Dolby Surround Technology

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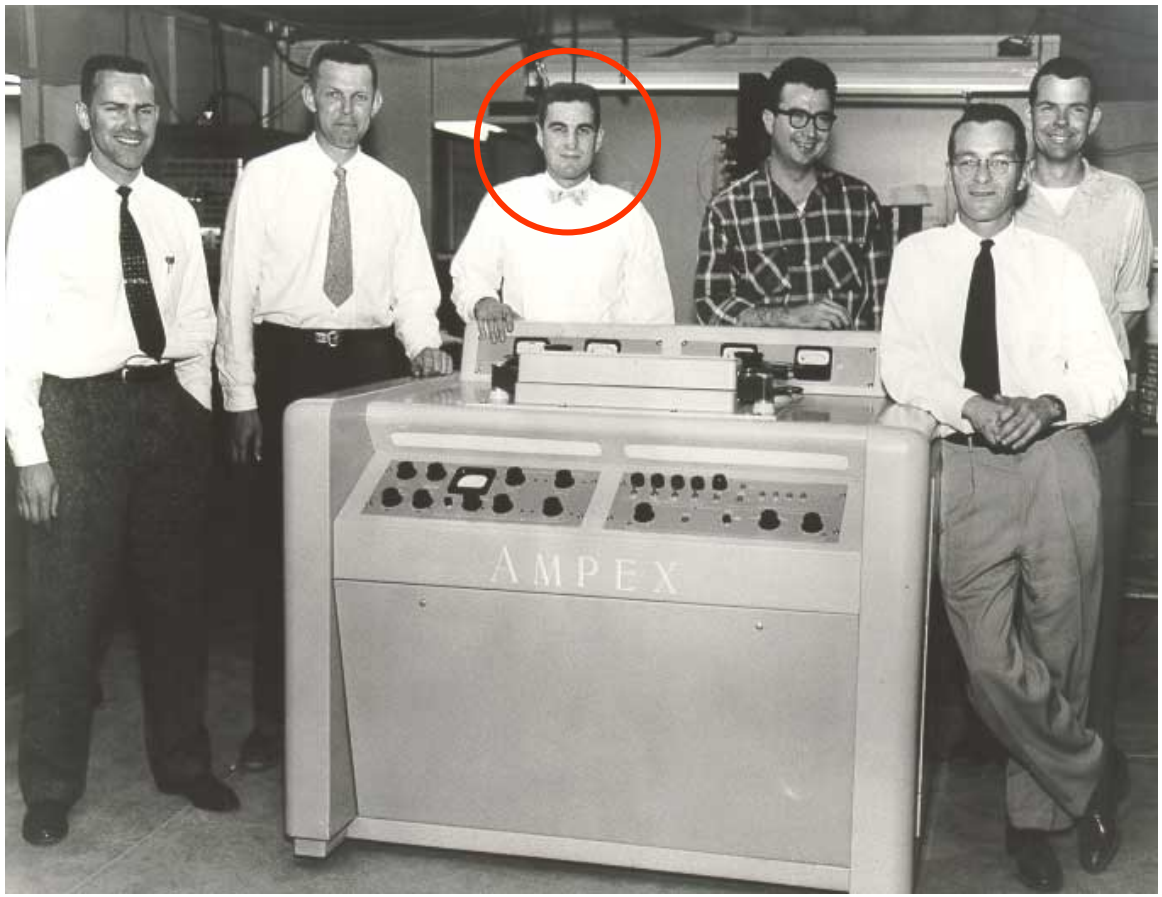
Overview

1. History: Dolby
2. Dolby Products
3. Academy of Motion Picture Arts and Sciences
4. Dolby in Cinema
5. Surround Sound Manufacturers
6. Reference

1.0 - History : Dolby

- **The man who founded Dolby Laboratories Inc.** - **Ray Dolby.**



with the team of Ampex engineers who developed the first practical videotape recorder.

