanical assembly, and you are more likely to find these configured as full- rather than half-normal. Using hand-wired patchbays can be time consuming, but it can be inexpensive, and unless you get someone's retired studio junk, you'll find really high quality jacks because they've been used in professional applications. However, new long-frame patchbays with solder or punchdown terminals are substantially more expensive than pre-wired patchbays.

While I don't usually encourage beginners to make their own cables (commercially made cable assemblies are usually highly reliable and usually cost just a bit more than the parts alone), there are certain benefits to using custom cables for patchbay wiring, particularly if you're using patchbays with solder terminals. If you have to solder one end, you might as well solder the other. Since you'll be using a lot of connectors, buying them in bulk rather than off the rack at your local music store can save quite a bit of money. Buying a 500 foot roll of cable and 100 plugs will save you a bundle over buying 50 ten foot pre-made cables. Your reliability will be only as good as your soldering skill, but if you don't know how to make good solder joints before you start wiring a patchbay, you surely will by the time you finish! And by making your own cables, you can use a 7 foot cable when that's the length you need rather than a 10 foot off-the-shelf cable.

A slick way to install a wire-it-yourself patchbay if you have the space is to wire the jacks to a barrier terminal strip or punchdown block which you mount in the rear of a rack. Only having to wire directly to the jacks once makes it easy to re-configure your wiring when the need arises. An alternative to making all of your own cables is to order them custom made by companies like Whirlwind or Gepco. They buy in such huge quantities and have all the tools and trained assemblers, so they can make cables to your specifications for just a little more than it will cost you for the parts. It's worth investigating, particularly if you're planning a large patchbay.

Grounds and Shields

It's good practice to keep cable shields intact from end to end, though you may occasionally need to break the connection between shield and ground at one end to fix a ground loop problem (that's another article), Therefore it makes sense to include the patchbay in your shielding scheme, connecting shields to sleeves at every jack and patch cord plug. This is no problem if your jacks have individual terminals, but some patchbay jacks which are built as pairs have the two sleeves physically (and therefore electrically) connected together as part of the mounting assembly. Normally (pun inevitable) this is no problem, but you could end up with a secondary ground path when patching between two pieces of equipment.

Sometimes the patchbay can serve as the hub of a star-grounded system. All the jack sleeves are connected together at the patchbay and this becomes the single ground point for the system. This can work but you need to be very careful about ground wiring throughout the system. It's really best to use jacks that are electrically isolated and just carry your grounds through the patch cable shield.

