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**DIGITAL SOUND FOR  
MOTION PICTURE THEATRES ???  
A REALITY CHECK**

**BY  
JOHN F. ALLEN**

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*FIRST IN DIGITAL STEREO*

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# **DIGITAL SOUND FOR MOTION PICTURE THEATRES ??? A REALITY CHECK**

by  
**JOHN F. ALLEN**

**New technology is essential if exhibition is to survive in the future. If one accepts (as do I) the premise that the motion picture experience needs to be reinvented, then certainly surrounding an audience with digital stereo sound would be an integral part of such an overhaul. However, even without improvements in the current 35 MM / 24 frame-per-second image performance, digital sound itself holds the potential to dramatically enhance motion picture entertainment.**

**The question then becomes not whether digital stereo can improve the movie going experience, but how much of the improvement will be realized. If recent history is any indication, the destiny of digital cinema sound is, in my opinion, a bleak one indeed.**

**This pessimism has nothing at all to do with the quality of digital soundtracks, but rather with several major factors which must be expertly dealt with at many levels throughout the motion picture industry. For exhibitors, three of these factors are theatre sound playback systems, sound system tuning procedures and format standardization. Simply installing a digital processor and putting the word digital on the marquee will not be enough. Surviving in the future will take a genuine financial commitment, a new level of technical training and the finest equipment.**

**While the battle over standardization will ultimately be resolved, this industry has a very long way to go in the areas of theatre sound delivery systems and their tuning procedures. (Thin walls and noisy ventilation systems must also be mentioned here.)**

## **INADEQUATE SOUND SYSTEMS**

**The word inadequate may be too generous, as so many current theatre sound systems are painfully incapable of reproducing and delivering the true quality of digital stereo to the ears of the audience. From my perspective, since we first introduced digital stereo in commercial theatres in 1984, this industry has neither properly prepared itself for**

digital's demands, nor does it seem likely to do so. In light of this situation, I shall devote most of this article to this issue.

I base my concern for digital's future on the often pitiful way current stereo films are presented in modern theatres. This applies to both 35 MM and 70 MM presentations. At worst, dialog can be hard (sometimes impossible) to understand. More often, subtle effects and many of the background nuances are completely wiped out. Music is thin, "canned" and all but ruined. If all this weren't enough, dynamic range is so compressed, the word dynamic no longer applies. In short, many sounds that are recorded are never heard in a majority of today's theatres. Further, it would appear that this problem has not been fully realized. If you are curious, try listening to a stereo film or a laser disc over a good set of headphones and you will hear what I mean.

Even studio systems can fail in this regard as evidenced by the the number of comments made by producers and engineers upon listening to their films on truly superior sound systems. Typically their rather startled reaction is "I'm hearing things I've never heard before."

#### WHERE DID THE HARP GO?

At one such listening session, a producer of a major film noted that he could hear the harp in his orchestra for the first time since he had been present on the scoring stage and heard it live. He hadn't heard it next door in the studio's control room. He hadn't heard it on the rerecording stage. He hadn't heard it at the Motion Picture Academy or in any other theatre. But there it was: the harp. Delicate. Perfect - just as it was supposed to be.

Of course, a great deal more than the missing harp came through and was also heard by this producer for the first time. He kept shaking his head in disbelief. I think it is fair to say that he was amazed.

Where had the harp been hiding all this time? Yes indeed, as Warner Hollywood Studios' chief engineer John Bonner put it, it is possible for a film to "sound better than it was made."

Many other experiences add further testament to the shortcomings that can be found in theatre sound systems. Over the years, I have played exhibitors 35 MM prints of various films using very high quality sound systems. Quite often, they have remarked that from the very first moment, these presentations of 35 MM prints sounded better than the 70 MM versions they had heard in their own theatres.

