## On The Level

By Steve Puffenberger

#### Using Compression to keep Audio Levels Under Control

Recording audio for video is always a challenge. You don't want the mic in the picture so it's far away from the talent, but the actors are talking quietly - then they're shouting, or someone bangs something. Naturally you set your recording levels so the loud sound doesn't overload the camera and distort, but the quiet parts are now almost inaudible.

There are ways to deal with that on set which an experienced sound tech can handle, but let's say you're at the edit bay and you can't reshoot. You turn up the gain on the clip to hear the quiet part, and the loud part crackles and about blows your ears off. Unlike the old days, when fully saturated audio just sounded a little funny, when digital audio runs out of digits it's ugly.

#### **Dynamic Range**

The difference between loudest and softest part of an audio track is called "dynamic range." The greater the difference, the more you have. Speech usually has a wide dynamic range, because there's a lot of "dead air" between words or syllables. Orchestral music has wide dynamic range. Pop music has very narrow dynamic range.

Audio track with wide dynamic range (dialog)



Audio track with narrow dynamic range (music)



In analog audio, we had a dynamic range of about 20dB. Below 20dB you would run into the "noise floor" of the tape (hiss from the tape or electronics).



Analog audio meter. Note 0dB

With digital audio, you can have a range of about 100dB, because noise is practically nonexistent. You're more likely to pick up room tone than hiss from electronics.



Digital audio meter. Note 0dB.

With an analog meter, the red starts at 0. You have about 3dB of "headroom" before the peaks will distort badly. With digital audio, if the peaks hit zero, you have ear splitting distortion. If you were transferring analog to digital audio, a 0dB analog test tone should fall at -12dB on a digital meter.

(If you're new to all this dB stands for <u>Decibels</u> (aka 1/10<sup>th</sup> of a "Bel," (B) and the "bel" is a level of loudness named after Alexander Graham Bell. I'll spare you the specifics, but in an NLE the dB is used as a relative level of power in an audio signal.)

But I digress.

The wonderful part about digital audio is that you have so much dynamic range, that if your softer sounds are too low, you can generally improve that without adding noise by using the **Amplitude & Compression** tools built into your NLE or audio workstation.

All these tools have been around for a long time. You've heard them used extensively on radio, especially on AM radio where engineers bragged about having a 2dB dynamic range. That's because heavily compressed audio SOUNDS louder, when it really isn't. It just raises the soft parts to a level near the loud parts, so when you're tuning the dial (I'm showing my age, when you had a real "dial" you'd turn to find a radio station), you'd be most likely to stop at the loudest-sounding station.

Another digression.

#### Peaks

In an audio waveform the NLE is showing you relative volume, as if you were looking at the VU meter trace over time. What you'll see are Peaks and valleys. To control dynamics we want to reduce the distance between the peaks and valleys, but keep the overall level up to "normal" so it plays well with other videos.

If you look at this clip, you'll see a very tall peak about midway through. That's where someone drops something. It's very close to 0, which means that's the loudest peak in this track.



That loud peak means this is the loudest you can make the track without it distorting, unless you use dynamics processing tools.

Let's look at those tools in your NLE. I use Adobe Premier so the screen shots are from there. Other systems will have similar tools.

### Using the Tools

#### NORMALIZE

The Normalize command is the easiest, and also the simplest. It simply raises the level of the clip so that the highest peak doesn't exceed the danger zone. To normalize a clip by itself in Premier:

- 1. Right click the clip
- 2. Choose "Audio Gain"
- 3. Choose "Normalize (Max or All) Peaks to" and then enter a value, like 3dB



You'll see the track increases or decreases in volume so that all the peaks are at 3dB. It's very useful if your audio is consistent, but was recorded lower than normal when shot.

But this really doesn't change dynamic range. The loud parts are just as far away from the soft parts, but at least the loud parts are all consistent.

To get the peaks leveled, you need to use one of the other options.

#### LIMITER

A LIMITER simply makes the loud parts lower, while not changing the soft parts.

Limiter is an effect you can apply to a clip or to a whole track. Below I'll show you how to add an effect to a whole track in Premier, but to add it to a clip:

- 1. In Effects, open Audio Effects | Amplitude and Compression
- 2. Click "Hard Limiter" and drag it to the audio clip.
- 3. In Effect Controls, you'll see it now added to the clip. Choose "Edit" under Custom Setup to get to the parameters.

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00:03:12:20	In: L, R   Out: L, R

- 4. In Presets, you can choose from several options Adobe provided. Try the various presets to find one that's close, then tweak the parameters to get it just the way you want. (You can twirl down "Individual Parameters" in Effect Controls to make adjustments more quickly.)
- 5. After you do a Hard Limit, you'll want to run Normalize to bring all the levels up to 'normal."

