

Digital Capture Specifications

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1. Document Control

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2. Introduction

This document details the State Library of Queensland's provision of digital source files and the standards for their capture to meet future access and preservation requirements. The standard covers the imaging of a broad range of media, including photographs, manuscripts and other original documentary heritage materials and publications. It also applies to the turning digital of audio and moving image content and outlines the file formats for each type of digital object.

The State Library recognises that the application of standards in line with international best practice is critical to the successful implementation and sustainability of turned digital content. Digital information is fragile in ways that differ from analogue and hard copy information and, as such, present many preservation challenges. They are at risk of being lost due to the rapid pace of development in computer hardware, operating systems and application software, coupled with the short effective life of most physical storage media. In addition, digital files are more easily corrupted or altered without realisation.

Digital asset management, long term preservation and storage must be considered at all stages of the life cycle of digital objects. Ensuring quality standards at the point of capture/creation is an important strategy to protect the State Library's increasing investment in turning digital and receving born digital content.

Other institutions have done a great deal of work to define capture standards for digital objects. The State Library acknowledges, and draws on this body of work. Documents were reviewed from projects such as American Memory, Colorado Digital Project, National Libraries of Australia and New Zealand as well as the State Library of Victoria.

3. Principles

- The State Library turns physical collections into digital files once, and at quality that will
 ensure long term access and preservation.
- Digital versions are created by digital capture from the original version or from the highest quality version available and will be exchangeable across platforms, broadly accessible, and will be digitised according to documented specifications.
- Where digital files are being donated and are of significant importance, the requirement for these to meet State Library's specifications may be waived. However, every endeavour should be made to ensure the files being provided are at the highest quality possible.

4. Visual works

4.1 Definition:

Two dimensional works that communicate meaning, information or an artistic experience by visual means. Works may be created using traditional analogue processes or digital technologies.

Material types that are treated by State Library within this category are:

- Photographs and items created using photographic processes, including
 - Silver gelatin prints
 - Negative film on ester, celluloid or nitrate bases
 - Colour positive film such as 35mm slides and transparencies on ester, celluloid or nitrate bases
 - Negatives on glass base such as silver gelatin and wet plate collodion.
 - Other early photographic processes such as salted paper prints, daguerreotypes and ambrotypes
 - Digital prints created through pigment transference, ink jet, dye sublimation and other such technologies
 - o Digital files created through capture devices such as cameras or scanning equipment
- Maps
- Architectural drawings and plans
- Posters
- Post cards
- Pictorial content in newspapers
- Two dimensional works of art

4.2 Recommended Source File Specifications

Uncompressed TIFF (Tagged Image File Format) is used by the State Library as the master archival file format.

Use	Description	Resolution	Size	Format	File
					extension
All Archival materials including photographs, transparencies, maps, albums, plans & artworks	24-bit colour	600 ppi	6000 pixels (across longest dimension)	TIFF	.tif

Use	Description	Resolution	Size	Format	File extension
Extraordinary and highly unusual collections supported with colour chart and ruler including:	24-bit colour	600 ppi	1:1 100%	TIFF	.tif
Significant artworks					
Illuminated addresses					
 Items listed as Treasures in the Disaster Plan 					
Artist Books & Realia					

No retouching of imperfections in the original image will be performed to ensure faithful capture.

All files will have the minimum of post digitisation editing, which should only involve:

- minor changes in levels (lightness, darkness, contrast) to match the original image or to slightly enhance important detail
- photographic print collections with a white border will be cropped to display a minimal portion of the border to just beyond the image area of the photograph
- photographic print collections with a white border containing inscriptions will not be cropped thereby displaying the entire border
- Cropping of additional white borders or non image components such as photo corners, mount boards, frames etc.
- Adjustments in colour balance to match the original
- Transparency collections will be cropped to the image area
- Transparency collections with original inscriptions on the borders or mountings will not be cropped

Technical metadata must include at a minimum:

- file size
- pixel dimensions
- date of creation

but would also be beneficial to include:

- Equipment make and model
- Exposure information
- Colour space
- Software type used

4.3 Recommended minimum standard for donated material

Where digital files are donated to State Library the preferred minimum standard is as outlined above.

