



## Dolby® Surround 7.1

### Technical Information for Theaters

In 2010, Dolby partnered with Walt Disney Pictures and Pixar Animation Studios to deliver *Toy Story 3* in Dolby® Surround 7.1 audio format to suitably equipped 3D cinemas in selected countries. Dolby Surround 7.1 is a new audio format for cinema supported by the Dolby CP650 and CP750 Digital Cinema Processors that increases the number of discrete surround channels to add more definition to the existing 5.1-channel surround array.

This document provides an overview of the Dolby Surround 7.1 format, and the effect that it may have on theater equipment and content. Full technical details of cabling requirements and software versions are provided in appropriate Dolby field bulletins.

Table 1 lists the channel names and abbreviations used in this document.

**Table 1** Channel abbreviations

Channel Name	Abbreviation
Left	L
Center	C
Right	R
Left Surround	Ls
Right Surround	Rs
Low-Frequency Effects	LFE
Back Surround Left	Bsl
Back Surround Right	Bsr
Hearing Impaired	HI
Visually Impaired-Narrative (Audio Description)	VI-N

### Theater Channel Configuration

Two new discrete channels are added in the theater, Back Surround Left (Bsl) and Back Surround Right (Bsr) as shown in Figure 1. Use of these additional surround channels provides greater flexibility in audio placement to tie in with 3D visuals, and can also enhance the surround definition with 2D content.

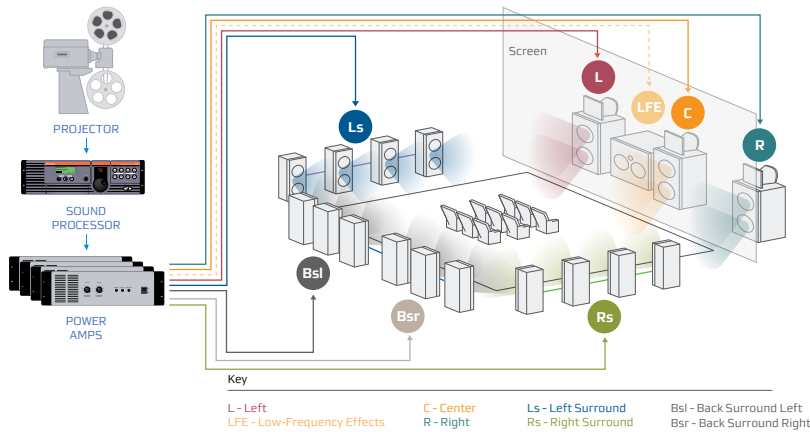


Figure 1 Dolby Surround 7.1 channel layout

Existing theaters that are wired for Dolby Digital Surround EX™ will already have the appropriate wiring and amplification for these channels. Those that are not wired accordingly will need to install additional amplifier channels and cable runs as necessary to enable these discrete channels.

The Bsl and Bsr channels are calibrated to 82 dB, the same as in a standard Dolby Digital Surround EX installation. When used in Dolby Surround 7.1 mode, 82 dB becomes the reference level for each of the four surround channels in both mixing and playback. A summary of the surround channel routing in various formats or decode modes within the cinema processor is shown in Figure 2.

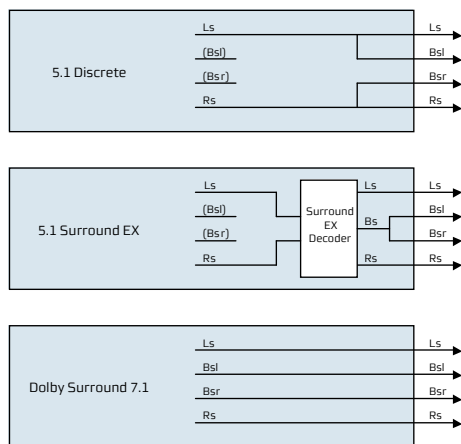


Figure 2 Surround channel routing within the cinema processor

## Supported Dolby Equipment

### Cinema Processors

Dolby Surround 7.1 is supported in CP650 and CP750 processors with digital inputs. It is not supported in the DMA8 or DMA8Plus Digital Media Adapters, which support only 5.1 discrete channels.

