

TECHNICAL STANDARDS FOR DELIVERY OF TELEVISION PROGRAMMES TO [Broadcaster Logo]

This document is a complete guide to the common technical standards agreed by the BBC, BSkyB, Channel 4, Channel 5, ITV and S4C. Further information is available from the Digital Production Partnership: <http://www.digitalproductionpartnership.co.uk/>

The Standards include:

- Technical Specifications, i.e. the technical production methods which must be used, and the parameters which all material must meet to be acceptable by the broadcasters.
- Picture and Sound Quality requirements, which also form a binding obligation on producers of material. Assessment of quality is by nature subjective, and is highly dependent on the nature of the programme. Some of the Quality Requirements are expressed in relative terms (“reasonable”, “not excessive” etc), and it will be necessary to make a judgement as to whether the quality expectations of the intended audience will be fulfilled, and whether the broadcaster will feel that value for money has been achieved.
- Delivery Requirements, which specify the form and layout of the programme material.

Every programme submitted for transmission must satisfy a Quality Control process specified by the broadcaster. Any programme failing the QC process on tape or file may be rejected and returned to the supplier for repair.

Broadcaster Specific Information:

Technical Responsibility and Contacts:

General Responsibility

[Broadcasters details]

Technical Liaison

[Broadcasters Technical Contact Details and web site link]

File Naming Requirements

Programme files delivered to the [Broadcaster] must be named as below. NB Filenames must be in upper case, with filename extensions in lowercase:
the [Broadcaster] for programme specific identifier information

| Requested Programme File Name Format | Example Filename | Notes |
|---------------------------------------------|------------------------------|--------------|
| Broadcaster Identifiers | XXXXXXXX.mxf XXXXXXXX.xml | |

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1 General Quality Requirements

1.1 Picture Quality

The picture must be well lit and reasonably but not artificially sharp.

The picture must be free of excessive noise, grain and digital compression artefacts.

The picture must be free of excessive flare, reflections, lens dirt, markings and obstructions (e.g. lens hood), and lens aberrations.

Movement must appear reasonably smooth and continuous, and must not give rise to distortions or break-up to moving objects, or cause large changes in resolution.

The picture must be free of excessive black crushing and highlight compression. Hard clipping of highlights (e.g. by legalisers) must not cause visible artefacts on screen.

There must be no noticeable horizontal or vertical aliasing, i.e. jagged lines, field or frame rate fluctuations in fine detail.

Colour rendition, especially skin tones, must be consistent throughout, and a realistic representation of the scene portrayed unless it is altered as an editorially essential visual effect.

The picture must be stable and continuous - i.e. no jumps, movements, shifts in level or position.

There must be no visible contouring / artefacts caused by digital processing. Quantisation noise must not be apparent.

There must be no noticeable spurious signals or artefacts e.g. streaking, ringing, smear, echoes, overshoots, moiré, hum, cross-talk etc.

Note: EBU R118 is used to assess the suitability of cameras for HD use.

1.2 Sound Quality

Sound must be recorded with appropriately placed microphones, giving minimum background noise and without peak distortion.

The audio must be free of spurious signals such as clicks, noise, hum and any analogue distortion.

The audio must be reasonably continuous and smoothly mixed and edited.

Audio levels must be appropriate to the scene portrayed and dynamic range must not be excessive. They must be suitable for the whole range of domestic listening situations.

Stereo audio must be appropriately balanced and free from phase differences which cause audible cancellation in mono.

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

1.3 Access for People with Disabilities

The Equalities Act 2010 (formerly the Disability Discrimination Act) requires service providers to take positive steps to make their services accessible to people with disabilities. It states that where a service provider offers or provides services to members of the public, the provider will have to take such steps as is reasonable to make it easier for disabled people to make use of the service. Broadcasters are service providers and this therefore applies to them. (DCMS Guidance 2006)

Programme suppliers are therefore required to consider the needs of people with hearing or visual impairments while generating captions, subtitles and graphics, using voiceovers, and while mixing sound.

The Communications Act 2003 sets targets for broadcasters (monitored by Ofcom) to provide subtitling, sign language and audio description services, so suppliers may be asked to provide appropriate additional material.

For further information, please refer to the appropriate technical contact on the front page of this document.

2 Technical Requirements - Video

NOTE - This section is applicable to both file and tape deliveries. Specific requirements which are different for file and for tape are covered in separate sections 4 and 5.

2.1 High Definition Format

All material delivered for UK HD TV transmission must be:

- **1920 x 1080 pixels in an aspect ratio of 16:9**
- **25 frames per second (50 fields) interlaced - now known as 1080i/25.**
- **colour sub-sampled at a ratio of 4:2:2**

The HD format is fully specified in ITU-R BT.709-5 Part 2.

