

Sound IS the Experience 1TM

DIGITAL CHOICES

BY

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Last summer's digital stereo release of TERMINATOR 2 reported a boxoffice increase averaging 68 percent in those theatres presenting a digital print, compared to those theatres with conventional analog presentations. This should be expected. The public has shown a very strong desire for the quality of digital stereo by their purchases of compact discs.

The TERMINATOR 2 boxoffice increase parallels our own experience with the pioneering digital presentations of FANTASIA that we did seven years ago, as well as other recent digital releases. I have always maintained that digital stereo, *properly presented*, will sell more tickets. I further believe that this industry not only should have digital sound, but that it MUST have it!

Several organizations have proposed or accomplished various schemes to present digital sound with motion pictures. Seven of these, Optical radiation Corporation, Dolby Laboratories, Strong International, the National Film Board of Canada, Karasync Digital Audio and Sony have all proposed distinctly different digital processes. The seventh company, High Performance Stereo, which is my company, was the first to bring digital sound to commercial movie theatres in 1984 and 1985 utilizing double systems and digital ready HPS-4000[™] sound systems. We do not offer a digital processor. Rather, we specialize in motion picture loudspeakers. Since I have discussed the speaker and amplifier requirements for digital stereo in previous articles, this article will concentrate on the six primary digital film processes which have been most recently proposed.

DIFFERENT PATHS TOWARDS THE SAME GOAL

In one way or another, all the proposed digital film systems offer sound quality that can be considered generally equivalent to the compact digital disc. This is to say that they all have similar dynamic range, signal to noise ratios and low distortion. They also offer at least the same six discrete channel sound format. These channels are designated left, center, right, left surround, right surround and bass. The NFB system departs slightly from the totally discrete approach by deriving the bass channel from the low frequency sum of the left, center and right channels. Some systems also offer additional channels for SMPTE and MIDI (Musical Instrument Digital Interface) time code information. While differences in the sound quality available from these systems should, theoretically, be relatively minor, these different processes employ totally different digital data storage schemes and digital manipulations. In other words, none of the proposed digital stereo film formats is "the least bit" compatible with another.

CINEMA DIGITAL SOUND

Optical Radiation Corporation teamed up with the Eastman Kodak Company and was the first to market a technology for marrying digital audio to both 35 mm and 70 mm motion picture release prints. Cinema Digital Sound, or CDS, prints have no conventional analog soundtrack. The CDS digital track occupies the normal soundtrack area. As such, these prints have been reserved for those theatres equipped with a CDS processor and associated sound pick up (reader) mounted in a penthouse on top of the projector. The sound quality is excellent and the error correction scheme quite impressive. The system is now so well refined that the T2 openings went without a hitch. Thus far, only the CDS system has actually been used for official composite digital releases.

Last November, ORC announced that they were sharply curtailing their CDS activity and attempting to find a buyer for their CDS system. At this writing, none has been found and it is not clear whether the the CDS system will ever be used again. Because the CDS system serves as the stepping off point for digital sound on film, I felt it useful for this article to include this discussion, at least as a reference for comparing the other digital systems being offered. Whether or not we see CDS prints again, the system itself, as well as Howard Flemming and the dedicated team that built it, are certainly worthy of this industry's admiration and respect.

SR-D

Dolby's new digital stereo format, called SR-D, places the digital information between the sprocket holes on the soundtrack side of a 35 mm print, allowing a normal (Dolby SR encoded) analog soundtrack to remain in place. This provides all the advantages of a compatible single inventory print release. Thus, SR-D digital prints can be played in any theatre, whether digital or analog equipped. At present, Dolby has not announced a digital system for 70 mm prints.

Curiously, Dolby Labs. has spent most of the last decade publicly down-playing the advantages of digital sound while quietly developing digital processes of their own, designed primarily for transmission purposes. With the introduction of the CDS system, however, Dolby responded with one of their Audio Coding systems called "AC-3", adapted for motion picture sound. The SR-D processor is priced at \$19,600.00.

