Every couple of years *SOS* covers the subject of patchbay wiring, and for a while the phones stop ringing — at least with patchbay enquiries. As time passes, the phones start ringing again as new readers discover patchbays and wonder how to set them up, and over the past few weeks there have been enough of these calls for me to justify revisiting the subject. Most of the patching in smaller studios involves analogue, line-level signals, so this is what I'll be talking about here, though we'll also be covering digital patching in the coming months.

SOCKET CENTRAL

Patchbays are relatively simple in concept — their job in life is to bring all those obscure line inputs and outputs that are usually tucked away behind mixers or dark, dusty rack cabinets to a central, easily accessible location. Instead of having to squeeze behind your mixer every time you want to make a change, you simply use a short patch cord to join the required pair of sockets on the patchbay.

Just as no two studios are exactly the same, so it is with patchbay systems, though all follow certain basic rules. You first need to sit down with a piece 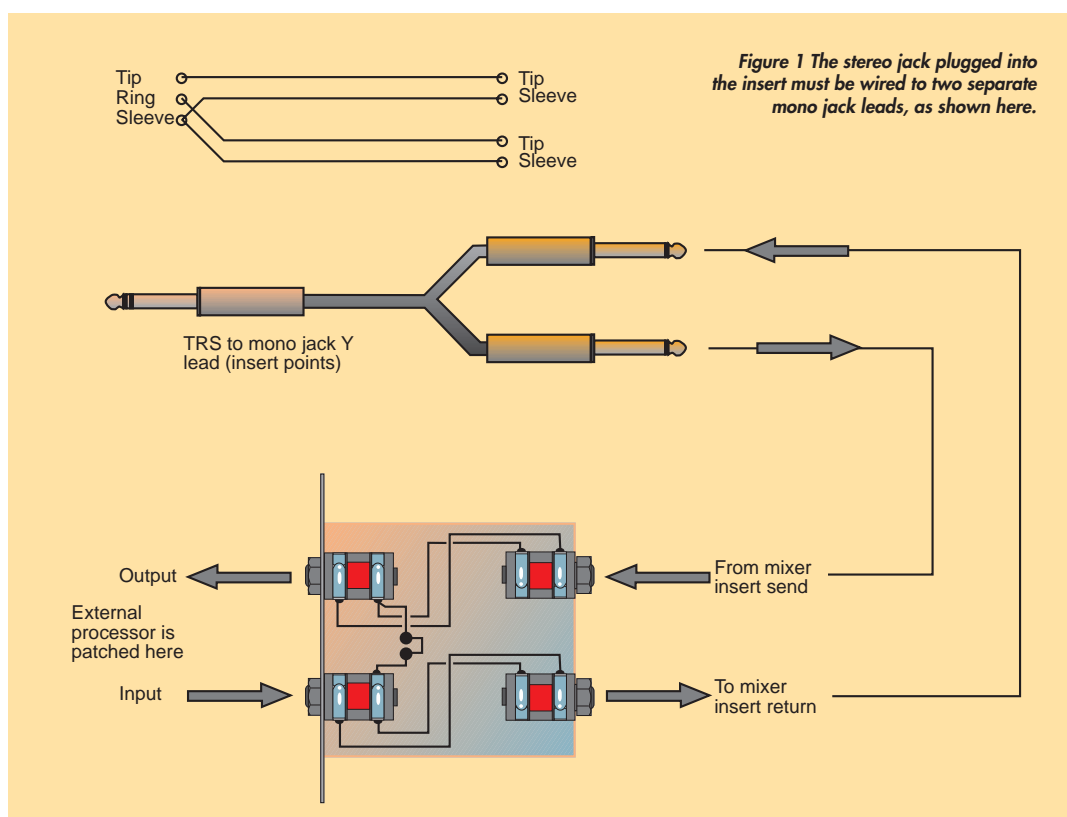of paper and plan out your requirements. In most cases it simply isn't practical, or even desirable, to bring every single connection to a patchbay — if something isn't likely to be changed, leave it wired conventionally and only use a patchbay where you're likely to be making regular changes. For example, you may have a compressor that needs to be patched into different mixer insert points, or an effects unit that is frequently patched into different places, and connecting these to a patchbay obviously makes sense. Similarly, you may need access to your stereo tape machines, because although you'll be mixing onto them most of the time, you may occasionally need to copy tapes from one machine to another, or feed a DAT tape back through the mixer. Again, bringing their inputs and outputs to a patchbay makes the job easier.

