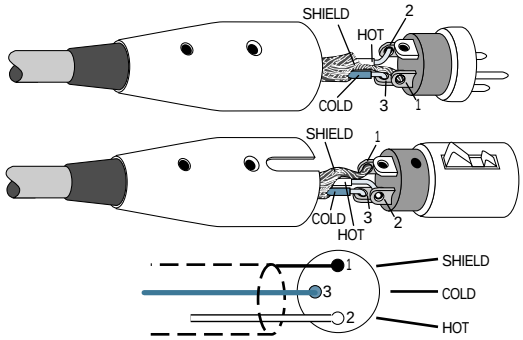
A Connector Compendium

XLR Connectors

Mackie mixers use 3-pin female XLR connectors on all microphone inputs, with the industry standard wiring convention: Pin 1 to the shield, pin 2 to the "hot" (positive polarity) side of the audio signal, and pin 3 to the "cold" (negative polarity) side of the signal.

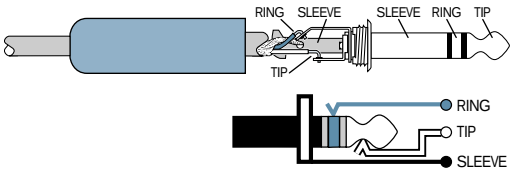


A standard "mic cable" mates with these inputs.

We also use 3-pin male XLRs for the balanced Main line outputs on most models and a few other assorted outputs on some models. These connectors are also wired as pin 1 ground, pin 2 high, and pin 3 low. You can use a mic cable to connect to those, also. Depending on where the signal goes next, you may need a hybrid cable with an XLR female connector on one end and something else (most often a 1/4" TRS plug) on the other.

1/4" TRS Phone Plugs and Jacks

TRS stands for Tip-Ring-Sleeve, the three connections on a "stereo" 1/4" phone jack or plug. TRS jacks and plugs are used in several different applications:

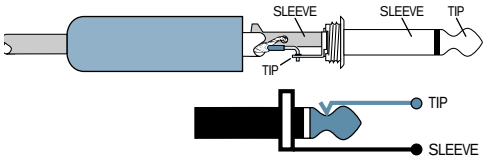


- Stereo headphones, and rarely, stereo microphones and stereo line connections. Conventional stereo headphone wiring is tip for left, ring for right, and sleeve to common ground and/or shield.
- Balanced mono circuits. When wired as a balanced connector, a 1/4" TRS jack or plug is connected tip to signal high, ring to signal low, and sleeve to ground.
- Unbalanced Send/Return circuits. When wired as a send/return connector, a 1/4" TRS jack or plug is connected as tip to signal send (output from mixer), ring to signal return (input back into mixer), and sleeve to ground.

Mackie mixers do not directly accept single-plug type stereo microphones or line-level sources. If you want to use such a microphone, you'll need an adapter that splits the stereo plug into two XLR or TRS plugs, one for each channel.

1/4" TS Phone Plugs and Jacks

TS stands for Tip-Sleeve, the two connections on a "mono" 1/4" phone jack or plug. TS jacks and plugs are used in many different applications, and are always unbalanced. The tip is connected to the audio signal and the sleeve to ground.

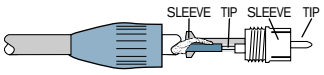


Some examples:

- Unbalanced microphones
- Electric guitars and electronic instruments
- Unbalanced line-level connections

RCA Plugs and Jacks

RCA or "phono" plugs and jacks are often used in home stereo and video equipment and in many other applications. They are unbalanced, and electrically identical to a 1/4" TS phone plug or jack. Connect the signal to the center pin and the ground or shield to the surrounding "basket." Mackie uses RCA jacks for TAPE inputs and outputs on many mixers. Adapters to convert an RCA male plug to male 1/4" TS plug are available at any electronic shop, like Radio Shack®.

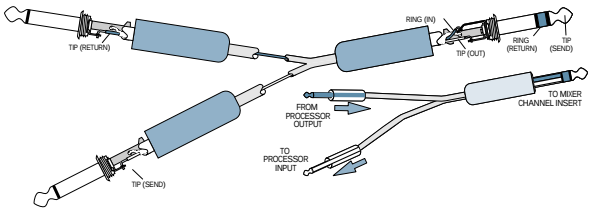


Insert and Y Cables – Similar but Very Different

Insert Cable

A specially wired cable is used for connecting the input and output of a processing device to the INSERT jack on a Mackie mixer. This cable has a TRS plug to mate with the INSERT jack and two TS plugs to connect to the processor input and output.

