The Solid Mix: Learn the Basics of Mixing

Turn a 16-track session into a great stereo mix in this walkthrough

By Jeff Casey – Recording Magazine – [*Edited by JB for DESN275*]

Mixing a song is a lot like building a house: you need to start with a solid foundation (bass and drums), then add support structures (rhythm instruments), make sure the essential utilities are in place (vocals and lead instruments), add walls to the frame (background vocals and percussion), and finish the house off with some window treatment (effects processing).

Of course, the analogy eventually breaks down! You're not using a hammer and nails, you're using EQ, dynamics processing, and effects. But mixing is a challenging and fun part of the recording process. When you finally nail it (another building metaphor!), the music jumps out of the speakers.

Setting the stage

For the purposes of this article, let's create an imaginary project: a 16-track session with four tracks of drums (kick, snare, and two overheads), a bass guitar, two electric rhythm guitars, an acoustic guitar, a stereo keyboard, a lead vocal, an electric lead guitar, two background vocals, and two percussion tracks. This is a fairly common arrangement, and it covers most of the instruments you might have to deal with in a mix.

It's a good idea to set up a few multieffects processors before starting the session. Many engineers will typically set up a medium-sized room reverb as general ambience for the song, a longer plate reverb for percussive sounds, one or two mono delays to use for ambience, a multitap delay as an effect, and a chorus effect that will fill out some sounds. This is a fairly generic setup that serves as a good starting point. Of course, you won't be able to set the parameters of these processors accurately until you start building the mix, but at least you won't have to continuously interrupt the creative process to patch in new processors.

Listen up

Proper referencing is probably the most important part of achieving a balanced mix. Make sure you are intimately familiar with your monitoring system, which comes from listening to it a lot. You don't want to borrow your friend's stereo system to mix! If what you're mixing fits into any standard category, it's a good idea to have a few [example mixes] in that style on hand for comparisons while you're working.

Mono compatibility is another concern that must be taken into account. More often than not, your mixes will be listened to in an environment that does not provide perfect stereo imaging. And if you're fortunate enough to be mixing a project that is eventually going to get radio airplay, you must remember that most radio stations don't broadcast in true stereo. So your mix needs to sound good in mono as well as in stereo. To ensure this, simply press the "mono" button every once in a while to assure that nothing is cancelling out. The secret to good mono compatibility is to use effects in moderation and with care.

Why are effects so often the culprit in mono incompatibility problems? The answer lies in their technology. Many inexpensive effects (and, to be fair, a lot of the more expensive ones of older vintage) generate stereo in some or all of their algorithms by taking the wet output and panning it hard left, and taking a phase-inverted version of the wet out and panning it hard right. This phase inversion gives a very open and spacious sound, but when the two sides are summed together, they cancel each other out. Poof, no effects. This is why many some processors claim "true stereo" output; they shouldn't have this problem and they want you to know it.

In general, it's only a good idea to make minor adjustments to tracks while [you are listening to them] soloed. While you'll probably be able to make a track sound outstanding on its own, it might not sit well with the other instruments once brought into the mix. To that end, try to make as many tweaks as possible while listening to the track in context with the rest of the instruments.

Finally, and this is probably the most important advice I will impart in this article: take breaks periodically so your ears can rest. It's imperative that you focus all of your attention on the mix while you're working on it, but it's equally important for you to clear your head every once in a while. A fresh perspective is paramount in achieving an even blend of instruments.

Now you're ready to mix. Some engineers like to build their mixes around the lead vocal, especially if the song is a ballad. However, I rarely use this approach. As long as you've left yourself enough headroom, you should have no problem laying the vocal into the mix later. When I build a mix, I always start with the kick drum and bass guitar.

Step 1: the foundation

An important synergy exists between the kick and bass tracks. Together, these two instruments form the backbone of most songs and constitute most of the mix's low-end content.

Different engineers have different ideas about where to start; some like to start with the lead vocal, others like to start with the drums. I like to bring up the bass track first and listen carefully to the natural sound of the instrument without any processing engaged. (Of course, this is important to do with every track.)