2.1.1 Origination

Material may be originated with either interlaced or progressive scan.

Interlaced and progressive scan material may be mixed within a programme if it is required for editorial reasons or the nature of the programme requires material from varied sources.

2.1.2 Post-production

Electronically generated moving graphics and effects (such as rollers, DVE moves, wipes, fades and dissolves) must be generated and added as interlaced to prevent unacceptable judder.

2.1.3 Film motion or 'film effect'

It is not acceptable to shoot in **1080i/25** and add a film motion effect in post production. Most High Definition cameras can capture in either **1080i/25** or **1080p/25**. Where film motion is a requirement, progressive capture is the only acceptable method.

2.1.4 Field dominance

Cuts in material must happen on frame boundaries (i.e. between field 2 and field 1). Motion on **psf** material must always occur between field 2 and field 1 (i.e. field 1 dominance).

Note - It is possible to shoot material at **1080p/50**. If this is done, the correct 2-frame marker phasing must be maintained when down-converting to **1080i/25** or **1080psf/25**.

2.2 Video Line-Up

Programme video levels must be accurately related to their associated line-up signals. Video line-up must be colour bars of the type known as EBU 100% or 75% (100/0/100/0) or (100/0/75/0) and filling the 16:9 raster. SMPTE pattern bars are not acceptable. For required durations, see Delivery Requirements below for Tape or File as appropriate.

2.3 Video Levels and Gamut (illegal signals)

High Definition digital signals will be assessed according to the recommendation **ITU-R BT709-5 Part 2**.

Video levels must be received within the specified limits so that the programme material can be used without adjustment. Any signal outside the specified limits is described as a gamut error.

2.3.1 Measuring signal levels

Digital video levels are usually measured with a device which displays a trace like a traditional waveform monitor. This gives readings in mV (emulating an analogue signal), or as a percentage of the allowable levels.

The limits of signal levels are defined by reference to a nominal black level and a nominal white level. Black level comprises R, G and B all at zero (or 0% or 0mV) and white level is all three components at 100 % or 700mV.

In a picture signal, each component is allowed to range between 0 and 100% (or 0mV and 700mV). This equates to digital sample levels 16 and 235 (8-bit systems) or 64 and 940 (10 bit systems).

2.3.2 Tolerance of out of gamut signals

In practice it is difficult to avoid generating signals slightly outside this range, and it is considered reasonable to allow a small tolerance, which has been defined as follows under **EBU Rec103**:

- **RGB components must be between -5 % and 105% (-35 and 735mV)**

and

- **Luminance (Y) must be between -1% and 103% (-7mV and 721mV)**

Slight transient overshoots and undershoots may be filtered out before measuring, and an error will only be registered where the out of gamut signals total at least 1% of picture area. Many monitoring devices are designed to detect errors to this specification.

2.4 'Blanking'

HD images must fill the active picture area (1920 x 1080 pixels). No 'blanking errors' are permitted on new, up-converted, or archive material.

However a two pixel tolerance will be permitted during CG or complex overlay sequences where key signals, graphic overlays or other effects do not fully cover the background image. Where animated key signals or overlays cause moving highlights at the edge of the active image it is preferable to blank these pixels completely. A note of the timecodes and reasons for these errors should accompany the delivered programme.

2.5 Aspect Ratio

All high definition programmes (except as below) must be delivered in 16:9 Widescreen. This means that the active picture must fill a 16:9 screens vertically and horizontally without geometric distortion.

2.5.1 'Cinemascope ratio' letterbox

For delivery to dedicated movie channels or at the discretion of the broadcaster, programmes may be delivered with an active picture in the cinema ratios of 2.35:1 (21:9) or 1.85:1, centred vertically between black bars in a 16:9 frame, filling the width of the frame, and with no geometric distortion.

2.5.2 Floating images

Short sequences of images surrounded by black borders, (floating images), may be used for artistic effect. Note however, that widescreen consumer TV sets operating in Auto Zoom / Auto mode often interpret large black borders at the top and bottom of the screen as letterbox, so are likely to enlarge the picture. The resulting unpredictable zooming can be annoying for the viewer and undermine the artistic intent. If used, the black space around floating images must be consistent across sequences of images.

2.5.3 'Pillarboxed' HD material

Some 'pillar-boxed' material is acceptable at the discretion of the broadcaster where it has been acquired on a medium that has the capability to be transferred to a legitimate HD resolution, for example, 35mm film shot using 4 perf at an aspect ratio narrower than 16:9. The pictures must be centrally framed in a 16:9 raster with no geometrical distortion.