1.0 - History : Dolby

- **While still in college, he joined the small team of Ampex [Ampex Corporation in Redwood City, CA] engineers dedicated to inventing the world's first practical video tape recorder, which was introduced in 1956.**

- **After six years at Cambridge leading to a Ph.D. in physics, Dolby worked in India for two years as a United Nations Adviser to the Central Scientific Instruments Organization.**

1.0 - History : Dolby

- **He returned to England in 1965 to found his own company, Dolby Laboratories, Inc. in London.**

1.0 - History : Dolby

- **The company moved its headquarters to San Francisco in 1976 (1976 - 1986).**

2.0 Dolby Products

Analog Recording Technologies

DOLBY SYSTEM

DOLBY B NR

DOLBY C NR

Dolby SR

DOLBY S NR

DOLBY HX PRO

Film Sound

DOLBY STEREO

DOLBY

DOLBY DIGITAL

DOLBY DIGITAL SURROUND•EX

Digital Audio Coding

DOLBY DIGITAL

Consumer Surround Sound

DOLBY SURROUND

DOLBY SURROUND PRO • LOGIC

DOLBY SURROUND PRO LOGIC II

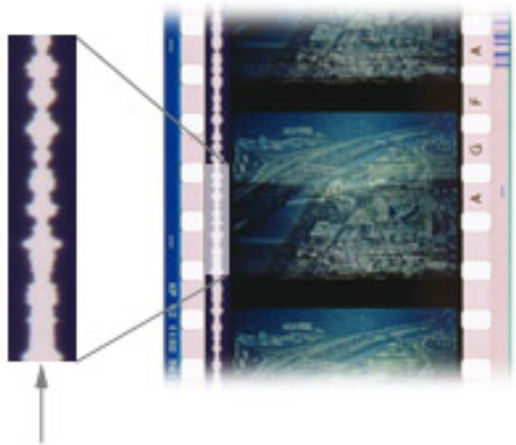
VIRTUAL DOLBY DIGITAL

DOLBY DIGITAL VIRTUAL SPEAKER

3.0 Academy of Motion Picture Arts and Sciences

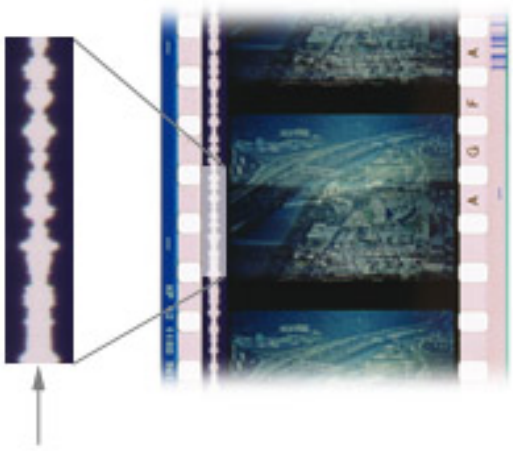
- **In the mid 1920s, we saw many technologies brought to the table, but during the 1930s, the Academy of Motion Picture Arts and Sciences established a standard for sound-on-film.**

- **A sliver of space to the side of the picture frame was home to an optical track through which light was driven and picked up by a photo sensor.**