**35 MM optical stereo sounding better than “70”? How is this possible? One exhibitor stated that the sound he heard just echoing in the lobby of one such good sounding theatre, was in every way superior to what he heard sitting in the middle of his own theatres.**

**All this is no joke! Again, the reality is that there is much more potential in today’s conventional analog soundtracks, that too few ever hear, and that is totally wasted. Is it probable that digital stereo will become the great success that it needs to be when current analog stereo has been so poorly implemented? In such an environment, can digital sound make much of a difference? Obviously it cannot.**

### **“IT’S THE SPEAKERS STUPID”**

**Employing a parody of President Clinton’s “it’s the economy stupid” campaign theme reminds us that no good sound system designer ever forgets how important the loudspeakers are. After all, speakers are what an audience listens to. Though unequaled in their performance, the market for large, full performance, high output loudspeakers has diminished over the years - almost to the point of non-existence. Crystal clear sound quality has taken a back seat to the desires of architects and designers for smaller cabinets. Pure laziness has played a roll as well. People don’t like to bother with speakers that they cannot lift. (I have sometimes wished I was in the piccolo business myself.) Unhappily, the sad truth is if you can lift a speaker, it’s too small, even for a living room - let alone a movie theatre.**

**Too small, that is, if you really expect to accurately reproduce all the sound, music and massive wave fronts that went into the microphones. Anyone who attends live symphony orchestra concerts knows what I mean. (Those who don’t attend should do so.)**

**It has to be faced, the sound systems in most theatres today are just plain too old and/or too small. If all the benefits of digital sound are ever to be heard by movie audiences, the obsolete speakers and amplifiers presently inhabiting theatres must finally go the way of hand-cranked projectors and carbon arcs. Without installing better, more powerful theatre speakers and amplifiers, digital stereo will fail to meet its true potential. Audiences will feel unimpressed and cheated. What’s more, the mere gimmick of adding greater numbers of subwoofers to “pump up” the bass, will soon become tiresome and give digital movies the reputation of just being too loud, too unpleasant and all boom.**

**To their credit, some speaker builders have recently offered more rugged surround speakers, and at least one manufacturer has committed itself to building full size, uncompromised loudspeakers, designed specifically for placement behind movie screens.**

But with the relatively small size of the theatre market and the tiny profit margins allowed on the larger equipment, it's easy to understand the dedication required to get these speakers developed and produced.

#### NEW SOUND SYSTEM TUNING METHODS

Another affliction plaguing motion picture sound quality is the way theatre sound systems are tuned, or mistuned to be more precise. Unfortunately, the use of pink noise with real time analyzers for the purposes of sound system equalization, became popular in movie theatres just as this technique was being discredited and abandoned by many in the professional sound field.

Rather than real tuning, today's stereo theatres are only "equalized". I use the term mockingly. Technicians are familiar with the routine: Microphones are placed far from the speakers, in the reverberant field of the theatre. Pink noise is played through each speaker and the microphones deliver their resultant signals to the analyzer. The technician adjusts the equalizers all over the place until the analyzer shows the desired response. Unfortunately, this method is not repeatable and quite simply doesn't work. The results are thousands of theatres which currently sound considerably worse than they should, no matter what speakers and amplifiers are installed.

The reason this method fails is essentially two-fold. First, transient or impulse response is completely ignored because pink noise is a steady state signal. Pink noise can be very useful for setting levels and for general adjustments of non-acoustic circuits such as optical and magnetic sound pickups. However, when pink noise is played in a room over a loudspeaker for more than a brief time, there comes a point when the sound level stabilizes. With as much sound energy being put into the room as is being decayed and absorbed, a state of acoustic equilibrium is created. This hardly simulates anything approaching listening to program material which is highly impulsive. At its best, pink noise is useful in rooms only when it is well understood what it reveals, what it does NOT reveal and how misleading it can be.

This brings us to another rather complicated problem with the pink noise method. It relates to the difference in the way we hear and the way microphones respond. Basically, our brains ignore a lot of early reverberation. Later reverberation is treated quite differently than a sound's first arrival. Microphones do not have brains. Pink noise measurements made in the reverberant field of a room cannot represent the spectral balance we hear when a film is playing because the reverberation processing our ears and brains perform is absent from the microphone or the analyzer.

