

Māori Television External File Delivery Specification for Finished Programme Content

June 2016

Version 1.5

Revision History			
Version	Date	Author	Comments
0.1	01/05/2014	Gavin Ho	Initial Draft
0.2	06/05/2014	Gavin Ho	Revised Screener Specification
0.3	13/06/2014	Gavin Ho	Revised Audio Channel Mapping
0.4	19/02/2015	Gavin Ho	Added Delivery Methods and Revised Audio Loudness measurement
1.0	15/10/2015	Gavin Ho	Final Version for Phase 1 (Standard Definition) Delivery
1.1	16/12/2015	Gavin Ho	Final Version for Phase 2 (High Definition) Delivery
1.2	04/02/2016	Gavin Ho	Revised File Naming Convention
1.3	29/02/2016	Gavin Ho	Added Tail Format. Revised Audio Channel Assignments
1.4	06/05/2016	Gavin Ho	Clarified Head Format. Removed Audio Post Reference and added AAF Spec
1.5	24/06/2016	Gavin Ho	Added End Tag Requirement to Tail End

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1 Overview

1.1 What's New

1.2 Introduction

This document is intended on setting a standard specification for all inbound file-based media for completed Programme content. The intention is for this specification to remain reactive to technological change whilst maintaining compatibility with Māori Television's workflows and infrastructure.

The purpose of this document is to ensure that originating media is of a sufficient quality and technical standard to support its intended use and end point. Every care has been taken to ensure that the specifications conform to International Standards where possible.

1.3 Deliverables

The Master File(s) should be delivered in the appropriate file format as outlined in this document. All files delivered for transmission must be accompanied by completed documentation as defined below

1.3.1 Inclusive Documentation

- Presentation Cue Sheet
 - In original .xlsm format and name matching the associated media file

1.3.2 Additional Documentation

- Music Cue Sheet
- VO Scripts/Transcripts
- Publicity Material

2 General Technical Requirements

2.1 Signal Requirements

Although most material is now produced and delivered digitally, the signals must still be compliant with analogue standards. For example, excessive (illegal) levels are likely to cause severe picture disturbances when copied to analogue tape formats such as Betacam SP, or to cause sound buzz on analogue transmission. This is particularly relevant to Broadcasters who simulcasts HD content as down converted or down scaled content within digital platforms and also on any analogue networks.

2.2 Video System Standards for Standard Definition (SD) Delivery

All signals and recordings supplied shall be 4:2:2 SD 576i/25 (PAL 625/50 Interlace Standard).

Composite material shall conform to the relevant ITU Recommendations in all aspects of timing, frequency response and bandwidths.

Material will be assessed according to ITU-R BT601-5 Part A. All measurable signals are to conform to European Broadcast Union (EBU) standards. Failure to meet these standards will result either in the programme being returned or the broadcaster repairing the programme at the broadcasters option.

2.3 Video System Standards for High Definition Television (HD) Delivery

All signals and recordings supplied shall be 1080i/25 (interlaced).

The signal format will be 4:2:2 HD 1080i 50 fields, as per "System 2" in the EBU-Tech 3299 statement on High Definition (HD) Image Formats for Television Production.

The HD video signal also conforms to the following normative references:

- SMPTE 274M: "1920x1080 scanning and analogue and Parallel Digital Interfaces for Multiple Picture Rates".
- ITU-R BT.709: "Colorimetry".
- SMPTE 292M: "Bit-Serial Digital Interface for High Definition Television Systems".
- SMPTE 334M: "Vertical Ancillary Data Mapping"

Material will be assessed according to ITU-R BT709-5. All Measurable signals are to conform to European Broadcast Union (EBU) and ITU standards. Failure to meet these standards will result either in the programme being returned or the broadcaster repairing programme at the broadcasters option.

2.4 Content Signal parameters

Content signals must correspond to the reference line-up levels. These include peak sound, maximum luminance & colour difference (Y Cr Cb) component levels, and black levels. Care must be taken to avoid illegal colours (Y Cr Cb component signals exceeding the gamut limit) which may be generated by some caption and graphics systems.