Where digital files do not meet the specifications but are considered significant and appropriate for donation, the requirement for these to meet the specifications may be waived. However,

donated digital files should be at the highest resolution possible and all endeavours should be made to acquire with at least the following specifications:

- If supplied as JPEG files, the smallest amount of compression
- For digital cameras, captured at highest quality settings
- · RAW files preferred if captured with a digital camera

5. Printed and Written Content

5.1 Definition

Printed and written material includes both hand written and typescript, published and non-published works on paper.

Published works may include but are not limited to books, newspapers, street directories, inserts and foldouts (maps), atlases, music scores, ephemera and journals/serials, whilst non-published works would include diaries and other manuscript material.

5.2 Recommended Source File Specifications

Uncompressed TIFF (Tagged Image File Format) is used by the State Library as the master archival file format.

Use	Description	Resolution and size	Format	File
				extension
Published and non- published works on paper including manuscripts, diaries, printed text	24-bit Adobe RGB colour	400ppi - items sized greater than A5 (148 x 210 mm or 5.8 x 8.3 in) including A4 , A3 and foolscap (203.2 x 330.2 mm or 8 x 13 in) sizes	TIFF	.tif
		600ppi - items sized less than A5 and greater than A6 (148 x 210 mm or 8.3 x 5.8 in and 148 x 105 mm or 4.1 x 5.8)		
		600+ ppi - Items less than A6 digitised to a minimum of 6000 pixels on the longest dimension		
Extraordinary and highly unusual collections supported with colour chart and ruler including:	24-bit Adobe RGB colour	400ppi - items sized greater than A5 (148 x 210 mm or 5.8 x 8.3 in) including A4 , A3 and foolscap (203.2 x 330.2 mm or 8 x 13 in) sizes	TIFF	.tif
Very small or very large collections - eg miniature diaries/scrolls		600ppi - items sized less than A5 and greater than A6 (148 x 210 mm or 8.3 x 5.8 in and		
Items listed as Treasures in the Disaster Plan		148 x 105 mm or 4.1 x 5.8) 600+ ppi - Items less than A6 digitised to a minimum of 6000		
Artist Books & Realia		pixels on the longest dimension		

No retouching of imperfections in the original image will be performed to ensure faithful capture.

All files will only have the minimum of post digitisation editing, which should only involve:

- minor changes in levels (lightness, darkness, contrast) to match the original image or to slightly enhance important detail
- photographic print collections with a white border will be cropped to display a minimal portion of the border to just beyond the image area of the photograph
- photographic print collections with a white border containing inscriptions will not be cropped thereby displaying the entire border
- Cropping of additional white borders or non image components such as photo corners, mount boards, frames etc.
- Adjustments in colour balance to match the original

Technical metadata must include at a minimum:

- file size
- pixel dimensions
- date of creation

but would also be beneficial to include:

- Equipment make and model
- Exposure information
- Colour space
- Software type used

Summary of current equipment and technical metadata specifications and capacity are documented in Appendix B

5.3 Recommended minimum standard for donated material

Where digital files are donated to State Library the preferred minimum standard is as outlined above.

Where digital files are do not meet the specifications but are considered significant and appropriate for donation, the requirement for these to meet the specifications may be waived. However, donated digital files should be at the highest resolution possible and all endeavours should be made to acquire with at least the following specifications:

- If supplied as JPEG files, the smallest amount of compression
- For digital cameras, captured at highest quality settings
- RAW files preferred if captured with a digital camera
- Unedited files direct from the camera or digitisation device if RAW files are unavailable
- The preferred format for text based documents is MS Word or Adobe PDF

6. Audiovisual content

6.1 Definition:

Audiovisual material refers to moving image and sound collections. They can be recorded or stored on different mediums or carriers such as motion picture film; grooved and optical discs; magnetic media including videotapes, audiotapes, data-tapes and hard drives.

Audiovisual collections can be in analogue or digital format and are usually dependent on equipment and software technology to access the information. Digital in this context refers to file-based digital audiovisual content.

The file/container format is the video wrapper that encapsulates the video, audio and data essences. Some file/container formats can only contain a specific encoding format, e.g. Windows Media file format can only contain Windows Media Video and Audio. Other video file formats such as Quicktime, AVI and MXF can encapsulate different types of encoding formats such as MPEG-2, DV, uncompressed etc., and the file formats are known as wrappers or containers in these instances.

