

# Schedule B

## SPE UHD HDR Video Master Specifications

### UHD HDR TIFF Encoding

File format: TIFF (.tiff)  
Bit depth: 16-bit  
Compression: none  
Color space: Rec. 2020 full-range (ITU-R BT.2020-2)  
EOTF: ST-2084 (PQ)  
Max luminance: uncapped  
Image width: 3840 (UHD)  
Image height: 2160 (UHD)

ITU-R. 2035, specifies the viewing environment. Studio reference display specifications are as follows:

Max luminance: 4000 cd/m<sup>2</sup> (nits)  
Black luminance: <0.005 cd/m<sup>2</sup> (nits)  
EOTF: ST-2084 (PQ)  
Color Primaries (CIE 1931 x, y):  
Red: 0.708, 0.292  
Green: 0.170, 0.797  
Blue: 0.131, 0.046  
White point (D65): 0.3127, 0.329

# SPE UHD SDR Video Master Specifications

## UHD SDR DPX Encoding

File format: DPX (.dpx)  
Bit depth: 10 or 16bit (Deliver highest bit depth available)  
Compression: none  
Color space: Rec. 709 full-range (ITU-R BT.709-6)  
Gamma: 2.4  
Image width: 3840 (UHD)  
Image height: 2160 (UHD)

ITU-R. 2035, specifies the viewing environment. Studio reference display should be in compliance with ITU-R BT 1886 as follows:

Max luminance: 100 cd/m<sup>2</sup> (nits)  
Black luminance: <0.1 cd/m<sup>2</sup> (nits)  
Gamma: 2.4  
Color Primaries (CIE 1931 x, y):  
Red: 0.64, 0.33  
Green: 0.30, 0.60  
Blue: 0.15, 0.06  
White point: 0.3127, 0.329

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# SPE HD SDR Video Master Specifications

## HD SDR DPX Encoding

File format: DPX (.dpx)  
Bit depth: 10-bit  
Compression: none  
Color space: Rec. 709 full-range (ITU-R BT.709-6)  
EOTF: Gamma 2.4  
Image width: 1920 (HD)  
Image height: 1080 (HD)

ITU-R. 2035, specifies the viewing environment. Studio reference display should be in compliance with ITU-R BT 1886 as follows:

Max luminance: 100 cd/m<sup>2</sup> (nits)  
Black luminance: <0.1 cd/m<sup>2</sup> (nits)  
EOTF: Gamma 2.4  
Color Primaries (CIE 1931 x, y):  
Red: 0.64, 0.33  
Green: 0.30, 0.60  
Blue: 0.15, 0.06  
White point (D65): 0.3127, 0.329

## HD SDR ProRes Encoding (Only with prior SPE authorization)

### **Codec: Apple ProRes 422 (HQ)**

Image width: 1920 (HD)  
Image height: 1080 (HD)  
Frame Rate: Native  
Data Rate: 220 Mbps VBR  
Chroma Sample: 4:2:2 (YUV)  
Color space: Rec. 709  
EOTF: Gamma 2.4  
Color Depth: 10 Bit  
Container: .MOV

### **Codec: Apple ProRes 4444 (no alpha)**

Image width: 1920 (HD)  
Image height: 1080 (HD)  
Frame Rate: Native  
Data Rate: 330 Mbps VBR  
Chroma Sample: 4:4:4 (RGB)  
Color space: Rec. 709  
EOTF: Gamma 2.4  
Color Depth: 10 Bit  
Container: .MOV

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# Mastering Requirements

## Source:

Home Video Mastering must be performed using 4K original camera source, or the highest resolution available from the full resolution master render files (created during digital cinema mastering). Source files must be in a scene-referred color space (e.g. Slog, LogC, Cineon, ACES) without display-specific color correction or LUTs rendered into the source files. This is to ensure the ability to use all available color gamut and dynamic range.

## Viewing Environment:

Recommendation ITU-R BT.2035 (Section 1 of Annex 1) describes the reference viewing conditions for HDTV, and should also be used for UHD TV mastering. It specifies a dim surround of approximately 10 lux, a chromaticity background of D65, and luminance background of between 8 – 12 cd/m<sup>2</sup>.