2.5 Video Levels and Gamut (Illegal signals)

Video levels including any line-up shall be received within the specified limits so that the programme can be used without adjustment.

SD video levels are based on the PAL System I which specifies 0 to 100% RGB Limits.

Overshoots can be reduced by the use of a low pass IRE filter. Single lines with larger errors caused by vertical processing such as aperture correction and aspect ratio conversion are permitted if they do not exceed a 1% Luminance limit.

2.6 Video Line-up

Line-up signals serve to identify individual signal channels and to provide reference levels that will confirm that the content transmitted is likely to be within transmission signal limits and will be as the producer intended.

At the beginning of each file, line-up signals consisting of one minute of first generation Colour Bars shall be present (for SD - 100/0/100/0 bars is preferred, but 100/0/75/0 is acceptable. HD - 100/0/100/0 bars).

The start of each programme shall be preceded by a graphical identification (Slate) and a countdown leader (optional). The Slate must show the Programme Name, Series, Episode Number, Title and Audio Channel Configuration where appropriate.

The video and audio signal levels must be related accurately to their associated line-up signals with no deviation being permitted

Line blanking level shall be used as a black reference for the programme.

Where the programme is delivered by file with embedded descriptive metadata present, the test signals, graphical identification and countdown are optional. Please note that the descriptive data's SOM value will need to reflect the actual start of the programme not any included optional material.

2.7 Progressive and interlaced formats

Most productions prefer to use progressive to capture and edit their production. When it comes to delivering the completed content, issues can develop that were unforeseen during the production process. One of the reasons issues occur is that we expect delivery and we transmit, like the majority of broadcasters, in interlaced format not progressive. The conversion process can cause some objectionable artefacts, particularly with fast panning material (Horizontal movement) and roller captions. It is essential that all conversions to interlaced have field 1 (also known as 'Odd' or

'Top)' as the first field of the interlaced frame and that this be maintained for the length of the programme.

2.8 Flashing Images and Repetitive Patterns

Flickering or intermittent lights and certain types of repetitive visual patterns can cause problems for some viewers who have photosensitive epilepsy.

Television is by nature a flickering medium (because of the 50 Hz refresh rate of typical receivers and the 25Hz effects of interlaced scanning) and it is therefore not possible completely to eliminate the risk of television causing convulsions in viewers with photosensitive epilepsy. However steps can be taken to reduce unnecessary risks.

The following guidance on the major factors involved is provided for reference.

However, the ITC guidelines should be consulted for complete information.

- Rapidly flickering images should not change at a fast rate i.e. less than 360ms (9 frames at 25 frames per second) between each flash.
- If brightness changes for a given area of a picture are less than 25% of screen maximum brightness then that area may be discounted.
- In marginal cases such images should be avoided if they are positioned near the centre of the screen. Changes in colour are not a problem unless they affect the red channel substantially.
- Prominent and regular patterns which cover a large proportion of the picture area should be avoided, especially if they represent bars, spirals, or 'dartboard patterns. Moving or flickering regular patterns are particularly hazardous.
- Care needs to be taken also with computer generated images, which, if highly detailed can cause a high degree of 25Hz inter-line flicker in the displayed television picture. Video luminance level as measured on a waveform monitor does not simply equate to screen luminance (brightness) and cannot be used to assess brightness without correcting for Gamma.

2.9 Sound and Vision Synchronisation

The relative timing of sound to vision should not exhibit any perceptible error. Sound must not lead or lag vision in excess of 20ms (1 field at 25 frames per second). A sound delay of greater than 20ms can be acceptable where this occurs in context to give a perception of distance.

2.10 Audio channel phase relationships

All audio channels must be in phase with each other and maintain that relationship for the duration of the programme.

2.11 Audio levels and loudness

The following audio Loudness requirements are aligned with Free TV Australia's OP 59 – Issue 2 Measurement and Management of Loudness in Soundtracks for Television Broadcasting.

Audio Levels will be evaluated by means of two measurements:-

- **Peak level**
- **Loudness**

Please note that loudness standards are still being developed and refined and so these standards may change without notice.

The programme's audio must adhere to the following standards for all measurements:

Audio Peak Levels

On all audio tracks, peak audio levels may not rise above -2 dBTP at any point. A conventional PPM with slower responses will not produce results that satisfy these standards.