The appropriate Dolby Surround 7.1 format or decode mode must be selected when playing 7.1 content. If the cinema processor is left in a 5.1 discrete mode with 7.1 content (or similarly is in Dolby Surround 7.1 mode with 5.1 discrete content), incorrect audio will be sent to the back wall speakers.

### **CP650**

Dolby Surround 7.1 requires the use of digital inputs (from the server) and Surround EX outputs on the CP650, and so requires that Cat. No. 790 or Cat. No. 778 digital input/output cards be installed. An additional format (format 91) has been created to enable Dolby Surround 7.1 support, and users will need to install appropriate software to enable this format. The format can then be automated using existing methods (for example, serial, Ethernet, or GPI).

Upgrading the software does not require additional B-chain equalization for theaters that are already configured for Surround EX. It is, however, necessary to alter the AES cabling from the server to the CP650 according to the channel configuration detailed in the Channel Allocation section of this document.

### **CP750**

An additional decode mode has been created to enable Dolby Surround 7.1 support, which can be activated by the CP750 front panel or PC setup software, or by automation (for example, serial or Ethernet).

Upgrading the software does not require additional B-chain equalization for theaters that are already configured for Surround EX. It is, however, necessary to alter the AES cabling from the server to the CP750 according to the channel configuration detailed in the Channel Allocation section of this document.

## **Digital Cinema Servers**

All Dolby Digital Cinema servers support Dolby Surround 7.1 playback, and any server that supports 16 channels of digital audio may be used with appropriate audio cabling.

## **Dolby Show Player and Dolby Show Store**

Dolby Show Player (DSP100) and Dolby Show Store (DSS100) equipment require system software that supports 16 channels of audio output. Configuration changes to the audio outputs, both in terms of software and hardware cabling, may also be required to correctly route the audio channels to the cinema processor.

## **Dolby Screen Server**

All Dolby Screen Server (DSS200) units are capable of supporting 16 channels of audio, but, again, hardware cabling changes may be required for correct channel routing.

## Digital Cinema Packages

Digital cinema packages (DCPs) supporting Dolby Surround 7.1 will be supplied with two composition playlists (CPLs). One CPL will reference a 5.1 discrete audio track, and the second will reference the Dolby Surround 7.1 audio track. The theater may be able to choose between audio tracks according to the equipment installed and the currently selected playback format, or will be given a single license (with a key delivery message) for either 5.1 discrete or Dolby Surround 7.1 audio according to the information supplied by the exhibitor to the content distributor.

The CPL name should indicate the sound format that it relates to. In accordance with current standard practice, an example CPL for a 3D feature with Dolby Surround 7.1 audio is:

FILM-TITLE\_FTR-1-3D\_F\_EN-XX\_US-\_71\_2K\_DI\_20100510\_DGB\_i3D\_OV

The `_71_` reference indicates the sound format. A CPL for a 5.1 discrete audio track will have a `_51_` reference in the title.

## Channel Allocation

According to current industry practice, 5.1 discrete audio tracks use the channel configuration shown in Table 2.

**Table 2** Existing 5.1 audio channel layout

Audio Channel	Analog Channel Number	Server AES Output Pair	Cinema Processor AES Input Pair
L	1	1	1
R	2		
C	3	2	2
LFE	4		
Ls	5	3	3
Rs	6		
HI <sup>1</sup>	7	4	4 <sup>2</sup>
VI-N (AD) <sup>1</sup>	8		

<sup>1</sup> These channels are not provided in all territories.

<sup>2</sup> The CP750 supports pass-through of HI/VI-N audio on AES input 4 in order to provide an analog output if required. The CP650 does not support this, in which case these channels must be converted using an external D/A converter.

To maintain compatibility with forthcoming channel allocation standards beyond 5.1 discrete, the additional Back Surround channels are placed according to the configuration shown in Table 3. As indicated, the server (and associated cabling) must support up to 16 channels of audio in order to be able to route the Bsl and Bsr channels.