Dolby's AC-3 process involves what is called a "low bit encoder". Normally, digital recordings store all the digital bits produced by the analog-to-digital converter. This

requires lots of data storage capacity of one form or another. Low bit encoders are used when storage capacity is limited. They "compress" or reduce the digital data so that it can be stored in less space. The challenge for low bit encoders is, of course, to reconstruct the compressed, or coded, data upon playback, so the original audio signal can be accurately restored with no change in sound quality. This is essentially impossible with current technologies. Increasingly clever digital manipulations and masking techniques are employed to maintain audio quality as much as possible and carefully fool our ears in ways that hide the discrepancies.

Dolby's AC-3 system isn't perfect. In fact, no manufacturer of low bit encoders has made any such claims of perfection. Having said that, it must also be said that Dolby's AC-3 system does a very good job at minimizing sound quality degradation. Indeed, one would would have to listen quite carefully to both the original and encoded recordings to detect any losses. With or without such a comparison, however, audiences are likely to be as impressed with this digital system as any other.

A PREVIEW

This past winter I visited a theatre where Dolby had temporarily installed an early version of their SR-D decoders. This installation was one of several unannounced final field tests to be carried out before SR-D's scheduled introduction later this year. STAR TREK 6 was selected to be the first feature recorded in SR-D in part because of the dynamic range which the sound for such films employ.

As with the CDS digital system, the sound in this presentation was discrete, clear, with a wide frequency range. And, most important, it all came out of the proper speakers. This last item may seem trivial but it isn't. There were no audible errors, dropouts or any indication that the system reverted to the analog soundtrack at anytime. This is particularly significant because my visit occurred late in the run. Any damage the digital track might suffer by being located between the sprocket holes would likely have been more evident at this point.

While Dolby's digital system worked well, the entire presentation lacked involvement due to this (brand new) theatre's loudspeakers which were unfortunately inadequate for digital stereo. Even though the level was quite correct (perfect really, along with an excellent mix) the sound was thin. In other words, there was certainly a lot more sound on the track than the audience ever heard. More about this problem later.

THE NATIONAL FILM BOARD OF CANADA

In late 1988, the National Film Board of Canada (NFB) contracted with several firms to

4

develop a digital sound on film recording system. The result was a significant research program. Like the CDS system, The proposed NFB system places the digital information in the analog soundtrack area of a 35 mm release print. Hence these digital prints will only play on properly equipped projectors.

One of the most interesting aspects of this system is that the sound recording camera is designed to photograph either analog or digital soundtracks. The projector's sound pickup is also capable of reading both types of recordings.

The proposed NFB system requires compression techniques which are unspecified in their 1990 technical paper. At this time, no motion picture has been released in this format.

DIGITAL LASERSOUND

Strong International has also entered the digital stereo competition, but with a significantly different approach called Digital LaserSound. The most obvious difference is that this is a double system. Rather than storing the digital data on the print, Strong's system puts the digital information on a three hour, 12 inch laser disc. The disc is synchronized to the film using SMPTE time code which is printed along the edge of the film. If synchronization with the picture is lost for any reason, the system is switched back to the film's analog stereo soundtrack. The speed with that this system has been demonstrated to reestablish digital synchronization and return to the digital disc, is a quite remarkable few seconds: this even when an entire minute of film is missing.

Using a laser disc offers several advantages: The first is the obvious one of allowing the prints to be single inventory and playable in any theatre. Less obvious, but no less important, are the advantages of easy language replacement, uncompressed digital recordings and even two additional audio channels. Strong's system provides what they call "true CD quality, 16 bit, 44,100 Hertz uncompressed digital audio". This means that there are no data reduction manipulations to overcome or hide during playback (beyond the "normal" analog-digital-analog conversion processes). Their DLS6 digital processor can also be expanded to provide 8 discrete channels. This could be a welcome advantage for special venue theatres with wide screens which can benefit from five full-range channels of sound behind the screen, rather than the current three full channels plus a subwoofer channel. Most will recall that the original 70 mm films were recorded with five full-range screen channels plus one surround channel. With the DLS6 system, this format is once again available, but in digital sound and with stereo surrounds.

Strong's Digital LaserSound processor is priced at about \$9,500.00, or about half that of Dolby's SR-D. Such a price differential may help overcome distribution's aversion to

double systems.

