

Requirement Updates for Dolby Digital and Dolby Digital Plus in DVB Products

Technical Bulletin 11

This technical bulletin updates Dolby requirements for digital video broadcast (DVB) product lines only. Requirements for all other products remain as stated in the documents relevant to those products.

The requirements in this document supersede certain statements in the *Dolby Licensee Information Manual: Dolby Digital Consumer Decoder*, Issue 5, Sections 7.13 and 7.14, as well as in the *Dolby Digital Plus Two-Channel Consumer Decoder System Development Manual*, Issue 1, Sections 4.2.1 and 5.2. All other requirements in those documents remain as stated.

Background

High-definition DVB services most commonly use Dolby® Digital or Dolby Digital Plus audio for both stereo and multichannel audio broadcast. Standard-definition DVB services commonly use the MPEG-1 LII audio format for stereo audio broadcast and the Dolby Digital audio format for multichannel audio broadcast. As a result, DVB DTV receivers often include both MPEG-1 LII and Dolby Digital (or Dolby Digital Plus) audio decoders.

When users switch between digital program services, they may well be switching between audio formats. In some situations, users will also be able to switch between analog and digital transmissions. Therefore, it is important that a DTV receiver delivers approximately constant average loudness levels between different formats such as MPEG-1 LII, Dolby Digital, and analog broadcasts (where applicable), such that users do not need to adjust their volume control as they switch between program services.

Dolby Digital

Dolby Digital includes a dialogue normalization parameter (*dialnorm*) that is added during the encoding process and is passed in the transmission with the audio. This parameter varies the gain in the Dolby Digital decoder to normalize all programs to a constant loudness level.

Dolby Digital also has two distinct decoding modes called Line mode and RF mode. Line mode reproduces dialogue at a constant -31 dBFS Leq(A)¹; RF mode reproduces dialogue at a constant -20 dBFS Leq(A) with a compressed dynamic range. Note that the dynamic range of both RF and Line mode is greater than that available in conventional analog television.

MPEG-1 LII

MPEG-1 LII audio does not support inclusion of metadata. Therefore, loudness level matching between individual program services encoded in this format must be performed at the broadcast station. This level matching is achieved by reducing program audio dynamics to a well-defined and constrained set of values. Current European Broadcasting Union (EBU) recommendations for audio broadcast using the MPEG-1 LII format in DVB systems usually require a line-up level (or reference level) of -18 dBFS and a peak level of around -10 dBFS. Transmissions that conform to these requirements usually have a loudness level of around -20 dBFS Leq(A)². It is very important to note that this figure is for guidance only.

Analog Broadcasts

Many DTV receivers also tune analog broadcasts and, therefore, need to provide the user with matched loudness levels between digital and analog broadcast services. The issues involved in level matching for MPEG-1 LII audio are also true for analog broadcast services. In practice, the levels for MPEG-1 LII and analog services will be very similar in a region or within one operator's group of services; this is because the MPEG-1 LII transmissions will have been configured to match the dynamics and levels of the preexisting analog transmissions.

Updated Requirements

Dolby Digital RF mode dynamic range compression must be implemented in all DVB products supporting Dolby Digital or Dolby Digital Plus.

This ensures that Dolby Digital dialogue levels match the levels of broadcasts containing analog and MPEG-1 LII audio at the line and RF remodulated outputs of the product.

¹ Loudness levels in this document are based on the Leq(A) method standardized in IEC 60804. The Dolby LM100 Broadcast Loudness Meter is designed for use by professional broadcast stations to intelligently detect the dialogue levels in a variety of programs.

² As transmission levels vary between markets, it is essential to make local measurements, confirm with a local operator, or seek advice from Dolby for the common loudness levels within a particular geographical region.

Dynamic Range Control Using Dolby Digital

Previous Specification	<i>Dolby Licensee Information Manual: Dolby Digital Consumer Decoder</i> Issue 5, Tables 7-81, 7-85, 7-93, and 7-97
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New Specification

Table 1 Updated Dynamic Range Control Requirements for Dolby Digital in DVB Set-Top Box Products

Setting		Operational Mode	Scale Factors (High/Low)	Line/Speaker Gain Correction
Optional	Maximum dynamic range	Line*	0.0/0.0	None
Optional	Standard dynamic range	Line*	1.0/1.0	None
Not Recommended	Minimum dynamic range	RF	No scaling allowed	–11 dB
Required	TV Style dynamic range**	RF	No scaling allowed	None

* Our recommended implementation of the Line mode configuration is detailed under Optional Configurations on page 5.