## Directory and File Naming

### Directory structure:

The directory structure delivered should meet the following specifications:

- 1) The project GPMS title should be included in the directory naming.
- 2) The GPMS title abbreviation should be included as part of the sequence directory name
- 3) The aspect ratio should be included in the sequence directory name to differentiate between versions.
- 4) The directory that contains the image files should be labeled by the pixel resolution (X x Y) of the images.

### Sequence File naming:

The image file/sequence should meet the following specifications:

- 1) Image sequences should include a base name prefix that matches the sequence directory name
- 2) Image sequences should have 7-digit number padding

See specification example here:

```
GPMSname/GPMSabbrev_uhd_185_master/3840x2160/GPMSabbrev_uhd_185_master.[0085680-0216745].dpx  
GPMSname/GPMSabbrev_hd_178_master/1920x1080/GPMSabbrev_hd_178_master.[0085680-0216745].dpx  
GPMSname/GPMSabbrev_hdr_185_master/3840x2160/GPMSabbrev_hdr_185_master.[0085680-0216745].tiff
```

```
GPMSname/ep_301/GPMSabbrev_ep301_uhd_178_master/3840x2160/GPMSabbrev_ep301_uhd_178_master.[0085680-0149822].dpx
```

Below are examples for the GPMS title “Chappie” with GPMS abbreviation “CHAPPO”:

```
chappie/chapp0_uhd_185_master/3840x2160/chapp0_uhd_185_master.[0085680-0216745].dpx  
chappie/chapp0_hd_178_master/1920x1080/chapp0_hd_178_master.[0085680-0216745].dpx  
chappie/chapp0_hdr_185_master/3840x2160/chapp0_hdr_185_master.[0085680-0216745].tiff
```



Below are examples for the GPMS television title, “The Blacklist” with GPMS abbreviation “BLACKL”:

*the\_blacklist/ep\_301/blackl\_ep301\_uhd\_178\_master/3840x2160/blackl\_ep301\_uhd\_178\_master.[0085680-0149822].dpx*  
*the\_blacklist/ep\_301/blackl\_ep301\_hdr\_178\_master/3840x2160/blackl\_ep301\_hdr\_178\_master.[0085680-0149822].tiff*

**ProRes Quicktime Movie File naming:**

Specification Example:

*GPMSname/GPMSabbrev\_hd\_178\_master/1920x1080/GPMSabbrev\_hd\_178\_master.mov*

Actual example for the GPMS title “Chappie” and GPMS abbreviation “CHAPP0”:

*chappie/chapp0\_hd\_178\_master/1920x1080/chapp0\_hd\_178\_master.mov*



## Head and Tail Leader Formatting

**Note-** All time code numbers in the below sections are referenced to 24 FPS time code

### Head Format:

All files should have embedded record TC in the file header. The files should also be numbered according to TC frame numbering as described below:

**Table 1: Head Format**

MASTER TC REFERENCE	FRAME NUMBER	ITEM DESCRIPTION
00:59:30:00 - 00:59:33:23	85680 – 85775	Slate
00:59:34:00 - 00:59:36:23	85776 – 85847	Black
00:59:37:00 - 00:59:46:23	85848 – 86087	BARS and Charts
00:59:47:00 - 00:59:49:23	86088 – 86159	Black
00:59:50:00 - 00:59:50:00	86160	10-pop
00:59:50:01 - 00:59:59:23	86161 – 86399	Black
01:00:00:00 - 01:00:00:00	86400	First Frame Of Picture (FFOP)

### Tail Format:

All files should contain 20 seconds of black after the last frame of picture (LFOP), followed by a tail 20-pop and an additional 5 seconds of black:

**Table 2: Tail Format**

MASTER TC REFERENCE	DURATION	ITEM DESCRIPTION
LFOP + 00:00:00:01 - LFOP + 00:00:19:23	20 sec	Black
LFOP + 00:00:20:00 - LFOP + 00:00:20:00	1 frame	Tail sync pop (20 sec after LFOP)
LFOP + 00:00:20:01 - LFOP + 00:00:25:01	5 sec	Black



## Textless Formatting

### Textless Format:

Each texted main picture element requires a corresponding textless replacement. This should be delivered as non-continuous sequences with accurate TC numbering that matches the appropriate insert TC. Black (3 seconds) should also be included between the slate and the first textless insert, and after the last textless insert (5 seconds).

