Trevor de Clercq
January 23rd, 1999

Digital Audio Processing
E85.2601, Prof. K. Peacock

Article Summary:

"Two Parts Too Many?" by Stephen St. Croix
(Mix. Jan. 1999. pg 20)

In this article, St. Croix addresses a few of the many myths and misunderstood characteristics concerning digital audio. All of these misconceptions fall under the basically flawed popular philosophy that audio is immune from any of the previous problems associated with analog recording once the audio is transferred into the digital realm. In certain cases, St. Croix points out, the old pitfalls of analog are even more severe when working with digital.

The first point St. Croix attacks is the notion that digital data (or audio) can be duplicated repeatedly without any loss of quality. While this theory may be true for copies made using a computer's hard drive, it does not hold for more commonly used digital audio formats. Although St. Croix does not mention this angle in his article, I know that the bit error tolerance is much lower for the computer industry and its related products (1 bit for every 2 million or something) than for the audio industry. In other words, when digital information is copied on a computer and then verified, only 1 bit out of 2 million (don't quote me on this exact number) can be in error; otherwise, the copy fails. With most outboard digital audio gear, however, this verification process (if it happens at all) is usually left uncommunicated to the user. When was the last time you copied a DAT and the DAT machine told you the copy failed? Never! But I'm sure most people have encountered failed copies when backing up computer data. The tolerance for digital audio (when not on a computer) is simply much less rigid and thus prone to errors. St. Croix gives a little history by mentioning that DAT recorders used to give error and interpolation readouts, a practice which has obviously discontinued since too many people become too worried. The most interesting thing about the article is a test suggested by St. Croix: take a DAT, play it ten times, and then copy it (digitally of course). Apparently if this process is repeated to the 15th generation, the loss in sound quality becomes very noticeable. If I get a couple free hours with two DAT recorders, I wouldn't mind conducting this test; it would speak volumes about the long term storage limitations of DAT.

The second topic of this article touches on the well-known headroom restrictions of digital audio versus analog tape. Basically, digital audio has no headroom. Since quantization distortion becomes more prominent with lower recording levels, though, engineers are caught between clipping and quantization noise. This margin for error is much smaller in digital than analog recording considering analog's smooth saturation characteristics and large headroom. As a result, recording to digital becomes more difficult. But the difficulties do not stop with level to tape. Every step of the recording process--mixing, bouncing, editing, signal processing, mastering, etc.--has to be maximized in terms of bit levels to take full advantage of digital audio's fidelity potential (just as one maximizes in analog). St. Croix's main point is, therefore, that the advent of digital recording does not save engineers from worrying about noise or headroom or achieving a good signal flow.

St. Croix's final point is a very specific one concerning EQ. Apparently, some people are under the assumption that "digital EQ is better than analog EQ." The problem with traditional analog EQ, of course, is its use of phase shift. This process, known as infinite impulse respone (IIR) is also used as the model for most digital EQ. Therefore, digital EQ suffers from the same problems associated with analog EQ. While some current digital EQ's use finite impules response (FIR)--a method free of sonic degredation--most digital EQ's today are based on the IIR model.