Documentation

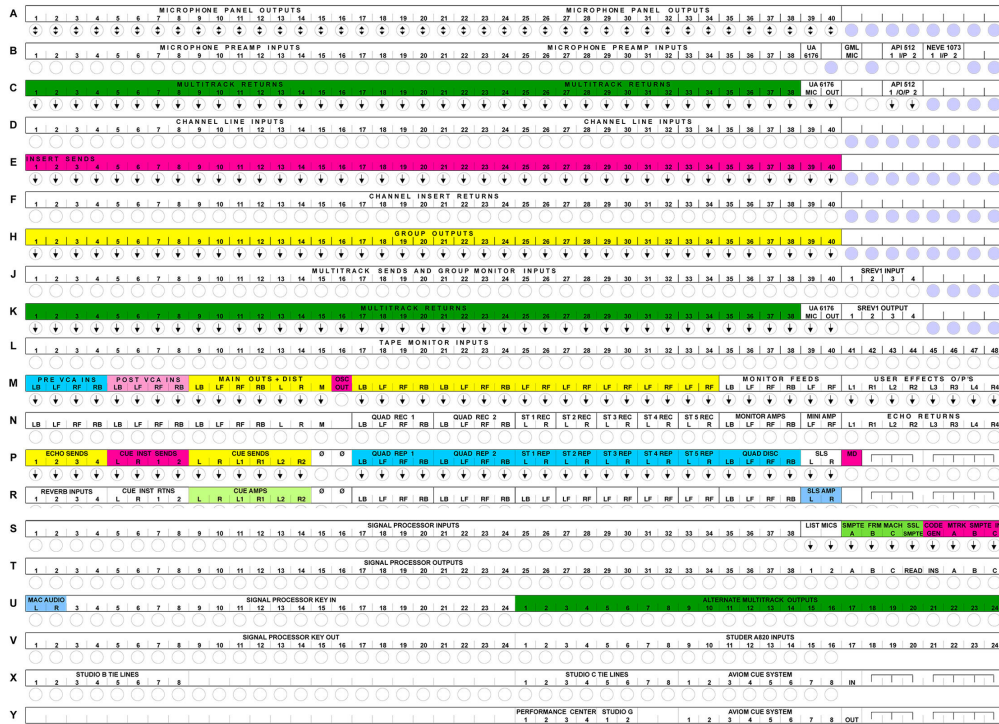
The best way to plan out your patchbay is to start with a big piece of paper, draw a block diagram of your whole studio showing all the inputs and outputs of every piece of gear that you have, whether they're connected or not. Regardless of your physical layout, it's probably easiest to draw the patchbay in the middle of the sheet with everything else surrounding it. Now, draw lines between inputs, outputs, and patchbay jacks for what you think you'll want as normal connections. Finally, add lines for things that you'll want on your patchbay as "patch when needed" connections. Study your diagram and make sure you've come up with a scheme that will work for you. It's a lot easier to erase a line on paper than it is to re-solder a cable. This drawing will become your guide to wiring as well as documentation for when you need to change or troubleshoot something.

It's very important to label the jacks in a meaningful way so you won't have to search too hard for what you're trying to patch. Patchbays come with label strips that you can write on, but I find it more convenient to print labels on plain paper using my computer. There are a few label templates floating around on the Web, mostly as Word or Excel formats. Not all jacks use the same side-to-side spacing (some are even spaced as pairs) so make sure the template you use matches the jacks in your patchbay. Most 1/4" patchbays have label strips that are wide enough so you can use two lines of text and still have it readable. For example, you might have the top line say "Channel Inserts" centered over a group of 16 jacks, with the bottom line having the numbers 1 through 16.

Because of the closely spaced jacks on a Bantam patchbay, it's nearly impossible to make plain language labels without using a font that you'll need a magnifying glass to read. Often colored backgrounds will be used to indicate different functions. For instance, your compressors could have an orange background and just numbers 1 through 8, with labels on the hardware to tell you which number on the patchbay corresponds to each unit.

Whirlwind has an excellent planning tool which you can download from their web site: <http://whirlwindusa.com/media/uploads/downloads/manuals/pb48wksh.pdf> It includes fields for cable lengths, connector types, and also how each cable is labeled on the gear end so you'll know where it goes when it's time to plug things together.

Here's an example of a patchbay that's probably bigger than you'll ever build, but it shows a lot of possibilities as well as clear labeling. This is from a studio at Berklee College:



Patchbay Maintenance

While there's nothing to burn out or align, patchbays do require a bit of TLC. If you don't have a spray can of Caig DeoxIT D series contact cleaner, get one. A light spritz into the jacks every few months will keep the jack contacts clean. After spraying the jacks, insert and remove a plug a few times to spread the cleaner around to where it'll do the most good. Spray some DeoxIT on a cloth and wipe your patch cord plugs with it occasionally to keep your patch connections noise-free.

If you're using a patchbay with long frame jacks, you might also have some of the old patch cords with unplated brass plugs. Just like Grandma's candlesticks, these brass plugs will tarnish and need to be cleaned when they get too cruddy. Pick up a can of Brasso or Red Bear brass polish in the kitchen department of your local department store and shine 'em up.

