Mixing

Richard Repp

For the last two months on the TI:ME Web site I have been describing how I develop and record a popular song. In November, I showed how to create the framework of a song using MIDI (http://www.ti-me.org/members/november2003/repp1.html). Then in December, I added instructions or recording audio to supplement the MIDI (http://www.ti-me.org/members/december2003/repp1.html). The present article shows how to take all the basic tracks that have been recorded and combine them into a final project suitable for a CD.

Overview

1. Set initial pans and faders.
2. "Comp" together the best lines.
3. Layer multiple tracks.
4. Add effects.
    a. Compression
    b. Equalization
    c. Reverb
5. Mix.
6. Master.

Step 1. Set initial pans and faders.

When we recorded the individual tracks last month, I recommended recording all of the instruments at the strongest possible level to minimize noise in the system. Now is the time to take all those sounds and mix them together to the proper relative balance. Step 1 is temporary because the following steps will change all of the balances, and we will need to mix again at the end. If an external mixing board or control surface is available, the mixing process can be much more enjoyable. If not, software at least makes the process possible without the added expense of external hardware.

Setting the values for the level (relative volume) of each track is relatively intuitive. The long "sliders" at the bottom of most mixing boards and software make balancing parts a simple matter of taste. The main challenge here is to avoid the "creeping slider" effect; newcomers to mixing have a tendency to make the tracks gradually louder and louder without turning down (attenuating) other instruments. Eventually many the sliders end up near the top volume, so that they cannot be amplified any more. To avoid creeping sliders, make sure to attenuate one signal every time another signal needs boosting.

Pans, or the relative left-right balance of the signal, are slightly more complex. Some instruments such as keyboards, have stereo effects built in, so the engineer may choose to pan the two resulting tracks hard (all the way) left and hard right to maximize the effects. Other engineers prefer to locate instruments in the mix as if the musicians were on a stage. Generally, the main focus instrument, often vocals, is placed in the center of the mix. Other instruments often centered include bass, kick drum, and snare drum. The other drums are often panned as a drummer might hear them (drummer's perspective), with the high hat to the left and the low toms to the right. Avoid direct center panning with any other instrument to give the mix space. Placement in the mix not only includes left and right, but also forward and back, using relative volume and reverberation tricks (see step 4) to simulate distance.

Step 2. "Comp" together the best lines.

One of the huge advantages to digital recording over analog recording is the ease of editing. Last month I recommended keeping multiple takes of a recording. Use these multiple takes to create one perfect take by copying out the best individual phrases from each of the recordings and editing the pieces together. This process is known as comping. (The term is short for composing, although not in the sense musicians usually use the word.)
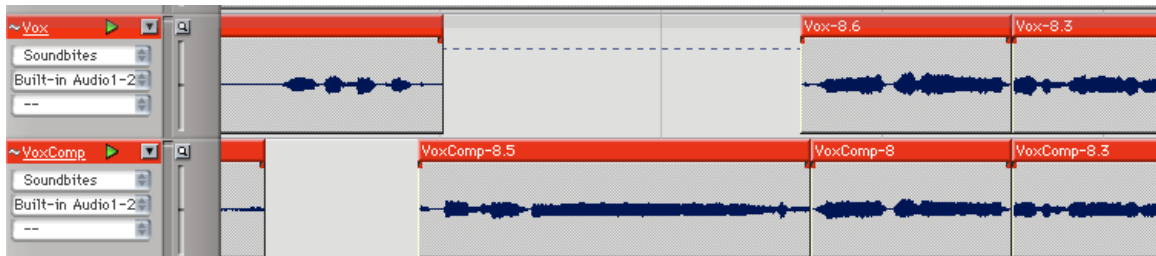
Now is also the time to trim out all of the extraneous noises such as breaths and throat clearings. Also, cull the little used parts such as toms to get rid of extraneous parts that leaked through.

Comping works well with tracks with natural silences, such as voice. Continuously played tracks can be comped together, but the process requires a bit more care. Choose edit points that have a strong transient, such as the beginning of a measure, to edit continuous parts. Cross fading also helps blur the transition through these edits. Drum parts are very difficult to edit by comping because of the leakage among all of the microphones. Also be careful of putting together parts that may sound great by themselves, but sound awkward when put with other takes. If the listener can hear the editing, then keeping the original mistake is probably more satisfying than botching a repair.

Once the best possible part is comped together, do not be afraid to use the line again in repeated sections such as choruses. One of the choruses is going to be the best, so why not use it every time?

