



Dolby[®] Metadata Guide

Issue 3

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A Guide to Dolby Metadata

Metadata provides unprecedented capability for content producers to deliver the highest quality audio to consumers in a range of listening environments. It also provides choices that allow consumers to adjust their settings to best suit their listening environments.

In this document, we first discuss the concept of metadata:

- Metadata overview

We then discuss the three factors controlled by metadata that most directly affect the consumer's experience:

- Dialogue level
- Dynamic range control (DRC)
- Downmixing

Finally, we define each of the adjustable parameters, and provide sample combinations:

- Individual parameters
- Metadata combinations

1 Metadata Overview

Dolby[®] Digital and Dolby E are both data-rate reduction technologies that use metadata. Metadata is carried in the Dolby Digital or Dolby E bitstream, describing the encoded audio and conveying information that precisely controls downstream encoders and decoders. In normal operation, the encoded audio and metadata are carried together as a data stream on two regular digital audio channels (AES3, AES/EBU, or S/PDIF). Metadata can also be carried as a serial data stream between Dolby E and/or Dolby Digital equipment. Metadata allows content providers unprecedented control over how original program material is reproduced in the home.

Dolby Digital is a *transmission bitstream* (sometimes called an *emission bitstream*) intended for delivery to the consumer at home through a medium such as DTV or DVD. It consists of a single encoded program of up to six channels of audio described by one metadata stream. The consumer's Dolby Digital decoder reproduces the program audio according to the metadata parameters set by the program creator, and according to settings for speaker configuration, bass management, and dynamic range that are chosen by the consumer to match his specific home theater equipment and environmental conditions.

Dolby E is a *distribution bitstream* capable of carrying up to eight channels of encoded audio and metadata. The number of programs ranges from one single program (Program Config: 5.1) to eight individual programs on a single Dolby E stream (Program Config: 8 × 1). Each program is discrete, with its own metadata in the Dolby E stream. Some metadata parameters in a Dolby E stream automatically configure a Dolby Digital encoder at the point of transmission, while others affect only the consumer's Dolby Digital decoder operation.

Dolby E is a professional technology used for broadcast applications, such as program origination and distribution; the Dolby E bitstream carries the entire metadata parameter set. Dolby Digital, used for consumer applications, such as transmission to the home or for DVD authoring, employs a subset of the full metadata parameter set called *Dolby Digital metadata*; the Dolby Digital bitstream carries only those parameters necessary for proper decoding by the consumer.

Metadata is first inserted during program creation or mastering, and is carried through transmission in a broadcast application or directly onto a DVD. The metadata provides control over how the encoded bitstream is treated at each step on the way to the consumer's decoder.

Here's an example of how it works:

In a broadcast truck parked outside a football stadium, the program mixer chooses the appropriate metadata for the audio program being created. The resulting audio program, together with metadata, is encoded as Dolby E and sent to the television station via fiber, microwave, or other transmission link. At the receiving end of this transmission, the Dolby E stream is decoded back to baseband audio and metadata. The audio program and the metadata are monitored, altered, or re-created as other elements of the program are added in preparation for broadcast. This new audio program/metadata pair, reencoded as Dolby E, leaves the postproduction studio and passes through the television station to Master Control, where many incoming Dolby E streams are once again decoded back to their individual baseband digital audio/metadata programs. The audio program/metadata pair that is selected to air is sent to the transmission Dolby Digital encoder, which encodes the incoming audio program according to the metadata stream associated with it, thereby simplifying the transmission process. Finally, the Dolby Digital signal is decoded in the consumer's home, with metadata providing the information for that decoding process. Through the use of metadata, the mixer in the truck has been able to control the home decoder for the sporting event, while segments such as news breaks, commercials, and station IDs are similarly decoded, each using metadata carried within each individual segment.

This control, however, requires the producer to set the metadata parameters correctly, since they affect important aspects of the audio—and can seriously compromise the final product if set improperly. Although most metadata parameters are transparent to consumers, certain parameters affect the output of a home decoder, such as downmixing for a specific speaker configuration, or when the consumer chooses Dynamic Range Control to avoid disturbing family and neighbors.

Figure 1 shows a 5.1 + 2 Program Config, consisting of a 5.1-channel program and a two-channel secondary audio program (SAP).

