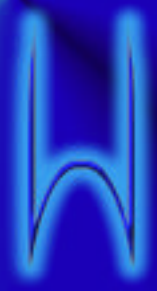

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A 70 MM REVIEW

BY

JOHN F. ALLEN

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A 70 MM REVIEW

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With the steady increase of 70 MM releases, it seems appropriate to take an in depth look at their associated sound systems. Of course the most obvious difference between 35 and 70 MM sound is the magnetic recording medium used for 70 MM prints.

35 MM stereo optical recordings use a light focused through the dual soundtracks onto a two channel pickup solar cell. The stereo variable area track causes the amount of light to fluctuate. The rate of change corresponds to the frequency. The amount of light is the level. The cell converts the changing lights into two electrical (audio) signals which are then processed into four channel sound, left, center, right and surround.

The magnetic stripes applied to 70 MM film store six discrete channels of sound. The oxide particles are arranged by the record head in various intensities. If you could see a magnetic recording you would see a series of lines across the track. The number of lines per unit of length would be the frequency. The density would be the level.

When run across a playback head, the magnetic flux density induces a voltage within the head's coils. This voltage is the audio signal which is then processed and amplified.

Optical, more properly called photographic, recordings can be very very good. They are produced at high speed on the film along with the picture and are thus inexpensive. They cannot be erased though they can be seriously damaged by scratches. They are immune to magnetic fields. The one thing they lack relative to magnetic is dynamic range. This is because there is only so much width to the optical soundtrack area. Since the width determines the signal level, there can only be so much level. Were one to excessively reduce the average recording level in order to increase the dynamic range, the noise would become objectionable.

Magnetic recordings provide lower distortion, better stereo separation and much more dynamic range. They are capable of delivering more volume and impact, but they are a pain in the neck. Not only are they susceptible to magnetized heads and sprockets, they can also suffer from dropouts. The magnetic striping must be applied to each print after developing. After a drying period the sound is recorded at normal playback speed. The prints must then be checked - one by one. 70 MM film stock is some 5 mils. thick versus 1

or 1.5 mils. for recording tape. The film's relative stiffness requires greater tension across the playback head for proper contact. This additional force causes the heads to wear out and lose high frequency response. Throughout the life of the head the high frequency response must be periodically readjusted. Thus, magnetic operations need more maintenance. Finally the expensive heads wear out completely and must be replaced.

Fortunately extra hard Sendust heads are now available. Though expensive, they last longer and don't require readjustment as often.

Each studio has used a different recording equalization standard and so the frequency balance of 70 MM films are not compatible with each other. A technician must use a test film made and furnished for each release to set up the theatre's magnetic preamplifiers for that movie. Such adjustments are not required for optical recordings as there is a standard and of course no head wear.

Alas, discrete 70 MM magnetic soundtracks do sound better than 35 MM optical recordings (not to mention the picture quality) and until someone comes up with a viable improvement, probably digital, we must live with it.

Originally the six discrete channels were allotted to five full range channels behind the screen (left, left-center, center, right-center and right) and a sixth surround channel. The advent of Dolby Stereo has meant some changes in the way these tracks are used. In addition to the Dolby noise reduction used to reduce the hiss and hum associated with magnetic recording and playback, tracks one, three and five are still the left, center and right channels as before, but two and four are now used as extra bass channels. Their bandwidth only goes up to 250 Hertz. The area above 500 Hertz can be used to store the high frequency components of a left wall (track two) and right wall (track four) stereo surround recording. In theatres equipped to play stereo surround, the frequencies below 500 Hertz are taken from the standard full range mono surround track six. This is mixed with the left wall and right wall signals and fed to the appropriate surround speakers. Very few films are made this way due to the difficulty and expense in mixing an eight channel soundtrack.

Both the additional dynamic range and the larger size of the theatres where 70 MM is usually installed, place extra demands on a sound system. Only the largest most efficient speakers are practical. Not only do they produce more bass, they play louder per watt of input. This is essential in large rooms. Well designed high efficiency speakers sound clearer because they produce less distortion. They can also deliver the greater output levels required for large spaces and handle the extra power this takes.

