



# NUTS and BOLTS

PART 10

## Mixing By The Numbers

As this month's issue of Recording

BY ALEX CASE

focuses on mixdown, Alex talks us through a mix

**W**anna know how to mix? Me too. And I've been doing it (trying at least) for about ten years. That's part of the pleasure of our craft. We keep learning, creating, and exploring. There is no single right way to do it.

Having said that, there is something of a standard approach to mixing pop music that is worth reviewing. It isn't the only way. In some cases, it isn't even the right way. But it is a framework for study, a starting point from which you can take off in your own direction.

Consider a pop/rock tune with the following somewhat typical arrangement: drums, bass, rhythm guitar (doubled), lead guitar, clavinet, lead vocal, and background vocals. Where do we begin?

First let's lay out the console. Whether physical or DAW-based, it helps to preset the signal flow with as much as we think we'll need.

Mixing forces us to be creative in how we shape and combine the various tracks and effects, yet we have to hook everything up correctly too. The latter tends to interfere with the former, so it helps to do a chunk of the tedious and technical thinking ahead of time so that it doesn't interfere with your flow of inspiration while mixing.

### Global effects

We don't yet know yet all the effects we may want for this mix, but some standards do exist. We'll probably want a long reverb (hall-type program with a reverb over two seconds), a short reverb (plate or small to medium room with a reverb time around one second), a 'spreader' (see the sidebar), and some delays (eighth note, quarter note, or quarter note triplet in time).

Launch the appropriate plug-ins or patch in the appropriate hardware. These are effects we'd like to have at our fingertips so that we can instantly send a bit of vocal, snare, and lead guitar to the same effect. The way to have all these effects handy is to use aux sends (see Nuts & Bolts #2, 8/99).

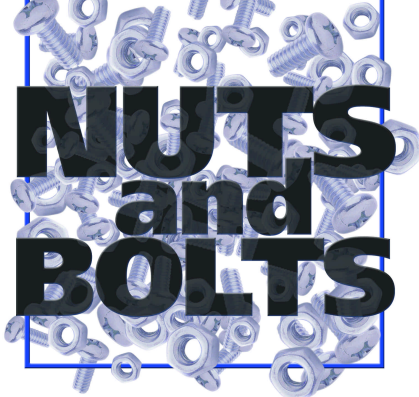
### Kick-starting

With the console laid out, we can start mixing. Where do we start? Well, the vocal is almost always the most important single piece of every pop song. So most engineers start with... the drums. Starting with the vocal makes good sense, because every track should support it. But easily 99% of all pop mixes start with the drums.

Why? Because the drums are often the most difficult thing to get under control. "The drum part" is a part with at least eight separate instruments playing all at once in close proximity to each other (kick, snare, hi-hat, two or three rack toms, a floor tom, a crash cymbal, a ride cymbal, and all the other various add-ons the drummer has managed).

It's hard to hear the problems and tweak the sounds of the drums without listening to them in isolation. So we tend to start with the drums so that they are out there all alone. Once the vocals and the rest of the rhythm section are going, it's hard to dial in just the right amount of compression on the rack toms.

What do we do with the drums? The kick and snare are the source of punch, power, and tempo for the entire tune. They've got to sound awesome, so it's natural to start with these tracks.



Step one: keep them dead center in the mix. The kick, snare, bass, and vocal are all so important to the mix that they almost always take center stage. The kick needs both a clear, crisp attack and a solid low frequency punch. Eq and compression are your best tools for making the most of what was recorded.

The obvious: eq boost at around 3 kHz for more attack and eq boost at about 60 Hz for more punch. Not so obvious: eq cut with a narrow bandwidth around 200 Hz to get rid of some muddiness and reveal the low frequencies beneath (see Parts 7 and 8 of this series, 1&2/00).

Compression does two things for the kick. First, it controls the relative loudness of the kicks, making the weaker kicks sound almost as

strong as the powerful ones. The second goal of compression is to manipulate the attack of the kick so that it sounds punchy and cuts through the rest of the mix. See last month's column for a description of the sort of low threshold, medium attack, high ratio compression that sharpens the amplitude envelope of the sound.

Placing the compressor after the equalizer lets you tweak in some clever ways. The notch around 200

### Why not distort the vocal? Or flange the reverb?...

Hz keeps the compressor from reacting to that unwanted murkiness. And as you push up your low frequency boost on the eq you can hear the compressor react. An aggressive boost of lows forces the compressor to yank down the signal hard. You'll find plenty of punchiness using this approach.