Step 3. Layer multiple tracks.

Layering is one of the easiest ways to add depth to the mix without much actual work. Again, saving those multiple takes from the recording process will come in handy. Try taking one of the vocal lines and adding another take right on top of the original. The layering of the two sounds produces a chorus-like effect on the vocals that many people find quite satisfying. The process is known as acoustic doubling. Software packages exist that will simulate two players playing at once, but I prefer actual acoustic doubling for a nice, thick sound. Acoustic doubling also works well on distorted guitar sounds for that "wall of sound" effect popular in today's rock bands. Doubling may not be as successful for percussive parts due to the noticeable timing fluctuations.

The key to doubling is to make the effect inaudible to the untrained ear. Like most effects, if the listener hears the technique, then the impressiveness of the process is diminished. One way to hide the extra track is to lower its level so that the distinctiveness is lessened. Be careful on the overdub that the attacks and particularly the releases line up exactly. Trimming off ending sibilance from the second part is often necessary. Doubling tends to be more satisfying on long, lyrical lines.

Step 4. Effects.

Effects are to mixing what spices are to cooking. Properly used they can flavor the mix and add professionalism, but when overdone, effects can ruin a recording. An exhaustive review of effects is out of the scope of this simple article, so I will explore just three of the most widely used effects. Even limited to three, I will just be able to touch on the basic uses of each of them.

Often engineers will add effects in the recording process rather than while mixing, but my previous article assumed that complex studios were not available, and all tracks are "dry" (without effects). The disadvantage to recording with effects is that once the effect is recorded, removing it is practically impossible.

a. Compression.

Compression is a dynamics-based effect. Compression adjusts the volume of a track automatically, depending on the level of the signal. A common use of compression is to smooth out a vocal line so that the listener can hear the soft parts, but not be overwhelmed by loud passages.

If your software has preset settings, try choosing a setting that makes sense for the material being compressed. Compressor settings are relatively complicated at first, so why not learn from someone else's experience! The first knob to set is the ratio, or how much compression will take place. A good place to start is a ratio of 4:1. Next lower the threshold (labeled as Control Level on the software pictured) until you notice an attenuation of about 6 dB (see the red line in the picture). The lower the threshold, the more compression results.
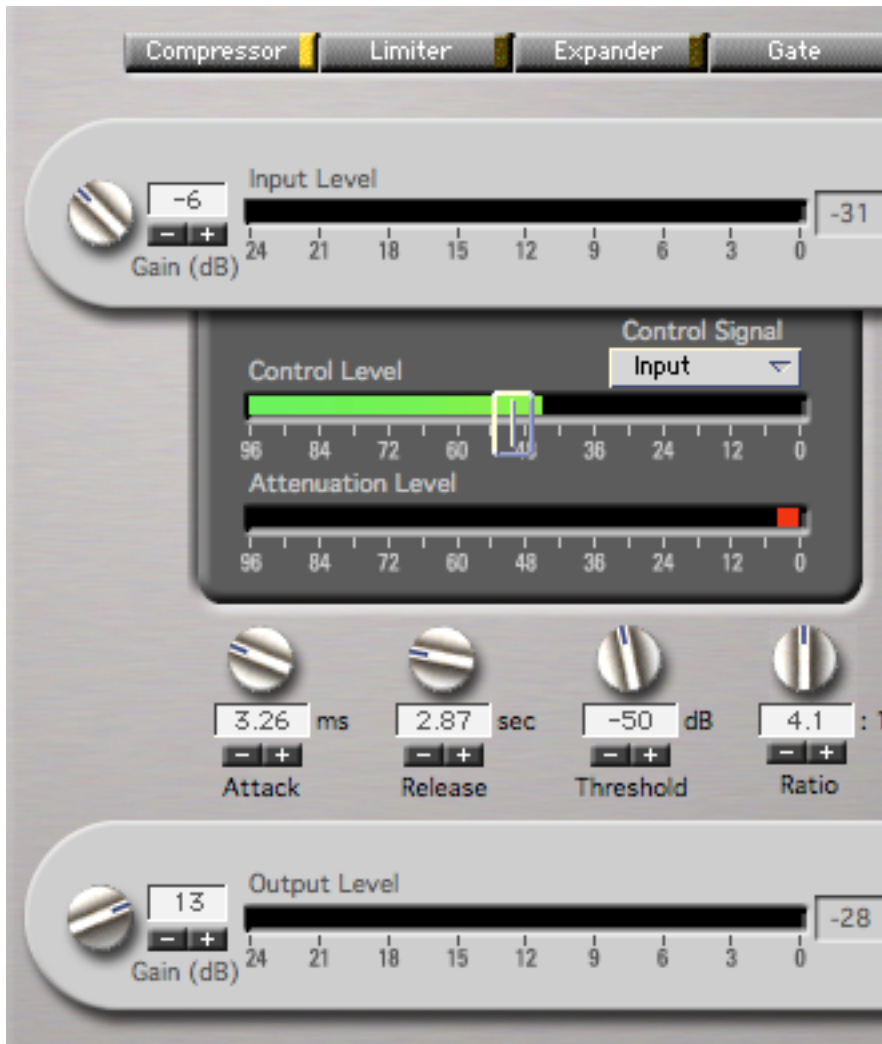
Any more than 6dB of compression will start to be noticeable. Poorly compressed signals will sound like pumping or breathing, and background noise becomes apparent.