Audio loudness

The audio loudness of a programme will be -24 LKFS with a maximum deviation of ± 1 LKFS, except for long form programmes where exact normalisation to target level is not practicable..

Audio Loudness Range (LRA)

Programmes should be mixed with a dynamic loudness range that is comfortable to experience for sustained periods of time. It should not be as dynamic as those mixes used for theatre or DVDs. The loudness range (LRA) of a programme should ideally not exceed 15LU.

Metering

- All loudness measurements should be made using a meter complying with recommendation ITU-R BS.1770-3 (A meter conforming to 1770-2 is still acceptable) and indicating its loudness measurement with a numerical readout.
- The permitted measured deviation from the target loudness level of -24LKFS shall not exceed ± 1 LKFS, except for long form programmes where exact normalisation to target level is not practicable.
- For the exchange of digital television content not employing metadata to indicate loudness level, the target loudness level value should be -24LKFS.
- For the exchange of soundtracks on digital television content that employs metadata to indicate a loudness level. Metadata value should correspond to the measured loudness value as per ITU-R BS.1770-3. This value should be used as the 'Dialnorm' metadata value in any transmission AC-3 encoder.
- Loudness can generally be measured in two basic ways: -
 1. Measuring the dialogue component of the soundtracks.
 2. Measuring the full mix of the soundtracks. Note that currently the LFE track of any 5.1 mix is not included in any full mix measurement.

The selection of either method is very dependent upon the content type. Generally most television productions have large quantities of dialogue (dialogue centric) so measuring the dialogue is a valid way of determining the loudness value, provided that the dialogue selected is at a normal level i.e. it is neither shouting nor whispering. Other material such as action movies, music and content with little dialogue or dialogue that is difficult to differentiate from other sounds will require the use of the full mix measurement technique to achieve a correct reading.

- All content will undergo a full mix measurement over the total duration of the soundtrack.

- The loudness value should be noted as a LKFS value and should also include the method of measurement such as dialogue or full mix and if the total duration was checked or a spot sample of soundtrack was used. Ideally the time code points of the portion used for the measurement should also be included.

2.12 Aspect Ratios and Safe Areas

All programmes will be delivered in 16:9 widescreen. Where the original material is only available in 4:3, a 16:9 pillar boxed version is acceptable.

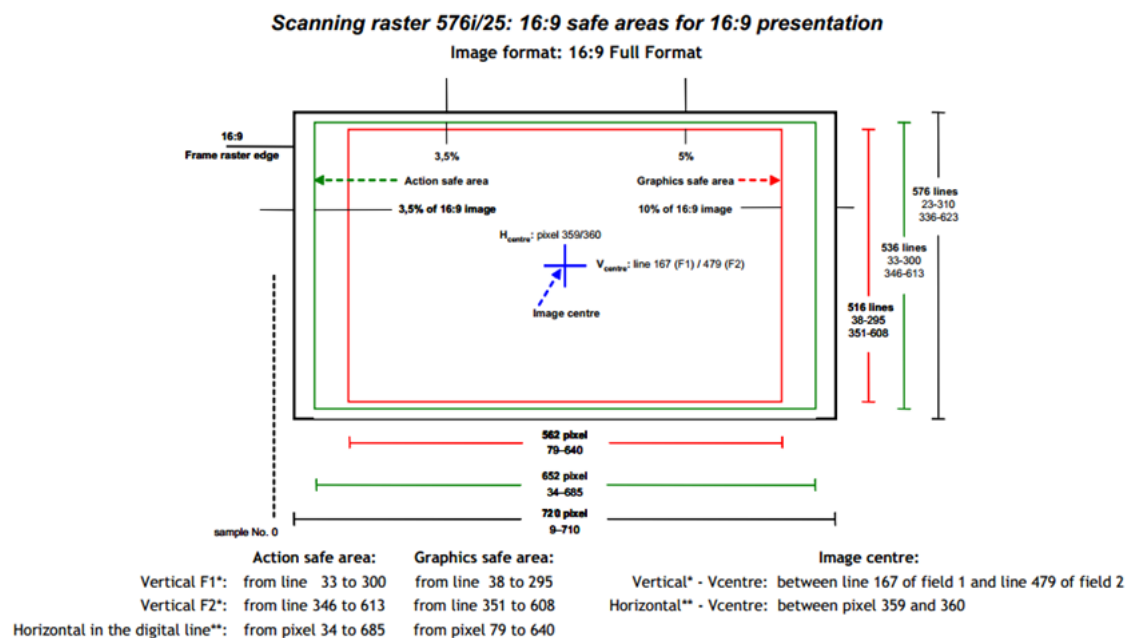
If the material is pillar boxed, it must fill the full height of the 16:9 frame i.e. A Postage stamped programme is not permitted. A letter-box programme that fills the full width of the 16:9 frame is however permitted i.e. A film production aspect ratio of 21:9 or similar.

