

# Nuts & Bolts

## Multitrack Recorders

All about the machine at the center of every studio

Have you ever been picked on by some bully in school? I have. After the event I replayed it over and over in my mind until I came up with the perfect comeback—the one I wished I'd delivered instead of giving him my Spam and potato chip sandwich.

The desire to improve history by rewriting it is pretty instinctive. And in music-making it isn't just a wish, it's a *modus operandi*.

The tool that lets us relive a situation as long as it takes to perfect it is the multitrack recorder. Rather than living with the "live-to-2" recording, the multitrack gives us that much-appreciated second—or third, or fifteenth—chance to get a better take.

### The ins and outs

Here's the idea: as music makes its way from the various microphones to the final 2-track master, we store it temporarily on a multitrack. And that's how it's hooked up: microphone out, through the console record path (channel path), to the multitrack recorder. On playback, we send signals from the multitrack recorder out through the console's monitor path to the mix bus. (Figure 1 sketches it out in a general way; check out our previous two installments to refresh your understanding of the console's busses and signal paths.)

Falling in between the channel path and the monitor path, the multitrack recording device—whether a computer hard disk recorder, digital tape deck, or analog

tape recorder—receives whatever tracks you are currently recording at its input; it plays back whatever tracks are already recorded. The multitrack is nothing more than an audio storage device. It stores the drums while you add bass. It stores the rhythm section while you add vocals and solos.

What are good devices for audio storage? There are just a couple of valid answers (so far): tape and disk. For analog storage, tape is the only practical multitrack medium. For digital, there's tape media like ADAT and TASCAM, but disks in all their formats are also possible: magneto-optical disks, internal or external hard disks, removable disks...

Naturally the recording device must possess high sound quality, reliability, and affordability. Three other features are perhaps less obvious.

First, it must be able to be erased and then re-recorded over, on the off chance someone makes a mistake. Second, the recording must be available for immediate playback right after being recorded. So while 35mm film might be a great release format for sound, it is impractical in the studio because it requires processing in a film laboratory before it can be played back.

A final functional requirement of the multitrack recorder is that it must be able to record and play back simultaneously. Its power as a creative tool in the recording studio depends on its ability to overdub record a new track while simultaneously playing back previously recorded tracks.

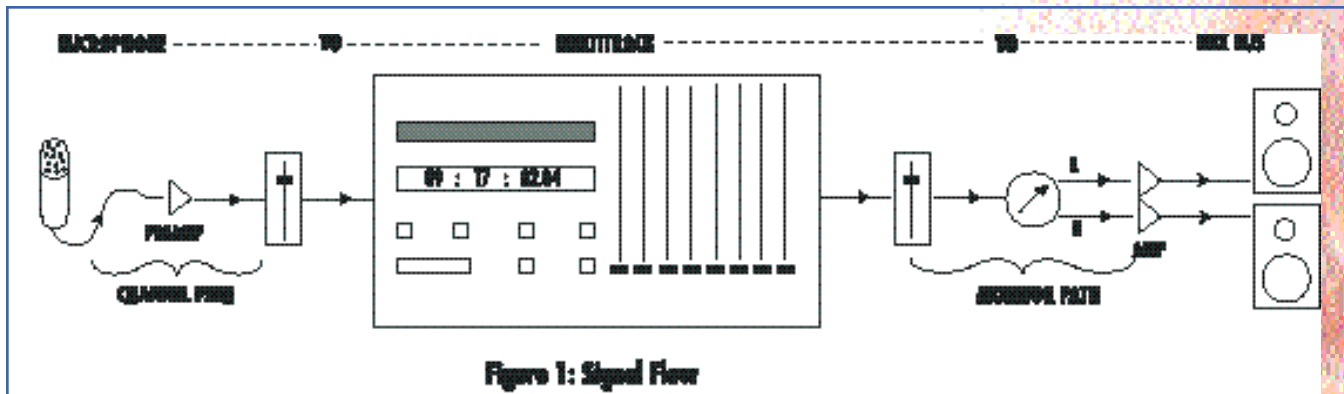


Figure 1: Signal Flow

How can a recorder play back one thing while recording another? Simple enough. Each track of the multitrack recorder assumes one of two states: playback or record. When a track is in the playback mode, its audio is sent to the multitrack machine's output. In record mode, new audio for that track is written/stored on the tape or disk.

### Overdubs

The cool thing about a multitrack is that it can enter record mode selectively, track by track, so that it records only on the tracks desired. The other tracks aren't being recorded onto, so they instead stay in playback mode. This accommodates the overdub.

Let's check out a power trio session consisting of drums on track one, bass on track two, guitar on track three. Vocals are to be done as an overdub onto track four. During the overdub, it is pretty clear what multitrack outputs one, two, and three are.

