Celebrating The 30th Anniversary Of Digital Sound In Theatres

With Sound Engineer John F. Allen

Gary Reber

This On-Screen interview with sound engineer John F. Allen took place during the Consumer Electronics Show (CES) in Las Vegas in early January 2015. The last time I did an interview with John was back in 1993 in Issue 6 November/December, very soon after I had founded the magazine in 1992.

Gary Reber *Widescreen Review*: I'm with HPS-4000 sound system inventor and designer and sound engineer John Allen, who invited me to his home in Las Vegas to talk about the 30th anniversary of introducing digital sound in cinemas.

John Allen: This is indeed the 30th anniversary of introducing digital sound to movie theatres. We first did it in 1984 as a special event for about 350 industry-only invited guests. The event was the introduction of my sound system at the Plitt Century Plaza Theater in Los Angeles. Ed Plitt wanted the best sound system for that theatre. He thought that if he improved the sound there, it would help him book the theatre, and it ultimately did. To this day, this was the only HPS-4000 system that I ever installed where I had to close the theatre. With all the work we needed to do, we closed the theatre for a week.

Just before the installation, Mr. Plitt telephoned me and said, "What can we do to really show this thing off?" I said, "Well, all of my sound systems from the very beginning have been digital ready, so why don't we do digital sound? There are now two movies that have digital masters—*Fantasia* and *Metropolis*. So why don't we play something?" Plitt agreed right away, and I began to tackle what would become an extremely difficult challenge.

Metropolis was originally a 1927 silent film by Fritz Lang. In 1984, Giorgio Moroder released the film with his own contemporary score. *Fantasia* was not available to us but Giorgio Moroder agreed to let me use *Metropolis*. At the time, it was nearly impossible to play digital sound in a commercial movie theatre. The only way to do it was to bring in a Sony 3324 digital tape recorder—a 600-pound, $120,000.00 machine, that was half the size of a typical couch—and lug it up the stairs. I'm serious, there was no elevator. Then once you got it up to the projection booth, there was no reliable way to synchronize the sound with the picture.

I called Tom Kobayashi over at Glen Glenn Sound because they had the equipment we would need. They actually had produced a short demonstration film with a digital soundtrack, called *Digital Dream*.

***WSR* Reber:** A beautiful film.

Allen: You saw it?

***WSR* Reber:** Oh, yeah.

Allen: They were among the early pioneers in digital motion picture sound. He kindly arranged for me to borrow a Sony 3324 as well as a synchronizer. We put a shaft encoder on the projector. The shaft encoder drove an old 35-mm dubber. The tape running on the dubber had time code on it. The time code was sent to the synchronizer, which controlled the Sony. That's how the picture and sound were supposed to stay in sync. Unfortunately, it barely worked. At that point in time, it could take a minute to lock up, maybe, and during that minute you had no sound.

The sound system I installed at the Century Plaza Theatre had the acoustic output of nine symphony orchestras. It's important to overpower everything so that amplifiers


The Plitt Century Plaza Theater in 1984

never clip and the sound system is never, ever strained. That's how we keep things from breaking, and that's how we keep things clean. Every channel in an HPS-4000 sound system, including the subwoofer, is powered to have four times the output that the loudest possible movie will require. The Plitt theatre was 160 feet long and 92 feet wide. It was a big room, so we installed a big system that also included the first use of our largest four-way screen loudspeakers. It sounded incredibly clear.

Giorgio Moroder not only let me have his film, he sent over his engineer Dave Concors to help out. The print we showed was Morodor's personal answer print, and the soundtrack we played was his master. These were things he never let out. He couldn't have been nicer. In addition to *Metropolis*, our program also included clips from several other 35-mm and 70-mm films. These were selected to illustrate the progression of film-sound quality over the decades. But *Metropolis* was stunning.

No one had ever played digital soundtracks over a sound system that powerful and that clean. All the engineers said that it was the best sound they'd ever heard—better than anything in Los Angeles. We got a review in the *LA Daily News* that said it was "the best in the area and perhaps the best in the country." That's pretty good.

When it was all over, we went out to lunch downstairs in Century City, at the Jade Island Restaurant. Ed Plitt and I were there, along with Plitt Theatres district manager Bob McKeehan. Six or eight of us were sitting around the table, and Ed, in his dry way, said, "Well John, that was great, … now what?" I said, "The only thing that we have left to do is play an entire feature here with digital sound." From then on, the conversation became quite serious because no one knew how to do that, let alone play anything longer than 20 minutes. That's the length of time that we were able to play anything with digital sound, without a required projector changeover. We couldn't do changeovers with a one-minute lockup. That wouldn't work.