6.2 Recommended Capture/Source File Specifications:

Refer to Appendix A: Audiovisual Capture Based on Formats for overview of transfer requirements.

Audio Capture

Audio Source	Analogue Tape (turning digital)	Digital File (born digital)
File format	BWF, Broadcast Wave version of the WAV file (preferred) or WAV	Make copies of original as is; create normalised versions. For Audio Compact Disc (CDDA), create 16 bit, 44.1kHz WAV files.
Channels	Same as original	Same as original
Audio encoding	LPCM - Linear Pulse-Code Modulation	LPCM
Compression	No compression	No compression
mode		
Bit depth	24 bit or native	Native to source, minimum 16 bit
Sampling rate	96 kHz or native	Native to source, minimum 44.1kHz

All audio digital masters captured from analogue sources must be a straight transfer without any enhancements.

Normalise processing and noise reduction techniques can only be performed on copies of the digital master files.

Technical metadata will include at least:

- file format
- compression format
- creator
- date of creation e.g. 2015-01-28 (yyyy-mm-dd)
- duration e.g. 00:01:23 (hh:mm:ss)
- sampling rate
- bit depth
- bit rate
- audio channels

For digital masters transferred from an analogue source, technical metadata may include:

- source material format and original identification number
- playback and digital converter equipment make, model and serial number
- analogue (format type, speed, channels) conversion to digital (bit depth, sampling rate)
- software information
- checksum file (MD5)
- software used

Motion Picture Film Capture

Digitisation capture will ensure entire exposed image frame regardless of sprocket hole/perforation position on each film cell.

Film Source	Film: 35mm/16mm/9.5mm	Film: 8mm/Super8
Image sequence output		
File format	Uncompressed 16 bit TIFF - Each frame is scanned as a file, and numbered sequentially	Uncompressed 16 bit TIFF - Each frame is scanned as a file, and numbered sequentially
Aspect ratio	4:3, 16:9 or native (For films, depending on film gauge, add black sections to match aspect ratio. No cropping of image)	4:3, 16:9 or native (For films, depending on film gauge, add black sections to match HD aspect ratio. No cropping of image)
Timing, grading	One-light transfer with best setting determined prior to scanning	One-light transfer with best setting determined prior to scanning
Bit depth	16 bit or native	16 bit or native
Resolution	- 4K (4096 pixels across) or minimum 2K (2048 pixels across) - capture entire image area	- 2K (2048 pixels across) or minimum HD (1920 pixels across) - capture entire image area
Color model	RGB	RGB
Audio		
File Format	BWF, Broadcast Wave version of the WAV file (preferred) or WAV	BWF, Broadcast Wave version of the WAV file
Channels	Same as original or dual mono	Same as original or dual mono
Compression mode	No compression	No compression
Audio encoding	LPCM	LPCM
Bit depth	24 bit	24 bit
Sampling rate	48 kHz	48 kHz

Video Capture

Video Source	Video (analogue and digital media dependent)	Video (digital media independent and file based born digital)
File/Container format	MKV - Matroska ; or QT MOV	 Native For DVD videos with complex menu, create image disc (IMG) in addition to copying VOB files. Select MOV if exporting from video editing program.
Video encoding	FFV1 ver. 3 - FF Video Codec 1 (for MKV); or V410/V210	- Native - If exporting from video editing program, export at uncompressed 10 bit, 4:2:2 or 4:4:4 (preferred) e.g. V210 or V410
Compression mode	Lossless FFV1 ; or uncompressed for V410/V210	 Native If exporting from video editing program, select uncompressed
Video definition	SD 720x576, HD 1920x1080 or native	- Native

Video Source	Video (analogue and digital media dependent)	Video (digital media independent and file based born digital)
		Export video definition settings in video editing program to be as per camera or HD 1920 x 1080
Aspect ratio	SD 4:3, HD 16:9 or native	- Native
Bit depth	10 bit or 8 bit (minimum)	NativeIf exporting from video editing program, 10 bit
Color space	Y:Cb:Cr	Y:Cb:Cr
Chroma sub- sampling	Native, 4:2:2 (minimum) or 4:4:4	- Native - Export from video editing software to 4:2:2 (minimum) or 4:4:4
Frame rate	25 fps (minimum) or native e.g. 24 fps, 50fps	Native or 25 fps
Audio (within container)		
Channels	Native or 2 channels	Native or 2 channels
Compression mode	No compression	No compression
Audio encoding	LPCM	Native or export in LPCM
Bit depth	24 bit	Native or 24 bit
Sampling rate	48 kHz	Native or 48 kHz