#### COMPRESSION

While hard limit lowers the loud parts, a compressor also raises the soft parts There are several compressors you can apply to a clip or to a track. To apply to a clip in Premier:

- 1. In Effects, open Audio Effects | Amplitude and Compression
- 2. Premier has three compressors. Pick one and drag it to your clip:
  - a. Dynamics Processing, which shows you a graph so you can customize your loudness curve (advanced)
  - b. Multiband Compressor allows you to compress up to 4 frequency ranges differently.
  - c. Single-band compressor, which applies compression evenly across the whole audio spectrum
  - d. And Tube Modeled Compressor, which does the same as Single Band, but more emulates the old tube compressors from the early days (my favorite).



While it's possible to apply more than one compression effect to a clip, it's NOT recommended!

3. Just like the Limiter, click "Edit" to apply the custom setup. (Single-Band Compressor shown here):

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- 4. Default has no compression, and you would have to enter parameters, but you can start with a Preset. Try several presets, then adjust the parameters to taste. The controls (common to all compressors) are:
  - a. Threshold: The loudness at which the compressor starts to work
  - b. Output Gain (sometimes called "Makeup Gain": Compressing will lower the overall volume of the clip, so you need to boost the output to bring it where you need.
  - c. Ratio: This is the amount of compression. Max is 30:1. Try it there and you'll see how it works.
  - d. Attack: This is the time it takes for the compressor to engage. The more milliseconds, the less abrupt the gain reduction will be when a loud part comes.
  - e. Release: The time it takes for the compressor to disengage, the higher value, the more gentle the release will be when the loud part passes

Some compressor panels show metering that will indicate what the compressor is doing, such as Tube Modeled Compressor On the left is the overall output volume, and on the right the amount of gain reduction.

The only way to really learn how to use this is to experiment, so throw some footage on your timeline, apply the effects and have fun.



#### APPLYING AUDIO EFFECT TO A TRACK OR MASTER (OVERAL)

If you have a lot of clips that need compressing, it can be tedious to copy and paste attributes from one clip to the next. It's better to apply the effect to all clips in a track, or to the master, for the entire audio mix.

# IF YOU'RE GOING TO APPLY A COMPRESSOR TO A TRACK, DO NOT APPLY IT TO INDIVIDUAL CLIPS.

In Premier we add effects to a track through the Track Mixer.

- 1. Click "Window" in the menu and click "Audio Track Mixer."
- 2. Position the mixer so you can see all the controls. (it will get bigger)



By adjusting the sliders you control the volume of the track. When you switch form Read to Touch, you can automate the mix, but that's the topic for another tutorial. We want to apply a compressor effect to one track or the master.

3. Expand the effects section of the mixer by clicking the tiny arrow at the very top left of the window.



4. The white areas are the "Effects Rack" for the tracks in use on the timeline. The one on the far right is for the MASTER, and applies the effect to all tracks. Click the arrow on one of the rack slots to choose Amplitude and Compression, then the Compressor or Limiter you wish to use (see above).



You can apply more effects to the track, such as reverb, noise reduction or others, but choose only one compressor/limiter. In this example, choose "Tube Model Compressor."

5. Tube Model Compressor will now appear in that first slot.



6. You can adjust overall output gain with the knob that appears in the rack. Now CLICK the compressor in the first slot and the controls will appear.

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	de Release:	24 ms

- 7. At the top in "Presets," choose your preferred preset to get a baseline.
- 8. Play and listen carefully to what's going on.
- 9. Feel free to adjust the parameters to dial in the best amount of compression and makeup gain.

If you apply the effect to the MASTER it will affect the whole mix. If you apply the effect to a TRACK it will affect only the one track. If you have dialog from different shoots or camera angles that need to be processed differently, you can assign one set of parameters to an audio track, and another set of parameters to another track, then just drop the audio clips needing processing into the respective tracks to fix issues easily.

#### **Noise Reduction**

One of the problems with boosting low level sound is that pesky room tone or electronics hiss from the microphone itself. This will get louder when the compressor kicks in. That's why you can use the multi-band compressor, so it doesn't raise levels on unwanted noise, or you'll need to apply noise reduction. That's a topic for another tutorial too.

#### A final point about Bass (Excessive Low Frequencies).

One of the problems we often see is overly loud bass. On a concert PA system, you hear the full spectrum of sound, which can't always be heard on a typical NLE setup. The subwoofers kick in and shake the building at inappropriate moments.

If you can, use a well-tuned audio system that has a "flat" frequency response all the way down into deep bass. That will allow you to hear what's happening in the low end.

But if you don't have full range speakers available, load your file into Adobe Audition or another program that has a spectrum analyzer where you can SEE the deep bass.

In Audition, there's a tiny handle at the bottom of the timeline when displaying the waveform.



Click and drag that UP to reveal the spectrum analyzer.



At the bottom are the lowest frequencies, and the top are the highest. The brighter the trace, the louder the sound. If you have a lot of very bright areas along the bottom of the timeline that's in the very low frequency area (20-30Hz) that will shake the walls. Unless you intend for an earthquake effect, or a bass line that punches the audio in the gut, use the EQ effects to attenuate the low end.