***WSR* Reber:** Let me interrupt. The film that you were playing, *Metropolis*, you were only playing 20 minutes.

Allen: 20 minutes. We played reel three. It was great, but at the end of 20 minutes you're out of tape and you have to stop. I said, "We need to play an entire feature, without changeovers." With a rental fee of $1,000.00 a day, we obviously couldn't use a Sony 3324 either, let alone two. So playing *Metropolis* wasn't practical.

The only other movie that was available with the digital soundtrack was *Fantasia*. This was early in December. Bob McKeehan reminded us that *Fantasia* was slated to open in February as a nationwide re-release. I began to think, maybe we can do that somehow. The Century Plaza was a two-projector theatre. In those days that was the best way to run a theatre. I said we'd have to bring in a platter—something they had avoided.

But again, how do you do regular showings day after day after day of a feature film with digital sound in a commercial theatre? Nobody had ever done it, no one knew how to do it and as near as I could tell, no one was even thinking about doing it for another ten years. I talked to John Bonner, chief engineer at Warner Hollywood Studios. I told him what we were thinking about and that we'd like to use *Fantasia*. He suggested that I call Disney's Nelson Meacham. Nelson Meacham was the engineer in charge of the digital re-recording of *Fantasia* two years earlier, in 1982. This came about because Disney felt they could no longer use the original 1940 soundtrack. Compared with modern recordings, it was no longer acceptable. In 1940 *Fantasia* was truly groundbreaking—the first stereo movie. But in 1982, something had to be done.

***WSR* Reber:** And what orchestra did they use?

Allen: The 1940 original was done with the Philadelphia Orchestra conducted by Leopold Stokowski. The 1982 recording was arranged and conducted by Irwin Kostal.


Sony PCM 3324 Digital Tape Machine

Kostal had won an Academy Award® for orchestrating *West Side Story*. He was also the music director for the film version of The *Sound Of Music*, for which he won a second Academy Award.

For the rescoring of *Fantasia*, he assembled an orchestra with musicians from all over the country. His string section included concert masters from several different orchestras.

***WSR* Reber:** It was in Los Angeles?

Allen: Yes. As I said, Nelson Meacham was the engineer in charge of the whole project and Shawn Murphy was the recording engineer. So in 1982 they recorded a new digital soundtrack master for *Fantasia*. Of course, it had never been used in a theatre, only at the studio to make the analog release prints.

I called Nelson and suggested an idea. I said, "We can't do changeovers. What if we put the digital soundtrack on a VHS cassette? If we put time code on the VHS audio track to synchronize the projector and the film on a platter, we could have a two-hour running time." (The film is 89 minutes.) "What do you think?"

He said, "Maybe."

***WSR* Reber:** What kind of VHS recorder?

Allen: A standard VHS recorder.

***WSR* Reber:** So you're just putting the time code on there?

Allen: Not exactly. In those days you typically recorded digital sound on U-matic cassettes in the PCM F1 format. I thought, "We can put F1 on a VHS cassette, can't we?"

***WSR* Reber:** So you're talking about professional.

Allen: Yes, sort of. But now you have to kind of backup a little bit to when Disney

Billboard at the Plitt Century Plaza Theater in 1984

built Epcot. Epcot has several movie theatres located around the park. The theatres contain the screens, the loudspeakers, the amplifiers, the projectors and the films. But there is no audio source in the theatres. The audio for all the theatres at Epcot comes from digital discs at a central location. The digital discs also contain time code that is fed to synchronizers at the theatres. The projectors in the theatres are outfitted with stepping motors. The synchronizers drive the motors. That is how the pictures and sound stay in sync. The Epcot films each run about twenty minutes or so. For films of this length, this synchronization system had proven quite stable and reliable. But it had never been used for a feature before. No one knew if it would work.