When it comes to your mixer, insert points may or may not be easily accessible, depending on the mixer's layout. However, the vast majority of project studio mixers have TRS (stereo) jack insert points, which means you need a special Y-lead to connect to them. Using a patchbay in this situation can make your life easier, though you'll still have to buy or make up a set of Y-leads to connect up the patchbay in the first place. (See *SOS* Mail Order P.283). Note, that although console insert points use the same sockets as, say, stereo headphones, they are not stereo. The TRS (Tip-Ring-Sleeve) jack socket is used simply because it has enough contacts to supply a signal output, a signal input and a signal screen. The stereo jack plugged into the insert must be wired to two separate mono jack leads, as shown in Figure 1. This explains the term Y-lead.

PAUL WHITE follows up a few leads and discovers they all end at the patchbay.

BAY WATCH!
ALL ABOUT PATCHBAYS

Figure 1 The stereo jack plugged into the insert must be wired to two separate mono jack leads, as shown here.

Tip
Ring
Sleeve

Tip
Sleeve

Tip
Sleeve

TRS to mono jack Y lead (insert points)

From mixer insert send

Output

External processor is patched here

Input

To mixer insert return

ALL ABOUT PATCHBAYS

▶ While patchbays are reasonably reliable, they're not as reliable as a solid piece of wire, so if your console has six effects sends and returns and you only have three effects units, it might make sense to leave these permanently connected. You may want to do something different once in a blue moon, but crawling round to the back of your rack with a torch once every six months isn't too much of a problem. It's up to you to decide the point at which wiring a patchbay becomes more trouble than the occasional visit to the back of your rack. In a typical mixer, you could also include the group outs and multitrack machine inputs in your patchbay plan, but in most instances, feeding a signal to your recorder (from a mic preamp, for example) via a group insert return is clean enough.
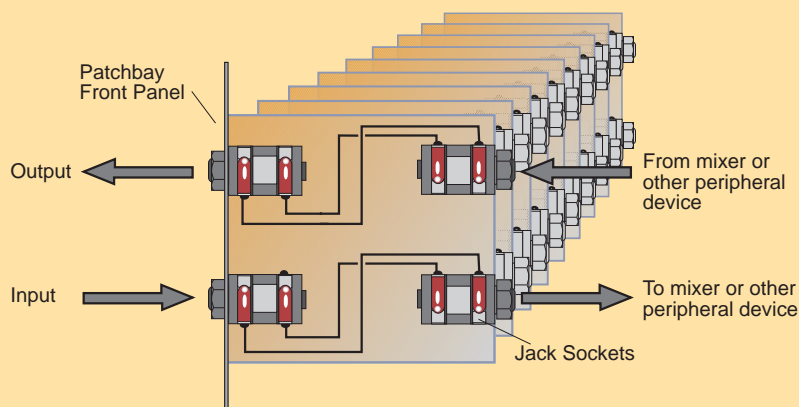
The ins and outs of your outboard and stereo recorders could be brought to the patchbay, and don't forget any side-chain or key inputs that you might want to access. Some of these may need to be wired in a special way, so I've covered unusual wiring requirements at the end of this article.

NORMALISATION

The simplest patchbay is one that acts like a bunch of extension cables to put your sockets within reach. For the purposes of the smaller studio I'm going to assume that standard jacks are being used; the smaller 'Bantam' jacks tend only to be used in pro studios. Those with balanced studio systems can use conventionally wired TRS (stereo) jacks, while unbalanced systems would need regular mono jacks. Most project studio mixers use unbalanced insert points even if everything else is balanced — if your console insert is a single TRS jack, it's unbalanced. This fact doesn't usually present a problem, but you do need to consult the manuals for any balanced outboard gear you have, to find out how to wire it for unbalanced operation.