To illustrate, a speaker with a one watt / one meter sensitivity of 109 dB sound pressure level would require about 400 watts to deliver a level of 109 dB in the middle of a 130 foot long theatre. Another theatre speaker with a 100 dB sensitivity would take 3200 watts to do the same. This is because it is 9 dB (eight times) less sensitive. Both systems have a 300 watt continuous power capacity and can probably safely handle peaks of 600 to 1000 watts. Obviously 3200 watt peaks would destroy either of them, 400 watt peaks would not. Every increment of 3 dB doubles the power. Hence 9 dB is two times two times two or eight times.

Theatre speakers have traditionally been deficient in bass response. In large theatres it is useful to employ more bass speakers to augment the three main screen channels. The so-called boom channels, tracks two and four, are thus used for this purpose.

What will all of this add up to for a 70 MM sound system? To answer that, I shall describe the recent sound system installation at the newly upgraded Waikiki Theatre #3 in Honolulu. The theatre, located in the heart of Waikiki on Kalakaua Avenue, has been a landmark in the islands from its opening in 1936. Consolidated Amusement Company of Honolulu owns and operates the theatre. The newly renovated auditorium now houses 1313 seats and is 130 feet long, 83 feet wide and 25 feet high at the rear. The Allen Surround Array™ formulas used to locate the surrounds for optimum sound coverage called for speaker mounting at 20 feet above the floor. For a theatre with adequate height, such as this one, only twelve surrounds were required, all running at equal output. Had Consolidated built a new theatre, the full ideal height would probably not have been available at the rear. Without this height, more surrounds would have been necessary, some running at different outputs. Three Klipsch TMCM-3 speaker systems were placed behind the screen for channels one, three and five. The massive horn loaded woofer sections of these systems (model TMWM) can also be used for the extra base channels, two and four, with the obvious advantage of matching the tone the three main systems. An additional advantage is the simple addition of the high frequency sections to these woofers should they wish to play conventional 70 MM films or future sound formats which may again require five full range screen channels. Horn type woofers also provide a more pleasing transient response or impact; they can shake you, not just the stage.

Consolidated's installation technicians under the capable direction of Wesley Inouye, did a superb job. Wesley Inouye performed all of the system wiring himself, neatly dressing each of the cables. I especially liked the appearance of the surround speakers that they had painted to match the theatre's drapery material. The sound system package selected by Consolidated was intended to provide top quality sound with a complete format

capability. They chose a Dolby CP-200 cinema processor, a Kintek mono enhancement processor, a Teccon Sendust head, BGW amplifiers and Klipsch theatre speakers.

Six very reliable BGW 750-C power amplifiers provided the exact power necessary; 400 watts per screen speaker. The twelve surrounds were split up into six groups of two. Each pair was fed from a 400 watt side of a 750-C for a total of 2400 watts for the surrounds. This was necessary for the less efficient surrounds to deliver the same level as each of the screen channels.

For the first time in any theatre installation, the Kintek system was interfaced with the Dolby CP-200 so that the 200's extensive switching capabilities could be used to switch between the two systems. Dolby's Sam Chavez provided a new format specifically for this and Kintek's Jim Townsend adjusted the outputs of their units to be compatible with the CP-200's inputs. The output of the Kintek subharmonic bass enhancement circuit was filtered through an input module normally used in their KT-90 subwoofer and fed the two Klipsch woofer horns used in channels two and four. This maintained the sonic matching and impact ability mentioned earlier. The racks were assembled for Consolidated at Kintek's plant in Newton, Massachusetts.

The theatre's sound system now has the capability of reproducing the full frequency and dynamic range of all current 35 MM and 70 MM motion picture films. The system even has the capability of playing Sensurround™ by using Kintek's ability to decode the Sennsurround™ DBX noise reduction.

Consolidated was delighted with the performance of the theatre's new sound system. They agreed that even the 35 MM soundtrack in this theatre sounded better than some of the 70 MM systems playing 70 MM films. When I was asked by someone why they should bother with 70 MM, in view of the systems' outstanding performance in 35 MM stereo optical, I replied, wait til you hear the 70. I dare say we were all astounded.

My thanks to Consolidated's Floyd Williamson for his help in preparing this article.

John F. Allen is the founder and president of High Performance Stereo in Newton, Mass. He is also the inventor of the HPS-4000® cinema sound system and in 1984 was the first to bring digital sound to the cinema. John Allen can be reached by E-mail at JohnFAllen@aol.com.