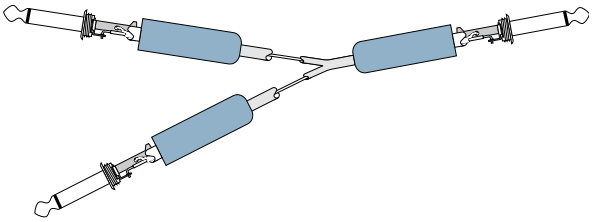
It's important to know which TS plug is the gozinta and which is the gozouta. Some commercially built Insert cables have them marked Tip and Ring, referring to the contacts on the other (TRS) end. Since some consoles wire the send and return opposite that of the Mackie, you usually won't find one off the rack that's marked "Send" and "Return." To save confusion, it's a good idea to identify and mark yours. A neatly printed paper label laid on the connector body and secured with clear tape won't smudge and will stay in place as long as you want it to.



Remember – a SEND goes to an INPUT, a RETURN comes from an OUTPUT. Hook them up backwards and your processor won't process.

Y-Cable

Sometimes called a "mult," a Y cable is used to split an output so you can send it to two inputs. We've shown Y-cables in multitrack recorder hookups where a bus output is split off to two recorder track inputs. You can also use a Y-cable to connect a track output to two inputs of the console where you may want to pan or EQ the track differently in two places in the mix.



A Y-cable can have either TRS or TS plugs (or even RCA plugs) on both ends, but unlike the Insert cable, it has the same wiring on all branches, though sometimes it's convenient to have connectors of the opposite gender on opposite ends of the cable so you can use it "in line."

Sometimes a Y-cable can be used to combine two outputs and send them to a single input. One application is to get a mono signal from a device that has only a stereo output. How well this works is a function of the characteristics of the outputs you're combining. Most of the time you'll be OK, but occasionally you'll find an output that isn't happy driving the low impedance of another output. Experiment, and listen for distortion.

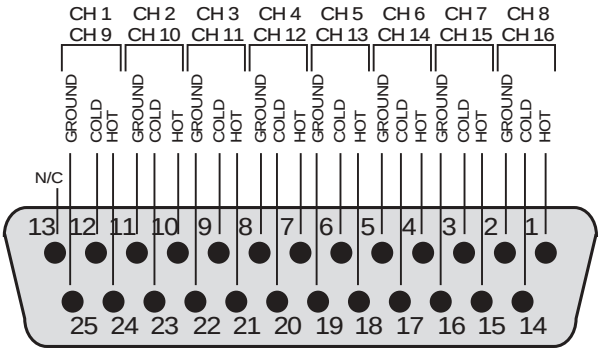
D-Subminiature Connectors

The Onyx series, including the 800R mic preamp, use a 25 pin female D-Subminiature (often called DB-25) connector for eight balanced direct outputs (four on one of the two connectors on the Onyx 1220). It's the same connector and the same pinout as used for the 8-channel analog inputs on the Mackie digital recorders and mixing consoles.

The 800R has a built-in A/D converter, so we've also provided eight line-level inputs on a DB-25 connector to connect line sources to the converter. The wiring for inputs and outputs is the same.

Here's how this connector is wired.

	Signal Description	REC OUTS 1-8	REC OUTS 9-16		Signal Description	REC OUTS 1-8	REC OUTS 9-16
Pin 1	+	Ch 8	Ch16	Pin 14	–	Ch 8	Ch16
Pin 2	shield	Ch 8	Ch16	Pin 15	+	Ch 7	Ch15
Pin 3	–	Ch 7	Ch15	Pin 16	shield	Ch 7	Ch15
Pin 4	+	Ch 6	Ch14	Pin 17	–	Ch 6	Ch14
Pin 5	shield	Ch 6	Ch14	Pin 18	+	Ch 5	Ch 13
Pin 6	–	Ch 5	Ch 13	Pin 19	shield	Ch 5	Ch 13
Pin 7	+	Ch 4	Ch 12	Pin 20	–	Ch 4	Ch 12
Pin 8	shield	Ch 4	Ch 12	Pin 21	+	Ch 3	Ch 11
Pin 9	–	Ch 3	Ch 11	Pin 22	shield	Ch 3	Ch 11
Pin 10	+	Ch 2	Ch 10	Pin 23	–	Ch 2	Ch 10
Pin 11	shield	Ch 2	Ch 10	Pin 24	+	Ch 1	Ch 9
Pin 12	–	Ch 1	Ch 9	Pin 25	shield	Ch 1	Ch 9
Pin 13	N/C	- - - -	- - - - -				