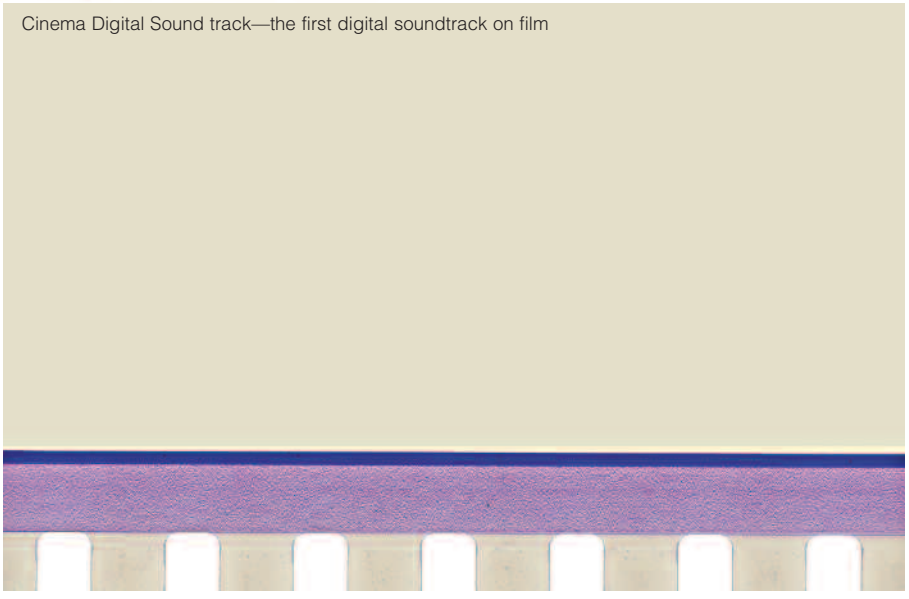

Fans queuing for *Fantasia* at the Plitt Century Plaza Theater in 1984

We had just a few weeks to figure everything out and make this happen. The first question was how much would it cost? We felt that $15,000.00 was a reasonable budget.

There was opposition. We were told to stop three times. But with the possibility that we might ultimately be given approval, we would still need to be ready when the film opened. So we secretly kept going. Finally, Plitt Theatres chairman and Ed's father, Henry Plitt called Disney chairman, Michael Eisner. He said, "We need to do this." Eisner said, "How much is it going to cost?" Henry said, "It looks like $15,000.00." After more discussion Mike Eisner and Henry Plitt agreed to share the cost. We were on. Looking back, it was a momentous and historic phone call. By the way, it ended up costing $30,000.00. But nobody minded when the grosses came in.

I flew out to Los Angeles from Boston. We finally got to the theatre and installed everything. Technicians from Disney Imagineering swapped out the projector motor with a new stepping motor. Disney engineer, Dave Barnett also joined us. He had built the Epcot synchronizer and was there to set it up. Nelson Meacham, of course, was there.

In the back of my mind the thing I was concerned about was that I had heard this new recording a year earlier with a 35-mm magnetic stereo print, and it didn't sound very good. There were tone problems. The treble was low, and it sounded kind of honky. At least it was clean. But I didn't know if it was the print, the (less-than-great) sound system in the theatre where I had heard it, or if the master itself sounded that way. The



Cinema Digital Sound track—the first digital soundtrack on film

first time we played it at the Century Plaza, I immediately knew that it was indeed the master after all. Nobody knew why, but it had to be fixed. This meant that I had to listen to the film over and over again because each part of the film—the Bach, the Tchaikovsky, the Stravinsky, the Beethoven, all of them—had a different sound. They all were recorded at different times and had different orchestral setups. I had just a couple of days to figure out what I could fix without ruining everything else and what I had to leave alone.

As an example, if I wanted to turn up the bass for one part of the film, it might ruin things for the rest of the film. So I had to do an awful lot of analysis figuring out what to do. The only option was to retune the sound system to make the film sound right. The tone wasn't wildly off, but it was off. These corrections took a lot of my time and time was one thing we didn't have. Don't forget this was still an operating theatre with regular shows running every day.

David Gray came over from Dolby and loaned us a brand-new CAT 150 card. At the time there were only two such cards in the world. This was a prototype of a new stereo decoder for the Dolby processors. It was generous of him to make such an offer, and I appreciated his support.

It turned out that running the sound so much revealed an unexpected problem. While I was listening to the film over and over again, the digital sound was dropping out in different places. We could never play the same thing twice the same way. It wasn't the VHS cassettes or a defective recording. We had four backup cassettes, and every one was doing it. We determined that it wasn't the VHS player either. So what was going on? We didn't quite know.

We were opening on Friday, February 8th. On Thursday we had a press conference. But we had this dropout problem and were getting quite concerned. When the reporters arrived I told them that what we're doing was so advanced it might not completely work. I had my fingers crossed. We began the film and somehow everything worked. We didn't play the whole film. But what we played for them worked perfectly from beginning to end—not a single dropout. It played seamlessly and sounded great.

After the reporters left, I looked at Nelson and said, "Maybe it's settled down. What do you think?" He said, "Let's play it again." We played it again and within a minute it didn't work. The only time it worked was when the reporters were there—so odd, because it's usually the other way around. It always works perfectly until the reporters show up and then things fall apart. Then when they leave it's better again. But this was just the opposite. For one brief moment we had been lucky. The reporters left without a clue that there was anything wrong.