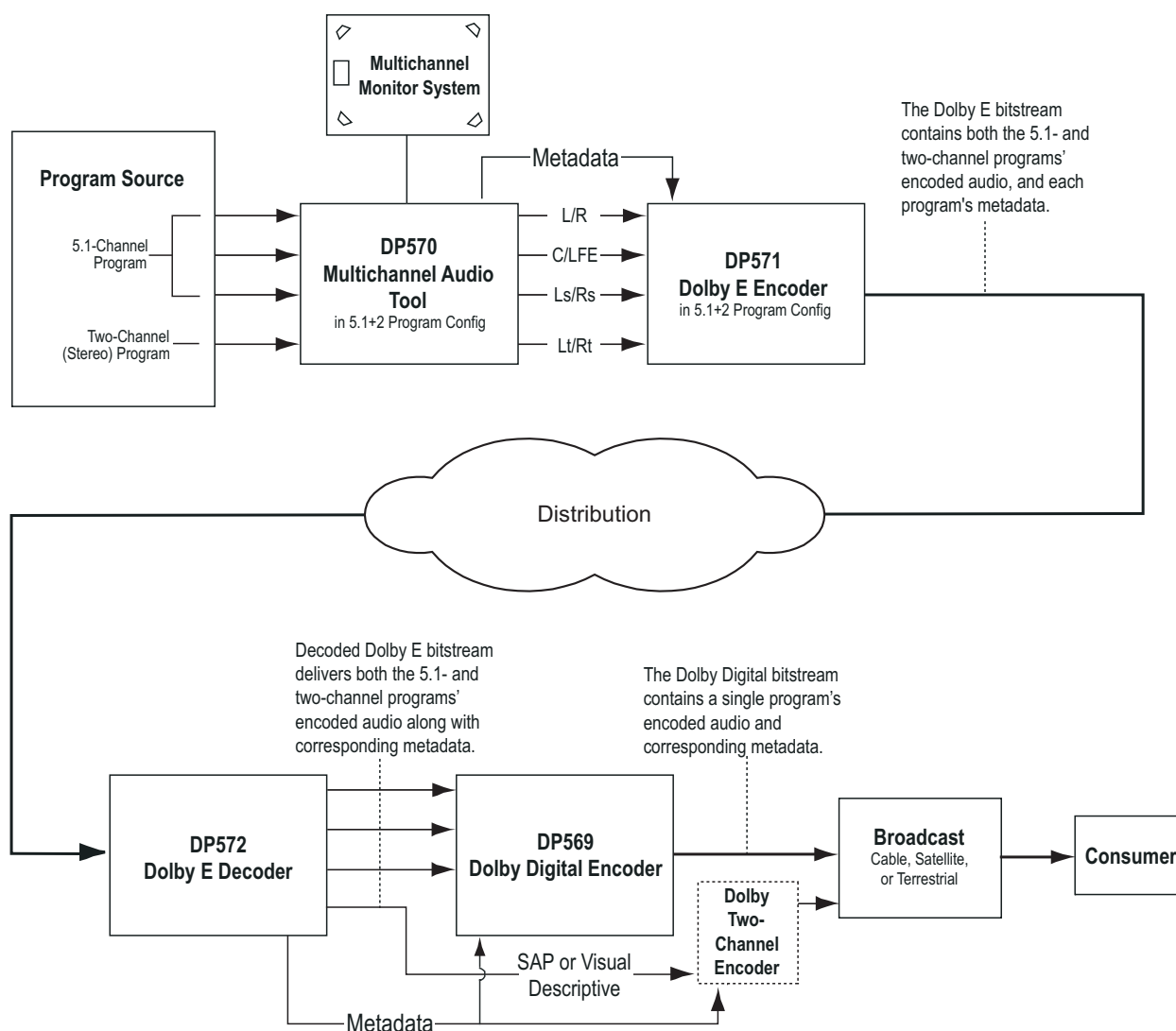


Figure 1 Metadata Flow from Production to Consumer

In the simplest terms, there are two functional classifications of metadata:

Professional: These parameters are carried only in the Dolby E bitstream. They are used to automatically configure a downstream Dolby Digital encoder, allowing maximum control by the content producer over how the encoded bitstream is treated at each step on the way to the consumer’s decoder.

Consumer: These parameters are carried in both the Dolby E and the Dolby Digital bitstream. The consumer’s Dolby Digital decoder uses these parameters to create the best possible audio program possible on each consumer’s playback system. Consumer parameters include the DRC values, which are ultimately enabled by the end user’s selection, as discussed in Section 3, Dynamic Range Control.

Both types of metadata can be examined, modified, or passed through during encoding. Table 1 lists the active metadata parameters and indicates whether the parameter is Professional or Consumer.

Table 1 Metadata Parameters
Extended Bitstream Information parameters are in italics.

Metadata Parameter	Professional	Consumer
Program Configuration	×	
Program Description Text	×	
Dialogue Level		×
Channel Mode		×
LFE Channel		×
Bitstream Mode		×
Line Mode Compression		×
RF Mode Compression		×
RF Overmodulation Protection		×
Center Downmix Level		×
Surround Downmix Level		×
Dolby Surround Mode		×
Audio Production Information		×
Mix Level		×
Room Type		×
Copyright Bit		×
Original Bitstream		×
<i>Preferred Stereo Downmix</i>		×
<i>Lt/Rt Center Downmix Level</i>		×
<i>Lt/Rt Surround Downmix Level</i>		×
<i>Lo/Ro Center Downmix Level</i>		×
<i>Lo/Ro Surround Downmix Level</i>		×
<i>Dolby Surround EX Mode</i>		×
<i>A/D Converter Type</i>		×
DC Filter	×	
Lowpass Filter	×	
LFE Lowpass Filter	×	
Surround 3 dB Attenuation	×	
Surround Phase Shift	×	

Special Parameters

There are other professional parameters included in the Dolby E bitstream that are not under direct user control, such as Timecode and Pitch Shift.

Timecode

Dolby E bitstreams carry timecode information in *hours:minutes:seconds:frames* format.

Pitch Shift

The Pitch Shift parameter can be generated automatically by a Dolby E decoder to control the Dolby Model 585 Time Scaling Processor. If the input to the Dolby E decoder is not at normal play speed (as with varispeed or program play), then the Pitch Shift Code parameter indicates the amount of audio pitch shifting required to restore the original program pitch.

2 Dialogue Level

Dialogue Level (also known as *dialogue normalization* or *dialnorm*) is perhaps the single most important metadata parameter. The Dialogue Level setting represents the long-term A-weighted average level of dialogue within a presentation, Leq(A). This level can be quantified with the Dolby Model LM100 Broadcast Loudness Meter.

When received at the consumer's Dolby Digital decoder, this parameter setting determines a level shift in the decoder that sets, or *normalizes*, the average audio output of the decoder to a preset level. This aids in matching audio volume between program sources.

In broadcast transmission, the proper setting of Dialogue Level ensures that the consumer receives a standard listening level, so switching channels or watching a television program through the commercial breaks doesn't require adjusting the volume. Using the same standard for all content, whether conveyed by broadcast television, DVD, or other media, enables the consumer to switch between sources and programs while maintaining a comfortable and consistent listening level.

The proper setting of the Dialogue Level parameter also enables the Dynamic Range Control profiles chosen by the content producer to work as intended in less-than-optimal listening environments, and is essential in any content production, whether it is for transmission in a broadcast stream or for direct distribution to consumers, as with DVDs.