2.6 Archive Material

Archive material must meet all the requirements in this document, including those for up-converted SD video where relevant, except for the following:

2.6.1 General quality - archive

Archive material must be taken from the best available source, and any improvement or restoration work which could reasonably be expected must be done (for example grading, dropout repair or audio equalisation.)

2.6.2 Aspect ratio - archive

Archive material should be zoomed to fill the 16:9 raster where possible without compromising the image quality or composition, otherwise it may be presented in a pillar-box format, which:

- may be of an intermediate ratio between 4:3 and 16:9, but must be of consistent width across sequences,
- must be centrally framed in the 16:9 raster,
- must show no geometrical distortion,
- must have clean and sharp pillar-box edges (i.e. any video or film edge artefacts may need to be blanked.)
- must be black outside the active picture, unless otherwise specified by the broadcaster.

Note however, that consumer TV sets operating in Auto Zoom / Auto mode may enlarge the picture to fill the screen horizontally. The resulting unpredictable zooming can be annoying for the viewer and undermine the artistic intent.

2.6.3 Safe areas - archive

Any captions or text already in the archive material should be kept within the caption safe area if possible, but if not, should be noted in the accompanying documents.

2.7 Use of Non-HD material

Some high definition programmes will contain some material from standard definition originals, and sources which are not considered to meet HD broadcast standards, such as domestic camcorders. This material is all called 'non-HD' in this document.

To maintain a high standard and meet audience expectations the amount of non-HD material is limited to **25%** of the programme's total duration. Non-HD material must not be used for large uninterrupted sections of the programme, unless agreed by the broadcaster. This includes archive material.

2.7.1 Non-HD material

Material acquired using the following methods or formats is considered to be below the high definition standard and will therefore be treated as non-HD:

- HDV from all manufactures
- Most cameras with image sensors under 1/2"
- Frame based (intra-frame) recording formats below 100Mb/s
- Inter-frame based recording formats below 50Mb/s
- Material generated or processed on 720 line equipment
- Film not meeting the requirement for HD in section **2.8** below

2.7.2 Up-converted SD video material

Particular care must be taken to deliver the best possible quality of up-converted material. In general standard definition pictures must look no worse than the original after being up converted, post processed and down converted. Only high quality up-conversion processes will achieve this. Standard definition video contains a half-line at top and bottom on alternate fields. This must be removed on up-conversion to HD, or it will be visible flickering at top and bottom of the HD frame. Any VITC or switching signals visible at the top of SD material must be removed. Any line blanking from SD signals must not appear in the HD conversion.

For these reasons it is necessary that all SD material is zoomed in by a small amount on up-conversion.

2.8 Film for High Definition Acquisition

Super16 film is *not* considered to be high definition no matter what processing or transfer systems are used. The following **35mm** film types and stock are acceptable for high definition acquisition;

- 3 perf - any exposure index although an exposure index of 250 or less is preferred.
- 2 perf – only if daylight stock with an exposure index of 250 or less is used

To avoid causing problems with high definition transmission encoding film should be well exposed and not forced more than one stop.

2.9 Photosensitive Epilepsy (PSE)

Flickering or intermittent lights and certain types of repetitive visual patterns can cause serious problems for viewers who are prone to photosensitive epilepsy. Children & teenagers are particularly vulnerable.

All UK Television channels are subject to the **Ofcom BROADCASTING CODE 2009** which states:

Section 2: Harm and Offence:

2.12 Television broadcasters must take precautions to maintain a low level of risk to viewers who have photosensitive epilepsy. Where it is not reasonably practicable to follow the Ofcom guidance (see the Ofcom website), and where broadcasters can demonstrate that the broadcasting of flashing lights and/or patterns is editorially justified, viewers should be given an adequate verbal and also, if appropriate, text warning at the start of the programme or programme item.

The Ofcom guidance is at: <http://stakeholders.ofcom.org.uk/binaries/broadcast/guidance/813060/section22009.pdf>

2.9.1 Testing for flashes and patterning

All programmes for tape delivery must be tested using the Harding Flash Pattern Analyser Algorithm v2.5 on an SD down-converted SDI feed.

All programmes for file delivery must be tested using the Harding Flash Pattern Analyser Algorithm v3.4 or later.

Any failure whatsoever will result in rejection of the programme, and any affected sections must be repaired and re-tested before acceptance.

Broadcasters will, at their discretion, either test the programme during the Quality Control process, or will require a relevant Harding FPA pass certificate to be delivered with the tape.

2.9.2 PSE-broadcast warnings

Verbal or on-screen text warnings at start of programme may only be used in exceptional circumstances when:

- **The relevant content is completely integral and necessary to the context of the programme and,**
- **Permission to use the relevant content has been cleared by the relevant broadcaster and documented in writing by those responsible for commissioning /editorial content.**

Advance notification and planning requirements will vary by broadcaster.