What signal appears at output number four? Seems logical that it should be the vocal being overdubbed. But one wonders how a recorder can play back the same track it's recording. In fact, it can't! So it doesn't.

On the track actually being recorded, the tape machine can't play back what it's laying onto tape or disk. There is an inevitable delay between when the signal is recorded and when it is played back. That delay is long enough to cause the musical equivalent of a train wreck.

The solution is that the machine doesn't even attempt to play back the track it is recording. Instead the output for the track being recorded is its own input. Honest. No typo there. The vocal signal being recorded is sent to multitrack input number four, and it is split within the multitrack machine before being recorded. The divided vocal signal goes both to the recorder and simultaneously to the multitrack output. This is standard operating procedure, and is shown in Figure 2.

The mode that routes the input of the track actively being recorded to its own output is called input mode. If a track isn't in input mode, its output signal is the audio already recorded on that particular track. Playback mode (or repro mode from 'reproduce') describes this configuration, and it is the standard signal flow for tracks not currently being recorded.

So there are two choices for what signal appears at each output of a multitrack. It can playback what's already on the tape or disk (that's

repro mode), or it can play back what is currently being sent to the tape or disk (that's input mode). You've got two options here: reread this paragraph half a dozen times or sit in front of a tape machine for a couple minutes. It's much more confusing to say than it is to do.

### The tricks and treats

Okay, so a multitrack is used to record the rather elaborate audio arrangement of a pop tune a few tracks at a time—an arrangement that might use more than 24 tracks of recorded music.

Naturally, we do more than just print tracks with the multitrack.

Let's explore some of the more subtle production capabilities offered by the humble multitrack recorder.

One handy feature is the ability to record from one track to another, a process called bouncing. There are a few reasons to bounce tracks.

The first reason is for convenience. As a project progresses, the multitrack can get a little messy, with alternate vocal tracks, solo out-takes, background vocal harmony ideas, and that experimental (but ultimately rejected) contrabassoon solo all spread out to various locations among the keeper tracks.

It's often helpful to reorganize the tracks into a more logical order: all the

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drums on the first few tracks, all the vocals on the last few tracks, with the rhythm section laid out in an order that is logical and comfortable for you. To move a signal from one track to another, simply hook up the output of one track to the input of another, set the source track to playback, the target track to record mode, and record.

On analog machines, this costs you a generation of quality, which is more than tolerable on some of the better machines. On digital machines, this bouncing ability often exists digitally within the machine. No patching, and no generation loss. Needless to say, we bounce tracks more often on digital multitracks.

Another variation on the bouncing theme is submixing. Instead of doing a direct transfer from one track to another, it is often handy to create and record a submix of a component of the tune. If drums were recorded across 12 tracks of the multitrack, it can be a good idea

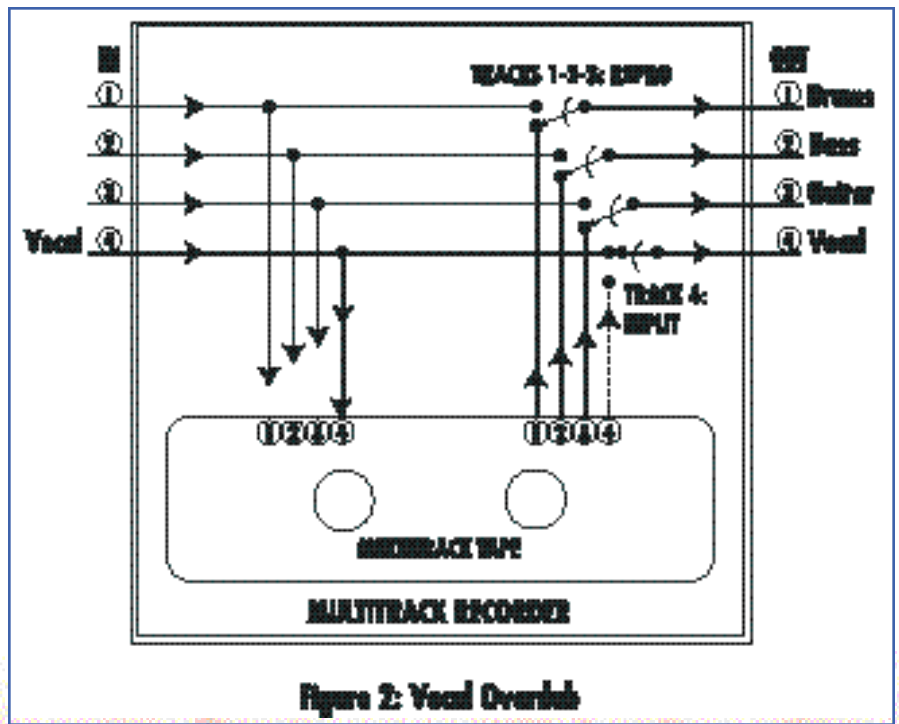


Figure 2: Vocal Overdub

to mix just the drums down to two new tracks, leaving the non-drum tracks unmixed for now.