Note: Programs without dialogue, such as an all-music program, still require a careful setting of the Dialogue Level parameter. When setting the parameter for such content, it is useful to compare the program to the level of other programs. The goal is to allow the consumer to switch to your program without having to adjust the volume control.

The Scale

The scale used in the Dialogue Level setting ranges in 1 dB steps from –1 to –31 dB. Contrary to what you might assume at first, a setting of –31 represents no level shift in the consumer’s decoder, and –1 represents the maximum level shift. Here’s why:

Dolby Digital consumer decoders normalize the average output level—that is, the output level averaged over time using the equivalent loudness method, Leq(A)—to –31 dBFS (31 dB below 0 dB full-scale digital output) by applying a shift in level based on the Dialogue Level parameter setting.

Note: The –31 dBFS Leq(A) should not be confused with the station reference level (often –18 or –20 dBFS). It is common to have different Leq(A) values for program material that has the same reference level. An average loudness level of –31 dBFS Leq(A) is quite compatible with facilities running at a variety of reference levels.

When a decoder receives an input signal with a Dialogue Level setting of –31, it applies no level shift to the signal because this indicates to the decoder that the signal already matches the target level and therefore requires no shift. In contrast, a louder program requires a shift to match the –31 dB standard. When the Dialogue Level parameter setting is –21, the decoder applies a 10 dB level shift to the signal. When the setting is –11, it applies a 20 dB level shift, and so on.

A Simple Rule:

$$31 + (\text{dialogue level value}) = \text{Shift applied}$$

Example:

$$31 + (-21) = 10 \text{ dB}$$

The most important point to remember is that in setting the Dialogue Level parameter, you are providing your listener with an essential service. For your listeners, setting this level properly means:

- The volume level is consistent with other programs.
- The DRC profiles you make available to them work as you intend.

Once dialogue level is set, you can set up DRC profiles to further benefit the consumer.

3 Dynamic Range Control

Different home listening environments present a wide range of requirements for dynamic range. Rather than simply compressing the audio program at the transmission source to work well in the poorest listening environments, Dolby Digital encoders calculate and send Dynamic Range Control (DRC) metadata with the signal.

This metadata can then be applied to the signal by the decoder to reduce the signal's dynamic range.

Through the proper setting of DRC profiles during the mastering process, the content producer can provide the best possible presentation of program content in virtually any listening environment, regardless of the quality of the equipment, number of channels, or ambient noise level in the consumer's home.

Many Dolby Digital decoders offer the consumer the option of defeating the Dynamic Range Control metadata, but some do not. Decoders with six discrete channel outputs (full 5.1-channel capability) typically offer this option. Decoders with stereo, mono, or RF-remodulated outputs, such as those found on DVD players and set-top boxes, often do not. In these cases, the decoder automatically applies the most appropriate DRC metadata for the decoder's operating mode.

The Dolby Digital stream carries metadata for the two possible operating modes in the decoder. The operating modes are known as Line mode and RF mode due to the type of output they are typically associated with. Line mode is typically used on decoders with six- or two-channel line-level outputs and RF mode is used on decoders that have an RF-remodulated output. Full-featured decoders allow the consumer to select whether to use DRC and if so, which operating mode to use. The consumer sees options such as Off, Light Compression, and Heavy Compression instead of None, Line mode, and RF mode. Advanced decoders may also allow custom scaling of the DRC metadata.

All that needs to be done during metadata authoring, or encoding, is selection of the dynamic range control profiles for Line mode and RF mode. The profiles are described in the following sections.

Note: While the use of DRC modes during decoding is a consumer-selectable feature, the Dialogue Level parameter setting is not. Therefore, setting the Dialogue Level parameter properly is essential before previewing a DRC profile.

Line Mode

Line mode offers these features:

- Low-level signal boost compression scaling is allowed.
- High-level signal cut compression scaling is allowed when not downmixing.
- The normalized dialogue level is reproduced from the decoder at a constant loudness level of -31 dBFS $Leq(A)$, assuming the Dialogue Level parameter is set correctly.

Line-level or power-amplified outputs from two-channel set-top decoders, two-channel digital televisions, 5.1-channel digital televisions, Dolby Digital A/V surround decoders, and outboard Dolby Digital adapters use Line mode.

Consumer control of the dynamic range is limited when downmixing. Products with stereo or mono outputs do not usually allow consumer scaling of Line mode. This is because these devices are usually downmixing (for example, when receiving a 5.1-channel signal). However, in these products, the consumer may have a choice between Line mode and RF mode.

RF Mode

In RF mode, high- and low-level compression scaling is not allowed. When RF mode is active, that compression profile is always fully applied.

RF mode is designed for products (such as set-top boxes) that generate a downmixed signal for connection to the RF/antenna input of a television set; however, it is also useful in situations where heavy DRC is required—for example, when small PC speakers are used for DVD playback. In RF mode, the overall program level is raised 11 dB, this results in dialogue being reproduced at a level of -20 dBFS Leq(A), while the peaks are limited to prevent signal overload in the D/A converter. By limiting headroom, severe overmodulation of television receivers is prevented. The 11 dB gain provides an average loudness level that compares well with existing analog television broadcasts.

In some situations it may be necessary to further constrain signal peaks above the average dialogue level so that there is less than 20 dB headroom. The selection of a suitable RF mode profile achieves this.

Dynamic Range Control Profiles

Six preset DRC profiles are available to content producers: Film Light, Film Standard, Music Light, Music Standard, Speech, and None. Each is applied in the pattern shown in Figure 2.