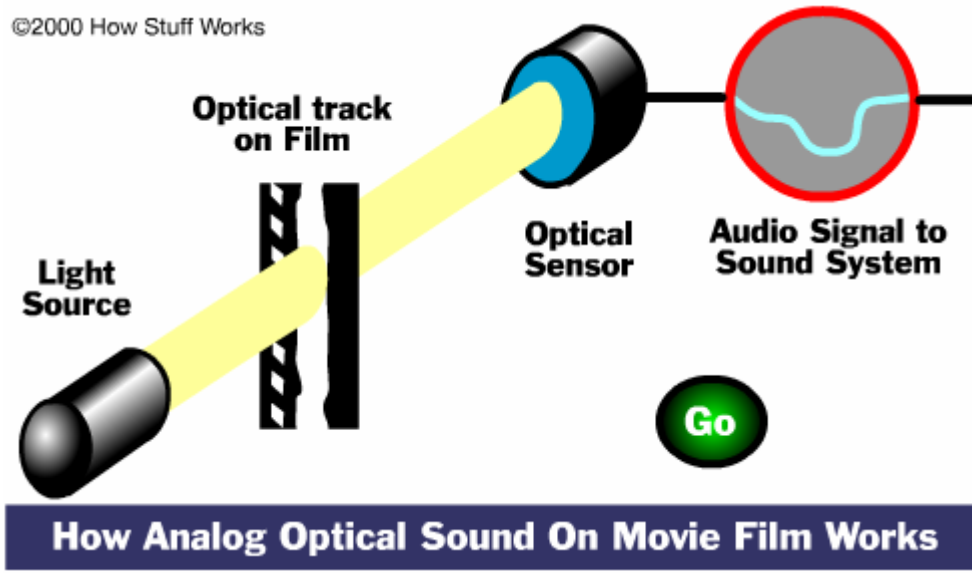


Academy Mono Optical Soundtrack

3.0 Academy of Motion Picture Arts and Sciences



Academy Mono Optical Soundtrack



- **By varying the width of the opening, the amount of light delivered to the photo cell varies as the film passes, creating varying voltages in the sensor, and a soundtrack is created.**

- **The basic principal of the Academy Optical Mono soundtrack is still employed in part today.**

3.0 Academy of Motion Picture Arts and Sciences

- **Magnetic Strip**

In the 1950s, magnetic recording became popular.

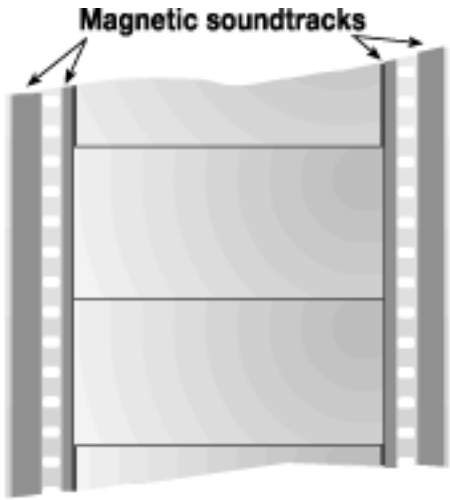


Figure 2: 70 mm magnetic print

3.0 Academy of Motion Picture Arts and Sciences

Magnetic sound-on-film had a couple of *advantages* over optical at the time:

- **Magnetic was stereo, while optical was mono.**
- **Magnetic had better sound quality.**

But there were *disadvantages*, too:

- **Magnetic had to be added to the movie after it was filmed.**
- **Magnetic was more expensive.**
- **Magnetic didn't last as long as optical.**
- **Magnetic was more easily damaged.**

Even though magnetic recording provided as many as six discrete tracks of sound on a film, the expense was simply too much. There had been experiments with stereo optical tracks, but there was too much noise to make that sound system worthwhile.

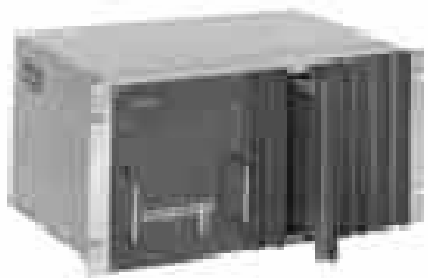
4.1 Dolby in Cinema : Analog

The second age of Cinema Sound: Dolby

DOLBY SYSTEM

Dolby A

- **Dolby Laboratories introduced Dolby A in 1965, a noise reduction method originally developed for professional recording studios, the movie industry saw an opportunity to reinvent the optical track.**