Pulling The Plug

There isn't a lot of high tech electronics involved in an analog patchbay. It's mostly a mechanical thing. A patchbay with good jacks lasts a lifetime, one with

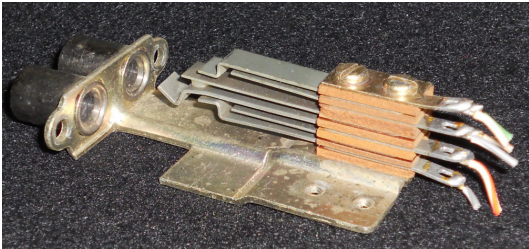
inexpensive jacks will work fine for a while, but will probably not last through too many studio upgrades before it's worn out. You should have a good understanding of mixing balanced and unbalanced connections because you're sure to encounter at least a few when setting up and using your patchbay.

When you get tired of digging through the spaghetti mess behind your rack to patch in a signal processor or move a synth to another mixer channel, you'll know it's finally time to invest in a patchbay. Patching digital signals is more involved and deserves (and gets) an article of its own. Stay tuned.

Bonus Track – Trips and Traps with Long Frame Jacks

Long frame jacks often show up on the surplus market or at hamfests. Typically they're cheap or even free though some sellers who don't realize that practically nobody uses these any more will just look at new prices and try to get too much money for them. Although new long frame patchbays are still being made and sell for every bit of what they're worth, "experienced" ones should be available for \$20 tops. There are some things to watch out for, however, or else you'll find yourself with a piece that's too large for a doorstep and too light for a boat anchor.

Many long frame jacks are built as pairs with contacts stacked up on a single piece frame. Often (though not in this example) there's a jumper made of a single stamped piece of brass that connects the appropriate parts of the top and bottom stack for normalling. Since half-normalling is rarely used outside of recording studios, nearly all of the jacks on this type of patchbay are configured as full-normals. You *can* use a full-normal patch bay in the studio, and you'll want one if you're going to use it for microphones, but it's not as flexible for general patching as a half-



normal bay. I've used a jeweler's saw to cut the normalling jumpers and then soldered wires to configure them as half-normal, but I'm a real cheapskate. Better to watch out for these fixed-normal jacks and stay away from them. There are plenty of long frame patchbays either with solder or punchdown terminals that you can configure either way. Look for those.

Since the tip and ring sections of a long frame plug are smaller in diameter than those of a more common 1/4" phone plug, inserting a standard 1/4" TRS plug into a long frame jack pushes the contacts further away from their resting position than they're supposed to go. You can get away with plugging in a regular 1/4" plug for the occasional emergency (though a mastering engineer friend of mine defends

his patchbays against this with a vengeance) but using them all the time rather than using patch cords with the proper plugs will eventually cause the jack to fail.

Long frame patch bays are almost never “pre-wired” with individual jacks on the back. Sometimes you’ll find them wired to telephone connection blocks known as “Christmas Trees” (when you see one, you’ll know why) or the more modern telephone punchdown blocks (66 block). These are convenient for wiring, but require a special tool to seat the wire properly in the terminal. ADC has their own style of solderless punchdown terminal on the rear of the jack which requires an extra special tool. The most common configuration of long frame path bays, however, is with solder terminals. This makes for a serious do-it-yourself wiring job.



While Bantam jacks are available with solder terminals, many of them are built with some sort of multi-pin connectors to go to the outside world, usually in groups of eight. Bantam patchbays designed specifically for studio use typically have DB25 connectors wired to the TASCAM analog standard. Bantam patchbays that have done telephone duty usually have a 50-pin Blue Ribbon connector, the type that used to be standard for multi-line keyset telephones. The best way to deal with one of those is to simply cut the wires at the jack, remove the telephone style connectors, and just solder to the jacks.

Another thing to watch out for when looking at “retired” long frame patchbays is that the telephone system doesn’t use the sleeve (ground) of the jack in the signal path. Often there is no sleeve connection point at all. Long frame patch cords made for use with audio patchbays are built with shield cable and have the shield connected to the sleeve on both ends but the long frame patch cables that you’ll find at surplus sales are usually unshielded. These will break your ground connection which may be tolerable for a balanced circuit, but won’t work with an unbalanced circuit. Be sure you know what you’re using.