2.10 Safe Areas for Captions

Captions and credits must be clear and legible and must be within the safe areas specified.

All font sizes must be legible as HD and also after down conversion for the SD viewer.

There are two primary caption safe areas defined for 16:9 material for UK transmission:

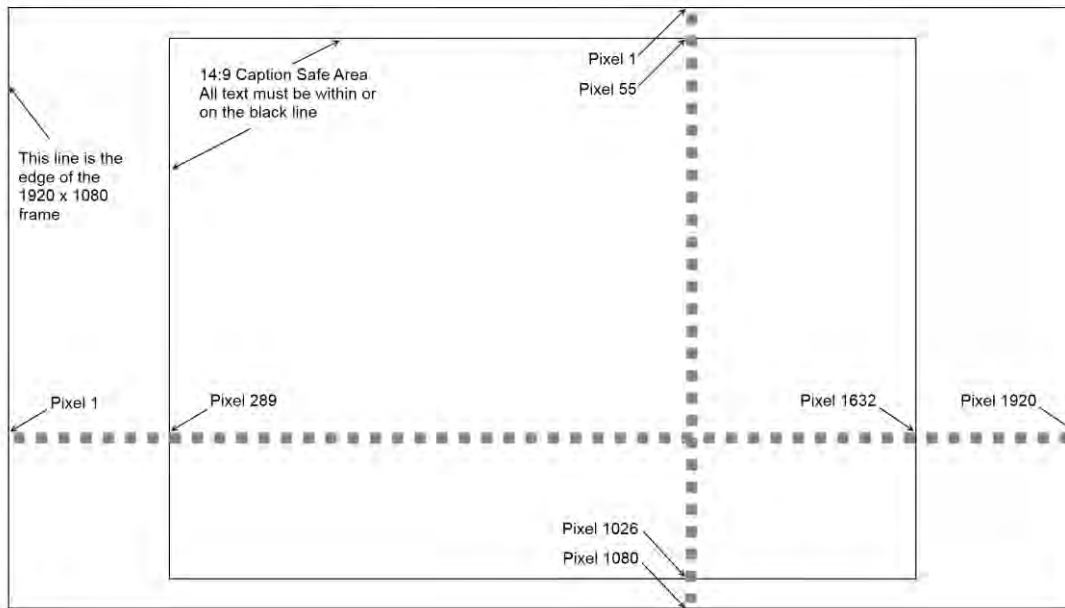
- **14:9** used for the majority of UK programmes/broadcasters.
- **4:3** required for certain programmes/broadcasters or for programmes distributed internationally.

| Caption Safe Area | Defined as (%) | HD pixels (inclusive) first pixel numbered 1 | TV line numbers (inclusive) numbering as per "Rec709" |
|--------------------------|---------------------------------------------|---------------------------------------------------------|------------------------------------------------------------------|
| 14:9 Caption safe | 70% of Active Width 90% of Active Height | 289 – 1632 55 – 1026 | 48 to 532 (F1) and 611 to 1095 (F2) |
| 4:3 Caption safe | 65% of Active Width 90% of Active Height | 337 – 1584 55 – 1026 | 48 to 532 (F1) and 611 to 1095 (F2) |

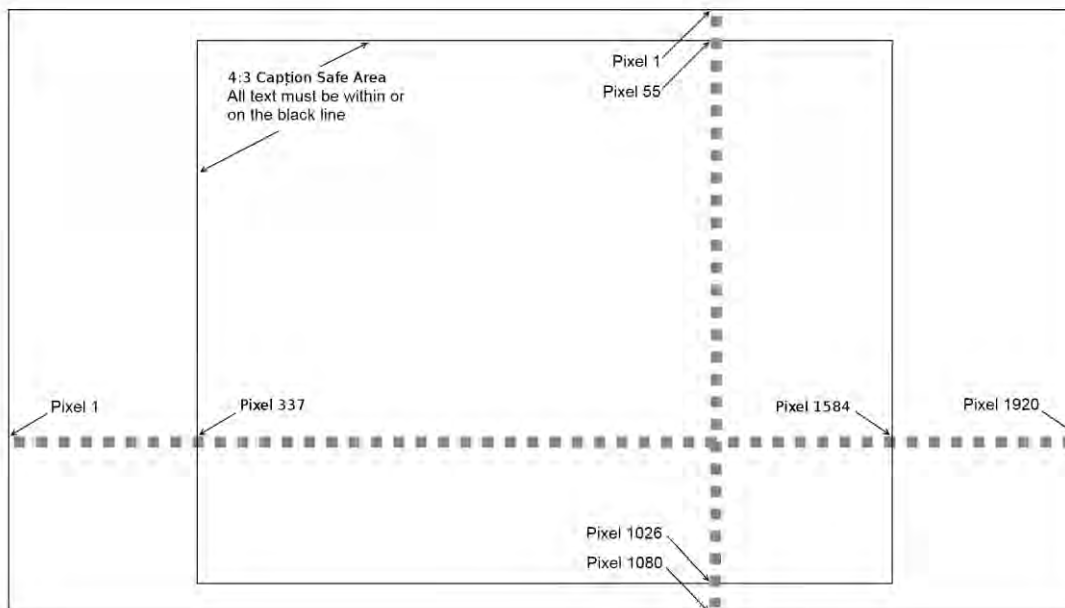
At the discretion of the broadcaster, programmes such as feature films and some acquisitions may be