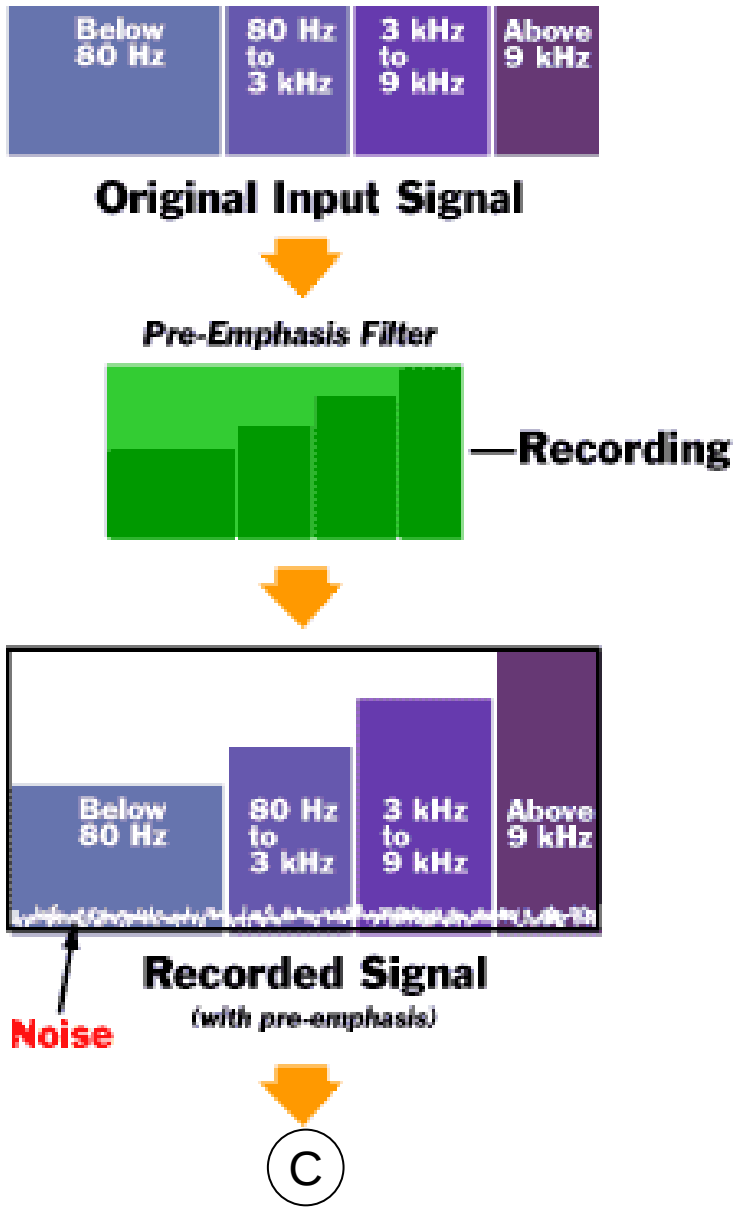


The first product manufactured by Dolby Laboratories, the A301, provided one-channel of A-type noise reduction (1966).

4.1 Dolby in Cinema : Analog

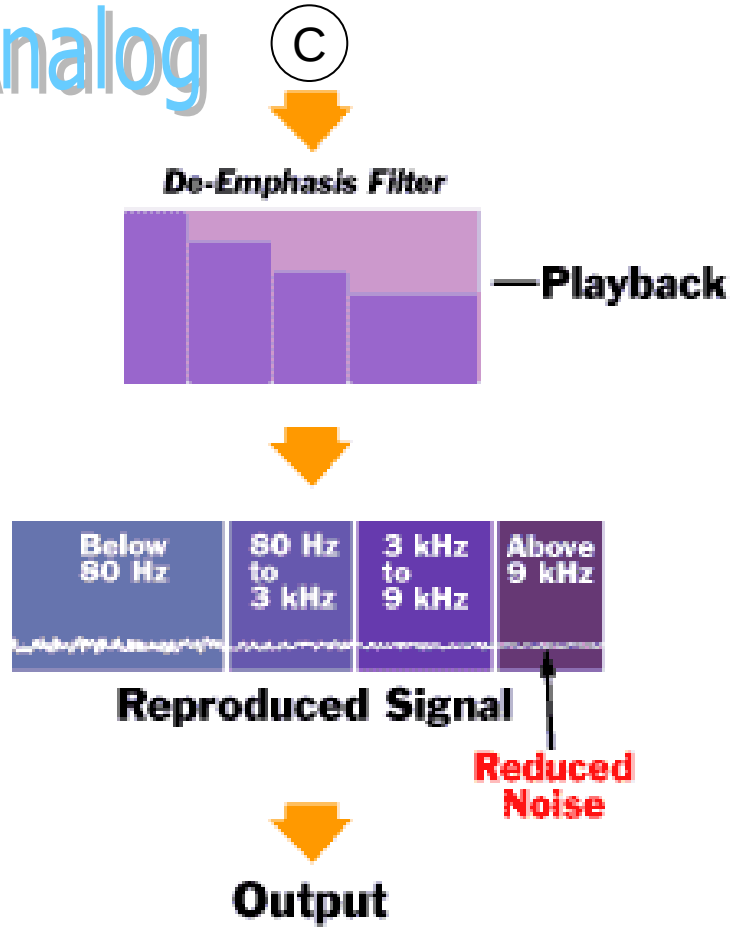
Dolby A breaks the incoming audio signal into four discrete bands.