What frequencies are lacking? Which are too prominent? Depending on the instrument, a solid bass sound can often be achieved using the following EQ settings: add 3 dB around 80 Hz, another 3–6 dB at 220 Hz, attenuate everything above 3 kHz with a shelving filter, and roll off everything below 50 Hz. For a more punchy sound, boost between 1 and 2 kHz instead of at 220 Hz. Of course, there are plenty of other ways to eq a bass guitar, but this is a fairly good starting point.

Unless you have been graced with an incredibly well-played bass track, you'll probably want to employ some dynamics processing. If the dynamics of the track are superior, you should try to maintain that integrity in the mix. You'll probably want to use a limiter on the track, with the threshold set to catch any transient peaks (e.g. fret noise, popping, etc.). On the other hand, most bass tracks can usually benefit from some compression. As a starting point, try a ratio at 3:1 and gradually increase it as needed. Set the threshold about 3–6 dB below peak, and adjust the attack and release setting according to the tempo of the song. If you have both available, try using both a compressor and a limiter. Patch the limiter in after the compressor, and set the threshold to catch any transient peaks. Pan the bass at the center of the mix.

The kick drum also gets panned to the center of the mix, and it's the instrument I bring in next. The center frequencies of a kick drum are typically at 80 Hz and 120 Hz. (Incidentally, the 80 Hz region is where the resonant frequency of the human chest lies, which is why we can often feel the thud of a kick drum on a loud monitoring system.)

Depending on the natural sound of your kick track, you'll want to either boost or attenuate these two frequencies so that it sits well with the bass. If you want to hear more of the "click" associated with the beater hitting the head, you'll need to boost around 1 kHz and above.

It's important to listen to the kick in relation to the bass. Because a lot of the energy in both tracks often resides in the 80-120 Hz range, you'll have to make some decisions. Neither instrument should obscure the other. If you want the kick to be more prominent, cut the corresponding frequencies on the bass. If the bass is to be more prominent, cut some of the thump out of the kick.

If you can, patch a gate across the kick drum to eliminate or at least reduce bleeding from the other drums. When setting the threshold, be sure the gate doesn't accidentally open during, say, a loud snare hit. I'd also throw a little room reverb on the kick track—not a lot, but enough to make the track sound convincing.

If you didn't have any room mics during the recording session, play the bass drum track soloed through a speaker at one end of the tracking room and put a mic at the other end. Or you can just use a reverb unit.

Sometimes it's almost impossible to get the kick drum track to sound as good as you'd like. In these instances you might consider using a sampled kick drum, triggered from your original track. Simply bus your existing kick track to an output that can be routed to the trigger input of a sampler. Return the sampler's output to a channel input on your mixer/DAW, and record-enable a new track. Then select an appropriate sample and hit Record. When you're done, delete the old kick track. If you have a modern sample replacement software plug-in like Toontrack Superior Drummer 3, Wavemachine Labs Drumagog, or Slate Digital Trigger, this process can be seamless and yield nice-sounding results.

Once your song has the spine it needs, you can start bringing in the other elements of the drum kit, starting with the snare drum. I strive for a crisp yet full-bodied snare sound. Try adjusting around 1 kHz to accent the attack, around 240 Hz to bring out the body, and somewhere around 3 kHz for the snap of the snares. If you want to add some thump to the track, boost 80–120 Hz by about 3 dB.

It's normal to gate [*Remember, a gate is a type of compressor that shuts down the sound whenever the level falls below a level you set with "threshold"*] the snare track just like the kick drum track, but chances are you won't be able to get all the hi-hats out of it—which isn't bad, because some blending of the various drums is what makes them real. If you don't want much attack from your snare track, slight compression (2:1 or 3:1) can make the drum sound flatter and fuller.

Reverb on the snare drum is paramount. If you have enough resources to set up a discrete snare reverb, do it. The type of reverb you select will depend on the song, but gated reverbs, plates, and large and small room reverbs are all common.

OR, use a mix of the room and plate reverbs you set up earlier. Play with both levels until you get the right combination. Remember that although the reverb might sound good now with just the kick, snare, and bass tracks, you'll probably need to adjust it later once you bring in the other mix elements.

A poor snare sound can also be fixed during mixdown. I'd avoid using a sample, though, because most snare tracks are too complex to produce a convincing electronic replication.