### Getting en-snared

The snare is next. It likely gets a similar treatment: eq and compression. The buzz of the snares is broad-band, from 2 kHz on up. Pick a range you like: 8 kHz might sound too edgy or splashy, but 12 kHz starts to sound to delicate and hi-fi. You make the call.

A low frequency boost for punchiness is also cool for snare. Look higher in frequency than you did on the kick—maybe 100 Hz or so. Also look for some unpleasant sound to cut. Somewhere between 500 and 1000 Hz lives a cluttered, boxy sound that doesn't help the snare tone and is only going to fight with the vocal and guitars anyway. Try to find a narrow band to cut and the rest of the mix will go more smoothly.

The snare definitely benefits from the addition of a little ambience. Plan to send it to the short reverb and/or hope to find some natural ambience in the other drum tracks. The overhead microphones are a good source of extra snare sound. And any recorded ambience or room tracks should be listened to now.

With the kick and snare punchy and nicely equalized, it's time to raise the overheads and hear the kit

fall into a single, powerful whole. The overheads have the best 'view' of the kit and the snare often sounds phenomenal there. Combine them with the kick and snare tracks to make the song really move.

It's tempting to add a gentle high frequency boost across the overheads to keep the kit crisp. If the tracks are already bright as recorded, don't feel obligated to add more high end. In fact a gentle and wide presence boost between 1 and 5 kHz can often be the magic dust that makes the drummer happy.

If you've got the toms on separate tracks, reach for your tried and true eq and compression. Eq in a little bottom, and maybe some crisp attack around 6 kHz. Try to eq out some 200 Hz muddiness, as with the kick. Compress for attack and punch, and you've completed your drum mix—for now.

## Get down

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Moving on to bass, we find similar issues. We need to compress to balance the bass line. Some notes are louder than others, and some strings on the bass are quieter than others. Gentle compression (4:1 ratio or less) can even out these problems. A

slow attack time adds punch to the bass in exactly the same way we did it on the drums.

Release is tricky on bass guitar. Many compressors can release so fast that they follow the sound as it cycles through its low frequency oscillations. That is, a low note at, say, 40 Hz cycles so slowly (once every 25 milliseconds) that the compressor can actually release during each individual cycle. Slow the release down so that it doesn't dis-

...Or distort the  
flanged reverb?  
Anything goes.  
Travel safe.

tort the waveform in this way and rides the sound from note to note, not cycle to cycle.

The obvious eq move is to add low end. But be careful, as the track may already have a lot of low end. The trick is to get a good balance of low frequencies from 30 through 300 Hz. Listen for a bump or dip in the

response—either too much or too little in a single low frequency area, and equalize in a correction.

Glance back at your kick drum too. If your kick sound is defined in the low end, say at about 65 Hz, then make room for it in the bass guitar with a complementary but gentle cut. Find eq settings on both the kick and the bass so that the kick's punch and power don't disappear when the bass fader is brought up.

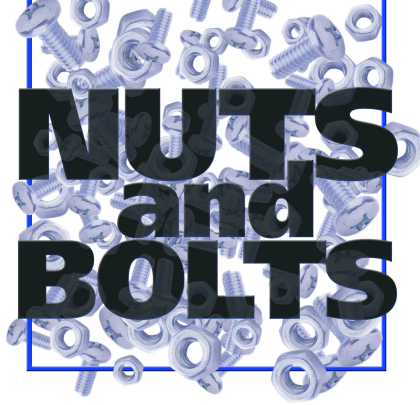
We often add a touch of chorus to the bass. This is most effective if the chorus effect doesn't touch the low frequencies. The bass provides important sonic and harmonic stability in the low frequencies; a chorus with its associated motion and pitch bending would undermine this.

Simple solution: place a filter on the send to the chorus and remove everything below about 250 Hz. The chorus effect works on the overtones of the bass sound, adding that desirable richness without weakening the song's foundation at the low end.

## Chugging on

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It's a rock and roll cliché to track the same rhythm guitar twice. The two tracks might be identical in every way except that the perfor-



mance is oh so slightly, humanly different. This results in a rich, wide, ear-tingling wall of sound.

The effect is better still as the subtle differences between the two tracks are stretched slightly. Perhaps the second track is recorded with a different guitar, a different amp, different mics, different microphone placement, or some other slightly different sonic approach.

In mixdown you make the most of this doubling by panning them to opposite extremes: one goes hard left, the other hard right. Balance their levels so that the net result stays centered between the two speakers.