This wiring convention is shared by Mackie, Yamaha, TASCAM, and perhaps other makers. Audio cables with a male DB-25 connector on one end and eight 1/4" (either TRS or TS) or XLR (either male or female) connectors on the other are available off the shelf.

You can also buy audio cables with male DB-25s on both ends for connecting your Onyx mixer directly to your HDR24/96 recorder. A dirty little secret is that a computer "modem" cable will probably work for this application in a pinch. Those cables, unlike multi-pair cables designed to carry audio, aren't build from shielded pairs. They're just 25 wires in a bundle wired pin-to-pin on both ends. But because outputs and inputs are balanced, and you're connecting line levels, unless you're in a place with a lot of EMI, you may be able to get away with using unshielded cable. Don't make a habit of this, but if you get to a show on Saturday evening and the band asks if you can record them, and you just happen to have your HDR in the back of the truck but didn't bring the right cables, the closest Radio Shack might let you fulfill this request (and get paid a little more for the gig).

Digital DB-25

We (as well as a number of other manufacturers) also use the 25 pin D-Subminiature connector for digital connections. Here things get less standardized and it's best to consult your equipment's manual for the correct wiring. Be aware that this connector is used both for AES/EBU and TDIF connections, and their wiring is very different (as well as being different from multi-channel analog).

To further complicate matters, alternate wiring configurations have been used by different manufacturers. Mackie and Yamaha share a common pinout, Otari and Digidesign have two other versions. Since a single traditional AES/EBU wire pair carries two channels, 25 pins is sufficient for eight channels (four pairs) in and out on the same connector. When connecting devices that have both digital inputs and outputs, the cable should be wired in a "cross-over" mode, so a pair of output pins connects to a pair of input pins. When using higher sample rates (88.1 kHz and up), there's a "dual wire" convention (the HDR24/96 uses this) that carries one channel (rather than two) on each pair of wires, so you get only four channels of digital I/O using this setup.

Patchbays - Let's Get Normal

"Do I need a patchbay?" is a common question. We've mentioned patchbays in passing, now it's time to explain them in some detail.

Basically, a patchbay is a bunch of conveniently mounted jacks that bring all your audio wiring together in one place. A patchbay makes it easy to reroute signals when your work calls for something out of the ordinary (which, any experienced studio engineer will tell you, is all the time).

As with many things in the studio, we can thank the telephone company for patchbays. In the days before automated switching, a telephone operator (be it in a city or an office building) used a patchbay to connect one of the few incoming phone lines to the individual home or office being called.

What To Patch

Certain connections are essentially permanent in a studio, but others frequently change with the task at hand. Like the telephone operator, with a patchbay, we can move our limited resources to wherever they're needed. That compressor you used on Channel 3 while tracking vocals last week might be needed on the bass on track 6 during today's mixing session. While you could dig through the spaghetti behind the console to shift a plug from one insert jack to another, it's quicker and less error-prone if the channel insert jacks and signal processor inputs and outputs are out front so you can easily see where each unit is connected.

Ideally, every connection point in your studio should run through a patchbay. In large, professional studios, that's pretty much the way it's done. Small studios generally make some compromises in the interest of economy, and even a modest sound-card-based studio can benefit from a small patchbay. You can start out small, and once you get the hang of patching, you'll recognize when you need to expand.

Virtual Patchbays

Before delving into the nitty-gritty of patchbay hardware, we must acknowledge that there are studio setups that don't really benefit from a physical patchbay. The obvious example is the workstation-based studio where all the audio goes into a computer sound card on one pair of jacks, leaves on another pair of jacks (or maybe as a recorded CD), and all signal processing is performed either with software plug-ins or built-in hardware.