excluded from this requirement.

2.10.1 14:9 Caption Safe Area (BBC, C4, C5, ITV & S4C)



2.10.2 4:3 Caption Safe Area (BSkyB)



2.11 Standards Conversion

When standards converted material is included in a programme, Motion Compensation (sometimes known as Motion Predictive or Motion Vector) standards conversion is required.

Currently speed change is the preferred method of changing between 24fps (including 23.98) and 25fps standards. Due attention must be given to the audio.

Use of non-linear editing platform hardware or software standards conversion is not permitted for whole programmes but may be used for short inserts at the discretion of the broadcaster.

3 Technical Requirements – Audio

NOTE - This section is applicable to both file and tape deliveries. Requirements which are different for file and for tape are covered in separate sections 4 and 5.

Programmes delivering surround sound must also carry a stereo mix meeting all requirements for stereo. This may be a mix-down from the surround channels. 5.1 and stereo must be synchronous.

Stereo viewers will receive either the stereo mix, or a mix-down from the surround channels generated in the playout chain or at their receiver.

For track layout and allocations, see the relevant Delivery Requirements for File (Section 4.4.1) or Tape (Section 5.4.).

3.1 Stereo Audio Requirements

Stereo tracks must carry sound in the A/B (Left/Right) form.

If mono originated sound is used, it must be recorded as dual mono, so that it may be handled exactly as stereo. It must meet all the stereo standards regarding levels, balance and phase.

3.1.1 Stereo line-up tones

All stereo tracks must use EBU 1KHz tone (left ident). All tones must be sinusoidal, free of distortion and phase coherent between channels.

Digital Audio Reference level is defined as 18dB below the maximum coding value (-18dBFS) as per EBU recommended practice R68.

3.1.2 Stereo audio levels and measurement (loudness or volume)

Stereo programme audio levels are currently measured by Peak Programme Meters (PPM). The Maximum or Peak Programme Level must never exceed 8dBs above the programme's reference level. The following levels, as measured on a PPM meter to BS6840: Part 10 with reference level set at PPM 4, are indicative of typical levels suitable for television, and are given as guidance only.

| MATERIAL | NORMAL | PEAKS FULL RANGE |
|--------------------------------------------------------------------------|---------------|-------------------------|
| | PPM | PPM |
| Dialogue | 3 - 5 | 3 - 6 |
| Uncompressed Music | 5 | 2 - 6 |
| Compressed Music (depending on degree of compression) | 4 | 2 - 4 |
| Heavy M & E (gunshots, warfare, aircraft, loud traffic, etc.) | 5 - 6 | |
| Background M & E (office/street noise, light mood music etc.) | 1 - 3 | |

All programmes must also be compliant with EBU recommendation on Loudness EBU R128.

3.1.3 Stereo phase

Stereo programme audio must be capable of mixing down to mono without causing any noticeable phase cancellation.

3.2 Surround Sound Requirements

Surround sound is transmitted as 5.1 format, and will be delivered as discrete tracks, except by agreement with the broadcaster.

3.2.1 Surround line-up tones

All surround tracks must carry BLITS tone, as described in **EBU Technical Paper 3304**. An audio file of BLITS tone may be downloaded from broadcasters' websites.

3.2.2 Surround audio levels and measurement (loudness or volume)

All programmes must also be compliant with EBU recommendation on Loudness EBU R128.

3.3 Sound to Vision Synchronisation

The relative timing of sound to vision should not exhibit any perceptible error. Sound must not lead or lag the vision by more than 5 ms.

3.3.1 Audio / Video sync markers

To assist in maintaining A/V sync through the post-production process, a 'sync plop' may be used. If the delivered programme leader contains one it must meet the following conditions:

- The sync plop must be between timecode 09:59:57:06 and 09:59:57:08
- The audio plop must be 1kHz tone on all tracks at -18dB (standard zero level)
- The duration of the vision flash must be 2 frames to allow it to pass through standards conversion successfully
- The audio plop must be synchronous across all audio PCM audio tracks and with the video flash (within +/- 5 ms)
- If an end sync plop is used it must be no closer than 10 seconds to the end of the programme and comply with the points above.

