CATCH THE NEXT INNOVATION

DOLBY E

MULTICHANNEL AUDIO CODING
FOR DTV PRODUCTION AND DISTRIBUTION

DOLBY®

To facilitate the conversion of TV production and broadcast facilities to multichannel audio, Dolby Laboratories has developed a new, professional digital audio coding system, Dolby E. With Dolby E, up to eight channels of high-quality audio plus Dolby Digital metadata (see sidebar) can be distributed via an AES3 pair, or recorded onto two audio tracks of a digital VTR.

Instead of having to replace their audio equipment and routing systems, many facilities can convert to multichannel audio simply by adding Dolby E codecs to their existing two-channel AES3 distribution systems. The result is efficient, cost-effective post-production and distribution of multichannel programs prior to final Dolby Digital (AC-3) encoding and transmission.

Dolby E is a professional system for use within the broadcast and post-production infrastructure. Audio never reaches the consumer in Dolby E form; it is encoded with Dolby Digital just prior to final transmission. To help differentiate their functions, Dolby E is referred to as a distribution coding system, and Dolby Digital as an emission coding system.

Some industry experts predict that thrilling 5.1-channel Dolby Digital sound could be even more vital to DTV's success than its improved picture. Multichannel audio cannot reach the viewer, however, if it never gets to the transmitter. Dolby E will help ensure that it does.

Dolby E at a Glance

- Simple, cost-effective conversion of two-channel broadcast and post-production facilities to multichannel audio.
- Distributes eight channels of high-quality audio and Dolby Digital metadata via AES3 or digital VTR audio track pair.
- Ten or more encode/decode cycles without degradation.
- Glitch-free audio editing synchronous with video within digital domain.
- Compatible with international video standards.

Why another audio coding system?

With its combination of quality, multichannel capability, and very low data rate, Dolby Digital coding is ideal for transmitting multichannel audio to the DTV viewer at home. It has been adopted as the standard audio coding in ATSC countries and is gaining favor as an alternative audio format for DVB countries.
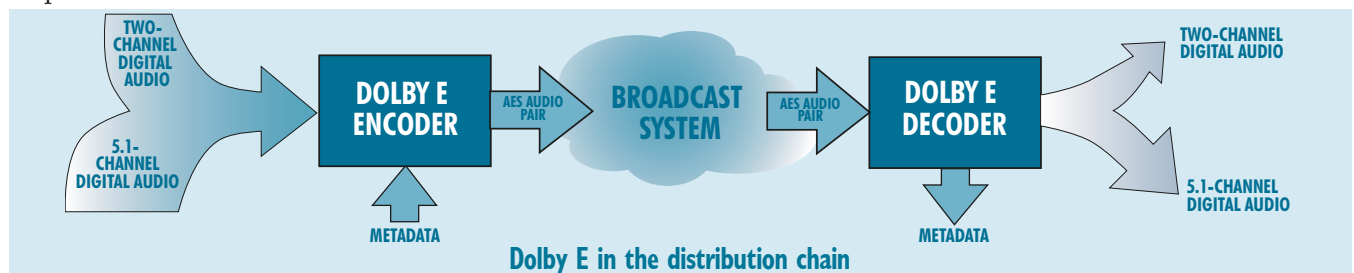
Dolby Digital audio coding is not appropriate, however, for distributing multichannel audio within professional post-production and broadcast environments. Because it is optimized for maximum quality at low bit rates, it is limited to a single cycle of encoding (transmission) and decoding (reception). Also, because its frames do not match video frames, Dolby Digital audio is not optimized for editing when changes to the picture are needed.
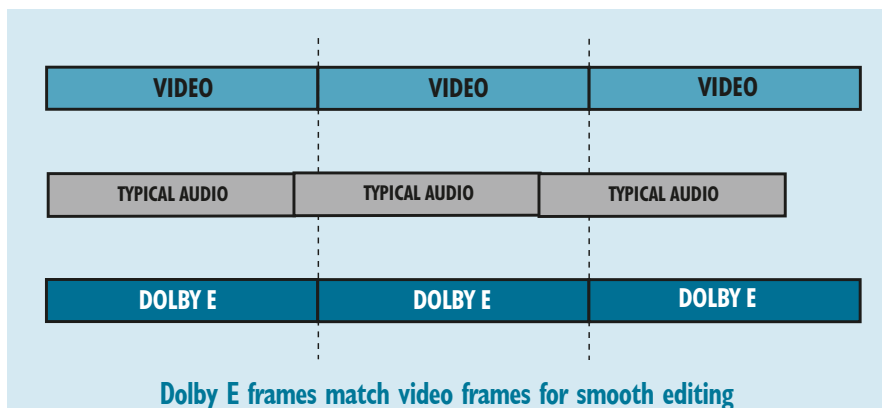
Dolby E, on the other hand, has been developed specifically for distribution, rather than emission, for applications such as sending a program to a local station for commercial insertion, routing it within the same studio for voice-over editing, or sending it via satellite to another broadcast facility. As a result of its sophisticated algorithm and higher data rate, Dolby E programs can withstand ten or more tandem encode/decode cycles without audible degradation.