Since the compressor is attenuating the level, another setting called the Output Gain amplifies the level. Set the output gain so that the signal coming out of the compressor is about the same as the signal going in. At this point tweaking other settings such as the attack (how fast the compressor engages), the release (how fast the compressor disengages), and the ratio may help slightly.

Compressors are effective on vocals, bass, and any part with wide fluctuations in level. A special compressor known as a limiter is often used on the final mix to maximize volume. Remember, compressors should never draw attention to themselves.

b. Equalization.

Equalization improves the sound by changing the spectral balance of a sound. The bass and treble knobs on your home stereo are simple EQs. In recording studios, the equalizers

are more complex and can narrow in on specific frequencies in the midrange. EQ is used to correct problems in the recording process caused by difficulties in microphone placement or improperly balanced recording rooms. Some recording purists minimize the use of EQ, preferring to rerecord the sound until it is just right.

To use an EQ, try boosting a narrow band of frequencies and move the band around until you find a frequency band you DO NOT like. One such frequency band may be in the midrange on kick drum, usually around 250-300 Hz, that makes the drum sound fluffy. Take the offending sound and cut it out. Now all of the bass and treble sounds I like are accentuated without amplifying them. EQ results in a more professional sound when used to "seek and destroy' offending sounds, not to accent frequencies that are pleasant.
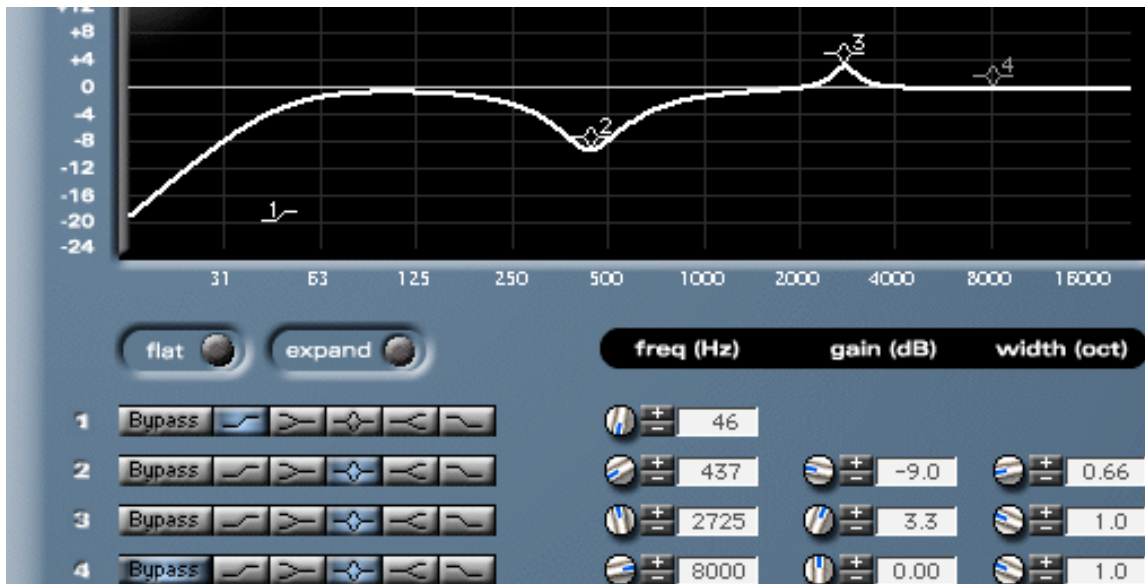

Some engineers recommend equalizing individual tracks while listening to the entire mix. Mixing is a matter of give and take, so it is possible to make every track sound great by itself, but terrible mixed together. For example, rock guitar players tend to like a lot of bass crunch in their sound, but the extra bass interferes with the true bass instruments and makes the mix sound muddy.