Video Modified Masters (for video formats other than MOV V210/410)

Source	Tiff images (from film scans)	Digital video
File/Container	MKV - Matroska	MKV - Matroska
format		
Video encoding	FFV1 ver. 3 - FF Video Codec 1	FFV1 ver. 3 - FF Video Codec 1
Compression mode	Lossless FFV1	Lossless FFV1
Video definition	Native	SD 720x576, HD 1920x1080 or
		native
Aspect ratio	Native	SD 4:3, HD 16:9 or native
Bit depth	Native	10 bit or 8 bit (minimum) or native
Color space	Native	Y:Cb:Cr or native
Chroma sub-	Native	Native, 4:2:2 (minimum) or 4:4:4
sampling		
Frame rate	Same as film speed	25 fps (minimum) or native e.g. 24
		fps, 50fps
Audio (within		
container)		
Channels	Native	Native or 2 channels
Compression mode	No compression	No compression
Audio encoding	Native or LPCM	LPCM
Bit depth	Native or 24 bit	24 bit
Sampling rate	Native or 48 kHz	48 kHz

When creating FFV1 in MKV wrapper with FFMPEG software, the following switches are used:

- -c:v ffv1
- -level 3
- -coder 1
- -context 1
- -g 1

-slices 24 -slicecrc 1 -c:a copy

The digitally captured lossless compressed files, FFV1 in MKV, will be regarded as preservation masters (archival) for videotape, and video masters for films. The preservation master for film, are the image sequences where each frame (cell) of film is represented by an image file (TIFF). Videos produced using the V210/V410 in MOV specification will be regarded as the master in these instances and would not require further conversion to FFV1 in MKV. Video producers are expected to export their project at the highest quality uncompressed e.g. V210 in MOV. They should not export as a compressed file before converting it to uncompressed.

Technical metadata will include at least:

- file format
- compression format
- creator
- duration e.g. 2015-01-28 (yyyy-mm-dd)
- date of creation
- sampling rate
- bit depth
- bit rate
- chroma-subsampling
- color space
- audio channels
- video signal- PAL/NTSC/SECAM

For digital masters transferred from an analogue source, technical metadata may include:

- · source material format and original identification number
- playback and digital converter equipment make, model and serial number
- analogue (format type, speed, channels) conversion to digital (bit depth, sampling rate)
- software information
- time code
- hash sums

6.3 Recommended minimum standard for donated material

If a donor is unable to adhere to the digital audio or video master standards, the material should be the highest quality or video definition possible, without any further compression. Files should not be zipped or transferred to a DVD-video. For a recent production, donors might be able to export video similar to State Library's video capture requirements. The table below demonstrates the alternative for donated material if FFV1 is unavailable.

Video Master	
File/Container format	QT MOV
Video encoding	Uncompressed i.e. none, v210 or v410
Compression mode	No compression or further compression (video to be exported in highest quality e.g. uncompressed 10 bit, 4:2:2 V210 from FCP)
Video definition	1920x1080 or 720x576

Video Master	
Aspect ratio	16:9, 4:3
Frame rate	25 fps or native
Bit depth	10 bit or 8 bit (minimum)
Chroma sub-sampling	4:2:2(minimum) or 4:4:4
Color space	Y:Cb:Cr or RGB
Audio (within video container)	
Audio essence compression format	LPCM
Compression mode	No compression
Channels	Same as original
Bit depth	24 bit or native
Sampling rate	48 kHz or native

7. Sources consulted

Federal Agencies Digitization Initiative

http://www.digitizationguidelines.gov/guidelines/FADGI_Still_Image-Tech_Guidelines_2010-08-24.pdf

http://www.digitizationguidelines.gov/guidelines/video_reformatting_compare.html

Indiana University Media Digitization and Preservation Initiative (MDPI) https://mdpi.iu.edu/doc/MDPIwhitepaper.pdf