This is helpful in two ways. First, it frees up tracks for other purposes. Digital recording software can sometimes offer "infinite numbers of

tracks," but that can be limited by the size of the storage medium and the power of the machine doing the recording. And analog recorders, and digital tape and MiniDisk machines, have fixed numbers of tracks available. So bouncing down lets you take



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a large number of tracks and pre-mix them to make room for more of your orchestration.

Second, if some elements of the tune—like the drums in this case—are already carefully pre-mixed, then creative energy, effects devices, patch cables, and fader fingers are free to focus on the remaining elements of the mix.

Of course, there is a downside to submixing. In order to free a track by submixing, you must perform the rather scary act of erasing the original. Submixing twelve drum tracks to a stereo pair of tracks will indeed free up ten tracks for vocals, solos, and other musical ideas, but only if you are willing to erase the original snare track, the original kick drum track, etc.

And the submixed drums are only useful in the final mix if the submix itself is, as they say, totally killer. Without knowing exactly what the entire mix will sound like, you've got to create an appropriate, complementary, compelling submix of the drums.

Clearly, submixing some number of tracks down to fewer tracks is its own skill, requiring not only basic mixing chops but also a little bit of extra-sensory perception to predict the appropriate mix goal of a given element of the overall mix. Expect to make a few mistakes. Plan to remix these submixes a few times, and try to have a backup of any tracks you erase. This is easier to do with digital systems than with analog recorders, since you don't lose a generation of sound quality when you dub off a backup.

Sometimes submixes are printed to the multitrack not so much to free other tracks but to 'store' a mix move. Printed mix moves are a good way to have manual fader rides and crazy pan pot moves in a mix without automation. Just do the mix move manually, recording the audio result to spare tracks of the multitrack.

Yet another variation on the bouncing theme is called comping. A comp is hip-speak for a composite. It refers to creating a single track that is in fact a collection of pieces of any number of different tracks—the best chorus happened on take three while the best bridge happened on take seven, and the best intro was yesterday's scratch vocal. Aack!

Mixdown with vocals all over the multitrack coming up on faders all over the console is very distracting. They are comped by recording all the appropriate pieces to a separate track. The comped track then appears in one place, on one fader, and is a lot less distracting during mixdown. In fact, comping is nothing more than bouncing from many different source tracks one at a time to the same destination track.

The multitrack can do more than just record instruments, other tracks, and submixes. Why not record some effects to the multitrack? If you stumble upon a truly magic effect that you think may be difficult to reproduce, record it to its own tracks.

Sometimes it's necessary to record the effect because you're borrowing the \$3500 Spastron Digital Nirvana Box and it has to be returned tonight. More likely it's because the total effect uses an elaborate signal path through 14 different effects units, and though you actually own them, the exact settings may be difficult to recreate. Printed effects are a good habit when you have spare tracks and have created a rather dramatic effect.

Finally, there is no reason the entire mix itself can't be recorded on the multitrack. Naturally, the mix is recorded to the 2-track master machine, be it DAT, disk, or analog tape. But if you have spare tracks, print a safety version of the mix on the multitrack. Beyond the comfort of having a backup copy, you create the basis for a fast, and therefore cheap, recall.

You've no doubt experienced the temptation to recall a mix. You, the artist, or the label decide a week or two after mixdown that everything in the mix was gorgeous... but it just needs a little extra reverb on the snare, and some slap echo on the slide guitar would be nice.

These changes generally require the entire mix to be recalled. That is, the same studio full of the same gear has to be restored to the exact same configuration it was in the day you mixed, knob by knob, switch by switch. And all manual moves must be re-performed exactly as before.

This ain't trivial. It's difficult to get a recall to truly match the original mix. Often the best you can do is get "close enough for rock and roll" and move on. If the entire mix is on two tracks of the multitrack, the recall is pretty trivial.

Push up the two faders with the original mix on them, and use the snare and slide guitar tracks as sources for the additional effects. Mix

the new effects with the old stereo mix, and for just a few minutes work you've got a new-and-improved mix that will please everyone for at least another week or two.

### Pros and cons

We can see where a multitrack is a core part of your studio and its operations, and the right machine will let you do everything from storing and assembling passes to recalling entire mixes. So how do you choose the right machine?