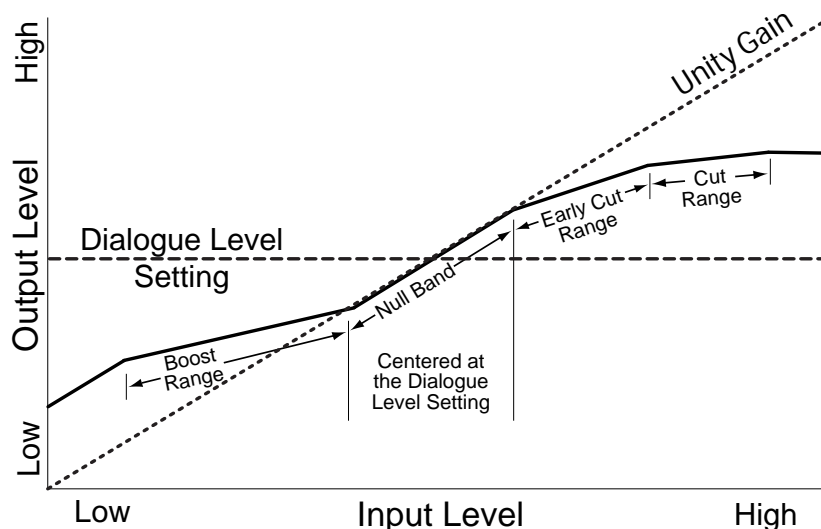


Figure 2 DRC Profile

In each case, the center of the null band is assigned to the region surrounding or adjacent to the Dialogue Level parameter setting, and the DRC profile is applied in relation to that level. Here are the details of the range for each profile.

- **Film Light**
 Max Boost: 6 dB (below -53 dB)
 Boost Range: -53 to -41 dB (2:1 ratio)
 Null Band Width: 20 dB (-41 to -21 dB)
 Early Cut Range: -26 to -11 dB (2:1 ratio)
 Cut Range: -11 to +4 dB (20:1 ratio)
- **Film Standard**
 Max Boost: 6 dB (below -43 dB)
 Boost Range: -43 to -31 dB (2:1 ratio)
 Null Band Width: 5 dB (-31 to -26 dB)
 Early Cut Range: -26 to -16 dB (2:1 ratio)
 Cut Range: -16 to +4 dB (20:1 ratio)
- **Music Light** (No early cut range)
 Max Boost: 12 dB (below -65 dB)
 Boost Range: -65 to -41 dB (2:1 ratio)
 Null Band Width: 20 dB (-41 to -21 dB)
 Cut Range: -21 to +9 dB (2:1 ratio)

- **Music Standard**
 - Max Boost: 12 dB (below –55 dB)
 - Boost Range: –55 to –31 dB (2:1 ratio)
 - Null Band Width: 5 dB (–31 to –26 dB)
 - Early Cut Range: –26 to –16 dB (2:1 ratio)
 - Cut Range: –16 to +4 dB (20:1 ratio)
- **Speech**
 - Max Boost: 15 dB (below –50 dB)
 - Boost Range: –50 to –31 dB (5:1 ratio)
 - Null Band Width: 5 dB (–31 to –26 dB)
 - Early Cut Range: –26 to –16 dB (2:1 ratio)
 - Cut Range: –16 to +4 dB (20:1 ratio)
- **None**
 - No DRC profile selected. The dialogue level parameter (*dialnorm*) is still applied.

These choices are available to the content producer for both Line mode and RF mode. The content producer chooses which of these profiles to assign to each mode; when the consumer or decoder selects a DRC mode, the profile chosen by the producer is applied.

In addition to the DRC profile, metadata can limit signal peaks to prevent clipping during downmixing. This metadata, known as overload protection, is inserted by the encoder only if necessary. For example, consider a 5.1-channel program with signals at digital full-scale on all channels being played through a stereo, downmixed line-level output. Without some form of attenuation or limiting, the output signal would obviously clip. Correct setting of the Dialogue Level and DRC profiles normally prevents clipping and unnecessary application of automatic overload protection.

Note: DRC profile settings are dependent on an accurate dialogue level setting. Improper setting of the dialogue level parameter may result in excessive and audible application of overload-protection limiting.

4 Downmixing

Downmixing is a function of Dolby Digital that allows a multichannel program to be reproduced over fewer speaker channels than the number for which the program is optimally intended. Simply put, downmixing allows consumers to enjoy a DVD or digital television broadcast without requiring a full-blown home theater setup.

As with stereo mixing where the mix is monitored in mono on occasion to maintain compatibility, multichannel audio mixing requires the engineer to reference the mix to fewer speaker channels to ensure compatibility in downmixing situations. In this way, Dolby Digital, using the metadata parameters that control downmixing, is an “equal opportunity technology,” in that every consumer who receives the Dolby Digital data stream can enjoy the best audio reproduction possible, regardless of the playback system.

It is important to consider the output signals from each piece of equipment that can receive a Dolby Digital program in the home. Table 2 shows the output types from different equipment.

Table 2 Outputs from Dolby Digital Signal Processing Equipment

Equipment	Output			
	Digital	5.1-Channel Analog	Two-Channel Analog	RF Remodulated
5.1-channel amplifier The standard home theater A/V amp	×	×		
5.1-channel decoder	×	×		
High-end DVD player	×	×	×	
DVD player	×		×	
PC Includes games consoles	×	(some units)	×	
High-end set-top box Often HDTV	×	×	×	×
Set-top box Usually SDTV	×		×	×
IDTV TV set with an integrated digital TV tuner	×		×	
High-end TV Large screen TV with a 5.1-channel speaker system	×	×		

Set-top boxes, used to receive terrestrial, cable, or satellite digital television, typically offer an analog mono signal modulated on the RF/Antenna output, a line-level analog stereo signal, and an optical or coaxial digital output. DVD players offer an analog stereo and a digital output, and some offer a six-channel analog output (for a 5.1-channel presentation). Portable DVD players offer analog stereo, headphone, and digital outputs. DVD players in computers and game consoles offer a digital output as well as analog stereo, headphone, and possibly six-channel analog outputs. 5.1-channel amplifiers, decoders, and receivers have six-channel analog outputs and possibly six speaker-level outputs.