Safe action and graphics areas

All programmes should be produced for a 16:9 action and 16:9 graphics presentation as per EBU R 95-2008 recommendations outlined in the following page.

Important note about safe areas

Although these safe areas are derived from international recommendations and practices, the displayed area seen by a viewer is to a large extent, determined by the viewer's home equipment, in particular the set top box, and/or the type of television used e.g. LCD, Plasma, CRT. These setups are obviously outside the control of the broadcaster and so the safe areas should be treated as best case guidelines only.

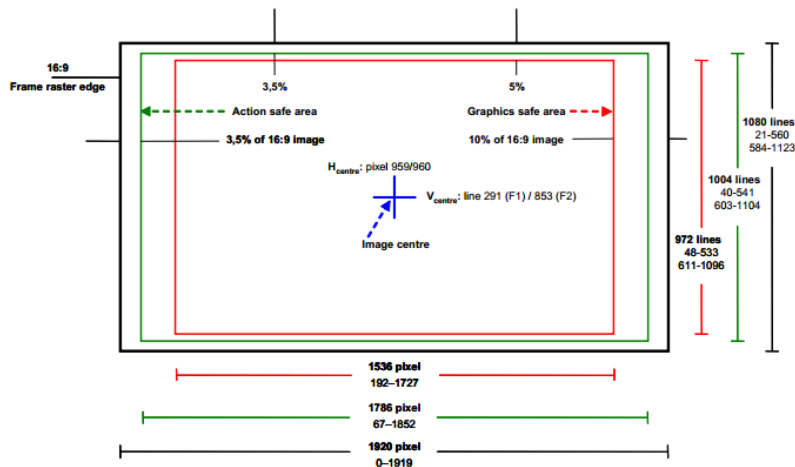


* The total number of lines is 625 (active lines from 23 to 310 and 336 to 623 inclusive = 576 lines).

** The complete digital line comprises 864 samples. Of these, the "digital active line" comprises 720 samples or pixels (numbered from 0 - 719 inclusive) of which the image active line comprises pixels 9 to 710 inclusive (see EBU R92 concerning peculiarities of the 576i/25 (625/50) scanning raster).

Scanning raster 1080i/25 and 1080psf/25: 16:9 safe areas for 16:9 presentation

Image format: 16:9 Full Format



Action safe area: **Graphics safe area:**

Vertical F1*: from line 40 to 541 from line 48 to 533
 Vertical F2*: from line 603 to 1104 from line 611 to 1096

Horizontal in the digital line**: from pixel 67 to 1852 from pixel 192 to 1727

Image centre:

Vertical* - Vcentre: between line 291 of field 1 and line 853 of field 2
 Horizontal** - Vcentre: between pixel 959 and 960

* The total number of lines is 1125 (active lines from 21 to 560 and 584 to 1123 inclusive = 1080 lines).

** The complete digital line comprises 2200 pixels. Of these, the "digital active line" comprises 1920 pixels (numbered from 0 - 1919 inclusive). All active pixels are included in the image active line.

2.13 Delivery Methods

We will accept delivery of files over the Internet or on Hard Drive/Flash Drive according to the following methods:

IP Delivery

Our preferred method of delivery is via an Aspera transfer over the Internet. Please email grp_deliverables@maoritv.com to retrieve your account details for access. Aspera provides a secure, auditable and robust delivery mechanism to send your files and you will automatically be notified when your files have been successfully transferred.