An example is provided below, which includes textless slate and black (continuous sequence 85680-85847), three textless picture inserts (non-continuous sequences), and black at tail.

chapp0_uhd_185_master_txtls.[0085680-0085775].dpx	Textless Slate
chapp0_uhd_185_master_txtls.[0085776-0085847].dpx	Black
chapp0_uhd_185_master_txtls.[0087378-0087431].dpx	Textless Insert 1
chapp0_uhd_185_master_txtls.[0087846-0088245].dpx	Textless Insert 2
chapp0_uhd_185_master_txtls.[0088517-0089128].dpx	Textless Insert 3
chapp0_uhd_185_master_txtls.[0089129-0089248].dpx	Black

An EDL should also be provided to define the textless placement, according to long play time code. See sample below.

**Table 3: Sample EDL**

LIST	ITEM			PROG START	PROG END	LOC STAMP START	LOC STAMP END
TITLE: TEXTLESS							
FCM: NON-DROP FRAME							
001 textless	*SLATE	V	C	00:00:00:00	00:00:04:00	00:59:30:00	00:59:34:00
002 textless	*BLACK	V	C	00:00:04:00	00:00:07:00	00:59:34:00	00:59:37:00
003 textless	*INSERT1	V	C	00:00:07:00	00:00:09:05	01:00:40:18	01:00:42:23
004 textless	*INSERT2	V	C	00:00:09:05	00:00:25:20	01:01:00:06	01:01:16:21
005 textless	*INSERT3	V	C	00:00:25:20	00:00:51:07	01:01:28:05	01:01:53:16
006 textless	*BLACK	V	C	00:00:51:07	00:00:56:07	01:01:53:16	01:01:58:16

## Metadata Requirements

In addition to the image files, please provide all applicable metadata. This should include ST-2086 metadata and Dolby Vision metadata with accompanying DoVi grade project file. Please see Appendix E for specifications.

## Slate Contents

Please see Appendix A for tables that describe the information that is necessary to include in all slates for Main, Textless, and Foreign Insert sequences.

## Presentation Aspect Ratios

Please see Appendix B for a list of accepted presentation aspect ratios for Sony Pictures.

## Archive Delivery Specs

The archive should be written to LTO7 or *latest LTO version*.

The contents of the master archive should include all media files and a metadata file that lists the media and content metadata. For a complete description of LTO archive specifications, please see Appendix C.





## Appendix A – Master Archive Slates

Table 4: Fields that should be included on the [Main Master Archive Slate](#)

<b><i>Slate Label</i></b>	<b><i>Label Definition</i></b>	<b><i>Label Examples</i></b>	<b><i>Comments</i></b>
<i>GPMS Title</i>	<i>Full name of the production</i>	<i>Breaking Bad, Season 3</i> <i>The Amazing Spider-man</i>	<i>Episodic titles should include the season #</i>
<i>GPMS Title Abbreviation</i>	<i>Abbreviated title name established by Sony Pictures</i>	<i>BREBAD</i> <i>AMSPMA</i>	<i>These can be found at Tekzone &lt;<a href="https://tekzone@spe.sony.com">https://tekzone@spe.sony.com</a>&gt;. If not there, contact Sony to provide GPMS abbreviation</i>
<i>Version</i>	<i>Unique version identification</i>	<i>Domestic</i> <i>International</i>	<i>Refers to the cut of the show</i>
<i>Episode Number</i> <i>Trailer number</i>	<i>Episode identification</i>	<i>Episode 308</i> <i>International Trailer A</i> <i>MOW Night 1</i>	<i>Use for Episodic, Trailer, and Movie of the Week identification</i>
<i>GPMS Episode Title</i>	<i>Full name of episode title</i>	<i>"I See You"</i>	
<i>Frame rate</i>	<i>Frame rate of master image file</i>	<i>23.976</i>	