4 File Delivery Requirements

All programmes delivered as files must comply with all the relevant video and audio requirements above. The files must conform to AMWA Specification AS-11 v1.0 constrained to the UK DPP AS-11 shim.

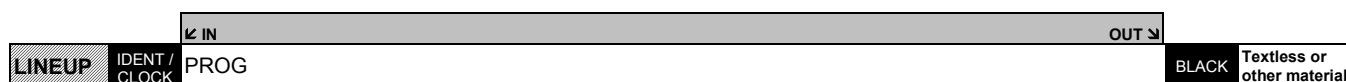
This document covers the requirements for transmission-ready files. There may be additional requirements for programmes intended for further editing, re-versioning or archiving.

The method of delivery to the broadcaster of programme files is to be agreed with the relevant broadcaster. Information on the options is available on the DPP website, <http://www.digitalproductionpartnership.co.uk/>

Each programme should be delivered as a single principal MXF file containing the audio and video, plus a single XML file (see 4.11 Metadata below.) There must be only one programme in each file, although a programme may be either soft or hard-parted within that file, as specified by the broadcaster, according to the diagrams below. Only when agreed in advance with the relevant broadcaster, programmes in several parts may be delivered in more than one file, as shown in the third diagram below.

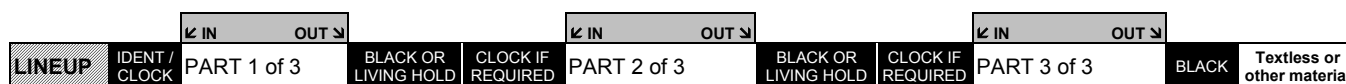
Single part or soft parted programme

A single part programme will always be played out from start point to end point without interruption. Soft parting is where a programme is provided as a single continuous programme, but the broadcaster may break the transmission of the programme at several points to insert commercials or for other reasons. IN and OUT points for continuous playback only must be included with the delivery metadata; suggested timecodes for breaks should not be included.



Hard - parted programme

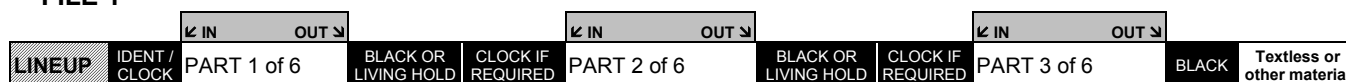
A hard-parted programme is billed and scheduled for transmission as a single entity, but is delivered as a single file containing clearly separated parts between which adverts, trails etc will be inserted.



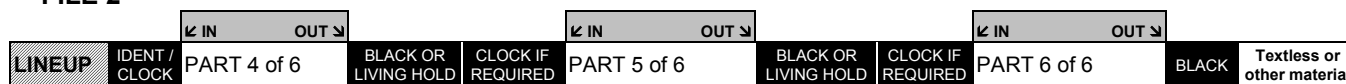
Multi - part programme delivered on multiple files

Where a programme's delivery must be split over more than one file, e.g. due to editing up to transmission.

FILE 1



FILE 2



4.1 File format

Each high definition programme must be delivered as a single MXF OP1a file which conforms to the AMWA specification AS-11 v1.0. The AS-11 file must use the 'UK DPP HD shim specification' that describes exactly how the file must be constructed to meet DPP requirements.

The AS-11 file must contain the metadata described in section 4.11 below

Note: AS-11 is an Application Specification published by the Advanced Media Workflow Association (www.amwa.tv) and applies to MXF OP1a files that are intended for delivery of finished programming. MXF provides an extensive 'toolkit' and this specification describes how it must be used to ensure that finished programmes are interoperable when exchanged between production companies, post houses, broadcasters and other organisations in the programme delivery workflow.

Although AS-11 restricts how the MXF file is constructed it does permit some variation to suit location or other specific requirements (differing frame rates between Europe and the USA, for example). The specification therefore includes the concept of a 'shim' that further refines (or constrains) the possible options to a single, carefully controlled set that meets an individual requirement. DPP has defined two AS-11 shims, one for SD and one for HD file delivery in the UK.

A copy of the AS-11 specification is provided at the end of this document. Consult your systems suppliers to ensure they can provide AS-11 compliant files.

4.2 Video codec

As described by the AS-11 specification (and the UK DPP HD shim), the video essence in the file must be encoded at a nominal bitrate of 100Mbit/s using the 'AVC Intra' codec. It must use the High 4:2:2 Intra profile@level 4.1. AS-11 gives full technical details of how the file should be constructed.