Most signal routing that's required with such a system can be done within the computer, so a patchbay doesn't really help much until you start to expand beyond two inputs and two outputs. If you have several input sources such as mics or synthesizers, chances are you're connecting those to your Mackie mixer and using the mixer to route those to the sound card's input jacks.

Then there's the studio that has a sufficient number of mixer inputs so that every sound source in your toy chest has its own dedicated input channel, and there's a mixer output dedicated to each recorder track. A demo studio that does everything with one or two microphones, a couple of synths, a sampler, and a drum machine is a good example. If this sounds like you, then the rest of this section is academic. But if you're a gear slut or are always trying new approaches, read on.

The Connector Menagerie

TS, TRS, XLR, RCA, terminal boards. Mackie, as well as other manufacturers of audio equipment, uses several types of connectors. One thing that a patchbay does is standardize those connectors so that every interconnection is always made using the same type of patch cable – the kind that matches the jacks on your patchbay.

There are a few different kinds of connectors used on patchbays, too. On the front ("business") side, you'll find standard 1/4" jacks of both the TRS and TS variety, long frame telephone-style jacks, a miniature phone jack called Bantam or Tiny-Tel, and occasionally RCA jacks. On the rear (equipment) side, you'll find solder or wire-wrap terminals, multi-pin connectors, punchdown terminal blocks, and individual 1/4" or even RCA phono jacks. With all those options, which one do you choose? The choice is usually dictated by your budget, your wiring skill, patience, and how much you value your time.

Quality is important here, since all your signals will be going through these connectors. Poor contact between a jack and a plug can create distortion, and a plug can work loose from a jack that isn't solidly constructed. This is one of those places where you get pretty much what you pay for, and patchbays run from under $50 to several hundred bucks.

A Balancing Act

Patchbays are available with two- or three-conductor jacks to accommodate either balanced or unbalanced wiring. Patchbays with balanced (TRS) jacks are a bit more expensive than those with unbalanced jacks, but they're a good investment. They'll always work with your unbalanced gear, and they'll be ready when you upgrade to balanced gear. Take this advice on faith and go for a balanced patchbay.

Patching Inserts

One head-scratcher, and a good example of how a patchbay allows you to seamlessly mix balanced and unbalanced connections, is how to handle one of the handiest patch points, the channel inserts. Nearly all insert jacks are unbalanced, and like the Mackie mixers, use TRS jacks with the tip (or ring, depending on the manufacturer) being the send and the other contact being the return.

Since many signal processors (which frequently are patched in through inserts) have balanced connections, connecting them to an unbalanced input or output unbalances them, compromising common mode noise rejection. The good news is that, since you're going to have an unbalanced connection anyway, going through the patchbay rarely causes harm.

By wiring the insert jacks on a balanced patchbay so that the ring and sleeve are tied together, you can patch them to either balanced or unbalanced devices with standard patch cables.

Getting Normal

A basic patchbay is composed of two horizontal rows of jacks. Convention is that the top row is used for outputs, with inputs on the row below. One of the things that makes a patchbay particularly useful is "normalling" between the top and bottom rows of jacks.

In a normalled patchbay, a signal that comes into a top row jack will go out the jack directly below it without the need for a patch cable between them. Normalled connections are used with things that are, well, normally connected together. With normalled jack pairs and some good planning, you won't need a tangle of patch cables for your everyday setups.

Why bother wasting all those good jacks on normal connections? Well, because life in the studio doesn't stay normal very long. Let's say your 24-track recorder outputs are normalled through a patchbay to the line inputs or tape returns of console channels 1 through 24. As a result of some "can we do just one more guitar track?" unplanned production, you end up with the lead vocal on Track 2, background vocals on Tracks 5 and 11, the bass on Track 3, drums on Tracks 1, 7, 8, and 10, with guitars and keyboards scattered about on the remaining tracks.

Wouldn't it help your sanity during mixing if you could group the mixer channels in a more musically related manner, say the bass on Channel 1, the kick on Channel 2 (where it's convenient to balance with the bass), the other drums on the next three channels, the guitars all together in a group, then the keyboards, then the vocals? The solution? Bypass the normals and patch them where you want them using your patchbay.