A technique called pre-emphasis boosts the signal of each band above 10 decibels (unit used to measure the intensity of a sound), the level of ambient noise.



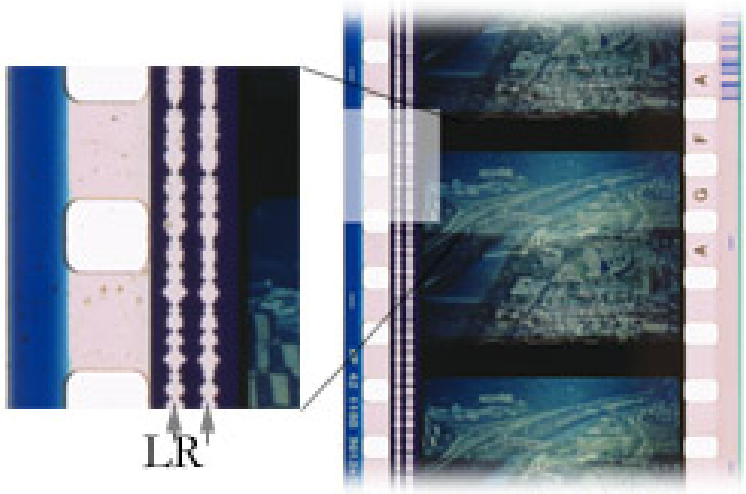
4.1 Dolby in Cinema : Analog

Each signal then travels through a compander, where the signal is compressed to further eliminate low-level noise and is then expanded again. The signals are combined, and the result is much cleaner sound.

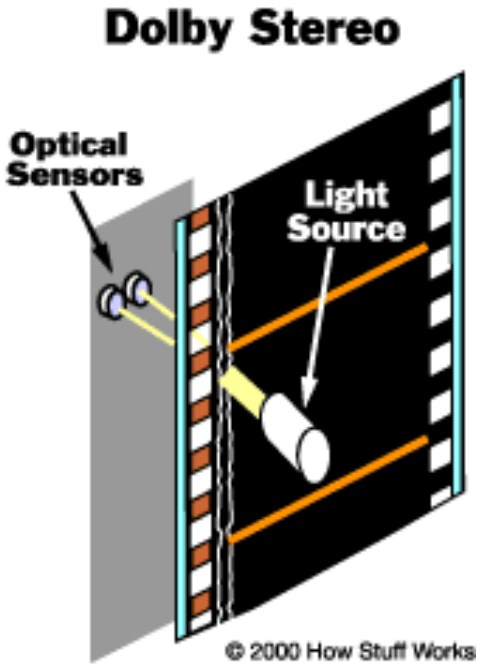


The main compromise in Dolby A is a narrower frequency response, resulting in a smaller dynamic range. Dolby noise reduction has evolved from Dolby A to Dolby Spectral Recording, an enhanced process that reduces noise twice as much as Dolby A.

4.1 Dolby in Cinema : Analog



Optical Dolby Stereo Soundtrack



Even Dolby A couldn't compensate for the level of noise if more than two optical tracks were put on the film. A major breakthrough in surround sound came when Dolby Stereo was created.

4.1 Dolby in Cinema : Analog

Using an amazing process called matrixing, Dolby devised a way to use the two optical lines on the film to create four distinct channels of sound:

- **Left**
- **Right**
- **Center**
- **Rear**

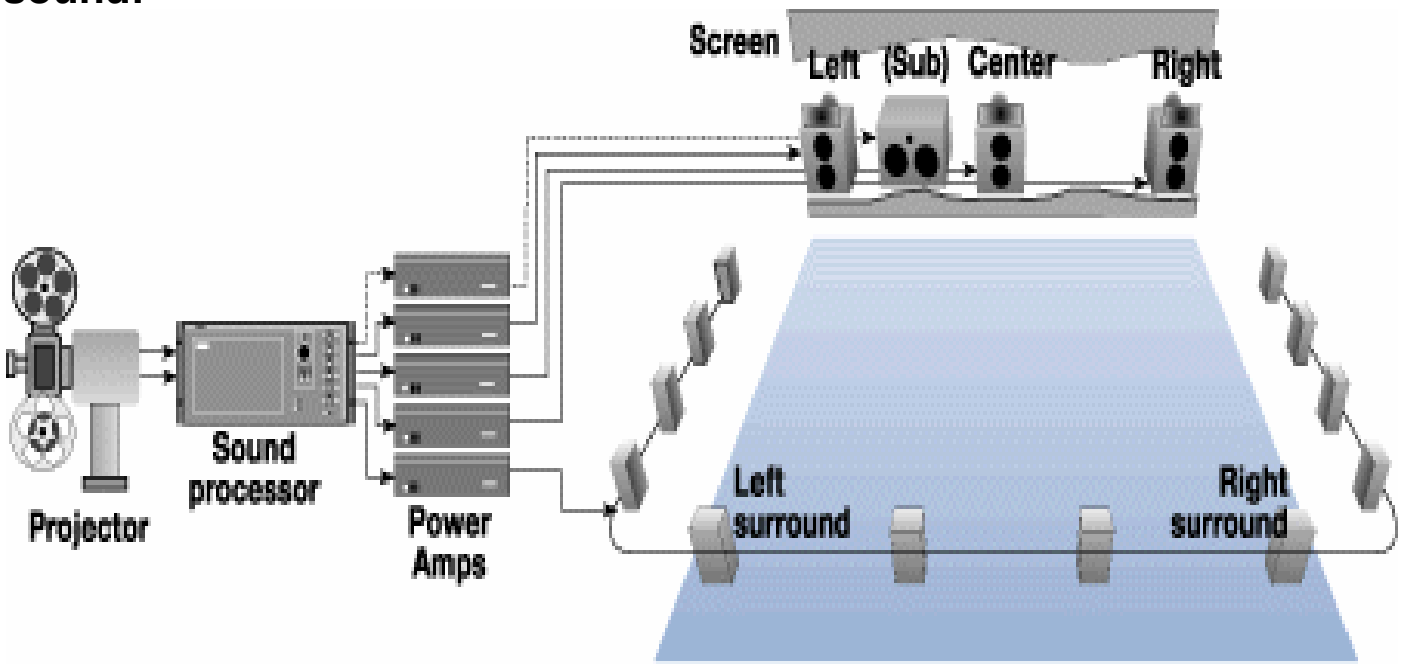


Figure 3: Dolby analog playback

4.2 Dolby in Cinema : Digital Age

Dolby Digital

Quite possibly the most popular of the digital formats is Dolby Digital, which is also known by several other names:

- **Dolby Digital 5.1**
- **Dolby AC-3 (Dolby's third audio-coding design)**
- **Dolby SR-D (Spectral Recording Digital)**

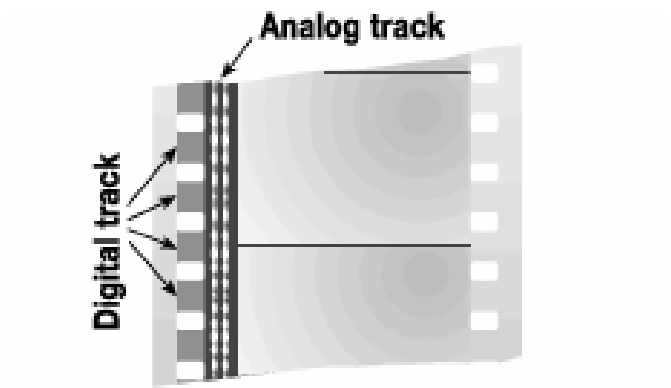


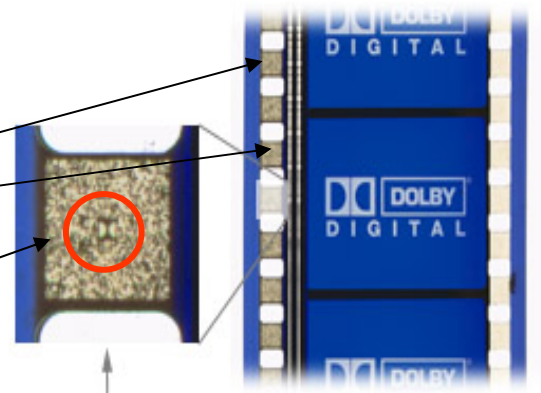
Figure 4: 35 mm Dolby Digital print

4.2 Dolby in Cinema : Digital Age

Dolby Digital uses the space between the sprocket holes to encode information.