Common problems with equalization include adding too much bass and treble, and boosting the same frequencies on multiple instruments, thus overloading that frequency band in the main mix. EQ is more effective when used to cut frequencies rather than to boost. Try not to boost frequencies more than about 3 dB, or the EQ will be noticeable.

c. Reverb

Everyone sounds better singing in the shower, right? The natural echo effect of the tiles in the shower can hide a multitude of errors, and so we want to use reverb to our full advantage in the studio also.

One way to maximize the effect of reverb is to use busing. Unlike compression and EQ, separate reverbs should not go on each individual track. Instead, place the desired reverb on an auxiliary track by itself. Now use aux sends to send parts of individual tracks to the reverb. The more signal sent through the bus, the more reverb that track gets.
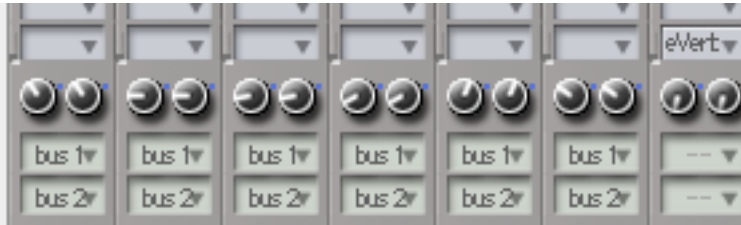
Using one reverb helps solidify the consistency of the mix. All the players sound like they are in the same room. Also, reverbs tend to be RAM hogs, so eventually lots of different reverbs will slow down the system.

In the reverb software, try some of the presets provided by the programmers. Like the other effects, a multiple of settings are there to tweak, but one of the preset standards will probably do just fine. Reverb is a combination of direct sound, sound bounced of near surfaces (early reflections) and sound bounced off of far away surfaces (late reflections). Many software packages add to the realism by adjusting for absorption characteristics of material from which the sound is (virtually) reflected. Some reverbs also add feedback to the system (echoes of echoes) to add a special effect.

Since we are using bussing, set the mix to 100%
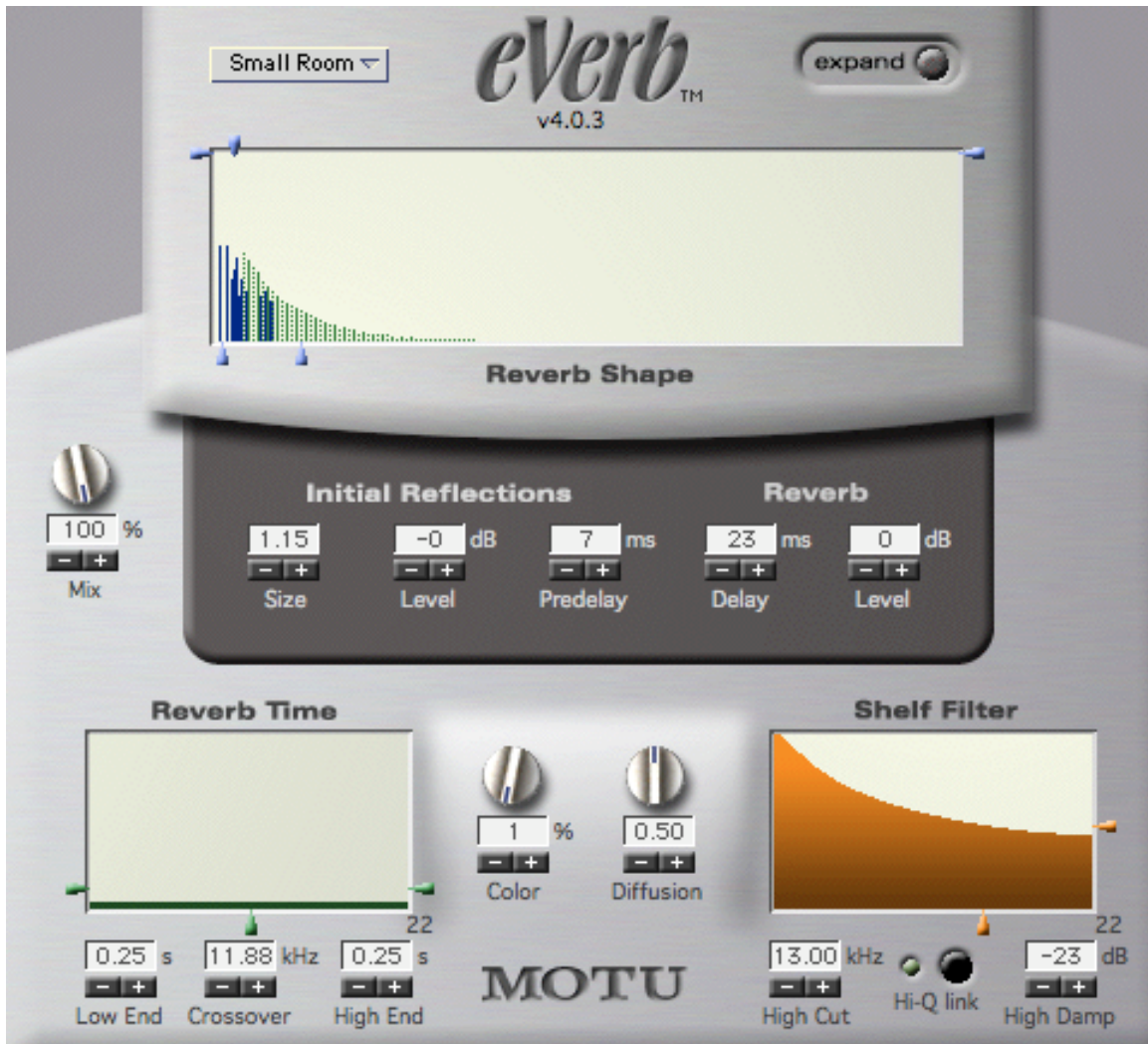
Reverb is effective on lead instruments and vocals as well as most treble instruments. Reverb on bass and kick drums makes the mix sound muddy. Too much reverb will make the mix sound blurry and unfocused. Sometimes engineers will attempt to use reverb and other effects to cover up poorly recorded material or untalented musicians, but remember, no matter how much cologne you apply, everyone still knows you have not taken a bath! Use effects sparingly.