The most convenient style of jack patchbay is the
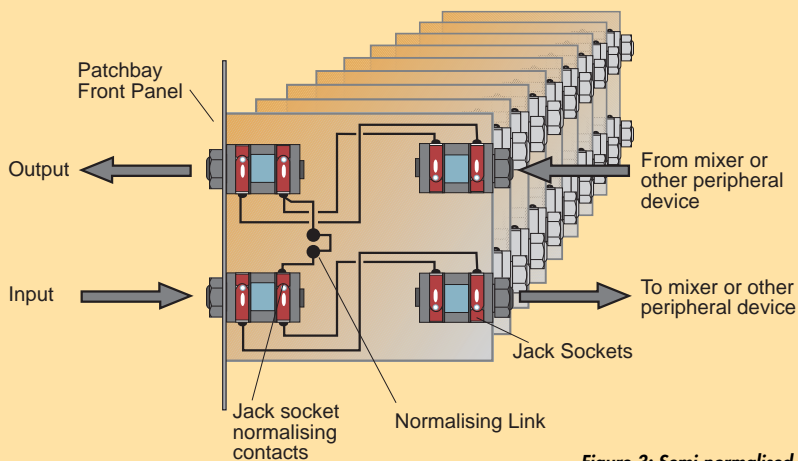

Figure 2: Non-normalised patchbay.

Figure 3: Semi-normalised patchbays.

small studio, mixer connections you might consider taking to a patchbay would be:

• Line inputs
• Insert points
• Aux sends
• Aux returns
• Stereo mix output
• Studio headphone feed

You might also want to take some of your mixer's monitor inputs to the patchbay, to be used as spare line-ins when you mix. If you need to record a signal directly to tape without going through the one that also uses standard jacks at the back to make the permanent connections to your mixer and outboard equipment. You can buy hard-wired versions where the cables are soldered directly to the back of the patchbay, and this is slightly better from the reliability point of view. But it's not so convenient or flexible, and you have to enjoy soldering. One exception to this is the patchbay made by Neutrik, which uses solderless connections to clamp the stripped wire ends.

The simplest job a patchbay can do is providing remote access to equipment inputs and outputs. In this context, each patchbay socket acts as an independent extension lead connected back to the ▶

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▶ relevant equipment input or output. There is no connection to any other socket on the patchbay. Such an arrangement is known as 'non-normalised', for reasons that will become evident shortly. Figure 2 shows the inputs and outputs of an effects unit wired to a non-normalised patchbay.

Things get slightly more complicated when it comes to console insert points (or compressor side-chain insert points), because when there's nothing plugged into the patchbay, you need the insert send to be connected to the insert return. If this were not the case, the signal path would be interrupted unless a patch cable were used to join the send to the return. To get around having to use lots of patch cables simply to maintain a normal signal flow, another type of patchbay, known as 'normalised', is used. The insert jacks in a mixing console are already normalised, in that the socket features a pair of sprung switch-contacts that automatically route the insert send directly to the insert return if no jack is inserted. As soon as you plug in a jack to connect to your patchbay, this normalising contact opens. You need to duplicate its function on the patchbay.

A normalised patchbay uses exactly the same type of internal switch contacts as the ones on your console insert points; these link the upper and lower sockets in any pair if nothing is plugged into the front of the panel. However, it can be useful to

