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.

Subject: Re: Analog vs Digital
Posted by audioaudio90 on Thu, 10 Feb 2011 15:51:55 GMT
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Theoretically, I prefer analog imperfections over digital losses. Practically speaking, just about everything I record or listen to is digitized. We're living in a digital world, so I guess I have to be a digital girl.

Subject: Re: Analog vs Digital
Posted by MusicDiva on Thu, 10 Feb 2011 22:34:25 GMT
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Listening to digital has become so much the norm that people seem to give you a second look when you say you like analog. I love and respect that past and how much technology has advanced. I love to pop in old cassettes from time to time or listen to the radio. It's not as good, technically probably but I still love it. It just brings back memories

Subject: Re: Analog vs Digital
Posted by Adveser on Mon, 21 Mar 2011 11:58:31 GMT
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Here's some stray observations. I may alternate between the spelling of words:

Can analog produce a perfect copy of the original mater tapes in any form? No.

Can you make unlimited bit-for-bit perfect copies of the original digital master tapes with digital? Yes

Digital enhances fidelity by eliminating high frequency masking and noise generated by mechanical noise, as well as eliminating the physical limitations and nonlinear response of magnetic material.

We can simulate the tonal characteristics of analogue reproduction with digital processing, with far more accuracy, control and can specifically change characteristics that have drastic effects on the real analog equipment such as amplifiers and speakers.

Purely analogue playback is completely fruitless if a single process in the reproduction of the material is done digitally.

Digital will always sound superior if any one part of the production process was done digitally.

Class A/B (or another analogue) amplification will always be superior to Class-D amplification because speakers are analog devices. Eliminate op-amp based pre-amps to create dead silent operation.

If you want something to sound like it was done analogue, run it through the analogue equipment

and record it digitally. It's gonna end up there eventually anyway!

Only classic recordings of a period where the recording, editing, mixing, mastering, and pressing were all strictly analog and original could one even consider using a mass-produced and inferior analogue copy of the original master tapes.

That's all the ranting I wanna do tonight

Subject: Re: Analog vs Digital
Posted by Wuzajock on Wed, 20 Apr 2011 21:03:35 GMT
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Adveser, that'a a very good argument for digital sound I must say. However, a friend who owns a music store and has been in the music business for nearly 40 years still swears that audio fidelity cannot be any better than in analogue form. Perhaps because he sells vinyl? I don't know.

Subject: Re: Analog vs Digital
Posted by Adveser on Thu, 21 Apr 2011 04:10:44 GMT
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It is because he likes the non-linear distortion, which is fine. I like the distortion I create with DSP. You could not in either case claim there is more fidelity in a more aerodyne (better sounding at the expense of accuracy) mix or mastering of the original source material.

I equate fidelity by the amount of high-frequency information is retained, which digital's 96Khz limitation being the best we have currently.

Sampling is about as much of a non-issue as A/B amps using an alternating pattern and rectifiers to reproduce a class-a signal. I don't have the numbers but I've read how sampling works and the thing is that the complaints one would have about it are at the very extreme of poor audio quality IMO.

Subject: Re: Analog vs Digital
Posted by Wayne Parham on Wed, 27 Apr 2011 21:50:20 GMT
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Honestly, I think once a person gets past the level of mid-fi, when their system is capable of good high-fidelity sound, the biggest problems with source material are actually at the mastering and post-production level, not so much in the distribution media. Now, this of course, assumes that the source equipment, amplifiers and speakers are very good and the distribution format/media is too. You can't really compare a scratched or worn vinyl album with a CD, for example. But if the source media is in good shape and the system components are good, I think the biggest

differences in sound quality are in the master sources.

Think about how many times you've listened to a really clear CD or record album. One that has no tape hiss and where the instruments and vocals are clear. It sounds great whether on CD or vinyl. Now think about the times when you've heard an older recording that had tape hiss and reduced top-octave "sparkle". Or where the mix is compressed and pushed to the point of distortion. I've heard these kinds of recordings on both vinyl and CD. It kind of doesn't matter what the distribution media is - If the source master is poor, there's nothing going to help that sound better.

But back to the really good stuff. When I hear a recording that has been done well, it has very black silent passages with no hiss. It has smooth vocals without breakup. It has bass note progressions that are powerful but also clear. The top-octave has sparkle and air without sounding etched or artificial. I can listen to it on certain vinyl pressings (like half-speed masters) and it sounds perfect. Or on a digital copy that is uncompressed, it also sounds perfect.

What sounds less than perfect are the cheaper vinyl pressings and sometimes CDs. They just sound slightly artificial. Some MPEGS and audio streams are even worse. They're like listening to FM radio. Compressed dynamic range, bandwidth limited, who knows what all else.

On the other hand, one new format I'm really liking is BluRay. Some of those have stunning audio quality. You can hear the difference right away. It's a lossless digital format, and when combined with good mastering and post-production, the sound quality is excellent. I'm wondering just how close they can come to those thousand dollar tapes.