5. Mix.

Now is the fun part. Everything is already in place and the time to put the final mix together has arrived. Make sure to be fresh for the final mixing period. Ears and brains get tired, so those 3 AM mixing sessions often lead to poor results. Get in a creative mood by setting the lighting and space to inspire.

This step is simply a more carefully detailed repeat of Step 1, the rough mix. Think of the mix as a three dimensional panorama with the musicians in front, and try to mix for a

natural sound. I recommend mixing at around 85 dB, but change the volume levels several times to make sure the mix sounds good at all volumes. Also, take drafts of the mix to all types of consumer-level playback devices to see if it will sound good on a boom box, a Walkman, or in the car. Use systems you know well and compare the mix directly to music in a similar style you like.

On the computer the user controls only one track at a time with the mouse. To make adjustments to multiple tracks, digital systems use automation. The user can program multiple tracks to change volume, pan, or most other settings, and then not have to worry about mixing the final product live.

When all of the automation is set, record the final two-track (or surround) mix. With automation, all we need to do is hit a button and have the computer compile an audio file suitable for burning to a CD, or whatever medium suits your needs.

6. Master.

All done, right? Well, maybe. The mix probably sounds as good as you can make it, but an expert may be able to make it sound more professional. This last step is mastering, and although it does not seem complicated, to master properly takes years of experience, high quality equipment, and a perfectly balanced room.

The mastering engineer takes the two-track mix from the mixing engineer and polishes to be prepared for distribution. First, the engineer runs the mix through a multi-band compressor. This special compressor is similar to the device explained earlier, except that it compresses the high frequencies, midrange frequencies, and bass frequencies separately, for a perfectly balanced mix. Next, another series of equalization removes any flaws from the mix.

Then a controversial step, limiting. By attenuating the very loudest parts of the song, the engineer can raise the volume of the entire mix. The higher volume helps album sales because people tend to like louder music better. Unfortunately, all this loudness tends to squash the life out of music. Finally, the music is normalized, or amplified to the highest level possible on a compact disk.

By following the steps outlined over the last three months, a dedicated musician can produce a recording that has an acceptable level of quality for demo disks and self-publishing. Getting that extra level to produce a truly profession recording takes a great deal of money and experience. The good news is that with a very limited budget, the struggling musician at home can produce a recording better than used to be available in many recording studios.