Information

Dolby

Making the Most of Audio Source Tracks for DVD: Some Guidelines from Dolby Laboratories

These guidelines are for use in the preparation and creation of Dolby Digital soundtracks for DVD from the most commonly encountered film and music soundtrack formats.

A brief explanation of terms

- **Dolby AC-3** is a proprietary audio coding technique developed by Dolby Laboratories for storing and transmitting single or multiple channels of audio.

- **Dolby Digital** is the digital sound format using Dolby AC-3 for such applications as cinema sound, DVD-Video discs, and digital broadcast. In addition to audio, a Dolby Digital data stream can carry information such as instructions for consumer decoders on how to configure the audio to suit different playback systems.

- **5.1** describes the standard discrete surround-sound configuration of three full-range front channels, two full-range surround channels, and a bass-only low-frequency effects channel.

- **Dolby Surround** is the consumer version of the original, analogue Dolby Stereo multichannel film format. It is a matrix encoding process enabling stereo soundtracks to carry four channels of audio information—left, center, right, and surround.

- **Dolby Surround Pro Logic** is the decoding process for Dolby Surround programming provided in millions of home playback products.

Note: Dolby Digital can deliver any channel configuration from mono to 5.1. Depending on the source material, a mono, stereo, or Dolby Surround-encoded stereo Dolby Digital soundtrack may be preferable to a 5.1-channel soundtrack.

Working from 5.1 masters

5.1-channel masters, usually stored on multitrack tape or magnetic film, contain discrete L, C, R, LS, RS, and LFE tracks. Analog programs encoded with Dolby A-type or Dolby SR noise reduction should be decoded appropriately before encoding as a Dolby Digital bitstream at a bit rate of 448 kbit/s.

Because the dynamic range of magnetic film masters can exceed that of digital formats, it may be necessary to make adjustments to avoid exceeding the available headroom. You

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should also watch out for delays that may have been recorded onto the master's surround channels, and for content on the LFE channel above 120 Hz, the recommended cut-off frequency. Depending on the program material, further action using delays or filters may be appropriate.

Working from Dolby Surround or Dolby Stereo matrix-encoded two-track masters

With a matrix-encoded, two-track master (Lt/Rt), first transfer the program to a digital format at a sample rate of 48 kHz, using Dolby A-type or Dolby SR noise reduction decoding as appropriate. Once in the digital domain, the tracks may be cleaned up by applying equalization, dynamic range compression, or proprietary de-noising. It is important, however, to apply these processes in exactly the same way to both tracks, which is easily accomplished by using stereo-ganged devices. Otherwise, the matrix surround decode process, which depends upon accurately maintaining the two tracks' similarities and differences at the time of encoding, will be altered.

Encode the conformed material for DVD as a stereo Dolby Digital track (2/0) at no less than 192 kbit/s (or up to 448 kbit/s) setting the Dolby Surround Mode flag to indicate that the material is matrix-surround encoded. On playback, the flag will activate the Dolby Surround Pro Logic decoder included in all multichannel Dolby Digital decoders to reproduce the soundtrack as the director intended.

It is best to transmit two-channel matrix-encoded material as such to the consumer, and not decode it in the studio to derive an "artificial" discrete multichannel mix. For one thing, the results can vary from the intent of the original producer/director, especially if extra processing has been added on top of the surround decoding in the studio. Also, the sound will fail to meet listener expectations for true 5.1-channel material.

In addition, many consumers do not yet have a full 5.1-channel Dolby Digital playback systems, and connect their DVD players' two-channel outputs to a stereo or Dolby Surround Pro Logic system. Under these circumstances, the Dolby Digital decoders in the players "downmix" multichannel soundtracks "on the fly" to mono, stereo, or Dolby Surround matrix-encoded stereo. If the multichannel soundtrack was derived from a matrix-encoded two-track master, there may be downmix quality problems due to phase effects from the original matrix encoding. In nearly every case the original Lt/Rt mix will give the best results.

When upmixing from an Lt/Rt master is absolutely necessary, it is best to use a matrix decoder without steering or even a simple "Hafler" matrix. Any steering logic, including that used by Dolby Pro Logic, adds some degree of "swimminess" that is not welcome, particularly for pure music applications. Of course, due consideration must also be given to downmixing playback situations, suggesting, for example, that no time delays be used in the surrounds.

Working from discrete four-track masters

Dolby analog (Dolby Stereo) matrix-encoded film soundtracks were originally produced from discrete four-track master tapes. While the four tracks on these masters corresponded to L, C, R, and S, during the matrix-encoding process the results were monitored through a matrix *de*coder ("4:2:4" monitoring) to anticipate what would be actually heard in the cinema.

The final sound intended to be heard in the cinema, therefore, can be quite different than that of the four channels played discretely. For one thing, matrix decoding typically narrows the front stereo image. It is a good idea, therefore, to compare the discrete four-track mix to the decoded Lt/Rt mix, and narrow the frontal image of your DVD multichannel mix accordingly. Similarly, matrix decoding typically sends some information from L and R to S, so a judicious addition of L and R or ambience to the surround channel is appropriate. In this way it is possible to re-create the originally intended sound while maintaining the discrete elements.

Alternatively, you could simply use a Dolby Surround matrix encoder to create a surround-encoded two-channel mix for the DVD from the four-channel master, and flag the bitstream as matrix surround-encoded.

Note: four-track masters for multitrack magnetic-format film soundtracks, as opposed to matrix-encoded stereo optical (above), represent the actual L, C, R and S tracks as heard in the cinema and can be encoded without further modification for 3/1 mode DVD soundtracks.

Working with stereo music masters

If the two-channel master is analog, first transfer it to the digital domain and then perform any sweetening or cleaning up, such as equalization, dynamic range compression, or proprietary de-noising. The resulting tracks should be encoded at as high a bit rate as possible (192 kbit/s up to 448kbit/s) as a stereo (2/0) Dolby Digital bitstream. The Dolby Surround Mode flag should not be set.

Creating a ".1" channel

While 5.1-channel film sound mixes are created to take proper advantage of the ".1," or low-frequency effects (LFE) channel, you should think twice before creating such a channel for material originally produced without one.

Keep in mind that Dolby Digital's five main channels (L, C, R, LS, RS) are all full-range, and the LFE channel does not extend frequency response. It exists primarily to enable more powerful low-frequency special effects for film soundtracks. Also, remember that all Dolby Digital decoders offer bass management, a feature that enables the consumer to direct extreme low frequencies to a subwoofer, or to any of the speakers in the system (such as L and R) that can reproduce low bass. When bass management is used, a ".1" track derived from a four or five-channel mix may cause unwanted summing or cancellation of low frequencies in a subwoofer. Delivering a quality track with five full-range main channels, which allows the end user to optimise bass management to his specific playback system, is the best way to assure accurate delivery of the sound intended by the program's producers.

A final factor to consider is that the ".1 track" is ignored by Dolby Digital's downmixing process, so it should include no vital information that would be missed in mono, stereo, or Pro Logic playback.