<b><i>Slate Label</i></b>	<b><i>Label Definition</i></b>	<b><i>Label Examples</i></b>	<b><i>Comments</i></b>
<i>FFOP to LFOP Frame Ranges</i>	<i>Frame range between the first frame and last frame of program, inclusive of both first and last frame of picture</i>	<i>FFOP: 720 LFOP: 175685</i>	
<i>Program Runtime</i>	<i>Established temporal length of the product expressed as both HH:MM:SS:FF and the frame count including FFOP and LFOP</i>	<i>02:01:30:05 / 174966 frames</i>	
<i>File Type</i>	<i>File Type of Master Archive</i>	<i>10-bit DPX 16-bit TIFF</i>	<i>When applicable, the bit depth should be included</i>
<i>Resolution</i>	<i>Horizontal x Vertical Pixel Count</i>	<i>3840x2160 1920x1080</i>	
<i>Presentation Aspect Ratio</i>	<i>Aspect ratio of image as presented</i>	<i>239LB 178FF 133SM</i>	<i>See list of accepted presentation Aspect Ratios in Appendix B</i>
<i>Color Space</i>	<i>Color space of image data</i>	<i>Rec709 xvYCC Rec2020</i>	
<i>EOTF</i>	<i>Electro-Optical Transfer Function used for grading the master archive</i>	<i>Gamma 2.4 PQ (ST 2084)</i>	



<b><i>Slate Label</i></b>	<b><i>Label Definition</i></b>	<b><i>Label Examples</i></b>	<b><i>Comments</i></b>
<i>Post Facility</i>	<i>Name of post production facility that creates the master archive</i>		
<i>Creation Date</i>	<i>Date of master archive creation as YYYYMMDD</i>	<i>20150305</i>	
<i>Source File Barcodes (optional)</i>	<i>Reel or Barcode IDs of source film/tape asset e.g. DPX LTO barcode</i>	<i>Reel 1 of 6: OL2015 LTO 1 of 3: OL8733</i>	
<i>Notes (optional)</i>	<i>Additional notations that may provide additional information</i>	<i>No commercial blacks</i>	



**Table 5: Fields that should be included on the textless master archive slate**

<b><i>Slate Label</i></b>	<b><i>Label Definition</i></b>	<b><i>Label Examples</i></b>	<b><i>Comments</i></b>
<i>GPMS Title</i>	<i>Full name of the production</i>	<i>Breaking Bad, Season 3 The Amazing Spider-man</i>	<i>Episodic titles should include the season #</i>
<i>GPMS Title Abbreviation</i>	<i>Abbreviated title name established by Sony Pictures</i>	<i>BREBAD AMSPMA</i>	<i>These can be found at Tekzone &lt;<a href="https://tekzone@spe.sony.com">https://tekzone@spe.sony.com</a>&gt;. If not there, contact Sony to provide GPMS abbreviation</i>
<i>Version</i>	<i>Version referenced by the textless shots</i>	<i>Domestic International</i>	<i>Refers to the cut of the show for which the textless material is designed</i>
<i>Episode Number Trailer number</i>	<i>Episode identification</i>	<i>Episode 308 International Trailer A MOW Night 1</i>	<i>Use for Episodic, Trailer, and Movie of the Week identification</i>
<i>GPMS Episode Title</i>	<i>Full name of episode title</i>	<i>"I See You"</i>	
<i>Frame Rate</i>	<i>Frame rate of the textless images</i>	<i>23.976</i>	



<b><i>Slate Label</i></b>	<b><i>Label Definition</i></b>	<b><i>Label Examples</i></b>	<b><i>Comments</i></b>
<i>FFOP to LFOP Frame Ranges</i>	<i>Frame range between the first frame and last frame of program, inclusive of both first and last frame of picture</i>	<i>FFOP: 720 LFOP: 175685</i>	
<i>Program Runtime</i>	<i>Established temporal length of the product expressed as both HH:MM:SS:FF and the frame count including FFOP and LFOP</i>	<i>02:01:30:05 / 174966 frames</i>	
<i>File Type</i>	<i>File Type of Master Archive</i>	<i>10-bit DPX 16-bit TIFF</i>	<i>When applicable, the bit depth should be included</i>
<i>Resolution</i>	<i>Horizontal x Vertical Pixel Count</i>	<i>3840x2160 1920x1080</i>	
<i>Presentation Aspect Ratio</i>	<i>Aspect ratio of image as presented</i>	<i>239LB 178FF 133SM</i>	<i>See list of accepted presentation Aspect Ratios in Appendix B</i>
<i>Color Space</i>	<i>Color space of image data</i>	<i>Rec709 xvYCC Rec2020</i>	
<i>EOTF</i>	<i>Electro-Optical Transfer Function used for this master archive</i>	<i>Gamma 2.4 PQ (ST 2084)</i>	