In all of these cases, a Dolby Digital decoder creates the analog audio output signal.

In the case of the set-top box or DVD player, the analog stereo output is a downmixed version of the Dolby Digital data stream. The digital output delivers the Dolby Digital data stream to either a downstream decoder or an integrated amplifier with Dolby Digital decoding.

In each of these devices, the analog stereo output is one of two different stereo downmixes. One type is a stereo-compatible Dolby Surround downmix, of the multichannel source program that is suitable for Dolby Surround Pro Logic[®] decoding. This kind of downmix is also called Pro Logic or Left total/Right total (Lt/Rt). The other type is a simple stereo representation (called Left only/Right only, or Lo/Ro) suitable for playback on a stereo hi-fi or on headphones, and from which a mono signal is derived for use on an RF/Antenna output. The difference between the downmixes is how the Surround channels are handled. The Lt/Rt downmix sums the Surround channels and adds them, in-phase to the Left channel and out-of-phase to the Right channel. This allows a Dolby Surround Pro Logic decoder to reconstruct the L/C/R/S channels for a Pro Logic home theater. The Lo/Ro downmix adds the Left and Right Surround channels discretely to the Left and Right speaker channels, respectively. This preserves the stereo separation for stereo-only monitoring and produces a mono-compatible signal. In all downmixes, the LFE channel is not included.

On most home equipment, the consumer can use the product's user interface to choose the appropriate stereo output for his playback system. The mono signal feeding the RF/Antenna output is usually derived from the Lo/Ro downmix.

There are separate metadata parameters that govern the Lo/Ro and Lt/Rt downmixes. Certain metadata parameters allow the engineer to select how the stereo downmix is constructed and which stereo analog signal is preferred, but Lt/Rt is the default selection in all consumer decoders. See Section 5, Parameter Definitions, for more information on individual parameters.

During downmixing, as we have seen, the adjustment of Dynamic Range Control parameters is limited. Broadly speaking, the stereo outputs use the Line mode compression profile while the mono signal uses RF mode compression. As with dynamic range control, downmixing is ultimately dependent upon each consumer's unique listening environment.

While the engineer must optimize the multichannel mix for reproduction in an ideal listening environment, it is also important to preview the mix in downmixing conditions to ensure compatibility with different playback systems when selecting the downmixing metadata parameters. These previews can be achieved in real time using the DP570 Multichannel Audio Tool.

5 Parameter Definitions

This section explains both professional and consumer metadata parameters in greater detail.

Metadata parameters include:

- Universal parameters
- Extended Bitstream Information (Extended BSI) parameters

Extended BSI parameters are active only when both the producer chooses to use them *and* the consumer's decoder is capable of reading them. All decoders can successfully decode a metadata stream without Extended BSI parameters, and Extended BSI parameters translate seamlessly to decoders that read only universal parameters.

Note: Universal parameters include both professional and consumer metadata. Table 1 in Section 1 shows the professional/consumer distinction. Extended BSI parameters include only consumer parameters.

5.1 Universal Parameters

All universal parameters are supported by Dolby E encoders and decoders; all except Program Configuration and Program Description Text are supported by all Dolby Digital encoders and decoders.

Program Configuration

This parameter determines how the audio channels are grouped within a Dolby E bitstream. Up to eight channels can be grouped together in individual programs, where each program contains its own metadata. The default setting is *5.1 + 2*. Table 3 shows all the available configurations.

Table 3 Program Configuration Settings

Program Configurations	
5.1 + 2	4 + 2
5.1 + 2 × 1	4 + 2 × 1
4 + 4	3 × 2
4 + 2 × 2	2 × 2 + 2 × 1
4 + 2 + 2 × 1	2 + 4 × 1
4 + 4 × 1	6 × 1
4 × 2	4
3 × 2 + 2 × 1	2 + 2
2 × 2 + 4 × 1	2 + 2 × 1
2 + 6 × 1	4 × 1
8 × 1	7.1
5.1	7.1 Scrn

Program Description Text

This parameter is a 32-character ASCII text field that allows the metadata author to enter a description of the audio program. For example, this field may contain the name of the program (*Movie Channel Promo*), a description of the program source (*Football Main Feed*), or the program language (*Danish*).

Dialogue Level

The Dialogue Level parameter is discussed in Section 2, Dialogue Level.

Channel Mode

This parameter (also known as *Audio Coding mode*) indicates the active channels within the encoded bitstream and affects both the encoder and consumer decoder. This parameter instructs the encoder which inputs to use for this particular program; it tells the decoder what channels are present in this program so the decoder can deliver the audio to the correct speakers.

The setting is described as X/Y, where X is the number of front channels (Left, Center, Right) and Y the number of rear (Surround) channels.

The availability of certain channel modes depends on the Dolby Digital encoder data rate and whether the LFE channel is present. For example, you can't have a mono stream with an LFE channel (1.1!) or a 3/2 stream at 96 kbps. Appropriate data rates are shown in the definition of each setting.

Note: The presence of the LFE channel is indicated through a different metadata parameter (see LFE Channel).

Channel Mode Setting	Definition and Data Rate
1+1	Dual mono (not valid for DTV broadcast or DVD production)
1/0 Mono	From 56 kbps, usually 96 kbps
2/0 Stereo	From 96 kbps, usually 192 kbps
3/0	From 256 kbps
2/1	From 256 kbps
3/1	From 320 kbps
2/2	From 320 kbps
3/2	From 384 kbps, often 448 kbps

LFE Channel

The status of the LFE Channel parameter indicates to a Dolby Digital encoder whether an LFE Channel is present within the bitstream. Channel mode determines whether the LFE Channel parameter can be set. You must have at least three channels to be able to add an LFE channel.