Subject: Re: Analog vs Digital
Posted by Adveser on Thu, 28 Apr 2011 00:10:04 GMT
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Thanks for the post Wayne. It was fun to read.

Mastering generally has to be really poor for me to complain about and Compression is not an issue unless it is very over the top.

A point I would like to make is that compression is not "clipping" like a certain idiot likes to claim on the internet. That is impossible. Clipping occurs during recording when the peak of the signal can not be captured, not when it is compressed and hard limited. That retains all of the information there was and it is not clipped off. This guy is being completely dishonest about how it works to perpetuate a business model that claims major labels and even indie labels do not care about audio quality. By calling it "clipping" he is insisting that there is a serious defect that only he can cure by remastering the album.

The only problem loud mastering causes in my experience is when you have a old piece of equipment that strictly enforces -96db operation. That causes problems when the average signal

is 100db. I output to 24-bits and the loudest mastered album there is does not even come close to hitting 0db. Think about it. If MP3Gain can register the average volume at 100db than NOTHING is getting chopped off at that stage either.

16 bit has a Q value just like anything else. If the sound is too quiet it uses a lot less information to express the signal. Old CD's that peak at -6db are 14-bit recordings.

I'm really starting to believe that people that prefer ancient masters to a decent recent master like it because it contains more hiss and they like the vinyl EQ that was attached to those 2nd gen tapes that were used in the beginning.

Compression however, just like anything else, can be implemented poorly and that has been the case on a lot of records by engineers that were not patient enough to do it slowly, EQ, redo it, EQ again, ect. and by not being mindful or aware of how that sounds during extremely busy or quiet parts. Laziness ruins records and not compression, IMO.

Subject: Re: Analog vs Digital
Posted by Wayne Parham on Thu, 28 Apr 2011 01:16:10 GMT
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I think there are probably a lot of engineers and artists that push the compression because they know their audience will be listening on severely compromised equipment. But most audiophiles would prefer less compression, a large dynamic range and low noise floor. It's an entirely different market. One market segment is much larger than the other, but I would say the smaller segment is much more affluent. I know some guys that will pay several hundred to a few thousand dollars for a single audio tape, a reel-to-reel second generation copy of a master recording. Deep pockets.

Personally, I'm not in that crowd. I can't justify paying a thousand bucks for a single record. I don't have any problem paying more for a good album or CD though. The real trouble is finding them. So many recordings out there are just average. But really, it's the music I'm after, not the bragging rights. Sometimes I'll suffer through an album that maybe didn't get the best post-production because that's the only version available to me.

If I really like an album and the media I have it on is mediocre, I'm always on the lookout for a better version. Back in the vinyl days, it was half-speed masters (and sometimes still is, that or 200g albums). Now I'm started to move towards BluRay audio because some of the disks I have sound sooooo good. That's one thing I like about the current state of the art - There seems to be more high-quality media options available these days.

Subject: Re: Analog vs Digital
Posted by Adveser on Thu, 28 Apr 2011 06:36:02 GMT
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Digital just takes a ton of precision, a lot more patience, and a thorough understanding of what you are doing.

I form the opinion that modern recorded, mixed and mastered CD is better than ever. I have quite a few metal albums that are perfect.

Being anti-compression, but pro analogue is a complete contradiction. The idea on a very well made digital recording is to simulate how analog would compress the peaks, maximize the loudness and enable biasing of frequencies. Then you mix everything with it's own space.

When the following things occur, digital is going to sound bad and I don't judge the medium by these pitfalls:

*recording with peaks clipped.
*recording without a pre-amp
*recording without a compressor and hard limiter
*recording without the maximum volume being close to zero.
*recording a single take of an instrument with two drastically different volumes instead of doing two tracks, or any other situation where the volume is not consistent.

I think people forget that the tape itself was a sophisticated set of signal processing being applied to the recording. Treating analogue and digital the same way is a disaster waiting to happen. The physical medium in analog was another layer of modification too that was compensated for.

I think the mixer should be doing all the compression and loudness maximizing on a record though, leaving the mastering engineer's only job to fine tune the EQ and make create the final mixes needed for CD, or whatever else.

Subject: Re: Analog vs Digital
Posted by gofar99 on Tue, 03 May 2011 17:49:53 GMT
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Hi All, Great thoughts. I've been attached to both sides at one time or another. Now I do and love both. A recent experience really brought home to me the level of improvement that has taken place in the digital area. I ripped a large number of tracks from CDs that had been recorded well to MP3 at 320K. I put them on an external USB drive and fed it into my OPPO 83SE. Really amazing. I will have to try other formats and see how that works. One fault if you can call it that is the OPPO won't recognize some formats and only likes drives with FAT formatting. Still on a 500G to 1TB drive you can put a huge amount of music.

Subject: Re: Analog vs Digital
Posted by Wayne Parham on Tue, 03 May 2011 18:18:33 GMT
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Here's a related thread, with a couple good links that describe PCM (fixed width Nyquist) and Delta Sigma (one-bit oversampled bitstream) converters:
Non-oversampled v. Oversampled