** We recommend TV Style dynamic range as the default setting of the product.

Dynamic Range Control Using Dolby Digital Plus

Previous Specification	<i>Dolby Digital Plus Two-Channel Consumer Decoder Manual</i> Issue 1, Tables 4-22 and 4-23
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New Specification

Table 2 Updated Dynamic Range Control Requirements for Dolby Digital Plus in DVB Two-Channel Source Products

Setting		Operational Mode	Output	Scale Factors (High/Low)	Line/Speaker Gain Correction
Optional	Maximum dynamic range	Line*	RF or Line	0.0/0.0	None
Optional	Standard dynamic range	Line*	RF or Line	1.0/1.0	None
Not Recommended	Minimum dynamic range	RF	RF or Line	No scaling allowed	–11 dB
Required	TV Style dynamic range**	RF	RF or Line	No scaling allowed	None

* Our recommended implementation of the Line mode configuration is detailed under Optional Configurations on page 5.

** We recommend TV Style dynamic range as the default setting of the product.

Previous Specification	<i>Dolby Digital Plus Two-Channel Consumer Decoder Manual</i> Issue 1, Table 5-1, items 14–17
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New Specification

For DVB products, lines 14–17 should read as shown in Table 3.

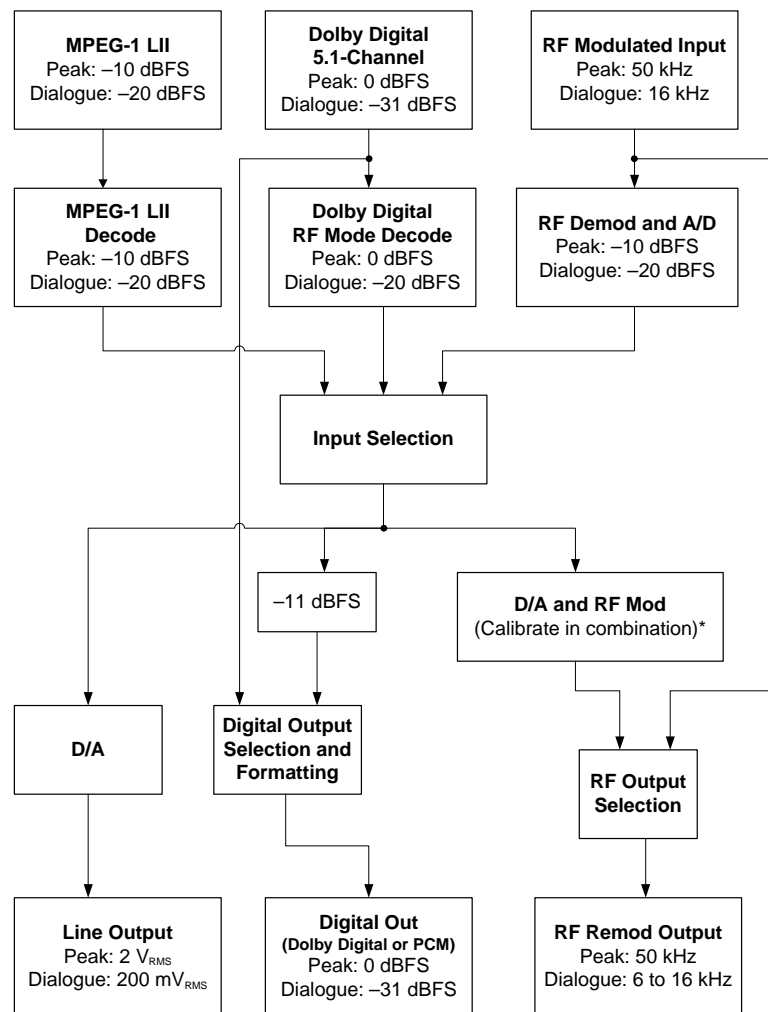
Table 3 Updated Lines in Requirements and Recommendations Table in Dolby Digital Plus Two-Channel Consumer Decoder Manual (for DVB Products Only)

	Technology		Category	Function		Property	
14.	RQ	Dolby Digital Plus	Core Processing: Dynamic Range Compression	RQ	Dynamic Range Control Settings	RQ	Include RF mode compression with no gain correction at RF, line, or speaker outputs for DVB products.
15.	RQ	Dolby Digital Plus	Core Processing: Dynamic Range Compression	OP	RF Output Inclusion	N/A	<i>Removed for DVB products.</i>
16.	RQ	Dolby Digital Plus	Core Processing: Dynamic Range Compression	OP	RF Output Inclusion	N/A	<i>Removed for DVB products.</i>
17.	RQ	Dolby Digital Plus	Core Processing: Dynamic Range Compression	OP	RF Output Inclusion	N/A	<i>Removed for DVB products.</i>

PCM Level Control Recommendation

Because digital outputs may pass a Dolby Digital bitstream that cannot be easily adjusted in level, we recommend attenuating all decoded PCM audio by 11 dB at the digital output of the product. This ensures consistent dialogue levels when a product is connected to a compatible digital audio reproduction device.