Physical Delivery

We will also accept your files on a Hard Drive/Flash Drive but it must either be formatted as NTFS (PC Formatted) or HFS+ (Mac Formatted.) This drive must have a USB 3.0 or faster interface.

3 Subjective Assessment Quality Requirements

3.1 General Vision Quality Requirements

It is inherently difficult to define precisely a suitable quality video product. There may therefore be some subjective assessments or reports that may be regarded as imprecise. This is an unavoidable consequence of the rapid changes in technology.

Guidelines are as follows:

- The picture must be sharp and well lit (unless artistic considerations require otherwise).
- The video signal must be free of excessive black crushing and highlight compression.
- Transient response shall be such that streaking, ringing, smear echoes and overshoots are not noticeable.
- Moiré and other patterning shall not be visible.
- Hum, cross talk and other spurious signals must not be apparent.
- Colour rendition, especially skin tones, must be a realistic representation of the scene portrayed unless artistic considerations require otherwise.
- Video processing (e.g. effects devices) must not introduce unintentional changes to luminance and chrominance levels nor cause perceptible timing shifts on entry or exit from the effect.
- Appropriate audio or video delay must be used to compensate for lip-sync errors.
- There must be no visible contouring / artefacts caused by multiple D-A and A-D conversions. Quantisation Noise shall not be apparent.

3.2 General Audio Quality Requirements

Audio signals must be suitable for reproduction in a domestic environment. Dynamic range should be restricted and changes in loudness controlled so that the viewer has no need to adjust volume during or between programmes and commercials.

All stereo recordings must provide good mono compatibility.

The audio shall be free of spurious signals such as noise, hum and cross-talk. Sibilance, distortion and wow and flutter should not be apparent.

The audio shall not show dynamic and frequency response artefacts as a result of the action of noise reduction or low bit rate coding systems.

Audio compression should be used as little as possible as the effects of compression used for broadcast distribution and transmission can exacerbate impairments. When audio compression is used to control the dynamic range of the programme it should be consistent with the style of the production but not to be excessive so as to cause viewer annoyance.

4 High Definition File Delivery for Linear Broadcast and/or VOD

4.1 XDCAM HD422

4.1.1 File Specification

XDCAM HD422 1080i50	
Container	
Format	MXF
Format Profile	OP-1A
Format Settings	Closed/Complete
Timecode Track	Present
Timecode Start	00:58:24:00
Video PID	2
Audio PIDs	3-10
Video Essence	
Format	MPEG2 Video
Format Settings Wrapping	Frame
Format Profile	4:2:2@High
Format Settings	GOP (M=3, N=12)
Bit Rate Mode	Constant
Bit Rate	50 Mbps
Width	1920
Height	1080
Display Aspect Ratio	16:9
Frame Rate	25fps
Scan Type	Interlaced
Scan Order	Top Field First
Bit Depth	8 bits
Colour Matrix	BT.709
Essence Stream Timecode Start	00:58:24:00
Audio Essence	
Format	PCM
Format Settings Wrapping	Frame AES
Bit Rate Mode	Constant
Channel Grouping Per PID	1
Bit Rate per Mono Track	1152 Kbps
Sampling Rate	48 kHz
Bit Depth	24 bits

4.1.2 Timecode

- 25fps content needs to begin at 00:58:24:00 with program starting at 01:00:00:00
- Video Essence and MXF timecode must be exact and match to the frame

4.1.3 Head Format

- 00:58:24:00 – 00:59:24:00 – Māori Television Standard Bars and Tone



- 00:59:24:01 – 00:59:34:00 - 10 seconds of slate
- 2 seconds of black and silence before start of program

4.1.4 Tail Format

- Māori Television Credit - At the end of the programme, an MTS end tag of 10" duration must be added. The MTS tag must come after the Production House Tag, and before the Funder (TMP or NZ on Air) tag. End tags are available from the Māori Television Website.
- 10 seconds of black at the end

4.1.5 Slate

- Show Title
- Episode Title
- Series Number
- Episode Number
- MTS House Number
- Audio Configuration for each channel
- Aspect Ratio
- Standard
- Frame Rate
- Total Run Time
- Date