LFE Channel Setting
Enabled
Disabled

Bitstream Mode

This parameter describes the audio service contained within the Dolby Digital bitstream. A complete audio program may consist of a main audio service (a complete mix of all the program audio), an associated audio service comprising a complete mix, or one main service combined with an associated service. To form a complete audio program, it may be (but rarely is) necessary to decode both a main service and an associated service using a maximum total bit rate of 512 kbps. Refer to the *Guide to the Use of the ATSC Digital Television Standard*, Document A/54 (see www.atsc.org) for further information. Although a detailed description of each option follows, in practice, most programming uses the default setting, Complete Main. An example of an exception to this rule is a special karaoke DVD, or an emergency service within digital television.

Bitstream Mode Setting	Definition
Complete Main (CM)	CM flags the bitstream as the main audio service for the program and indicates that all elements are present to form a complete audio program. Currently, this is the most common setting. The CM service may contain from one (mono) to six (5.1) channels.
Main M&E (ME)	The bitstream is the main audio service for the program, minus a dialogue channel. The dialogue channel, if any, is intended to be carried by an associated dialogue service. Different dialogue services can be associated with a single ME service to support multiple languages.
Assc. Visual Imp. (VI)	This is typically a single-channel program intended to provide a narrative description of the picture content to be decoded along with the main audio service. The VI service may also be a complete mix of all program channels, comprising up to six channels.
Assc. Hear Imp. (HI)	This is typically a single-channel program intended to convey audio that has been processed for increased intelligibility and decoded along with the main audio service. The HI service may also be a complete mix of all program channels, comprising up to six channels.
Assc. Dialogue (D)	This is typically a single-channel program intended to provide a dialogue channel for an ME service. If the ME service contains more than two channels, the D service is limited to only one channel; if the ME service is two channels, the D service can be a stereo pair. The appropriate channels of each service are mixed together (requires special decoders).
Assc. Commentary (C)	This is typically a single-channel program intended to convey additional commentary that can be optionally decoded along with the main audio service. This service differs from a dialogue service because it contains an optional, rather than a required, dialogue channel. The C service may also be a complete mix of all program channels, comprising up to six channels.
Assc. Emergency (E)	This is a single-channel service that is given priority in reproduction. When the E service appears in the bitstream, it is given priority in the decoder and the main service is muted.
Assc. Voice Over (VO)	This is a single-channel service intended to be decoded and mixed to the Center channel (requires special decoders).
Main Sv Karaoke (K)	The bitstream is a special service for karaoke playback. In this case, the Left and Right channels contain music, the Center channel has a guide melody, and the Left and Right Surround channels carry optional backing vocals.

Line Mode Compression Profile

Line mode is discussed in Section 3, Dynamic Range Control.

RF Mode Compression Profile

RF mode is discussed in Section 3, Dynamic Range Control.

RF Overmodulation Protection

This parameter is designed to protect against overmodulation when a decoded Dolby Digital bitstream is RF modulated. When enabled, the Dolby Digital encoder includes pre-emphasis in its calculations for RF Mode compression. The parameter has no effect when decoding using Line mode compression. *Except in rare cases, this parameter should be disabled.*

RF Overmodulation Protection Setting
Enabled
Disabled

Center Downmix Level

When the encoded audio has three front channels (L, C, R), but the consumer has only two front speakers (left and right), this parameter indicates the nominal downmix level for the Center channel with respect to the Left and Right channels. Dolby Digital decoders use this parameter during downmixing in Lo/Ro mode when Extended BSI parameters are not active.

Center Downmix Level Setting	Definition
0.707 (–3 dB) <i>default</i>	The Center channel is attenuated 3 dB and sent to the Left and Right channels.
0.596 (–4.5 dB)	The Center channel is attenuated 4.5 dB and sent to the Left and Right channels.
0.500 (–6 dB)	The Center channel is attenuated 6 dB and sent to the Left and Right channels.

Surround Downmix Level

When the encoded audio has one or more Surround channels, but the consumer does not have surround speakers, this parameter indicates the nominal downmix level for the Surround channel(s) with respect to the Left and Right front channels. Dolby Digital decoders use this parameter during downmixing in Lo/Ro mode when Extended BSI parameters are not active.

Surround Downmix Level Setting	Definition
0.707 (–3 dB) <i>default</i>	The Left and Right Surround channels are each attenuated 3 dB and sent to the Left and Right front channels, respectively.
0.5 (–6 dB)	Same as above, but the signal is attenuated 6 dB.
0 (–999 dB)	The Surround channel(s) are discarded.

Dolby Surround Mode

This parameter indicates to a Dolby Digital decoding product that also contains a Dolby Pro Logic decoder (for example a 5.1-channel amplifier), whether or not the two-channel encoded bitstream contains a Dolby Surround (Lt/Rt) program that requires Pro Logic decoding. Decoders can use this flag to automatically switch on Pro Logic decoding as required.

Dolby Surround Mode Setting	Definition
Not Dolby Surround	The bitstream contains information that was not encoded in Dolby Surround.
Dolby Surround	The bitstream contains information that was encoded in Dolby Surround. After Dolby Digital decoding, the bitstream is decoded using Pro Logic.
Not Indicated	There is no indication either way.

Audio Production Information

This parameter indicates whether the mixing level and room type values are valid. If *Yes*, then a receiver or amplifier could use these values as described below. If *No*, then the values in these fields are invalid. In practice, only high-end consumer equipment implements these features.

Audio Production Information Setting	Definition
Yes	Mixing Level and Room Type parameters are valid.
No	Mixing Level and Room Type parameters are invalid and should be ignored.

Mixing Level

The Mixing Level parameter describes the peak sound pressure level (SPL) used during the final mixing session at the studio or on the dubbing stage. The parameter allows an amplifier to set its volume control such that the SPL in the replay environment matches that of the mixing room. This control operates in addition to the dialogue level control, and is best thought of as the final volume setting on the consumer's equipment. This value can be determined by measuring the SPL of pink noise at studio reference level and then adding the amount of digital headroom above that level. For example, if 85 dB equates to a reference level of -20 dBFS; the mixing level is 85 + 20, or 105 dB.