Figure 1 shows one possible implementation.



* Calibrating the digital-to-analog converter in combination with the RF modulator ensures that full-scale PCM signals meet requirements for modulation of audio content.

Figure 1 Dolby Digital in RF Mode

Optional Configurations

Optionally, Dolby Digital Line mode dynamic range compression may be implemented and available as an alternative user option to the mandatory RF mode compression setting. If Line mode is used, we strongly recommend that all other sources be attenuated by 11 dB at the RF and line outputs to ensure consistent dialogue levels.

Figure 2 shows one possible implementation of the optional Line mode configuration.

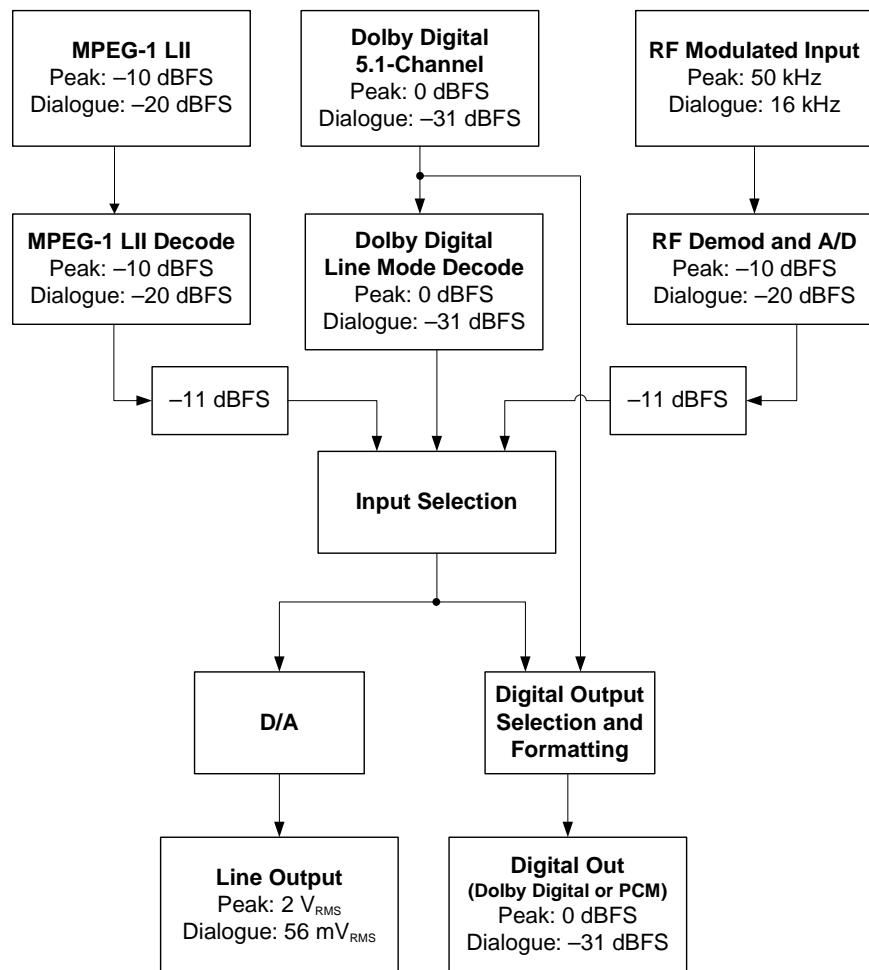


Figure 2 Dolby Digital in Line Mode

A PCM level control may also be offered in a service or setup menu, enabling fine adjustments of various decoded sources relative to a Dolby Digital bitstream at the product's digital output. This PCM level control can be configured during installation, to allow the installer or user to reduce the level of PCM signals at the digital output to best match the loudness level of Dolby Digital bitstreams when decoded on an external home theater A/V receiver.

If a primary volume control (designed for continuous use) is provided with the product, the control should not affect levels at the digital output. This is because adjustments at the digital output would not affect a Dolby Digital bitstream, and would lead to varying dialogue level differences between PCM and Dolby Digital bitstreams at the digital output of the product.

Testing and Compliance

Products will be tested to ensure they meet these new requirements beginning May 1, 2007. Products submitted to Dolby Laboratories before that date for approval will not be held to this requirement; we recommend, however, that products meet this standard—regardless of submission date—to ensure consistency in the DVB market.