4.3 Image format

HD video must be recorded with an active picture area of 1920 x 1080 pixels.

This must normally be structured as interlaced at 50 fields per second, described as System 2 in EBU-TECH 3299. Material may be originated as progressive scan, but should be delivered as interlaced. Also note the requirement in 2.1.1 above that moving graphics and effects, such as credit rollers, DVE moves etc, are always interlaced.

In some cases, only where specifically required by the broadcaster, material which has been originated entirely progressively, described as System 3 in EBU-TECH 3299, must be delivered as a progressive structured file.

4.4 Audio

The audio must be frame interleaved with the video as described by AS-11. All audio tracks must be encoded as PCM with a sample rate of 48kHz at a depth of 24bits/sample.

4.4.1 Track allocations

HD files must contain a group of either 4 or 16 tracks, with track allocations as on the table below. The EBU R48 or R123 code must be included in the metadata (see 4.11 below) to identify the track allocations.

| EBU Reference code | Prog Type | Audio track numbers | | | | | | | | | | | | | | | |
|--------------------|-----------------------------------|---------------------|-----------------|----------------|----------------|-----------------|-----------------|-----------------|-------------------|------------------|------------------|--------------|----------------|---------------|---------------|------------|------------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| R48: 2a | Stereo | St. Final Mix L | St. Final Mix R | Silence | Silence | | | | | | | | | | | | |
| R123:4b | Stereo with M&E | St. Final Mix L | St. Final Mix R | St. M&E L | St. M&E R | | | | | | | | | | | | |
| R123:4c | Stereo with Audio Description | St. Final Mix L | St. Final Mix R | St. Aud Desc L | St. Aud Desc R | | | | | | | | | | | | |
| R123:16c Option 1 | Stereo, 5.1 and M&E | St. Final Mix L | St. Final Mix R | St. M&E L | St. M&E R | 5.1 Final Mix L | 5.1 Final Mix R | 5.1 Final Mix C | 5.1 Final Mix LFE | 5.1 Final Mix Ls | 5.1 Final Mix Rs | 5.1 M&E L | 5.1 M&E R | 5.1 M&E C | 5.1 M&E LFE | 5.1 M&E Ls | 5.1 M&E Rs |
| R123:16c Option 2 | Stereo, 5.1 and Audio Description | St. L Mix | St. R Mix | St. Aud Desc L | St. Aud Desc R | 5.1 Final Mix L | 5.1 Final Mix R | 5.1 Final Mix C | 5.1 Final Mix LFE | 5.1 Final Mix Ls | 5.1 Final Mix Rs | 5.1 M&E L | 5.1 M&E R | 5.1 M&E C | 5.1 M&E LFE | 5.1 M&E Ls | 5.1 M&E Rs |
| R123:16d | 5.1 Two languages | 5.1 Lang 1 L | 5.1 Lang 1 R | 5.1 Lang 1 C | 5.1 Lang 1 LFE | 5.1 Lang 1 Ls | 5.1 Lang 1 Rs | Other | Other | 5.1 Lang 2 L | 5.1 Lang 2 R | 5.1 Lang 2 C | 5.1 Lang 2 LFE | 5.1 Lang 2 Ls | 5.1 Lang 2 Rs | Other | Other |
| R123:16f | Three Languages | St. Lang 1 L | St. Lang 1 R | Not Used | Not Used | St. Lang 2 L | St. Lang 2 R | Not Used | Not Used | St. Lang 3 L | St. Lang 3 R | Not Used | Not Used | Other | Other | Other | Other |

Note:

- R48:2a, R48:4b, R123:4b, R123:4c, R123:16c must only be used for programmes with single language soundtracks
- R123:16d must only be used for programmes with dual language soundtracks
- R123:16f must only be used for programmes with 3 different language soundtracks

Any unused audio tracks in the 16 track groups above must contain digital silence and encoded as PCM audio.

For compatibility with stereo systems, any audio generated as mono must be presented on two phase-coherent tracks, and flagged as stereo.

Any additional audio tracks required by the broadcaster must be delivered separately as 'B-WAV' files. (See 4.9 below)

The naming conventions used in all related documentation and metadata (see 4.11 below) must match those specified above.