Half- and Full-Normals

There are two flavors of normalling, half and full normal. With a full-normal connection, inserting a plug into either the top or bottom jack of a normalled pair breaks the connection between them, allowing you to re-route the signal with a patch cable.

With a half-normal arrangement, inserting a plug in the bottom jack of a pair breaks the normal connection, but plugging a cable into the top jack leaves the normalled jack pair connected. This turns out to be very useful, and it's the arrangement most commonly used in studio patchbays.

With a half-normal connection you can split an output to two places conveniently - the one to which it's normalled and the one to which you patch it. This makes it easy to connect the guitar track to two console channels, setting up EQ and effects on one channel for lead and the other channel for rhythm.

No Y-cable needed.

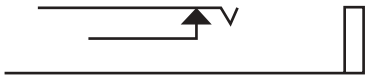
Since modern studio electronics have low impedance outputs and moderately high impedance inputs, putting a double load on a source is rarely a problem. You do need to keep your wits about you with half-normal patching, though. If you patch an output somewhere and haven't patched its corresponding input, you might wonder why you're hearing that track when you know you have its (patched) fader all the way down. It could be coming through its normalled mixer channel that you forgot to mute.

A full-normal configuration eliminates this confusion, but it also precludes easy "multing" of a signal.

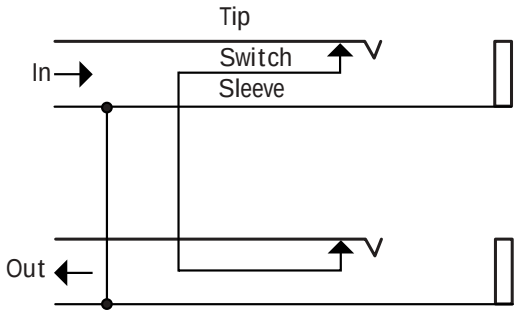
Although microphone patchbays aren't all that common, this is one application where the full normal configuration is almost always used. Since load impedance can substantially affect the sound of a microphone, and since most mic preamp inputs have relatively low impedance, you don't normally want to present a mic with a double load.

How Normalled Jacks Work

A normalled jack has a switch contact in addition to the signal contact that connects with the plug. Without a plug inserted, the switch is closed, electrically connecting the jack terminal to its associated switch terminal.

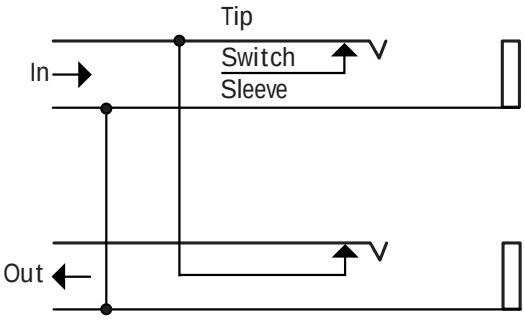


Inserting the plug breaks this connection.



Jacks Wired Full Normal

A pair of jacks wired in the full normal configuration is illustrated above. Unbalanced jacks are shown for clarity, but balanced jacks work the same way. With no plugs inserted, the signal comes into the top jack, flows through its switch contact to the switch contact on the bottom jack, and then out the bottom jack.



Jacks Wired Half Normal

Inserting a plug in either jack opens its associated switch, breaking the connection between the two jacks.

In the half-normal configuration illustrated above, the switch on the bottom jack is connected directly to the input source rather than the upper jack's switch. Since in the half-normal arrangement, the

switch contacts on the top jack aren't used, inserting a plug in the top jack has no effect on the connection between the input and output of the jack pair. Inserting a plug in the bottom jack, however, opens its switch, breaking the normal connection.

No Normals

You don't always want all of the jack pairs in your patchbay normalled. For example, you don't want a compressor's input and output connected together when it's not patched anywhere. It doesn't do any good, and it might cause the unit to go into oscillation because you're feeding its output back to the input.

Most patchbay jacks are configurable to be normalled either way, or not at all, as you choose.

E-Z Patchbays

When patchbay shopping at your friendly local (or on-line) music store, you'll most likely find units with front panel jacks that accommodate common 1/4" phone plugs, either balanced (TRS) or unbalanced (TS). Most of these patchbays also have 1/4" jacks on the rear so they can be connected to your studio gear using easily obtainable pre-made multi-channel "snakes" or individual cables. A patchbay with a common type of jack on the front panel makes patching of "visiting" gear simple.