Finally, you'll need to bring up the overhead drum tracks. There is no specific EQ template that applies to every drum set, but you'll probably want to cut a little at 1 kHz, where the snare resides, and roll off below 90 Hz to prevent accentuation of the kick drum. Other than that, you can boost or cut above 5 kHz to adjust the brightness of the cymbals (upwards of 9 kHz for the sibilance) and in the lower mids (150–880 Hz) to adjust the presence of the toms. While you could pan these track hard left and right, it's not a bad idea to keep everything closed in somewhat to keep things mono-compatible. Try a pan position of about eight o'clock and four o'clock. A touch of room reverb is probably also in order for the overheads, depending on the room itself.

Step 2: structure

If you have two electric rhythm guitar tracks (as is the case with our imaginary project), pan them opposite each other on the soundstage, perhaps as far out as seven and five o'clock. This creates a really powerful guitar sound. If you only have one guitar track to work with, you can create the same effect by using a short mono delay and panning it opposite the source track.

Guitars can usually benefit from some midrange EQ, somewhere in the neighborhood of 2–3 kHz. The crispness of the track can be found around 6–8 kHz, so adjust in that range accordingly. You might also want to add a little low end, say around 160–300 Hz, to bring out some warmth. Just be cautious of stepping on the bass track.

You'll almost always want to compress electric guitars at a fairly high ratio (between 4:1 and 10:1). Just keep in mind that some amps and many pedalboards include an onboard compressor, and the guitarist might have recorded the track with it engaged (not to mention whatever compression was used during the recording), so don't go overboard and completely squash the track's dynamics. [*Many mixing engineers avoid compression on a overdriven electric guitar track because it is probably already compressed enough. And further compression can take the life out of it.*]

Likewise, the track was probably recorded with some amp reverb. Add a little bit of your room reverb for ambience, but not too much.

Acoustic guitars give a song motion, especially on uptempo tunes with fast strumming. In order to accentuate this you'll need to boost the upper frequencies (between 6 and 10 kHz). You can probably roll off everything below 140 Hz; not much exists there other than rumble and other unwanted noises.

Some mild compression is probably in order here too. My preference is not to use anything higher than a 4:1 ratio. You'll want to route this track through your room reverb (or perhaps the plate reverb, should the song warrant it). Apply more reverb on acoustic than on the electric guitars.

In general you want to balance the mix evenly between the left and right speakers. A lot of motion occurring in one side and not the other will make the mix sound lopsided. Listen with care to what each instrument is doing, and try to blend them so that you have a fair amount of rhythmic motion on each side of the mix.

Most engineers will usually pan the acoustic guitar track opposite the upper end of the piano keyboard or across from some moving percussion (e.g. shaker, tambourine, etc.). This balances the mix in terms of upper frequency content and rhythmic movement.

For a more acoustic song, you might want to spread the acoustic guitar left and right (using the doubling technique outlined earlier) and keep the electric rhythm track(s) close to the center of the mix. This accents the acoustic performance more than the electric. Of course, on an acoustic-only song, put the acoustic guitar closer to center.

These days, chances are good that your piano tracks will have been produced by a sound module or virtual instrument plug-in. If so, you really shouldn't have much work to do (provided the samples used were of a decent quality). Try rolling off everything below 120 Hz gently so the piano doesn't clash with the bass guitar or kick drum. You might also want to boost everything above 6 kHz with a shelving EQ to accent the key attack. And while you're at it, add some midrange (2–3 kHz) for presence.

My preference is to pan the piano fairly wide across the soundstage, though not so wide that it isn't believable. (When was the last time you saw a 40-foot piano?) I usually put the track with the lower piano keys fairly close to center, say at eleven or one o'clock, and the track with the upper keys off to one side, say at seven or five o'clock. This keeps the piano's lower frequencies fairly close to center, where they will propagate more evenly, and allows you to put the upper keys across from another percussive instrument (e.g. acoustic guitar) so the mix is balanced.