<b><i>Slate Label</i></b>	<b><i>Label Definition</i></b>	<b><i>Label Examples</i></b>	<b><i>Comments</i></b>
<i>Post Facility</i>	<i>Name of post production facility that creates master archive</i>		
<i>Creation Date</i>	<i>Date of master archive creation as YYYYMMDD</i>	<i>20150305</i>	
<i>Source File Barcodes (optional)</i>	<i>Reel or Barcode IDs of source film/tape asset e.g. DPX LTO barcode</i>	<i>Reel 1 of 6: OL2015 LTO 1 of 3: OL8733</i>	
<i>Notes (optional)</i>	<i>Additional notations that may provide additional information</i>	<i>No commercial blacks</i>	



Table 6: Fields that should be included on the *foreign insert* master archive slate

<b>Slate Label</b>	<b>Label Definition</b>	<b>Label Examples</b>	<b>Comments</b>
<i>GPMS Title</i>	<i>Full name of the production</i>	<i>Breaking Bad, Season 3</i> <i>The Amazing Spider-man</i>	<i>Episodic titles should include the season #</i>
<i>GPMS Title Abbreviation</i>	<i>Abbreviated title name established by Sony Pictures</i>	<i>BREBAD</i> <i>AMSPMA</i>	<i>These can be found at Tekzone &lt;<a href="https://tekzone@spe.sony.com">https://tekzone@spe.sony.com</a>&gt;. If not there, contact Sony to provide GPMS abbreviation</i>
<i>Version</i>	<i>Unique version identification of the version to be used with the inserts to accomplish the localization</i>	<i>Domestic</i> <i>International</i>	<i>For example, the Domestic version might be used for CFrench inserts, and the International version might be used for the German inserts</i>
<i>Episode Number</i> <i>Trailer number</i>	<i>Episode identification</i>	<i>Episode 308</i> <i>International Trailer A</i> <i>MOW Night 1</i>	<i>Use for Episodic, Trailer, and Movie of the Week identification</i>
<i>GPMS Episode Title</i>	<i>Full name of episode title</i>	<i>"I See You"</i>	
<i>Insert Content</i>	<i>Top-level description of the insert content</i>	<i>German Foreign Inserts</i>	
<i>TERRITORY</i>	<i>Territory for which the inserts are intended to localize</i>	<i>Germany</i>	
<i>Language</i>	<i>Written language burned into the foreign insert images</i>	<i>German</i>	
<i>Insert Count</i>	<i>Number of Inserts</i>	<i>3</i>	

<b><i>Slate Label</i></b>	<b><i>Label Definition</i></b>	<b><i>Label Examples</i></b>	<b><i>Comments</i></b>
<i>Frame Rate</i>	<i>Frame rate of textless image</i>	23.976	
<i>Resolution</i>	<i>Horizontal x Vertical Pixel Count</i>	3840x2160 1920x1080	
<i>Presentation Aspect Ratio</i>	<i>Aspect ratio of image as presented</i>	239LB 178FF 133SM	<i>See list of accepted presentation Aspect Ratios in Appendix B</i>
<i>Color Space</i>	<i>Color space of image data</i>	Rec709 xvYCC Rec2020	
<i>EOTF</i>	<i>Electro-Optical Transfer Function used for this master archive</i>	Gamma 2.4 PQ (ST 2084)	
<i>Post Facility</i>	<i>Name of post production facility that creates the file</i>		
<i>Creation Date</i>	<i>Date of image track file creation as YYYYMMDD</i>	20150305	
<i>Notes (optional)</i>	<i>Additional notations that may provide additional information</i>	<i>No commercial blacks</i>	





## Appendix B – Sony Presentation Aspect Ratios

### PRESENTATION ASPECT RATIO for SONY Master Archives:

Aspect ratio in this context means presentation or display format – not the original shape or size of the film or data, but how the image appears on the screen. In most non-theatrical contexts that we service today, there is only one basic display format. Whether HD or UHD, the display is 16x9, or 1.78. Thus, these variants of the basic aspect ratio only describe how various products (standard definition tv, silent, sound, widescreen, anamorphic and 70mm features, as well as contemporary productions) are formatted within the 16x9 display to retain their compositional integrity. There may be other aspect ratios we deploy, either exceptionally or with the introduction of a new format, but these ten characterize the presentation of most of our product to date.