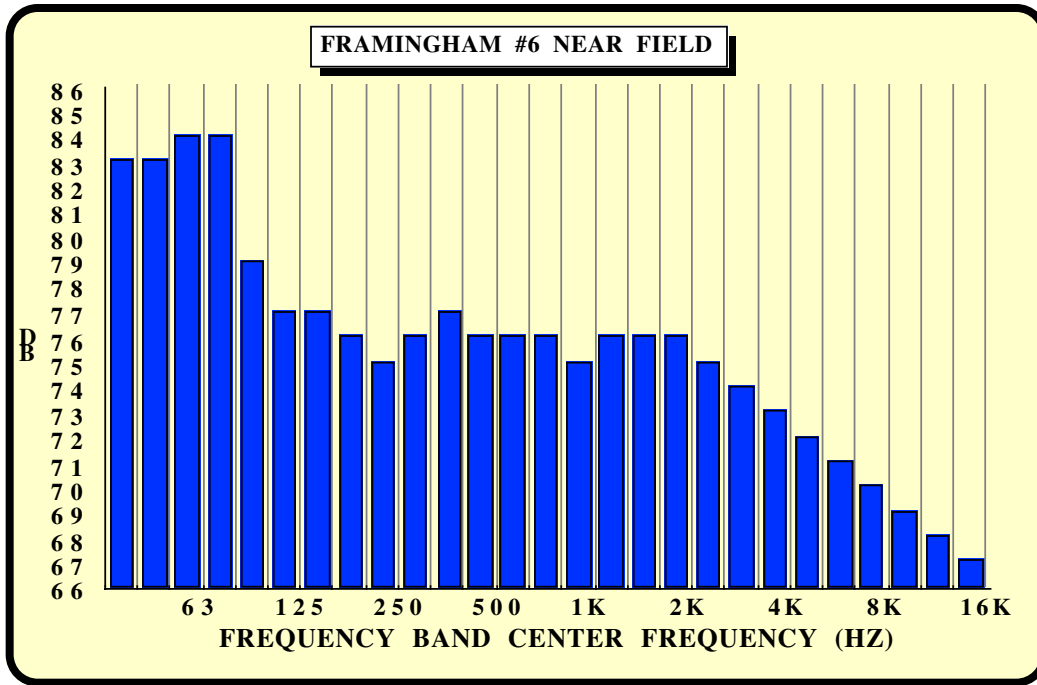


Figure 1.

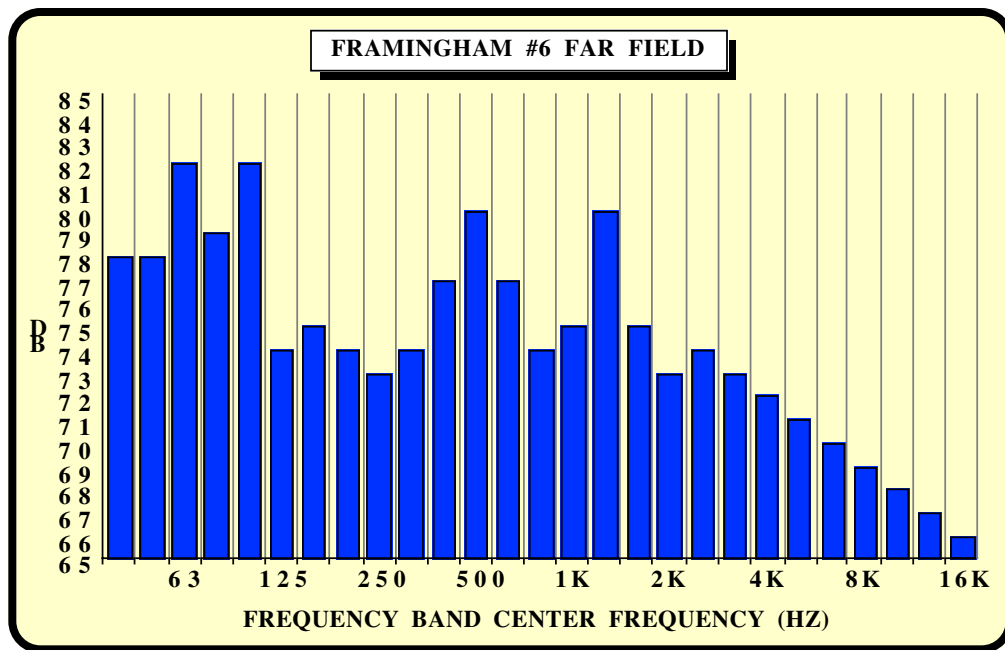


Figure 2.

