Subject: Analog vs Digital
Posted by Wayne Parham on Fri, 04 Feb 2011 01:19:29 GMT
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I'm squarely on the fence on this one. Back in the late 1970s and early 1980s - long before digital audio was mainstream - I was excited about the technology. I recorded audio to hard disk drives the size of washing machines using early A/D chips. It was exciting to me and I was eager for the technology to evolve. Eventually it did, of course.

Then as now, the strengths and weaknesses of digital audio remain. Actually, one of the early weaknesses has long since gone, the bandwidth/storage problem is no longer an issue. Storage was a problem in the 1970s when disks were often rated in kilobytes and the biggest drives were just a few megabytes. But the fundamental strengths and weaknesses remain.

The biggest strength in digital is its consistency. Once a source is digitized, it can be stored, transferred and copied any number of times without losing integrity. But its biggest weakness is the transformation process, and the fact that it is not possibly to make a truly lossless digital representation of an analog signal. Unless sampling is done at a hypothetical infinite rate, or to a perfectly band-limited signal, there is always something lost in the translation.

Of course, a very good case can be made that you can't make a perfect analog copy either. It would not be accurate to say that digitized recordings lose information without also admitting that analog recordings lose information too. The best analog recordings tend to have small random imperfections where the best digital recordings have small well-defined imperfections. The whole idea of increasing the sampling rate above the Nyquist frequency is meant to ensure that imperfections are limited to signals outside the passband, i.e. imperceptible and in fact, non-existant if the sampled signal is perfectly band-limited.

But that's the rub, isn't it? Since the sampled signal is not perfectly band-limited, the whole process becomes an approximation. The digitized signal now becomes a data set that suffers a potential host of problems such as aliasing and other artifacts. Reconstruction is never perfect.

You know, in a perfect world, the analog system probably would be better. Audio is an analog signal, amplifiers are analog multipliers and microphones and speakers are acoustico-mechanico-electrical converters. Everything is analog. So if you have an unlimited budget, you'll probably do better with purely analog components. But it will be an expensive system and probably pretty inconvenient. Lots of maintenance, biasing adjustments and things like that. Maybe get the digital gear to auto-adjust the analog gear.

But I also see the benefit of digital audio. If you put some effort in the conversion process (codecs) and the supporting components (the op-amps surrounding the DACs and ADCs), you can make a great system with performance that approaches the hypothetical limits. Once you get to that 99.9% point, it's probably pretty much counting angels on the head of the pin.