**16x9 133SM - 1.33:1 Side Matted** (“Side-matted” is also referred to as “pillar-boxed”) is used by late silent features and standard definition television. Library sound features (pre-1952) remastered at 2k have also generally been produced in 1.33 aspect ratio.

**16x9 137SM - 1.37:1 Side Matted** is the Academy sound aperture standard. Legacy sound features pre-1952 and remastered at 4k are produced in 1.37 aspect ratio.

**16x9 166SM - 1.66:1 Side Matted** is the flat (spherical) presentation format for the most common post-1952 European widescreen flat format (equivalent to 1.85 in US).

**16x9 - 1.78:1 Full Frame** is the native aspect ratio of HD and UHD. It is the *de facto* aspect ratio of all picture elements in the IMF package. HD and UHD productions are often composed 1.78 full frame. Most contemporary television is 1.78 Full Frame. We are phasing out 16x9 full frame versions (pan-, tilt-and-scan) of legacy product. Legacy film and television product is now generally re-mastered to original aspect ratio and composition using matting.

**16x9 185LB - 1.85 Letter-box** is the standard format for widescreen flat (spherical) theatrical features in the US produced post 1952.

**16x9 200LB - 2.00:1 Letter-box** is used for certain contemporary television productions, including *House of Cards*.

**16x9 220LB - 2.20:1 Letter-box** is the aspect ratio for theatrical features originated on 65mm flat negative for 70mm presentation, such as *Lawrence of Arabia*.

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**16x9 235LB - 2.35:1 Letter-box** is used for anamorphic widescreen features with optical sound track, produced from 1953-1970.

**16x9 239LB - 2.39:1 Letter-Box / 16x9 240LB - 2.40:1 Letter-Box**

It is important to correctly document whether a product is **2.39LB** or **2.40LB**. 2.39:1 is the ratio of modern (1971-present) anamorphic widescreen features. The actual SMPTE standard, modified from 2.35 in 1970, is @2.3976:1, but is frequently referred to as 2.40 for convenience. Modern data-centric productions are often formatted for 2.39 display and generally achieve a 2.39 picture by non-anamorphic means. The DCI standard for cinema projection is 2.39:1. There is widespread use of the colloquial 2.40, and some products are actually physically formatted in a 2.40:1 aspect ratio, such as Blu-ray disk masters and Blu-ray disks.

**16x9 255LB - 2.55:1 Letter-box** represents the original Cinemascope anamorphic widescreen ratio, which had no optical soundtrack and thus was wider than 2.35:1. This ratio is only used by a few Columbia films such as *The Long Gray Line*, and it disappears completely after 1959. Anamorphic widescreen is more commonly 2.35 or 2.39.



Table 7: X/Y Pixel Count for Side-Matted and Letter-Boxed Image Area

Aspect Ratio	HD pixels (RP199-2004)	UHD pixels
<b>16x9 133SM</b>	1440x1080	2880x2160
<b>16x9 137SM</b>	1480x1080	2960x2160
<b>16x9 166SM</b>	1793x1080	3586x2160
<b>16x9 178</b>	1920x1080	3840x2160
<b>16x9 185LB</b>	1920x1038	3840x2076
<b>16x9 200LB</b>	1920x960	3840x1920
<b>16x9 220LB</b>	1920x873	3840x1746
<b>16x9 235LB</b>	1920x817	3840x1634
<b>16x9 239LB</b>	1920x803	3840x1606
<b>16x9 240LB</b>	1920x800	3840x1600
<b>16x9 255LB</b>	1920x753	3840x1506

See also SMPTE RP199-2004



## Appendix C – LTO Delivery Specification

### Data Normalization Specification for Linear Magnetic Tape

This document defines the LTO format for digital intermediate (DI), digital source master (DSM), VAM, raw camera files, DPX Master and IMF/IMP deliverables on linear magnetic tape for the purpose of integration into Sony's permanent data archive. Specifically, this document pertains to deliverable content that will undergo data format normalization in order to become a part of Sony's archive. The current preferred delivery medium is LTO7 or latest LTO version. The delivery should be in TAR format. LTFS format should not be used.