4.1.6 Segments

- 2 seconds of black between segments

4.1.7 Post Roll

- All files require 30 seconds of post roll after textless or "End of Program" when no textless is available

4.1.8 Frame Rate Conversions

- When sourcing from a 23.976fps master 25fps files will be created using a 4% speed-up
- When sourcing from a 29.97fps master, frame rates should be converted using an industry standard Broadcast Standards Converter

4.1.9 Multipart Masters

- All programs split across multiple masters must be tied and encoded as a single "long play" file

4.1.10 Audio Channel Assignment

- Each MXF file will always contain 8 audio tracks. In the case where 8 tracks of audio are not available, the remaining tracks will be padded with silence.

	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Standard	Lo \ Lt	Ro \ Rt	DIA	VO	Lfx	Rfx	Lmus	Rmus
Stereo+5.1	Lo \ Lt	Ro \ Rt	L	R	C	LFE	LS	RS
Stereo / DV&E	Lo \ Lt	Ro \ Rt	Ldv&e	Ldv&e				
Reversioning	Lo \ Lt	Ro \ Rt	Lm&e	Rm&e				
Multi-Language	Lt FOR	Rt FOR	Lt ORIG	Rt ORIG	Lm&e	Rm&e		
Key								
• o – Only								



- t – Total
- DIA or d – Dialogue
- VO – Voice-over
- fx – Effects
- mus – Music
- dv&e – Dialogue, Voice and Effects
- FOR – Foreign
- ORIG - Original

4.1.11 File Naming Convention

The filename must comply with the correct naming convention:

ProgrammeName_SeriesNo_EpisodeNo_MTSHouseNo.mxf eg.

TeKaea_S12_E05_000111222.mxf

Redeliveries of the same file will include an addition of a leading number eg.

1_TeKaea_S12_E05_000111222.mxf

4.1.12 Estimated File Size

30 Minutes	10 GB
60 Minutes	21 GB
120 Minutes	50 GB

5 Standard Definition File Delivery for Linear Broadcast and/or VOD

5.1 D10 IMX

5.1.1 File Specification

D10 IMX PAL	
Container (SMPTE 379M)	
Format	MXF
Format Profile	OP-1A
Format Settings	Closed/Complete
Timecode Track	Present
Timecode Start	00:58:24:00
Video PID	3
Audio PIDs	2
Video Essence (SMPTE 356M-2001)	
Format	MPEG2 Video
Format Settings Wrapping	Frame
Format Profile	4:2:2@High
Format Settings	I Frame (M=1, N=1)
Bit Rate Mode	Constant

Bit Rate	50 Mbps
Width	720
Height	608
Display Aspect Ratio	16:9
Frame Rate	25fps
Scan Type	Interlaced
Scan Order	Top Field First
Bit Depth	8 bits
Colour Matrix	BT.470
Essence Stream Timecode Start	00:58:24:00
Audio Essence	
Format	PCM
Format Settings Wrapping	Frame AES (D10)
Bit Rate Mode	Constant
Channel Grouping Per PID	8
Bit Rate per Mono Track	768 Kbps
Sampling Rate	48 kHz
Bit Depth	16 bits

5.1.2 Timecode

- 25fps content needs to begin at 00:58:24:00 with program starting at 01:00:00:00
- Video Essence and MXF timecode must be exact and match to the frame

5.1.3 Head Format

- 00:58:24:00 – 00:59:24:00 – Māori Television Standard Bars and Tone
- 00:59:24:01 – 00:59:34:00 - 10 seconds of slate
- 2 seconds of black and silence before start of program

5.1.4 Tail Format

- Māori Television Credit - At the end of the programme, an MTS end tag of 10" duration must be added. The MTS tag must come after the Production House Tag, and before the Funder (TMP or NZ on Air) tag. End tags are available from the Māori Television Website.
- 10 seconds of black at the end

5.1.5 Slate

- Show Title
- Episode Title
- Series Number
- Episode Number
- MTS House Number
- Audio Configuration for each channel
- Aspect Ratio
- Standard
- Frame Rate
- Total Run Time
- Date

