How to optimise levels in an analogue processing chain Part II

Having set down some ground rules in the last issue BOB KATZ embarks upon the in-depth side of getting the most from your sound chain so it's running sweet and right.

LAST ISSUE I HELPED some of you get off the voltmeter-phobic wagon. To further you on that journey, just think of a voltmeter as a way of measuring the output of an analogue processor that doesn't have a meter of its own, or for double-checking the accuracy of the internal meter (usually a VU). For example, a classic Urei LA-4 compressor has a VU meter that can be selected between Output and Gain Reduction. Put it in the Output position and the meter measures the voltage level of the output in decibels. 0 VU on the LA-4 is the same as 1.23 volts (+4dBu). Put a test tone into your analogue gear, connect the external voltmeter, and prove that to yourself.

Good audio-certified voltmeters do not have to cost a lot. Here's a picture from my test bench of another classic, a Ballantine True RMS AC Voltmeter I bought surplus for US$35, attached to a Hewlett Packard attenuator/balanced bridge I picked up for $10. It can measure signals from 300 volts down to the noise floor in microvolts.

If you read between the lines of last issue's column, you'll remember that I advocate a lower analogue voltage level for 0 VU (where to calibrate -20dBFS on the digital side). This is because a lot of cheap gear simply does not have good headroom. So, running that LA-4's meter up to 0 VU may not be the solution when it is used in conjunction with some lesser equipment; or consider that your whole chain accumulates distortion, so running everything up to the max may not be a good thing if you are looking for a clean analogue chain. But if you are looking to get that 'max' sound, either through saturated tubes, solid state, or an overloaded A-DC, next issue I'll give some suggestions on how to obtain that sound from your processing chain in a controlled, repeatable manner.

Let's get down to the setting of basic analogue levels. Figure 1 shows a simple D-A-D processing loop, with a D-AC connected to a compressor in

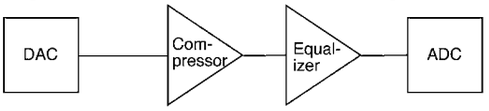

Fig. 1. D-A-D Processing Loop

series with an equaliser, and returning to an A-DC. But before we build a complex chain, we must first calibrate the levels of the D-AC and the A-DC to each other.

Figure 2 shows a D-AC connected directly to an A-DC with two Y cords feeding your monitor and the AC voltmeter. Use the monitor to make sure you have

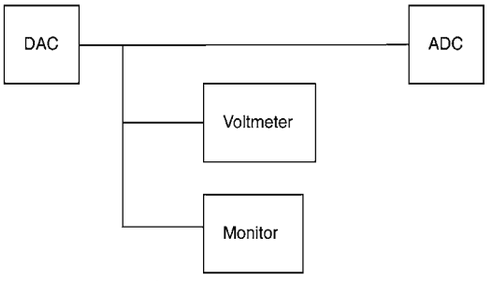

Fig. 2. D into A for Measuring

a clean signal and no bad connections. Feed a 1kHz -20dBFS sine wave digital test tone from your DAW to the D-AC and adjust its output to 0dBu (0.775 volts). This conservative level will guarantee your D-AC or the rest of your chain will never run 'ratty' on peaks and it is not so low that it will cause an audible decrease in signal-to-noise ratio.

Next, adjust the input gains of the A-DC while reading an accurate digital meter on its return to also read exactly -20dBFS (within 0.1dB). This makes the system have unity gain, and it also sets known and repeatable values for the analogue side of your chain. Most DAW digital meters do not provide accurate readouts to 0.1dB, but some plug-ins do, including the Inspector from Elemental Audio, the PAZ from Waves, and the excellent Digicheck utility that comes with RME interfaces.

SETTING LEVELS WITH MUSIC — Now repatch your analogue chain, for example like Figure 1. The best way to set levels for music at this point is to know the unity gain settings of each piece of analogue gear and start at those positions. When in doubt, get out the Y-cord and voltmeter and find the unity gain points on each processor's controls and mark them with a piece of tape.

At unity gain in each processor, and with a -20dBFS = 0dBu level, the VU meters of any piece may never come up to 0 with normal musical signal. That's a good sign if you like to have a clean analogue processing chain. Signal-to-noise ratio should still be excellent with this level calibration. It's a myth that you must be constantly concerned about signal-to-noise ratio, 'maxing' each piece's levels or especially the level of the A-DC. Just operate the active controls of the compressor or equaliser while occasionally checking the peak level on the A-DC. Let the A-DC's levels fall where they may; there is no such thing as 'too low' because you've adjusted your analogue system's gain to be noise-free for any normal monitor gain.

Of course, a significantly low level would force you to turn up your monitor gain, but if you follow the Max Peak Between -10 and -3dBFS rule, all will be well. It's highly unlikely you're A-DC will overload unless you are really pushing the equaliser, and if so, then attenuate the output gain of the equaliser below its taped unity mark until the A-DC is once again running below full scale. Or, if the equaliser has no output gain, attenuate the digital level within the DAW feeding the analogue chain. The noise and distortion of a 24-bit processing system is significantly below the noise floor of your analogue chain, including the convertors, so this practice will not cause any audible degradation; dither the DAW's output to 24 bits to be safe.

There's so much headroom in this calibration that an over is highly unlikely. If you do hear hiss at the listening chair at normal monitor gain with no signal, then it's probably caused by a defective or improperly-adjusted analogue processor. Disconnect the input to the A-DC and make sure the hiss goes away to isolate the problem to the analogue chain. In my system, I can raise the monitor gain by 10dB above my standard 0 cal and barely hear noise from the loudspeakers.

OPERATING THE ANALOGUE COMPRESSOR MAKEUP GAIN — The compressor will have an output or makeup gain control. Common practice is to adjust the makeup gain so the compressor does not change loudness switching between bypass and engaged (in) while listening to music. But this is not a requirement; as I mentioned, it is not necessary to max out the A-DC. Use the makeup gain only when you need to evaluate the sound of the compressor.

In Part III next issue, we'll talk about how to purposely get distortion from the chain. Now why would people want to do that? And in the last installment, Part IV, we'll discuss the nitty-gritty of interfacing balanced and unbalanced analogue connections and their many permutations. ■

Information

Resolution recommends Bob Katz's book *Mastering Audio — The Art and the Science* as an essential source of information for every pro audio enthusiast who cares about sound. You can buy it on line at **www.digido.com**