The following structure reflects the format for data deliverables in the medium of linear magnetic tape:

- The tape shall contain a metadata text file that lists the media metadata and the content metadata. *Please see Appendix D for an archivemetadata template.*
  - The tape shall contain a contiguous sequence of files without separate file marks.
  - The tape shall contain an md5 hash manifest file at the end of the tape.
  - The blocking factor shall be configured for a 1024x512-byte block size (i.e. "tar-b 1024").
  - The blocking factor of the tape will be variable (ie. "mt -f /dev/nst0 setblk 0").
  - The tar file will not utilize byte-swapping.
  - There will only be three file marks per tape, one at the beginning of each tape:
    - One file mark at the start of metadata archive
    - One file mark at the start of media archive
    - One file mark at the end of the media archive, representing the location of the checksum file.
  - The file shall be an uncompressed tar file (IEEE 1003.1, 2004) – no compression such as gzip or bzip will be used.
  - Multiple reels or folders can be placed on a single LTO, but reels should not be broken across LTOs. In cases where a reel does not fit on an LTO tape, the reel will span multiple tapes. Under no circumstances will a partially-written frame exist on a single tape; if there is not enough space for an additional frame, a new tape(s) will be used for remaining data.
  - The path separator shall be a "/" (forward slash) character
  - File and directory names shall be case-sensitive.
  - File and directory names shall consist only of the following 8-bit ASCII characters:
    - Letters A-Z and a-z
    - Numerals 0-9
-

- Underscore “\_”
- Period “.”
- Dash “-”
- Filenames will not contain whitespace and will begin with alphanumeric characters (a-z, A-Z, 0-9)
- All frames shall be regular files and directories (no symbolic references to other files, directories or devices).
- All file and directory paths will be relative paths (no absolutes)

If the aforementioned conditions are met, the archive will be able to be read on legacy SGI Irix systems, current and future Linux based systems as well as any other system that supports the format.

### General Specifications

It is acceptable to put multiple reels and sections on a single LTO, per the conditions noted above. Each resource should be consistent in terms of file type. For example, the finished master data file should consist of only .dpx files, not .dpx and .tiff files. Similarly, each resource (DSM, DPX master, VAM, etc) should be consistent in terms of the resolution characteristic of files. For example, a 4k DSM should consist of 4096x3072 files, not 4096x3072, 4096x2214 and 4096x2300 files. If there is a technical justification for this deployment of inconsistent file types or size, this should be documented and cleared in advance with Sony as a variant deliverable.

### MD5 Hash Manifests

In order to archive data for Sony Pictures archival, you **must** include an MD5 hash manifest file containing checksums of all files contained on the LTO. The manifest file must contain md5 checksums for only those files contained on that particular LTO, and may not span multiple LTOs. This will ensure that manifests and the data they relate to remain together as a unit.

MD5 validation (Message Digest version 5) is intended to ensure that each file received by the Sony Pictures is identical to the original camera source, master or deliverable file.

Before a manifest is created, the names of the directories and files making up the element should be checked for illegal characters as all names should conform to the naming specifications identified in this document. Do not change the names of files after the manifest is created, as that will invalidate the manifest.

MD5 manifest file names should relate to the delivery, include a tape barcode number, and have the file extension *.md5*. For example:

---

MyMovie\_UHD\_DPX\_Master\_Part1\_BARCODE#.md5

*The manifest should be located at the end of the tape.*

## Creating an MD5 Hash manifest

There are built-in and freeware utilities available for all platforms (Windows, MacOS, Linux ) that allow for creating and validating MD5 hash values.

### Examples of creating an MD5 manifest:

#### MacOS (command line): md5 (built-in command):

Open "Terminal.app"

```
$ cd /Volumes/MyMovieDriveName
$ find MyMovie/* -type f -exec md5 -r "{}" \; >
MyMovie_UHD_DPX_Part1_BARCODE#.md5
```

#### Linux (command line): md5sum (built-in command):

```
$ cd /mnt/media/MyMovieDriveName
$ find MyMovie/* -type f -exec md5sum -r "{}" \; >
MyMovie_UHD_DPX_Part1_BARCODE#.md5
```

If you want to validate your own manifest file, on Linux you can run:

```
$ cd /mnt/media/MyMovieDriveName
$ md5sum -c MyMovie_UHD_DPX_Part1_BARCODE#.md5
```

## Windows

If you use Windows to create your MD5 Hash Manifests, please make sure that the Windows drive letter is not included in the manifest file. Also, please ensure that you use forward slashes / for the path name and not backslashes \