The style with 1/4" jacks front and rear is usually called a "prewired patchbay" because you don't have to solder wires to the jack terminals themselves; you just plug things together with standard cables.

There are a couple of variations on prewired patchbays that can save you some wiring time if they apply to your setup. You can get a patchbay with DB-25 connectors wired in the TASCAM/Mackie analog convention, handy for connecting your multitrack recorder to the patchbay using a special cable with multi-pin cables on each end, eliminating a lot of plugs.

Another patchbay variation is one built specifically for connecting to unbalanced insert jacks. A single TRS jack on the rear splits out to a half-normalled pair of TS jacks on the front. This allows you to connect the patchbay to a TRS insert jack with a single two-conductor cable (breaking the normalled connection in the console jack) and regain the insert send/return normalling at the patchbay jack pair.

Long Frame Patchbays – What the Pros Use

Long frame jacks (the traditional telephone company style) can almost always be found in pro studio patchbays. They're 1/4" in diameter but are designed for a special plug, one with a tip smaller in diameter than the ring or sleeve parts. This design prevents the small diameter tip from touching the ring contact of the jack on its way in, and assures that the ground (shield) is connected before either signal lead.

Long frame patchbays are expensive when purchased new, but they're much more robust than standard TRS jacks and will last a lifetime. You can put a standard 1/4" phone plug into a long frame jack, but leaving one in place for more than a short time can cause the jack contacts to be permanently bent out of shape. If you use long frame patchbays, be sure to have some adapters to standard 1/4" plugs handy to accommodate that occasional visiting signal processor or keyboard.

Bantam™ (also called Tiny-Tel or "TT" for short) jacks are miniature long frame jacks, popular because they're half the size of 1/4" jacks, allowing twice as many to fit in the same panel space. That's important in a large system so the patchbay doesn't grow to an absurd physical size. These patchbays are pretty much the standard in larger modern studios – it doesn't take very long before you need a few hundred patch points and Bantam jacks can save a lot of rack space.

What to Normal?

When planning a patchbay, you must decide which connections will be normal, which will be patched, and which will be permanently connected and never see the patchbay. Two studios with identical equipment may set up their patchbays differently because of the work that they do, but there are certain things that always make good sense to bring to the patchbay. The following are by no means all the possibilities, but will get you thinking in the right direction.

Console channel inserts are good candidates for the patchbay. You usually have a many more mixer channels than things to patch in-line with them, and you might need a particular processor on almost any channel at some time or other.

Since most 1/4" patchbays have about 24 jacks to a row, a sensible arrangement for a 16 channel console is to connect the insert jacks to 16 normalled pairs of

jacks, and connect your compressors, equalizers, and serial type effects processors to the remaining 8 pairs of jacks without normalling.

If you have a prewired TRS patchbay, use an Insert cable between the console's insert jack and the pair of patchbay jacks. By plugging the TS send and return plugs into the rear TRS jacks for the insert connections, you'll be connecting the sleeve and ring jack contacts. This way, if you patch a balanced device in from the front, its tip and ring connections will go to the right places. You can purchase premade "Insert snakes" to carry several insert connections in a single bundle to keep things neat.

Remember the golden rule of patchbays – sends (outputs) go to the top row of jacks, returns (inputs) go to the bottom row. Knowing that your patch cables always go from a top to a bottom row will keep you from making mistakes and patching something in backwards.

Most people adhere to that rule when wiring things that are purely sources (insert outputs, recorder or preamp outputs, auxiliary sends) or destinations (insert returns, console line inputs, recorder inputs), but break the rule for devices that are inserted in line with the signal flow, such as equalizers, compressors or effect processors - devices that have their inputs and outputs associated with the same signal path.

The logic here is that the signal flow on the patchbay is always downward, so putting a processor input on the top row and its output on the bottom row makes a certain degree of sense. Use whatever logic will be most intuitive to you at 3 AM after a long overdub session when the band asks for a mix before they go home.

Multitrack recorder outputs are usually normalled to console line inputs or tape returns, but sometimes it's difficult to decide which console outputs, if any, to normal to the multitrack recorder inputs.