With Dolby E, audio frames match video frames, assuring that audio-follow-video edits are free of mutes, glitches, or other aberrations. It also makes it possible to switch, route, and perform assemble edits directly on the Dolby E bitstream without decoding and re-encoding.

Using Dolby E

Dolby E encodes up to eight audio channels plus metadata into a two-channel bitstream with a standard data rate of 1.92 Mbits/sec (20-bit audio at 48 kHz). With multichannel programming, a "5.1+2" configuration is typically used, with six of the eight channels carrying a 5.1 mix and the other two an Lt/Rt (matrix surround-encoded) or stereo two-channel mix. The system can also be used to carry a 5.1 mix plus two mono tracks (5.1+1+1), three stereo mixes (3x2), six mono channels (6x1), and so on.

TWO-CHANNEL DIGITAL AUDIO

5.1-CHANNEL DIGITAL AUDIO

DOLBY E ENCODER

AES AUDIO PAIR

BROADCAST SYSTEM

AES AUDIO PAIR

DOLBY E DECODER

TWO-CHANNEL DIGITAL AUDIO

5.1-CHANNEL DIGITAL AUDIO

METADATA

METADATA

Dolby E in the distribution chain

Dolby E frames match video frames for smooth editing

Dolby E adds one frame of delay during encoding and one frame during decoding, and requires a "color-black" reference signal to keep audio and video frame rates locked.

Dolby E has been designed to work with most standard video frame rates, 30, 29.97, 25, 24, and 23.98 fps and a 48 kHz sample rate. As well as 20-bit output words (up to eight encoded channels), it supports 16-bit output words (up to six encoded channels).

Dolby E in post-production

As more and more broadcast facilities equip with Dolby E, post-production facilities will be increasingly called upon to deliver mixes in the two-track, Dolby E encoded format. While this alone is sufficient reason to use Dolby E, its advantages are as useful in post-production as in program distribution. The ability to fit eight channels plus Dolby Digital metadata into a two-channel architecture, to accomplish audio-follow-video editing, and to

maintain audio quality can all help facilitate the post-production of audio destined for DTV transmission.

Most important of all, the use of Dolby E in post-production lets mixers include metadata parameters along with the mix that are carried down the line through the distribution chain to the Dolby Digital encoder. As a result, the mix reaches viewers at home exactly as originally produced, so they hear precisely what the program's creators intended.

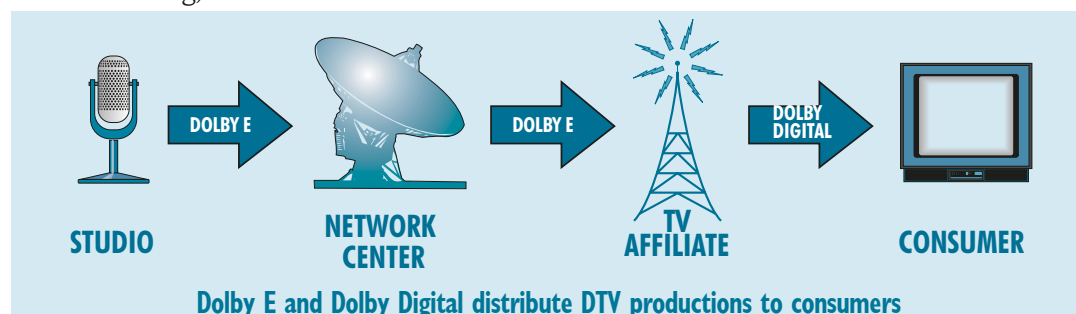## Dolby Digital encoding: the final step

Audio for DTV programs should be maintained in the robust Dolby E format right up to final master control, and only then re-encoded as a Dolby Digital data stream for transmission. Doing so will ensure the highest possible audio quality for the viewer at home, while at the same time simplifying the distribution process.

What is metadata?

The Dolby Digital emission coding system was designed not only to be highly efficient, but also to satisfy all viewers, from those with mono TV sets in noisy environments to those with elaborate multichannel home theater systems capable of a wide dynamic range.

To this end, the program producer can incorporate within the Dolby Digital bitstream auxiliary information called metadata (i.e., data about the data) to control aspects of the decoding and reproduction of the audio at the viewer's location. Listeners can then apply, partially apply, or ignore these parameters as appropriate to their equipment and preferences.

One metadata parameter can, for example, signify the program's number and type of channels (*audio coding modes*). Another, called *dynrange*, can be used to compress the audio's dynamic range by a predetermined amount when appropriate (such as late at night), yet allow listeners to opt for full dynamic range when they prefer. And *dialnorm* is used to automatically adjust the consumer decoder's output level to produce consistent playback loudness on all programs, including commercials.

Dolby E and Dolby Digital distribute DTV productions to consumers