Look at the photo and notice the gray dots between the holes.

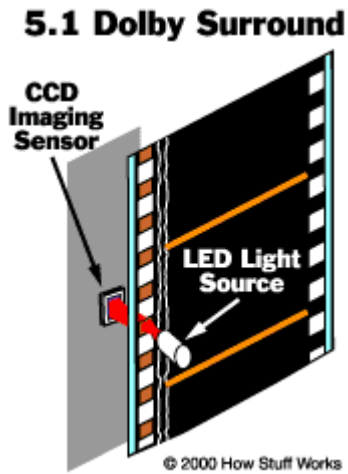
If you look closely, you can even make out the Dolby Digital logo in the center of each segment!



Dolby Digital

The Dolby Digital reader mounts on top of the projector (some projectors now have the reader built right in) and scans the film as it passes through.

Light from an LED shines through the film onto a CCD. The image, containing little specks that represent 1s and spaces that represent 0s, is sent by the reader to a *Dolby Digital Processor* unit that turns the binary data back into sound.



4.2 Dolby in Cinema : Digital Age

Dolby Digital uses six tracks:

- **Center**
- **Left**
- **Right**
- **Left surround**
- **Right surround**
- **LFE (low-frequency effects)**

5

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This configuration is commonly referred to as 5.1, for five main channels plus an effects channel. The effects channel uses a subwoofer and is often called the boom channel because its main use is for explosions and other powerful, teeth-rattling sounds.

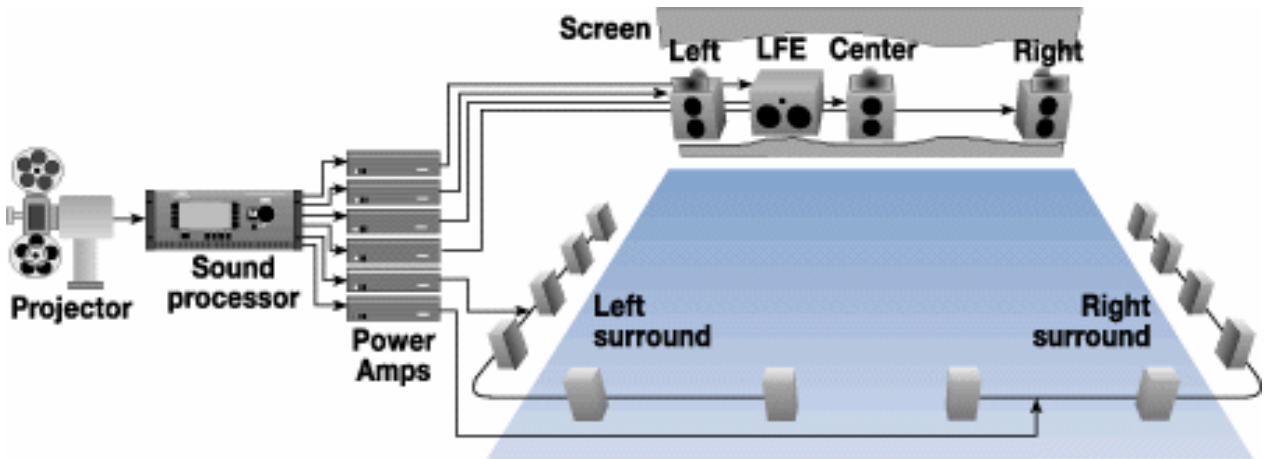

Figure 5: Dolby Digital playback

4.2 Dolby in Cinema : Digital Age

In the event of failure of the Dolby Digital reader or problems reading the digital information, the film has Dolby Stereo analog tracks.