Normalling subgroup bus outputs (or main stereo outputs if it's not a multi-bus console) to the recorder inputs is fairly common. By using bus assign switches and pan pots, you can route any console input to any recorder track. With the recorder inputs on patchbay jacks, you can always bypass the mixer's bus section and patch a direct output or outboard mic preamp straight to a track.

It's very convenient to have all the recorder inputs, outboard mic preamp outputs, and at least a few console direct outputs available on a patchbay. Since you never know where you'll be using an effect processor, it's handy to have them wired to the patchbay too.

Having one or two auxiliary sends and returns normalled on the patchbay to a reverb or multi-effect processor is convenient so that processor will be readily available during tracking without any patching, and can be used either with the send and return, or patched in-line (serial) with a track when recording or mixing.

Control room outputs usually can be wired directly to your monitor system. It's not likely you'll be sending them elsewhere other than perhaps to a set of alternate monitors, for which you'll probably use a switch. By connecting 2-track recorders (both inputs and outputs) through the patchbay, your usual mixdown recorder can be normalled to the mixer's main outputs, but you can easily patch your DAT to a CD-R or cassette deck for making dubs.

Wiring a Patchbay

Incorporating a patchbay into a studio setup requires quite a bit of additional wiring. You may have reservations about adding a patchbay because of all the extra cable length, but even -10 dBV unbalanced equipment has no problem driving upwards of 50 feet of good quality, well shielded cable. Don't sweat it, but don't go overboard on cable length either.

The simplest patchbays to install are the prewired ones with 1/4" jacks front and back. Configure each pair of jacks for the normalling that you want, plug in the cables, and you're ready to start plugging things together. This style of patchbay is also the easiest to reconfigure when you decide, after living with it for a little while, that you'd like to relocate a few patch points.

Patchbay Maintenance

While there's nothing to burn out or align, patchbays do require a little TLC. If you don't have a spray can of contact cleaner (Caig ProGold® is excellent) in your studio, get one. A light spritz in the jacks every few months, and wiping the patch cable plugs with a cloth on which you've sprayed a little cleaner will keep your patchbay connections noise-free. Don't forget the jacks in the rear, too, if you have prewired patchbays.

A Basic 8-Track Patchbay Setup

The illustration below is just one suggestion of how a patchbay for a basic 8-track studio might be set up. For clarity, not everything is shown, and in reality you'd probably want a second patchbay, but we didn't want to scare you off immediately.

We've shown the first eight channel Inserts connected to half-normalled jack pairs. Note that each mixer Insert jack goes to two patchbay jacks, the upper row jacks for the sends and the lower row for returns. The half-normal wiring between these jacks keeps the channel signal path intact (just as if there were no plug in the mixer Insert jack) until something is plugged into the patchbay Insert Return jack. The outboard processors, which are most likely to be patched to these inserts, are adjacent to the Inserts, wired to non-normalled jacks.

The four mixer subgroup outputs are brought to the patchbay and normalled to four recorder inputs. The other four recorder inputs are brought to the patchbay, but aren't normalled anywhere. They can be freely patched either to be fed from a subgroup, a channel insert output, or the output of the outboard mic preamp. Remember that a half-normalled configuration doesn't break the connection when a plug is inserted in the top jack of the pair. You can freely patch the subgroup outputs on the patchbay to the other four channels of the tape deck and select which track gets recorded (2 or 6, for example) with the deck's track-arming buttons.

The recorder outputs are shown connected directly to the mixer's line inputs. That's because we ran out of space on this patchbay, and you will, too, sooner than you thought. If you want to insert a compressor in a track during mixdown, you'll have to go to the mixer or recorder and unplug something. Or add another patchbay.

You could also rearrange the outboards, with the compressor and equalizer occupying top row jacks 17-20 (a little unintuitive but you'll learn quickly). Remember that we didn't normal four of the recorder inputs to anything – partly so that we could use this example. Then, with jack pairs 9 through 16 free, they could be used for the recorder outputs and mixer line inputs.

Putting the recorder outputs and console line inputs on the patchbay will allow you to rearrange tracks in a more sensible order at mixdown time. That should hold you for a while until you want to add a second patchbay for more inserts or outboards (or both). You probably won't get confused with only eight tracks, but by the time you expand to 24, you'll be a patchin' fool.