The inclusion of all this reverberation severely corrupts the measurement. Errors of 8 dB are common in my experience. Figures 1 and 2 show both near field and reverberant, or far field pink noise measurements done in the same theatre at the same time. Both measurements were averaged over space and time. Note the dramatic difference. The reverberant field measurement indicates two large peaks which do not actually exist. Imagine the disastrous consequences if one used equalization to “remove” these false peaks

Theatre sound systems tuned in and for the reverberant field, therefore, can exhibit audible peaks and dips in their frequency response of as much as 8, even 10 dB, and yet MEASURE FLAT! This phenomenon has given rise to the lament which pertains to many sound systems everywhere: “It measures great but sounds terrible.” Clearly the motion picture industry must move beyond pink noise based equalization methods and adopt superior (near field and first arrival dominate) tuning techniques if high quality natural sound is ever to be achieved in all theatres.

#### STANDARDIZATION

The third problem area with digital stereo which exhibitors must deal with is probably temporary, yet is still cumbersome and expensive. As this article is being written several companies are attempting to get their digital film sound format adopted. Of these different formats, three are promised to be used with this summer’s releases.

Dolby’s SR-D system currently leads the industry in digital releases. Universal’s Digital Theatre System (DTS) is scheduled for installation in as many as 1000 theatres in conjunction with their release of JURASSIC PARK. Sony’s Sony Dynamic Digital Sound (SDDS) system is scheduled to be field tested with four or five prints of Columbia Pictures’ LAST ACTION HERO.

Dolby’s SR-D system is a sound on film six channel system; left, center, right, bass, left surround and right surround. Systems using this format have come to be called 5.1 channel systems, with the “.1” referring to the bass channel which requires less data storage.

The Sony SDDS system is also a composite release print format with the addition of two more full range stage speakers for a total of eight discrete channels of digital sound. This format might be thought of as a 7.1 channel format. However, in this case, the designated bass track happens to be recorded in a normal full bandwidth channel. According to Sony, in smaller theatres the 5 screen channels can be folded down into the more conventional left, center and right configuration, by simply formatting the theatre’s



**SDDS processor accordingly.**

**At about \$5,000.00, the Universal DTS package is currently the least expensive. It is also a double system with the digital soundtrack stored on separate compact discs each called a CD-ROM.**

**There are actually two DTS formats. The first is a discrete 6-track version providing the 5.1 digital format. The second is a left-total / right-total 2-track system which is fed into the optical preamplifier inputs of a conventional 35 MM optical stereo processor and decoded into the left, center, right and surround channels. The DTS processor also has a separate bass channel output. (Note: The 2-track format has been discontinued.)**

**Both the DTS and SR-D digital processors are designed as add-on units to be used with existing theatre sound processors. The Sony SDDS system uses a completely new processor in addition to the theatre's existing unit. Each of these three formats retains the standard stereo analog soundtrack on the print.**

**For the present, a few exhibitors will face the chore of outfitting some of their top theatres with more than one digital processor, as none of the competing formats is compatible with another. Other exhibitors, who remember previous expensive sound formats that didn't last very long, will "wait and see" until it is clear which digital format will dominate. Unfortunately, this will delay the installation of digital equipment in many theatres and the industry's need for better sound will have to wait.**

**Ultimately, exhibitors hope a single digital soundtrack format will soon win out over the others. Since all the proposed systems will probably sound about the same in theatres, sound quality will probably have less influence on who wins, as will such issues as cost, reliability and industry politics. My personal hope is that, once recognized, the best will emerge as the new digital sound standard and that exhibitors will commit to the investments required. My further hope is that exhibitors as well as their technicians can and will make the rigorous, time consuming efforts required to reeducate themselves about the sound system performance / design issues involved, so that we may all enjoy the full advantages and pleasures of such beautiful sound.**

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