If a server supports internal channel mapping, it may be possible to use this to route the Bsl and Bsr audio to channel 7/8 server output, respectively, which can simplify the cabling requirements for 7.1 support. In the case of Dolby servers, Dolby will provide adapter cables to perform the required routing to support the CP650 and CP750, as detailed in the appropriate field bulletins.

**Table 3** New 7.1 audio channel layout

Audio Channel	Analog Channel Number	Server AES Output Pair	Cinema Processor AES Input Pair
L	1	1	1
R	2		
C	3	2	2
LFE (SW)	4		
Ls	5	3	3
Rs	6		
HI1	7	4	-
VI-N (AD) <sup>1</sup>	8		
-	9	5	-
-	10		
Bsl	11	6	4
Bsr	12		
-	13	7	-
-	14		
HI2	15	8	-
VI-N (AD) <sup>2</sup>	16		

<sup>1</sup> These channels are not provided in all territories. In order to maintain compatibility with existing installations, Audio Description will be provided on channels 7/8 for initial Dolby Surround 7.1 releases in territories where this is current practice.

<sup>2</sup> Similarly, not all territories provide these channels. In order to maintain compatibility with forthcoming channel allocation standards, HI/VI-N audio may additionally be provided on channels 15/16.

## Hearing Impaired and Visually Impaired Narration (Audio Description)

In territories that use HI or VI-N channels, these will continue to be available with both 7.1- and 5.1-channel audio tracks. With existing 5.1 DCPs, Audio Description is commonly placed on both channels 7 and 8 in order to provide maximum flexibility, but over time this will migrate to channel 16 for all 5.1-channel, 7.1-channel, and future audio formats.

During the transition period, as applicable for 7.1 content, HI and VI-N will be placed on channels 7/8 and channels 15/16, and cinemas will need to prepare for VI-N ultimately being placed on channel 16. This can be resolved either by channel routing within the digital cinema server or by appropriate hardware cabling. The most flexible solution to this transition is to provide a switch, potentially automated, that allows the input to the audio transmitters to be switched between channels 8 and 16.

Figure 3 shows a solution that can provide maximum compatibility and flexibility for signal routing. If an HI track is not present on the DCP, CP650 and CP750 processors provide an appropriate center-weighted sum of L-C-R analog output, which is commonly used for this channel.

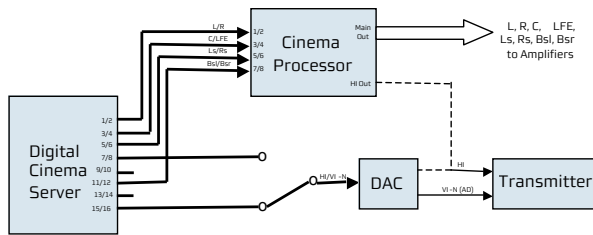


Figure 3 HI/VI-N signal routing

## Show Building Considerations

When building a show with a main feature containing a Dolby Surround 7.1 audio track, it is likely that some preshow content will contain 5.1 discrete audio. In this case, users must ensure that the cinema processor is in a 5.1 discrete mode at the start of the show, and the cinema automation system must change the cinema processor decode mode, switching to Dolby Surround 7.1 at the appropriate point for the Dolby Surround 7.1 content. Trailers supplied with a Dolby Surround 7.1 feature may also have 7.1 audio tracks, and this should be considered when cues are placed to select Dolby Surround 7.1 mode.

In the case of the CP650, Dolby Surround 7.1 (format 91) can be associated with a regular format cue that is available, for example, in Dolby Show Manager software to place on a show timeline, or by an existing automation system through GPI or ASCII control over serial or Ethernet connection.

With the CP750, Dolby Surround 7.1 is a decode mode rather than a format (because the processor does not support configurable formats in the same way as the CP650). Automation systems or theater management systems may need to be upgraded in order to use the new Dolby Surround 7.1 decode mode cue through ASCII control over serial or Ethernet connection. If an existing automation system is to be used, then it is possible to work around this by setting digital input 1 of the CP750 to default to Dolby Surround 7.1 when selected, then adding cues in the show to change to 5.1 discrete mode where necessary.

At no time should 5.1 content be played in Dolby Surround 7.1 mode, or vice versa, because incorrect audio will be heard in the auditorium through the Back Surround speakers.



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