When evaluating which multitrack to buy, rent, or borrow, the normal priorities apply. You'll be looking for the balance of sound quality versus price that fits your budget.

When evaluating the cost of a multitrack, do keep in mind the cost of the media as well as the cost of the machine. You've got the one-time cost of buying the tape machine to take care of first, but the per-project cost of the tape (or disks) to justify to yourself or the clients later.

Beyond this value calculation, some other features should be given due consideration. The multitrack recorder, whether tape- or disk-based, is a mechanically complicated device. Unlike, say, a digital multieffects unit, a multitrack has moving parts, and lots of them. It needs to be well designed and well maintained.

The multitrack gives us that much-appreciated second—or third, or fifteenth—chance to get a better take.

For a tape machine, look for a manufacturer you or a colleague knows to be trustworthy. If new, make sure it has a warranty to get you through any manufacturing faults. If used, try to assess the amount of loving care or sloppy abuse the machine endured.

If the machine hiccups during day one of an album you might lose the gig. If the machine crashes on day 231 you might lose all the audio for the entire project. It's tough to put a price on reliability, so give it some thought before you transact.

Related to quality is the 'feel' of the machine. How quickly does it fast forward and rewind? Is it cooperative or cantankerous as you record a chorus, rewind to the beginning of the chorus, re-record the chorus, rewind to the second repeat of the words "...baby, yeah..." re-record the words "...baby, yeah..." rewind, repeat, etc.

The process of recording a song is fairly active and very non-linear, and the multitrack needs a transport that can keep up with the creative needs of the session. Some feel like Italian sports cars, anticipating your every recording desire; some drive like an old school bus with a flat front left tire.

The decision to use a digital or an analog multitrack should really be governed by how it meets the above criteria. Choose the machine you feel gives you appropriate sound quality for the dollar while offering acceptable reliability and a comfortable transport.

If you go analog, you get the ability to edit tape. All you need is a razor blade for cutting, some special tape for taping the tape to another, er, piece of tape, and an editing block to help you cut consistently. With appropriate equipment, clean and steady hands, and a willingness

to live on the edge, you can literally cut and paste the tape to change the song in any way you desire. Swap verse one for verse three. Cut the solo to half its length. Pull out two bars of the intro. (Don't shudder—it's how we all did it, until very recently.)

Should you go digital, you've got the additional decision of whether to be tape- or disk-based. Compared to hard disks, tape-based formats are generally much less expensive, are often more portable, and they offer the ability to change instantly from one project to another. Changing tapes is a lot easier and quicker than backing up one hard disk project and restoring another (unless you switch hard drives, which can also be an option, if an expensive one).

Splicing digital tape is possible on the (very expensive) open reel formats, but is verboten for helical scan, cartridge-based tapes like the ones used in DAT, DTRS (DA-88 series), and ADAT formats. Hard disks overcome that disadvantage by offering nondestructive software-based editing. 'Nondestructive' means that the edits don't alter the actual audio file—they're done in software "on the fly," so you're free to change your mind.

There are other advantages to hard disk recording. These include ever-decreasing prices, external and removable drives to improve portability, and random access.

You are familiar with the appeal of random access if you have ever tried to zip to the fifth song on an album on both CD and cassette. The CD gets there instantly and effortlessly. On cassette you fumble for the location, fast-forwarding and rewinding until you find it.

Tape-based multitrack machines have the same problem—only there's the added benefit of a room full of people waiting for you to find the right place on tape. Tape counters, memory locations, and good notes on a take sheet can make this less of a headache, but disk-based recorders offer true random access. Want to hear track six? Click. Here it comes.

Another type of multitrack recorder we haven't mentioned is the DAW (digital audio workstation). These systems are in the hard disk category, but they're really a whole subject unto themselves. They combine all the advantages of stand-alone hard disk recorders with excellent editing. And track bouncing in a DAW is different, because you can do it without deleting the original tracks. If this sort of power appeals to you, you should follow the 'DAW Diaries' in this magazine for tips and tricks that have worked for my fellow writers.

In my recording life I use both tape and hard disk machines. I guess I'm showing my age, but I prefer the 'vibe' that comes from using tape-based multitrack machines. Rewinding before re-taking a solo gives the session a sort of pace that I find natural. Instant access to the beginning of the solo makes it all too easy to work way too fast and lose the chance to take a breath and be creative.

On the other hand, random access locating and its associated nondestructive editing are clearly a powerful production tool. The choice is yours, and a bit of practice and forethought will help you pick the multitrack that's right for you.

Alex Case welcomes suggestions for Nuts & Bolts. You can contact Alex at [case@recordingmag.com](mailto:case@recordingmag.com).