For example:

#### **Correct** MD5 manifest entry:

```
0f000e3ce51d740a4ef8bce7a9a0d544 MyMovie/uhd_master/picture/uhd_txt.mxf
```

#### **Incorrect** MD5 manifest entry:

```
0f000e3ce51d740a4ef8bce7a9a0d544
X:\MyMovie\uhd_master\picture\uhd_txt.mxf
```



Please be sure to clean up all temp and system generated hidden files from the delivery media before creating manifest and writing LTOs. For example:

```
.DS_Store  
.TemporaryItems  
._somefilename  
Thumbs.db
```

The MD5 Manifest file shall be of the form:

```
ea9595c13824c6624d78e44fe38992a8 MyMovie/uhd_master/picture/uhd_txt.mxf  
13d2d26fbbd16c1578108c10015e372f MyMovie/uhd_master/picture/uhd_txtls.mxf  
ea998bf215d9d0f1fe62e5d2a68ca306 MyMovie/uhd_master/audio/uhd_txt_A1.mxf  
7bc087b7b5fe96755a776a1055981d55 MyMovie/uhd_master/audio/uhd_txtls_A1.mxf
```



## Appendix D – Archive Metadata Text File Contents

### Media Metadata

**Show:**

**Barcode:**

**Tape:** 1 of

**Date (production date):**

**Tape Type:** LTO-7 or latest version

**Blocking Factor:** variable

**Data Organization:** single tar archive

**Read Method:** tar -b 1024 -xvRf /dev/nst0

**Written by:** [hostmachine]: /dev/nst#

**Software used to create:** Linux

**Total Files:**

**Total Size:**

**Tar Files:** 3

**Post House:**

**Date of LTO Manufacture:**

### **Media Contents:**

[List media contents below, in short (sequence) listing]

### Content Metadata:

Show Title: "Name of Feature or Television Project"

GPMS Abbreviation: "Example: SMURF2 for Feature Smurfs 2"

Version Info: "Examples: Domestic, International, etc"

Media Class: "Specify CTM for SDR master or HDRDM for HDR master"

Content Type: "Examples: Longplay, Textless, etc."

Source material: List of barcodes containing data (LTO, hard drive, etc.)

File Type: "Examples: TIFF, DPX"

Resolution: Horizontal x Vertical pixel count, i.e. "3840x2160" or "1920x1080"

Bit Depth: Image bit depth, i.e. "10, 16"

Color Space: "Examples: Rec709, Rec2020"

EOTF: "Examples: Gamma 2.4, PQ"

Frame range: \*see content listing

Processing: Indicate special image processing, if any, i.e. "Uprez, Sharpening, etc."





## Appendix E – Color Metadata Specifications

### SMPTE ST-2086, Max Fall, Max CLL Metadata

When providing the ST-2086, Max CLL and Max FALL metadata, please ensure the data is contained within a simple text file. The contents should contain the mastering display primaries, white point chromaticity, and maximum, minimum luminance, maximum content light level (Max CLL), and maximum frame average light level (Max FALL) values in nits. Below are example text file contents:

```
--master-display "G(13250,34500)B(7500,3000)R(34000,16000)WP(15635,16450)L(40000000,50)"  
--max-cll 4099,720
```

### Dolby Vision Metadata

When providing Dolby Vision metadata, please provide a feature longplay XML. A separate textless XML is not necessary unless the frame numbering between feature and textless differs. Also, provide a full longplay XML for any alternate versions that require changes in picture edits (eg. Extended cut, censor cut). Please note the following requirements for XML delivery:

1. The frame number start of the XML should match the image sequence frame number start. For example, if the feature TIFF image sequence is 85680-245234, the first event in the XML must also start at frame 85680.
2. The XML must include metadata for all frames of TIFF data provided, including any head and tail leaders.
3. The Canvas Aspect Ratio and the Image Aspect Ratio must be accurately defined in the XML.
4. The Color Encoding specifications in the XML must match the color encoding of the delivered image files.

In addition to the XML files, please provide the Dolby Vision grade project file. This is the project file from Baselight, Resolve or any other Dolby Vision compliant color correction software. The project must be a longplay project (not reel-based) and should contain head and tail leaders to match the TIFF delivery.

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