Presence and intelligibility live in the upper middle frequencies. Use equalization to make sure the consonants of every word cut through that rich wall of rhythm guitars you've created. Search carefully from 1 to maybe 5 kHz for a region to boost the vocal that raises it out of the guitars and cymbals.

You might have to go back and modify the drum and guitar eq settings to get this just right. Mixing requires this sort of iterative approach. The vocal highlights a problem in the guitars, so you go back and fix it. Trading off among the competing tracks, you'll find a balance of crystal clear lyrics and perfectly crunchy guitars.

Strength in the vocal will come from panning it to the center, adding compression, and maybe boosting the upper lows (around 250 Hz). Compress to control the dynamics of the vocal performance so that it fits in the crowded, hyped-up mix you've got screaming out of the loudspeakers.

Where do we start? Well, the vocal is almost always the most important single piece of every pop song. So most engineers start with... the drums.

A touch of compression might be necessary to control the loudness of the performance, but often electric guitars are recorded with the amp cranked to its physical limits, giving it amplitude compression effects already. Complementary equalization contours (boost one where the other is cut and vice versa) can add to the effect of the doubled, spread sound.

### Key in

The clavinet completes our rhythm section. It probably wants compression to enhance its attack in much the same way the kick, snare, and bass guitar were treated.

Giving it a unique sound through eq and effects will ensure that it gets noticed. Consider adding some flange or distortion (using a guitar foot pedal or an amp simulation plug-in—or re-recording it through an actual amp) to make it a buzzy source of musical energy.

This compression and equalization track by track has so maximized the energy of the song that it won't forgive a weak vocal. Natural singing dynamics and expression are often too extreme to work—either the quiet bits are too quiet or the loud screams are too loud, or both.

Compress the dynamic range of the track so that it can all be turned up loud enough to be clear and audible. The soft words become more audible. But the loud words are pulled back by the compressor so that they don't overdo it.

The vocal, a tiny point in the center, risks seeming a little small relative to the drums and guitars. The 'spreader' to the rescue (again, see the sidebar). Send some vocal to the spreader so that the vocal starts to take on that much desired larger-than-life sound.

As with a lot of mix moves, you may find it helpful to turn the effect up until you know it's too much and then back off until it's just audible. Too much spreader is a common mistake, weakening the vocal with a

Strength in the vocal will come from panning it to the center, adding compression, and maybe boosting the upper lows (around 250 Hz).

Panning it midway off to one side is a good use of the stereo soundstage. Pan it opposite the toms and solo guitar to keep the spatial counterpoint most exciting. Add a short delay panned to the opposite side for a more lively feeling.

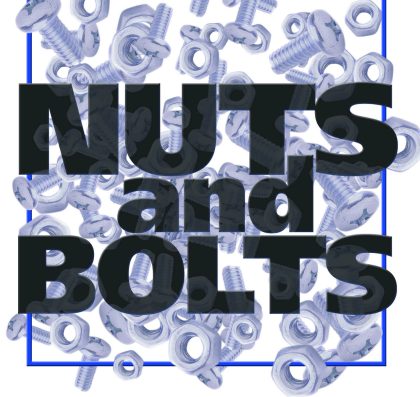
With drums, bass, guitar, and clav going in the mix, we've completed the rhythm section. Time to add the fun parts: vocal and lead guitar.

### Speak up

The vocal gets a good deal of our attention now. The voice must be present, intelligible, strong, and exciting.

chorused-like sound. The goal is to make the vocal more convincing, adding a bit of width and support in a way that the untrained listener wouldn't notice as an effect.

Additional strength and excitement comes from maybe a high frequency eq boost (10 or 12 kHz or higher!) and some slick reverb. The high frequency emphasis will highlight the breaths the singer takes, revealing more of the emotion in the performance. It is not unusual to add short reverb to the vocal to enhance the stereo-ness of the voice still further and to add a long reverb to give the vocal added depth and richness.



Sending the vocal to an additional delay or two is another common mix move. The delay should be tuned to the song by setting it to a musically relevant delay time (maybe a quarter note). It is mixed in so as to be subtly supportive but not exactly audible.

Add some feedback on the delay so that it gracefully repeats and fades. Send the delay return to the long reverb too, and now every word sung is followed by a wash of sweet reverberant energy that pulses in time with the music.

If your kick sound is defined in the low end, say at about 65 Hz, then make room for it in the bass guitar with a complementary but gentle cut.