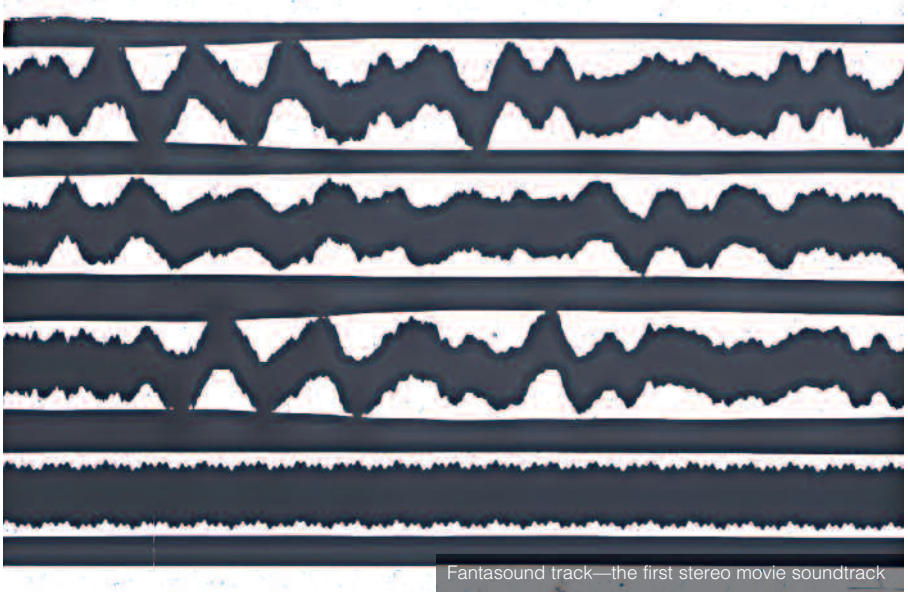
At this point we were in trouble and we knew it. However, we also knew we had a way out if absolutely necessary, but it was expensive. The next thing I saw was Nelson over in the corner on the phone. I walked over to where he was. Now, before I go on, you should understand that Nelson is always very calm. Nothing rattles him. But as I approached, I heard him say, "Yes, we're in real trouble now. We need to bring over the one-inch machine." Which means the one-inch video tape recorder that was used to record *Fantasia*'s new print master.

This was going to cost $500 a day. What's more, these are delicate machines that are not supposed to be going out to theatres. Still, Disney engineers quickly brought in the one-inch recorder AND the original digital print master. The next day we opened, using the one-inch machine and the Fantasia print master. It worked perfectly every time. But it was very expensive and unsustainable.

What was really happening? Why wouldn't the cassettes play and the one-inch would? And, by the way, this was the only one-inch print master, there was no copy, and it was in a theatre! Do you understand?

***WSR* Reber:** If anything happens to it...

Allen: If anything happens to it!… Enter Bill Hogan, the savior. Bill realized that as the helical head of a one-inch machine goes



Fantasound track—the first stereo movie soundtrack

around, the head leaves the tape for a moment, then engages the tape again and starts the next revolution. That's how those video tape recorders work. Our cassettes were made as real-time copies from the one-inch print master. It turns out there are differences in the way these two machines record video.

When recording digital sound on a video tape recorder, the bit stream is recorded in the 525-line, NTSC video format. The gap created when the rotating head leaves the tape is ten of those lines with a one-inch recorder. The gap with a VHS cassette recorder is 13 lines. The difference between the 10-line gap and the 13-line gap was the reason we were getting errors and dropouts. Bill Hogan figured this out and saved us.

It was Saturday afternoon when we finally knew what the problem was. We had now been playing two days with the one-inch machine. Every show had been perfect. The audience was crazy about it. People were lining up around the building. We were selling out a 1,500-seat theatre show after show. You were there. The sound was so incredible that people would not leave the theatre. I think you saw that too because you also waited. Ten minutes after the shows ended, there were still people, of all ages, sitting in their seats getting over the whole thing. The sound was that beautiful.

My ears spend a lot of time in front of live symphony orchestras in the world's best concert halls. I have to tell you, there were moments in that film where the sound of the Beethoven sixth symphony was more satisfying to me in a movie theatre than hearing it live at Boston Symphony Hall. That's how close we were to re-creating the live experience. We had really done a good job, and Shawn Murphy had done a good job. Obviously, you have to have a good recording to make that happen, and we had one.