Digital Library Federation

http://old.diglib.org/standards/bmarkfin.htm

https://www.library.umass.edu/dmsdocument/112-university-of-massachusetts-amherst-libraries-digital-preservation-policy4-26-2013-templated-pdf

Refining Conversion Contract Specifications: Determining Suitable Digital Video Formats for Medium-term Storage by George Blood

http://www.digitizationguidelines.gov/audio-visual/documents/IntrmMastVidFormatRecs 20111001.pdf

IASA TC-06 Guidelines for the Publication of Video Recordings https://www.iasa-web.org/sites/default/files/publications/IASA-TC_06-D_20180611.pdf

National Library of Australia

Image capture standards

http://www.nla.gov.au/standards/image-capture

http://www.slv.vic.gov.au/our-collections/digitised-collections

File Format & Content Creation Guidance

This web page contains format considerations and recommendations for creating digital content suited for long-term preservation and use. This information was compiled for users of the Harvard Library's preservation repository (DRS), but could be applied more generally to any digital content with long-term value.

https://wiki.harvard.edu/confluence/display/digitalpreservation/Digital+Preservation+Services

http://www.digitalpreservation.gov/formats/fdd/fdd000074.shtml

Association for Library Collections and Technical Services Preservation and Reformatting Section

http://www.ala.org/alcts/resources/preserv/minimum-digitization-capture-recommendations

8. Related Documents

- Content Strategy
- <u>Digitisation Policy</u>
- Digital Preservation Policy
- Descriptive metadata standards
- Technical metadata standards
- <u>Directory and digital file naming standards</u>
- Transcript standard

9. Definitions

Term	Definition
Analogue	An electrical signal that varies continuously. Analog is the traditional method of modulating signals so that they can carry information. Amplitude modulation (AM) and frequency modulation (FM) are the two most common methods of analogue modulation.
Authenticity	The quality of being reliable or trustworthy. In the case of digital materials it refers to the fact that whatever is being cited is the same as it was when it was first created unless the accompanying metadata indicates any changes. Confidence in the authenticity of digital materials over time is crucial owing to the ease with which alterations can be made.
Authentication	A mechanism which attempts to establish the authenticity of digital materials at a particular point in time. Mechanisms to assure authentication may include digital signatures, naming schemes, watermarking and various kinds of (open) encryption techniques.
Born-digital	Digital material that was created and exists only in a digital format, for which there has never been and is never intended to be an analogue equivalent.
Digital content	A broad term for an object of some sort (text, image, sound, and video) captured in digital format.
Digital material	A broad term encompassing both born-digital and digital surrogates created as a result of converting analogue materials to digital form (digitisation).
Digital object	Data stored as computer files and requiring applications software for viewing, including databases, spreadsheets, word processor documents, web pages, video, audio, images, maps, 2 and 3-D models etc.
Digital preservation	The series of managed activities required to maintain continued access to digital materials beyond the limits of media failure or technological change for as long as necessary

Term	Definition
Digital preservation strategies	Technical approaches to long-term digital preservation including such strategies as data migration, normalisation, technology preservation (hardware and software) and technology (software) emulation.
Digital surrogate	A digital copy of an analogue object that has been created using digital technologies
Digitisation	The process of converting a non-digital object into a digital object. The resulting digital surrogate would then be classed as digital material and subject to the same broad challenges involved in preserving access to it as born-digital materials
Metadata	Data about data. Information which describes significant aspects of a resource such as context, content and structure of records and their management through time. Metadata supports a variety of operations on objects.
Digital preservation strategies	Technical approaches to long-term digital preservation including such strategies as data migration, normalisation, technology preservation (hardware and software) and technology (software) emulation.
Digital surrogate	A digital copy of an analogue object that has been created using digital technologies
Preservation Metadata	Preservation metadata is intended to store technical details on the format, structure and use of digital content, the history of all actions performed on the digital material including changes and decisions, the authenticity information such as technical features or custody history, and the responsibilities and rights information applicable to preservation actions.
Preservation	The processes and activities involved in protecting something from loss and ensuring the survival of material through time.
Secure digital repository	A storage system in which digital objects are stored for subsequent access or retrieval. A secure digital repository aims to provide reliable, long-term access to managed digital resources to its designated community, now and in the future.
Trusted digital repository	A storage system in which digital objects are stored for subsequent access or retrieval. A secure digital repository aims to provide reliable, long-term access to managed digital resources to its designated community, now and in the future. A trusted digital repository will also meet the assessment criteria in developed certification checklist
BWF	Broadcast WAV Format
CDDA	Compact Disc Digital Audio
Codec	coder-decoder/compressor-decompressor
FCP	Final Cut Pro editing software
FFV1	FF Video Codec 1
FPS	frames per second
HD	High Definition (1920x1080 pixels)
kHz	kilohertz
IMG	a raw disk image file format
LPCM	Linear Pulse-Code Modulation
MKV	Matroska wrapper/container for video (Open Source)
MOV	Apple Quicktime wrapper/container for video
Mbps	Megabit per second