RESUMING NORMAL SERVICE

Patchbays invariably comprise two rows of jack sockets, one above the other, and the number of socket pairs may be anything from 16 to 24, depending on the model. Clearly, manufacturers don't want to have to build both non-normalised and normalised versions of the same product (see main text for an explanation of these terms), so they invariably include some way of changing individual pairs of sockets from non-normalised to normalised operation. This means that some patchbay sockets on the same patch panel can be normalised and others non-normalised if required. A number of manufacturers use an individual circuit board to hold each pair of sockets (with a further pair for the rear connections), and all you have to do if you need to swap from normalised to non-normalised operation is remove the circuit board and put it back in the other way around, so that the rear sockets are now at the front. Other methods of changing from normalised to non-normalised operation include tiny switches, jumper links, or printed circuit pads that can be linked by blobs of solder.
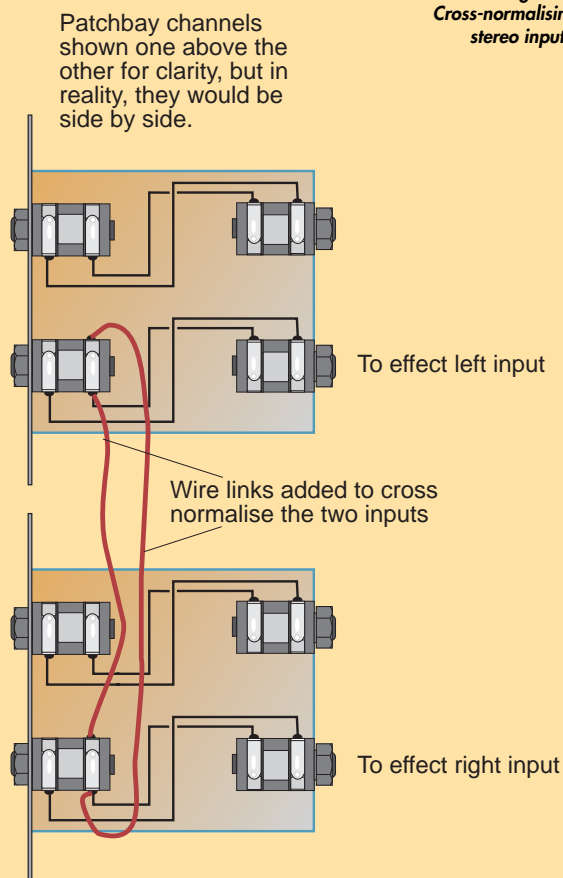
be able to take a signal from an insert send without breaking the signal path, something you might want to do if you need to split a signal for any reason. To facilitate this perfectly reasonable option, most patchbays are semi-normalised rather than completely normalised. This is actually simpler than it sounds; when nothing at all is plugged in, the patchbay output (insert send) is connected to its input (insert return), so the circuit is completed by the normalising contacts. If a jack is plugged into the output only, the input still remains connected to the output, but whenever a jack is plugged into the input, the signal path is broken. Figure 3 shows how the normalising contacts work in a typical patchbay, where the lower socket is the input and the upper socket is the output. This is the standard convention for patchbays.

The method of normalising I've just explained gives the best of both worlds, as it allows signals to be split off from an insert send point, or external effects and processors to be patched in using both the insert send and return. The term 'sniff and break' is sometimes used to describe this type of patchbay: plugging into a patchbay output socket allows you to 'sniff' or split the signal without affecting the existing signal flow, while plugging into the patchbay input breaks the signal flow.

ROUTING DECISIONS

As emphasised earlier, you have to decide which signal routes to connect via a patchbay and which to leave permanently connected, without a patchbay. It's generally best to bring all the console channel, group and master insert points to a semi-normalised patchbay, but if you don't want to wire up all the channel inserts, at least make sure that you can access all the channels used by your multitrack, plus a few extra channels for microphones, when recording. You may also decide to fit a normalised patchbay between the console and multitrack machine, as this will enable you to use 'voice channel'-type processors or DI boxes to feed signals directly to the multitrack without involving the mixer ▶

Patchbay channels shown one above the other for clarity, but in reality, they would be side by side.

Figure 4: Cross-normalising stereo inputs.

To effect left input

Wire links added to cross normalise the two inputs

To effect right input

> "A good patching system represents a considerable investment, both in money and in assembly time, so it pays to get it right first time."

▶ — though, as pointed out earlier, you can get to your recorder fairly directly by feeding the DI box or preamp via one of the group insert returns.

Non-normalised patchbay sockets are simply extensions to existing inputs and outputs, so you could use them to connect the ins and outs of all your outboard gear and stereo tape machines. However, this isn't the most effective way to work, as you may end up with lots of leads plugged into your patchbay all the time, just to connect your tape recorder to your console. If something is normally connected to one place, normalised sockets may allow you to do it more effectively. For example, in my own setup, normalised sockets are used to connect the DAT machine to the console tape ins and outs, but I can still access the tape ins and outs by plugging directly into the front of the patchbay. This breaks the contact joining the tape machine to the mixer and allows me to record to or from another source when necessary.