The film was doing great business, we were getting great press, we were getting good reviews. Everything was going perfectly in terms of the shows. What wasn't great was this $500 a day charge, and we had to fix it. Over that Saturday night Disney remastered *Fantasia* from beginning to end—in one night. But in addition to a new one-inch master, this time they also mastered directly to the VHS cassettes. So the cassettes were perfect, every one of them. The main and the spares were all error free.

They asked me if I wanted to be there for the remix. I said, "No thank you. Tomorrow you're going to hand me a new recording. I need to have fresh ears and be awake. I'll see you in the morning."

Right on time Sunday morning they brought me the new cassettes. I listened. By then I knew the film so well that I knew exactly which spots I had to listen to. There were only three. When I got those right, the entire film would sound right. I listened to those three things and felt I only had to make a little adjustment.

Shawn Murphy came. The head of Disney's music department dropped by, along with the head of the sound department. Mike Eisner came. Irwin Kostal came. Everybody came and listened. They were thrilled. Eisner said that it was the best sound he'd ever heard, "better than Lucas"—better than anything. He asked, "Why?" Nelson Meacham said, "This is John Allen, this is his sound system, and this is why."

So at that point we were on the air with the cassettes. The one-inch machine went back to the studio, and everything was fine. The show continued to run flawlessly for weeks. The digital presentation at the Century Plaza Theatre grossed twice the next highest-grossing theatre, which was the Plitt Northpoint in San Francisco, and five times the national average. It played four times longer at the Century Plaza than any other theatre, all because of the sound quality.

***WSR* Reber:** Because *Fantasia* is all about sound, not so much the picture.

Allen: Well, the animation is all about music as well as sound. The audience was all about sound. Something that exhibitors do not always recognize. Too many want to think that the audience doesn't know and doesn't care about sound—don't ask me why. They install weak sound systems that are basically aimed at that unfortunate idea. When this happens I feel that they're doing themselves a disservice, not to mention their customers. They save a few dollars so that they can then suffer millions in lost revenue over the years. I have seen it happen so often. It makes no sense. But give an audience a truly beautiful experience, and they will come back for more.

The digital sound presentation of *Fantasia* was a huge success. While it was still playing, I got a call from Ron Uhlig at Kodak. He said, "I hear you're doing digital sound in a theatre." I said, "Yes." He said, "What can we do to help?" I said, "Put it on the print." Of course, we were using a double system. We had to. There was no other way. He said, "We don't think we can." But in five years they did. And in five years we had four digital sound formats.

***WSR* Reber:** Your initial system was a dual system. I was on the dubbing stage for *Jurassic Park* with DTS creator Terry Beard, and that was how he did it. But he was inspired by what you were doing.

Allen: It wasn't only my idea. He had also thought that a double system made the most sense and was encouraged that we made it work.

The first digital sound printed on release prints was Cinema Digital Sound from the Optical Radiation Corporation. Unfortunately, they ran into trouble because they replaced the analog track. That meant there was no analog backup with their format. It worked fine, but when *Days Of Thunder* was released in 70-mm, the prints had no magnetic striping, and therefore, no analog backup. Unfortunately, it opened on one of the hottest days ever in Los Angeles. The temperature in some of the booths was over 100 degrees. Some of the digital sound equipment was not able to handle that temperature and started failing.

Paramount immediately pulled the prints and converted them to analog soundtracks with magnetic striping. That was the final straw for Cinema Digital Sound. They had been warned that not having an analog backup was a risky way to go. But because they were the first out, they were trying to put as much digital information as they could on the prints. They thought maybe a bandwidth of 13 kHz was possible. The early film stocks could not resolve what the later ones could. So they made the decision to go without an analog track. That way they had the space for the digital sound information that they could record. They were working with some real technical constraints, and unfortunately, ran into some bad luck.

When DTS came out, they had their problems too. But they were ironed out pretty quickly, and that system worked very, very well.

When Dolby Digital was introduced for release prints, it included a backup Dolby Stereo SR analog track. As soon as that was announced it was clear that they were going to be very successful. It's what people wanted and, frankly, what they needed — an analog backup. Then, of course, Sony came along. Sony's Mike Kohut wanted to bring back five main screen loudspeakers, with subwoofers and stereo surrounds.

***WSR* Reber:** That was SDDS.

Allen: SDDS, Sony Dynamic Digital Sound. Within five years of *Fantasia*, when everyone thought it was going to take ten, we had four digital soundtrack formats. The digital revolution was well on its way. That's how it all started.

***WSR* Reber:** Wow! Thank you, John, for the enlightening historical perspective of the early creation of digital sound in theatrical presentations. **WSR**