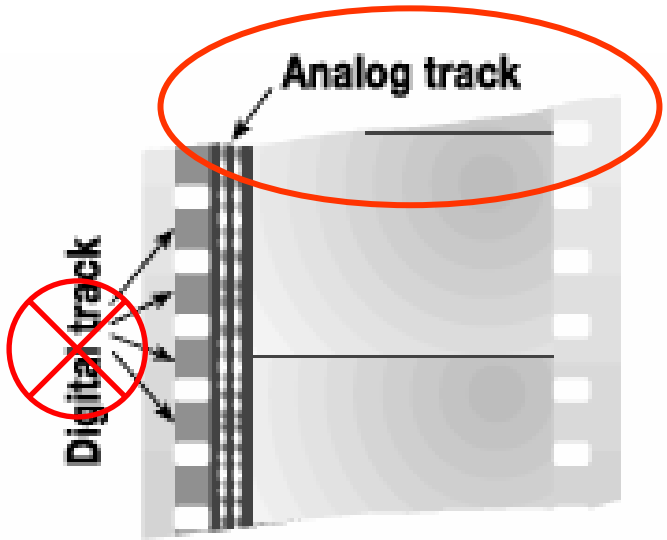

Figure 4: 35 mm Dolby Digital print

4.2 Dolby in Cinema : Digital Age

Dolby Digital Surround EX

The newest Dolby format, Dolby Digital Surround EX was introduced in 1999, and adds a third surround channel to the Dolby Digital format. Enabling improved realism, more precise sound placement, and exciting special effects

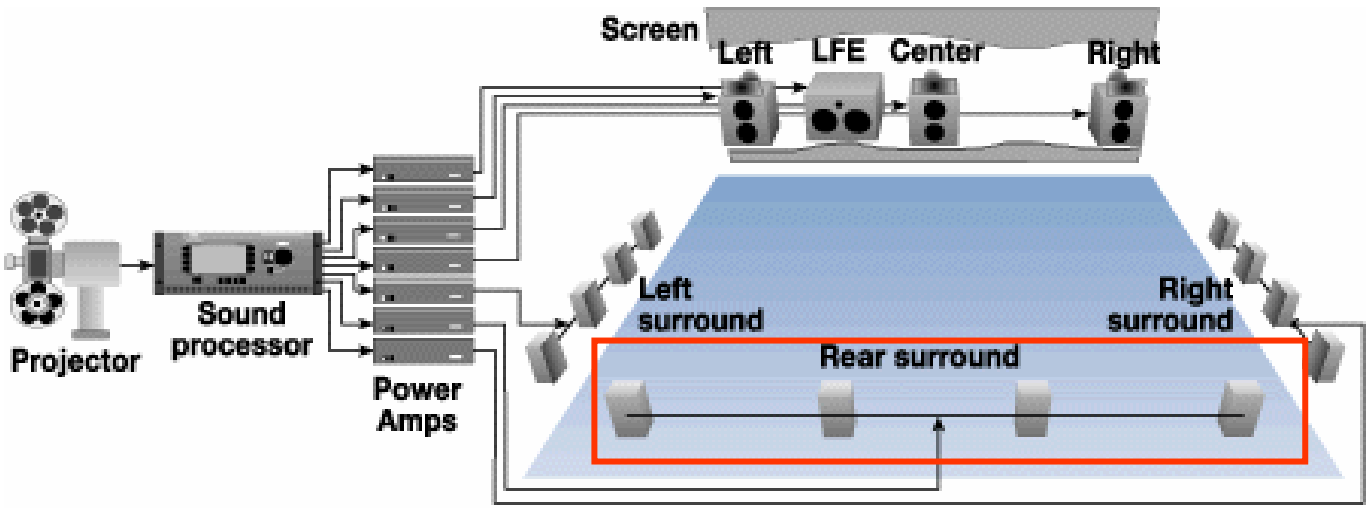

Figure 6: Dolby Digital Surround EX playback

5.0 Surround Sound Manufacturers

Digital Theater System

LucasFilm THX

Sony Dynamic Digital Sound

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6.0 Reference

- www.dolby.com
- www.surroundassociates.com
- www.cinenow.com
- www.hometheaterhifi.com
- www.filmsound.org
- www.recording-history.org
- www.mtsu.edu/~smpte/timeline.html
- www.thx.com
- www.dtsonline.com

Thank You.