Mixing Level Setting
80 to 111 dB in 1 dB increments

Room Type

The Room Type parameter describes the equalization used during the final mixing session at the studio or on the dubbing stage. A *Large* room is a dubbing stage with the industry standard X-curve equalization; a *Small* room has flat equalization. This parameter allows an amplifier to be set to the same equalization as that heard in the final mixing environment.

Room Type Setting
Not Indicated
Large
Small

Copyright Bit

This parameter indicates whether the encoded Dolby Digital bitstream is copyright protected. It has no effect on Dolby Digital decoders and its purpose is purely to provide information.

Copyright Bit Setting
Yes
No

Original Bitstream

This parameter indicates whether the encoded Dolby Digital bitstream is the master version or a copy. It has no effect on Dolby Digital decoders and its purpose is purely to provide information.

Original Bitstream Setting
Yes
No

Note: The parameters DC Filter, Lowpass Filter, LFE Lowpass Filter, Surround 3 dB Attenuation, and Surround Phase Shift appear *after* the Extended BSI parameters on Dolby E and Dolby Digital equipment menus.

DC Filter

This parameter determines whether a DC-blocking 3 Hz highpass filter is applied to the main input channels of a Dolby Digital encoder prior to encoding. This parameter is not carried to the consumer decoder. It is used to remove DC offsets in the program audio and would only be switched off in exceptional circumstances.

DC Filter Setting
Enabled
Disabled

Lowpass Filter

This parameter determines whether a lowpass filter is applied to the main input channels of a Dolby Digital encoder prior to encoding. This filter removes high-frequency signals that are not encoded. At the suitable data rates, this filter operates above 20 kHz. In all cases it prevents aliasing on decoding and is normally switched on. This parameter is not passed to the consumer decoder.

Lowpass Filter Setting
Enabled
Disabled

LFE Lowpass Filter

This parameter determines whether a 120 Hz eighth-order lowpass filter is applied to the LFE channel input of a Dolby Digital encoder prior to encoding. It is ignored if the LFE channel is disabled. This parameter is not sent to the consumer decoder. The filter removes frequencies above 120 Hz that would cause aliasing when decoded. This filter should only be switched off if the audio to be encoded is known to have no signal above 120 Hz.

LFE Lowpass Filter Setting
Enabled
Disabled

Surround 3 dB Attenuation

The Surround 3 dB Attenuation parameter determines whether the Surround channel(s) are attenuated 3 dB before encoding. The attenuation actually takes place inside the Dolby Digital encoder. It balances the signal levels between theatrical

mixing rooms (dubbing stages) and consumer mixing rooms (DVD or TV studios). Consumer mixing rooms are calibrated so that all five main channels are at the same sound pressure level (SPL). To maintain compatibility with older film formats, theatrical mixing rooms calibrate the SPL of the Surround channels 3 dB lower than the front channels. The consequence is that signal levels on tape are 3 dB louder. Therefore, to convert from a theatrical calibration to a consumer mix, it is necessary to reduce the Surround levels by 3 dB by enabling this parameter.

Surround 3 dB Attenuation Setting
Enabled
Disabled

Surround Phase Shift

This parameter causes the Dolby Digital encoder to apply a 90-degree phase shift to the Surround channels. This allows a Dolby Digital decoder to create an Lt/Rt downmix simply. For most material, the phase shift has a minimal impact when the Dolby Digital program is decoded to 5.1 channels, but it provides an Lt/Rt output that can be decoded with Pro Logic to L, C, R, S, if desired. However, for some phase-critical material (such as music) this phase shift is audible when listening in a 5.1-channel format. Likewise, some material downmixes to a satisfactory Lt/Rt signal without needing this phase shift. It is therefore important to balance the needs of the 5.1 mix and the Lt/Rt downmix for each program. The default setting is Enabled.

Surround Phase Shift Setting
Enabled
Disabled

5.2 Extended Bitstream Information Parameters

In response to requests from content producers, Dolby Laboratories modified the definitions of several metadata parameters from their original definition as described in ATSC document A/52. The revised definitions allow more information to be carried about the audio program and also allow more choices for stereo downmixing. When the metadata parameters carried in Dolby Digital were first described, they were generically called *Bitstream Information*, or BSI. We refer to the additional parameter definitions as *Extended BSI*.

Because the revised definitions affect metadata parameters that were not used by the consumer decoders, all decoders will be compatible with the revised bitstream. Newer decoders that are programmed to detect and decode the new parameters will be able to implement the new features Extended BSI provides.

Products that allow emulation of the effects of metadata, such as the DP570, normally have a feature that allows emulation of a new (or compliant) decoder or a legacy decoder.

Preferred Stereo Downmix Mode

This parameter allows the producer to select either the Lt/Rt or the Lo/Ro downmix in a consumer decoder that has stereo outputs. Consumer receivers are able to override this selection, but this parameter provides the opportunity for a 5.1-channel soundtrack to play in Lo/Ro mode without user intervention. This is especially useful on music material.

Preferred Stereo Downmix Mode Setting
Not Indicated
Lt/Rt Preferred
Lo/Ro Preferred

Lt/Rt Center Downmix Level

This parameter indicates the level shift applied to the Center channel when adding to the left and right outputs as a result of downmixing to an Lt/Rt output. Its operation is similar to the center downmix level in the universal metadata.

Lt/Rt Center Downmix Level Setting
1.414 (+3.0 dB)
1.189 (+1.5 dB)
1.000 (0.0 dB)
0.841 (-1.5 dB)
0.707 (-3.0 dB)
0.595 (-4.5 dB)
0.500 (-6.0 dB)
0.000 (-999 dB)

Lt/Rt Surround Downmix Level

This parameter indicates the level shift applied to the Surround channels when downmixing to an Lt/Rt output. Its operation is similar to the surround downmix level in the universal metadata.