Use good-quality screened leads to wire up your patchbay, and keep the leads as short as practical, while still leaving enough slack to accommodate future changes. Foil-screened cable is good, as it's easy to wire, stiff enough to keep it's shape, and fairly thin. Tape machines or hard disk multitracks may be connected by individually screened multicore if preferred.

The patchbay needs to be close to your console, and if you can arrange for the patchbay to face forward in your rack, rather than upward, you'll have less problem with dust accumulating in the sockets. Keep all signal cables away from mains leads wherever possible, and where they must cross, making them cross at right angles will keep induced hum to a minimum.

For the patch cables you'll need to plug into the front of the panel, choose a flexible, non-kinking
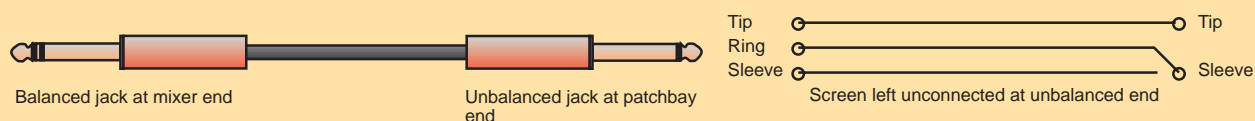
input will be permanently active, and there's no easy wiring dodge to get around this. Fortunately, most reputable gates, such as the omnipresent Drawmer DS201, have a front-panel switch to activate the key input. If you have a model that won't play ball, you'll have to resign yourself to visiting the back of the rack once in a while.

Another situation that you can do something about is the effects unit that has stereo inputs, but allows you to use it in mono by only plugging in one input. As soon as you connect both its inputs to a patchbay, it thinks you want to send it a stereo signal, so now if you send a mono signal to just one of the inputs, you may find only one channel works properly. To get around this, you need to create your own cross-normalising system between the two adjacent sockets handling the effects unit inputs, as shown in Figure 4. This simply involves soldering two short wire links, as in the diagram, so that when either of the inputs is used on its own, the signal is also linked to the other input jack via the socket's normalising contacts.

ALL PATCHED UP

In all but the smallest recording setup, a patching system is pretty much essential, and even if your studio is based around a computer with a soundcard or two plugged into it, a patchbay is still useful for converting all those horrid mini-jacks and phonos to standard quarter-inch jacks. But even given the merits of a patchbay, there's a valid argument in favour of making as many permanent connections as you can, to cut down on the number of plugs and sockets in the signal path. The connections in normalised patchbays always become intermittent eventually, so don't buy the cheapest of this type, or you may find it causes trouble sooner rather than later. The quality

Figure 5: Unbalanced to balanced connections.

Balanced jack at mixer end   Unbalanced jack at patchbay end   Screen left unconnected at unbalanced end

Tip / Ring / Sleeve — Tip / Sleeve

cable or buy ready-made leads. If possible, use an assortment of colours so that you can keep track of what's plugged where. Also get twice as many as you think you'll need, because that still won't be enough! If you use balanced patchbays, obtain both balanced and unbalanced patch cables, and make sure they look sufficiently different, so that you don't get them mixed up.

SPECIAL CASES

So far I've covered all the basic patchbay connections, but there are some oddball situations that may have you scratching your head. For example, what happens if you have a gate with a key input that becomes active as soon as you plug in a jack? If you connect this to a patchbay, the key

of a non-normalised patchbay is less critical, but it still pays to get something decent.

There can be advantages in connecting even an unbalanced patchbay to a balanced line input using balanced cable — it provides improved immunity to ground loops, for one thing. (See Figure 5 for how to do this.) Avoid the models of patchbay that have a common earth connection joining the ground or cold contacts of all the jack sockets together, as this can aggravate ground loop problems. Most importantly, plan your system properly before you start and leave room to expand it when your studio expands. A good patching system represents a considerable investment, both in money and in assembly time, so it pays to get it right first time. **SOS**