Step 3: power up

Vocals are some of the toughest tracks to deal with in a mix. Let's face it: the vocals are what sell the song. Lead vocals are almost always placed dead-center in the mix at the focal point. Depending on the performance, this track will probably require a good deal of compression [*True for rock/pop styles, but not so much in a jazz or unplugged style*]. Start with a ratio of about 3:1 and work upwards from there.

Male and female singers have different tonal qualities to their voices, and each must be EQed differently. For a male singer you'll probably need to cut some lower frequencies (120–300 Hz) to prevent popping. Conversely, a female vocal can usually benefit from adding a little in this range. Both typically require some boost/attenuation of the midrange (2–3 kHz), depending on the mic that was used during recording. Make sure the track has enough clarity in the upper mids, though not so much that it creates sibilance.

The type of song you're mixing will dictate the effects you use on the lead vocal. The most important thing to remember is that the mix needs to sound natural. If you're producing a polka tune, chances are a heavy hall reverb will not be appropriate.

You'll probably want to throw a little room reverb across the vocal to bring the track into focus with the rest of the mix. Then depending on the nature of the song, either use a plate reverb, a multitap delay, or a single delay effect (i.e. the infamous "Elvis vocal")—or quite often a combination of the three. Play around until you get a decent blend.

Other lead instruments, such as lead guitar tracks, are usually placed near the center of the mix, though not quite at 12 o'clock. Electric lead guitar tracks are treated in much the same way as electric rhythm tracks (in terms of EQ, compression, etc.). Try adding a little tap delay to your lead guitar track, and adjust the delay time according to the song's tempo.

Step 4: the supporting cast

There are two kinds of background vocals: single harmonies (usually an octave above the lead vocal) and complex arrangements (involving several harmonies of varying pitch). The first is treated much like a lead vocal track and is processed accordingly, usually panned just off-center.

If you have several harmonies going on at once, you might want to consider panning them across the soundstage to create a "wall of vocals." Process these tracks like any other vocal track, but compress them a little more than you would a lead vocal. Also try adding some high frequencies (upwards of 9 kHz) to create an "airy" effect for the arrangement. Add some reverb, but don't use as much as you would on a lead vocal.

With hand percussion, you'll want to accent the upper midrange frequencies. Tambourines, shakers, guiros, claves, and the like usually benefit from some additive EQ between 5 and 7 kHz. Shakers in particular can also use a boost around 10 kHz. Roll off everything below 240 Hz, as it isn't needed for these instruments.

Again, try to balance the percussion with the rest of the mix, paying particular attention to how you have the drum kit panned. If your percussion section consists of only a single instrument like a tambourine, you'll want to keep it fairly close to the center of the mix, perhaps at eleven o' clock or one o' clock.

Congas and other types of drums should be treated similarly to drum toms. Search for the resonant frequency of the instrument and determine whether it needs to be boosted or cut. You can boost a little low end to add body or some upper midrange for more attack.

Perhaps a little compression is in order? And don't forget to route these tracks through the room reverb.

Step 5: finishing touches

Stereo effect returns are almost always panned hard left and right, simply because you don't want to compromise the stereo imaging of the effect itself. Mono effects are either returned to the center of the mix (e.g. a doubled lead vocal) or to a specific location on the soundstage (e.g. a delay at two o'clock opposite the source track at ten o'clock).

In general, a little compression on your final mix is a good idea. Granted, you don't want to go overboard, considering the mastering engineer will likely be adding compression later, but just a little (a 2:1 ratio) can smooth over any level discrepancies you may not want to deal with at the sources. [*And if you are not planning to send this mix to a mastering engineer, overall stereo (buss) compression is probably a good thing.*]

If you have an automation system, use it! Many tracks are static and need no adjustment during the mix. But others, specifically the lead tracks, will probably require some tweaking. There's nothing more boring than a static mix.
If you're working on a DAW that offers an automation editing, the easiest way to automate your tracks is to listen to each section of the song, and determine the optimal level for the track at various reference points. Then draw the corresponding values for the track's volume. The same technique applies to automating the pan pot settings.

Groundbreaking ceremony

The template outlined in this article will yield a solid mix—that I guarantee. But each song is different, and if there was only one formula for mixing a record, every mix you heard would sound almost identical. So experiment, and press those buttons—that's what they're there for!