Lt/Rt Surround Downmix Level Setting
0.841 (-1.5 dB)
0.707 (-3.0 dB)
0.595 (-4.5 dB)
0.500 (-6.0 dB)
0.000 (-999 dB)

Lo/Ro Center Downmix Level

This parameter indicates the level shift applied to the Center channel when adding to the left and right outputs as a result of downmixing to an Lo/Ro output. When Extended BSI parameters are active, this parameter replaces the Center Downmix Level parameter in the universal parameters.

Lo/Ro Center Downmix Level Setting
1.414 (+3.0 dB)
1.189 (+1.5 dB)
1.000 (0.0 dB)
0.841 (-1.5 dB)
0.707 (-3.0 dB)
0.595 (-4.5 dB)
0.500 (-6.0 dB)
0.000 (-999 dB)

Lo/Ro Surround Downmix Level

This parameter indicates the level shift applied to the Surround channels when downmixing to an Lo/Ro output. When Extended BSI parameters are active, this parameter replaces the Surround Downmix Level parameter in the universal parameters.

Lo/Ro Surround Downmix Level Setting
0.841 (–1.5 dB)
0.707 (–3.0 dB)
0.595 (–4.5 dB)
0.500 (–6.0 dB)
0.000 (–999 dB)

Surround EX Mode

This parameter is used to identify the encoded audio as material encoded in Surround EX™. This parameter is only used if the encoded audio has two Surround channels. An amplifier or receiver with Dolby Digital Surround EX decoding can use this parameter as a flag to switch the decoding on or off automatically. The behavior is similar to that of the Dolby Surround Mode parameter.

Surround EX Mode
Not Indicated
Not Surround EX
Dolby Surround EX

A/D Converter Type

This parameter allows audio that has passed through a particular A/D conversion stage to be marked as such, so that a decoder may apply the complementary D/A process.

A/D Converter Type Setting
Standard
HDCD

6 Metadata Combinations

Table 4 provides examples of combinations of parameters that could be used as a preset.

Note: These parameter settings are provided as examples to demonstrate that different settings can be saved, named, and brought up as needed for quick use in different situations. The settings are not recommendations, but could be used as a starting point from which to create your own metadata values.

Table 4 Examples of Possible Metadata Settings
(*Extended Bitstream Information parameters are in italics.*)

Parameter	Action Film (5.1)	Drama (Lt/Rt)	Local News (Mono)	Music (5.0)	Live Sporting Events (5.0)
Program Configuration	5.1+2 or 5.1	5.1+2, 4 × 2, or 3 × 2	4 × 2, 3 × 2, 8 × 1, or 6 × 1	5.1+2 or 5.1	5.1+2 or 5.1
Program Description	Film	Drama	News	Music	Sports
Dialogue Level	-27 dB	-27 dB	-20 dB	-15 dB	-18 dB
Channel Mode	3/2L	2/0	1/0	3/2	3/2
LFE Channel	Enabled	N/A	N/A	Disabled	Disabled
Bitstream Mode	Complete Main	Complete Main	Complete Main	Complete Main	Complete Main
Line Mode Pro	Film Standard	Film Light	Speech	Music Standard	Film Standard
RF Mode Pro	Film Standard	Film Light	Speech	Music Standard	Film Standard
RF Ovrmd Protect	Disabled	Disabled	Disabled	Disabled	Disabled
Center Dwnmix Lev	-0.707 dB (-3 dB)	N/A	N/A	-0.707 dB (-3 dB)	-0.707 dB (-3 dB)
Srnd Dwnmix Lev	-0.707 dB (-3 dB)	N/A	N/A	-0.707 dB (-3 dB)	-0.707 dB (-3 dB)
Dolby Srnd Mode	N/A	Dolby Surround	N/A	N/A	N/A
Audio Prod Info	Yes	Yes	No	Yes	No
Mixing Level	101 dB	90 dB	N/A	95 dB	N/A
Room Type	Large	Small	N/A	Large	N/A
Copyright	Yes	Yes	Yes	Yes	Yes
Original Bitstream	Yes	Yes	Yes	Yes	Yes
<i>Preferred Stereo Downmix</i>	Lt/Rt Preferred	Lt/Rt Preferred	N/A	Lo/Ro Preferred	Lt/Rt Preferred
<i>Lt/Rt Center Downmix Level</i>	-0.707 (-3 dB)	1.0 (0 dB)	N/A	-0.707 (-3 dB)	N/A

(Extended Bitstream Information parameters are in italics.)

Parameter	Action Film (5.1)	Drama (Lt/Rt)	Local News (Mono)	Music (5.0)	Live Sporting Events (5.0)
<i>Lt/Rt Surround Downmix Level</i>	-0.707 (-3 dB)	0.595 (-4.5 dB)	N/A	-0.707 (-3 dB)	N/A
<i>Lo/Ro Center Downmix Level</i>	N/A	N/A	N/A	N/A	-0.707 (-3 dB)
<i>Lo/Ro Surround Downmix Level</i>	N/A	N/A	N/A	N/A	0.595 (-4.5 dB)
<i>Dolby Surround EX Mode</i>	Dolby Surround EX	N/A	N/A	N/A	N/A
<i>A/D Converter Type</i>	Standard	Standard	Standard	Standard	Standard
DC Filter	Enabled	Enabled	Enabled	Enabled	Enabled
Lowpass Filter	Enabled	Enabled	Enabled	Enabled	Enabled
LFE Lowpass Filter	Enabled	N/A	N/A	N/A	N/A
Srnd 3 dB Atten	Enabled	N/A	N/A	Disabled	Disabled
Srnd Phase Shift	Enabled	N/A	N/A	Enabled	Enabled