KARASYNC

The Karasync system is being developed by Karasync Digital Audio, Incorporated of Connecticut under the direction of John J. Karamon. Like the Strong system, the Karasync digital process is an eight channel double system with the digital soundtrack synchronized to the film. This system differs dramatically in the way the picture and the digital sound are kept together. The print used can be a normal analog print. No special time code or other mechanical means are used for synchronization. Rather than rely on such techniques, the Karasync design keeps the digital track locked to the analog soundtrack on the film by constantly comparing the audio recordings themselves. The analog and digital soundtracks are matched to each other and kept together by the use of a small computer. This means that any normal 35 mm, or even 16 mm, print could be used and presented in digital stereo.

Like other double systems and Dolby's dual soundtrack process, the Karasync reverts to the conventional analog track anytime the digital sound is not synchronized. For a more complete description of Karasync, see the March, 1990 issue of BOXOFFICE, page SW-52.

SONY DIGITAL SOUND

In February, Sony Corporation announced a digital sound on film system which is expected to be available for theatrical use within the next 12 months. Called Sony Digital Sound (SDS), this format will contain eight full 20 to 20 kilohertz bandwidth channels of digital audio placed on the film along with the normal analog soundtrack. The expectation is that this is intended to revive the practice of using five full-range channels behind the screen with the addition of a bass channel and stereo surrounds. With eight channels, of course, virtually any format is possible. For instance, one could have five screen channels and three surround channels: left wall, right wall and rear Wall.

So far, only Sony has announced a system with eight full range digital channels on a composite and analog compatible release print. Just where the digital information is to be placed on the print has not been announced. The remaining available area on a 35 mm print is quite limited, so we must wait to learn how this is to all be accomplished.

Imagine, however, a 35 mm release print with a normal stereo analog soundtrack, plus SMPTE time code for the Strong laserdisc, a Dolby digital track and a Sony digital track as well. Creating such a print could drive the people in the post-production facilities and the film laboratories positively crazy. But it would provide the exhibitors with the opportunity to select which digital process they want, rather than being forced to accept

THE "REST OF THE STORY"

My experience with the digital presentation of STAR TREK 6 and a similar experience I had listening to a CDS print of EDWARD SISSORHANDS (both with "modern" sound systems) confirms my fear that without better theatre speakers and amplifiers (especially speakers), digital stereo isn't going to make much of a difference. To put it another way, updating just a theatre's speakers and amplifiers will result in a far greater improvement in sound quality, than installing a digital processor alone. Do both (properly), and the results will be sensational: a true revolution. Self serving as these statements may seem, and I admit they are, they are also undeniably true.

While those offering digital film sound processes will be more than happy to discuss the advantages and benefits of their system, don't expect too much disclosure when to advice on speakers and amplifiers which, after all, they do not design, manufacture or sell. What is most often said is that while a particular process will sound best over the best sound systems, it will also be successful with all the existing theatre playback systems; a ridiculous notion to say the least.

It is notable that since their introduction in the mid 1970's, every proposed improvement in optical stereo soundtracks has failed to gain wide acceptance. This can even be said to some degree for Dolby's SR system, which should have all but replaced the older Dolby A system by now. Proponents of advanced soundtracks have generally been extremely careful about advising theatre owners to replace their existing loudspeakers and amplifiers. The constant refrain has been that producers and exhibitors would not adopt an improved recording formats if they also include the need to replace all those inadequate speaker systems and power amplifiers found in too many theatres. Unfortunately, without better playback systems, the superior recording formats never had a chance. Without a superior playback system, the improvements were often considered insufficient and not worthy of their cost. The truth is that the existing theatre sound systems simply "squashed' everything, so most of the (sometimes substantial) performance gains were "lost in the speakers".

While some theatre owners would no doubt be reluctant to upgrade their sound systems, our 1988-1989 BOXOFFICE/SMPTE survey revealed a rather healthy willingness on the part of theatre owners and equipment buyers to replace obsolete speakers and amplifiers, when necessary, in order to obtain the full presentation and boxoffice benefits of digital sound.

Which digital sound on film technology will "win?" Time (not to mention economics and plenty of industry politics) will tell. But in one form or another, digital sound is going to be an important part of the future of exhibition. Exhibitors and distributors alike should explore every opportunity to learn about and compare the proposed digital formats: Each as compelling, thoughtfully designed and incompatible with each other as you can imagine.

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