Term	Definition
MBps	Megabyte per second (1 megabyte = 8 megabit)
SD	Standard Definition (720 x 576 pixels)
QT	Apple Quick Time
TIFF	Tagged Image File Format
WAV	Waveform Audio File Format

10. Approval

Vicki McDonald	21 April 2019
State Librarian and Chief Executive Officer	Date

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APPENDIX A: Audiovisual Capture Based on Formats

Audio Transfer

	Analogue	Digital			
Source Material Example	Reel-to-reel tapes, audiocassettes, grooved discs e.g. LP	Audio-CD (CDDA)	DAT, Mini-Disc,	File based audio e.g. WAV, MP3, FLAC, including CD-R, DVD-R	
Procedure	Transfer to digital and wrap output as file	Transfer CDDA to 16 bit, 44.1kHz uncompressed LPCM	- Transfer to BWF (preferred) or WAV, maintaining native sampling rate and bit depth - Transcode/rewrap as required for modified master	Replicate original file Transcode/Rewrap as required for modified master	
Digital Master	LPCM in BWF (preferred) or WAV	LPCM in BWF (preferred) or WAV	LPCM in BWF (preferred) or WAV	Native audio file format and encoding	
Modified Master	-	-	LPCM in BWF (preferred) or WAV	LPCM in BWF (preferred) or WAV	

Motion Picture Film Transfer

	Motion Picture Image		Motion Picture Sound
Source Material	35mm, 16mm, 9.5mm 8mm, Super 8		Optical/Magnetic Soundtracks on
Example			film
Procedure	Scan film as individual	Scan film as individual	Transfer to digital and wrap output
	frames	frames	as file
Digital Master	TIFF images	TIFF images	LPCM in BWF (preferred) or WAV
Modified Master	FFV1 in MKV	FFV1 in MKV	-

Video Transfer

	Analogue	Digital			
Video carriers	Analogue	Digital – Media	Digital – Media	Digital – Existing	Authored DVDs
	Videotapes	Dependent,	independent, Non-	media independent,	
		transcoded transfer	transcoded transfer	file based	
Source	VHS, Video8, U-	D-1, D-2, D-3, Digital	DV tapes, BetacamSX	File based video e.g.	DVD-Videos
Material	matic, Betamax,	Betacam, D-5, D-6, D-	(in some cases), P2,	various encodings in	
Example	Betacam,	9, HDCAM/HDCAM	XDCAM, HDV, IMX	AVI, MP4, MOV etc	
	Betacam SP,	SR , BetacamSX	(in PD[Professional		
	1 inch or 2 inch		Disc"		

		(mostly), IMX (in tape- based form)			
Procedure	Playback into encoder, wrap output as file	Playback, capture of SDI or HDSDI serial stream, wrap file	-Transfer without transcoding for digital master - Transcode/Rewrap for modified master	- Replicate original file - Transcode/Rewrap for modified master	 Disc image (IMG) complex DVDs Replicate VOB files and merge Transcode/Rewrap for modified master
Digital Master	FFV1 in MKV, otherwise V210/V410 in MOV	FFV1 in MKV, otherwise V210/V410 in MOV	Native file format encoded in MKV/MOV	Native video file format and encoding	- Merged VOB/MPEG file - Disc image (if required)
Modified Master	-	-	FFV1 in MKV	-FFV1 in MKV -Not required for V210/V410 in MOV	FFV1 in MKV