5.1.6 Segments

- 2 seconds of black between segments

5.1.7 Post Roll

- All files require 30 seconds of post roll after textless or “End of Program” when no textless is available

5.1.8 Frame Rate Conversions

- When sourcing from a 23.976fps master 25fps files will be created using a 4% speed-up
- When sourcing from a 29.97fps master, frame rates should be converted using an industry standard Broadcast Standards Converter

5.1.9 Multipart Masters

- All programs split across multiple masters must be tied and encoded as a single “long play” file

5.1.10 16x9 Content

- 16x9 content will always be encoded anamorphic with the proper 16:9 Display Aspect Ratio flag set in the MPEG2

5.1.11 Audio Channel Assignment

- Each D10 IMX file will always contain 8 audio tracks. In the case where 8 tracks of audio are not available, the remaining tracks will be padded with silence.

	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Standard	Lo \ Lt	Ro \ Rt	DIA	VO	Lfx	Rfx	Lmus	Rmus
Stereo+5.1	Lo \ Lt	Ro \ Rt	L	R	C	LFE	LS	RS
Stereo / DV&E	Lo \ Lt	Ro \ Rt	Ldv&e	Ldv&e				
Reversioning	Lo \ Lt	Ro \ Rt	Lm&e	Rm&e				
Multi-Language	Lt FOR	Rt FOR	Lt ORIG	Rt ORIG	Lm&e	Rm&e		
Key <ul style="list-style-type: none"> • o – Only • t – Total • DIA or d – Dialogue • VO – Voice-over • fx – Effects • mus – Music • dv&e – Dialogue, Voice and Effects • FOR – Foreign • ORIG - Original 								

5.1.12 File Naming Convention

The filename must comply with the correct naming convention:

ProgrammeName_SeriesNo_EpisodeNo_MTSHouseNo.mxf eg.

TeKaea_S12_E05_00011222.mxf

Redeliveries of the same file will include an addition of a leading number eg.

1_TeKaea_S12_E05_00011222.mxf

5.1.13 Estimated File Size

30 Minutes	11 GB
60 Minutes	22 GB

120 Minutes	52 GB
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6 Screener

6.1 MP4 Screener

6.1.1 File Specification

MP4 H.264	
Container	
Format	MPEG-4
Video PID	2
Audio PIDs	1
Video Essence	
Format	AVC
Format Settings	GOP (M=1 N=25)
Entropy Coding Mode	CABAC
Bit Rate Mode	Constant
Bit Rate	10Mbps
Width	1920
Height	1080
Display Aspect Ratio	16:9
Frame Rate	25fps
Scan Type	Progressive
Bit Depth	8 bits
Colour Matrix	BT.470
Audio Essence	
Format	AAC
Bit Rate Mode	Variable
Channel Grouping Per PID	2
Bit Rate per Mono Track	192 Kbps
Sampling Rate	44.1 kHz
Bit Depth	16 bits

6.1.2 Timecode

- Timecode track is not required
- Timecode should be burnt-in on the upper right of frame with the program starting at 01:00:00:00

6.1.3 Trimming

- Head format of 1 second of Black
- Post Roll of 1 second of Black

6.1.4 Cropping

- Files should be cropped to remove VITC/switching signals or line blanking.

6.1.5 Audio Channel Assignment

- Each Screener file will always contain a single stereo audio track.

	CH1	CH2
Stereo	Lt	Rt

6.1.6 Estimated File Size

30 Minutes	1 GB
60 Minutes	2 GB
120 Minutes	4 GB

6.2 AAF for Audio Post

6.2.1 Timecode

- Timecode start 00:58:24:00
- Program start 01:00:00:00

6.2.2 Track Layout

- Track-lay order from top; guide voice – synch/dialogue – effects/atmos – music
- Please don't delete any audio. We may be able to restore or use some parts.
- Do not include video (send separate MP4)
- Send all tracks
- Consolidate media
- 100 frame handles
- Flatten audio tracks that have effects

6.2.3 Audio Format

- Sample rate - 48kHz
- Bit depth - 24bit
- Essence Type – Linear PCM
- Audio embedded in AAF