Eq, compression, delays, pitch shifting, and two kinds of reverb represent, believe it or not, a normal amount of vocal processing. It's going to require some experimentation, going back and forth among every piece of the long processing chain.

And that's just a basic patch. Why not add a bit of distortion to the vocal? Or flange the reverb? Or distort the flanged reverb? Anything goes. Travel safe.

The background vocals might get a similar treatment, but the various parts are typically panned out away from center and the various effects can be pushed a little more. Hit the spreader and the long reverb a little harder with background vocals to help give them more of that magic pop sound.

## Going solo

The lead guitar can be thought of as replacing the lead vocal during the solo. It doesn't have to compete with the lead vocal for attention, so your mix challenge is to get it to soar above the rhythm section.

An eq contour like that of the lead vocal is a good strategy: presence and low end strength. Compression should be used with restraint if at all; electric guitars are naturally compressed already. Additional reverb is also unusual for guitars. The tone of the guitar is really set by the guitarist, and that includes the reverb built into the amp.

Solo guitar might get sent to the spreader, and it might feed a short slapback delay. The slap delay might be somewhere between about 100 to 200 milliseconds long. It adds excitement to the sound, adding a just perceptible echo reminiscent of live concerts and the sound of the music bouncing back off the rear wall.

It's good to pan the solo about halfway off to one side and the slap a little to the other. If the singer is the guitarist, it might make more sense to keep the solo panned to center.

Of course, you can add a touch of phaser, flanger—something in your digital multieffects unit that you've been dying to try, and you can even add additional distortion.

## Overall

The entire stereo mix might get a touch of eq and compression. As this can be done in mastering, I recommend resisting this at first. But as your mixing chops are developed, you should feel free to put a restrained amount of stereo effects across the entire mix. You are trying to make it sound the best it possibly can, after all.

For equalization, usually a little push at the lows around 80 Hz and the highs around or above 10 kHz is the right sort of polish. Soft compression with a ratio of 2:1 or less, slow attack and slow release can help make the mix sound even more professional.

As the entire mix is going through this equipment, make sure you are using good sounding, low noise, low distortion effects devices. And don't forget to check your final mix in mono to make sure it'll survive radio airplay.

That sums up the components of one approach to one mix. It is meant to demonstrate a way of thinking about the mix, not the step by step rules for mixing. I hope it inspires you to form your own variation on this approach.

Alex's mixes often feature didgeridoo panned dead center and doubled kazoos panned hard left and right. Complain about this to [case@ecordingmag.com](mailto:case@ecordingmag.com).



## What's a spreader?

It's often desirable to take a mono signal and make it a little more stereo-like. A standard effect in pop music is to spread a single track out by sending it through two short delays. Each is set to a different value somewhere between about 15 and 50 milliseconds. Not too short or it starts to flange/comb filter; not too long or it pokes out as an audible echo.

One delay return is panned left and the other panned right. The idea is that these quick delays add a kick of supportive energy to the mono track being processed, sort of like the early sound reflections that we hear from the left and right when we play in a real room. The extra trick is to pitch shift them ever so slightly, if you have the gear that can do it. That is, take each delay and detune it by a nearly imperceptible amount, maybe 5 to 15 cents. Again, we want a stereo sort of effect, so it is nice if the 'spreader' has slightly different processing on the left and right sides. Just as we dialed in a slightly different delay time for each side, dial in a slightly different pitch shift as well—maybe the left side goes up 9 cents while the right side goes down 9 cents.

Now we are taking advantage of our signal processing equipment to create a widened sound that only exists in loudspeaker music; it isn't possible in the physical world. This sort of thinking is a real source of creative power in pop music mixing: consider a physical effect and then manipulate it into something that is better than reality (good luck, and listen carefully).

We are going to add this effect to the lead vocal, among others. And the lead vocal is going to be panned straight up the middle. In order for the spreading effect to keep the vocal centered, it helps to do the following.

Consider the delay portion of the spreader only. If you listen to the two panned short delays (and I definitely recommend trying this) you find the stereo image pulls toward the shorter delay. Now listen to just the pitch side of the spreading equation. The higher pitch tends to dominate the image. Arrange it so that the two components balance each other out (e.g., delay pulls right while pitch pulls left). This way the main track stays centered.

Experiment with different amounts of delay and pitch change. Each offers a unique signature to your mix. Overused, the vocal will sound too digital, too processed. Conservatively applied, the voice becomes bigger and more compelling.