4.5 Programme Layout / Format

All programmes delivered on file or tape must be laid out with elements in the following pattern relative to timecode:

| Time-code | Duration | Picture | Sound |
|------------------------------------|-------------------------------|-------------------------------------------|-------------------------------------------|
| 09.58.00.00 | 90' | EBU Bars (100/0/75/0 or 100/0/100/0) | Lineup tone |
| 09.59.30.00 | between 27" 00fr and 27" 05fr | Ident Clock or Slate | Silence |
| 09.59.57.06 (optional) | 2fr | 2 Frames peak white | 1 Frame tone (on first video white frame) |
| 09.59.57.06 | 2" 19fr | Black | Silence |
| 10.00.00.00 | | Programme | Programme |
| end of part (multipart programmes) | 5" | freeze or 'living hold' after end of part | fade or cut to silence by end of part |
| end of prog | 10" | freeze or 'living hold' | fade or cut to silence |
| end of prog + 10" (optional) | 2fr | 2 Frames peak white | 1 Frame tone (on first video white frame) |

4.5.1 Start and end

Note that it is usual for sound and vision to be automatically cut to air on transmission, so early vision or sound is not normally required. Vision may fade up from black starting at 10.00.00.00 if desired.

All programmes must end with a fade or cut to silence **before** the intended end point. Any fade out or reverb must be allowed for within the programme duration.

Vision freeze or 'living hold' must be held for a further 10" after the end point.

Any other programme elements after the end of the programme should not start less than 1min after end of programme.

4.5.2 The Ident Clock or Slate

A countdown clock or slate clearly displaying the following information must precede the start of programme and any subsequent part:

- Programme I.D. number
- Programme title (and series number if applicable)
- Episode number (if applicable)
- Episode subtitle (if applicable)
- Version (Pre/post watershed etc if necessary)
- Part number (if applicable)

No technical information may be included. The clock or slate may display telephone contact numbers for the post-production facility and production company, and may display company branding.

Where a moving clock is used, it must provide a clear countdown of at least 20 seconds, including a hand moving in 1 sec steps (i.e. **not** smooth motion) around a circular clock face. Clocks with only digital countdown are not acceptable.

There must be no audio tone or ident over the clock.

4.6 3D Delivery

Programmes delivered for 3D transmission will be subject to additional requirements and agreement with the broadcaster. The appropriate metadata flags should be set as specified in 4.11 below.

4.7 Closed captions (Subtitles)

Closed captions or subtitles must be delivered as a separate file as required by each broadcaster. The separate file must be named identically as the principal MXF file, apart from the filename extension.

4.8 Timecode

Timecode must be as specified in the AMWA AS-11 specification (para 6.3.6). To ensure compatibility with downstream systems it is very important that timecode is inserted in the file exactly as specified.

4.9 Audio only files

Additional audio only files related to a programme, such as Audio Description files, must be supplied as BWF (sometimes called 'B-WAV') files, conforming to the specification in EBU-Tech 3285. File duration and timecode must exactly match the principal MXF file.

4.10 SD Files (Legacy programmes only)

Delivery of standard definition legacy programme files must be by agreement with the broadcaster. Those files must meet the following requirements:

4.10.1 File format

Each standard definition programme must be delivered as a single MXF OP1a file which conforms to the AS-11 specification v1.0 published by AMWA. The AS-11 file must use the 'UK DPP SD shim specification' that describes exactly how the file must be constructed to meet DPP requirements.

The AS-11 file must contain the metadata described in section 4.11 below

4.10.2 Video codec

As described by the AS-11 specification (and the UK DPP SD shim), the video essence in the file must be encoded at a nominal bitrate of 50Mbit/s using the SMPTE ST 0356:2001 D-10 stream specification. This is a constrained version of MPEG-2 4:2:2 P@ML. AS-11 gives full technical details of how the file should be constructed.

4.10.3 Image format

SD video files must be recorded with a picture area of 702 x 576 pixels, where the 702 pixel wide picture must be centred in the active 720 pixel wide line. The picture information may extend the full width of the 720 pixel wide line, providing the image shape is not distorted. In either case there must be an additional 32 lines corresponding to a Vertical Blanking Interval (VBI) making a total of 720 x 608. The VBI must not contain any data or image.

4.10.4 Audio essence

The audio must be frame interleaved with the video as described by AS-11. All audio tracks must be encoded as PCM in an AES stream with a sample rate of 48kHz at a depth of 24bits/sample.

4.11 Metadata

Metadata is the name for all the information which is not the audio or video essence, but which is required to ensure that contents of the file can be identified correctly, and can be played back or converted in various systems. The metadata required is specified below, and must be delivered both within the principal file, and in an additional XML file (a type of text file which organises data so that it can be read in a standard way by computer systems, and which can be considered equivalent to a paper VTRR delivered with a tape.) For developers, the metadata XML schema will be made available.

Metadata can usefully be divided into two categories:

Structural

Describes the technical format of the file itself, the audio and video essences, and the other metadata included with the file. Structural metadata is usually added automatically by systems which construct the file, and are relied on by systems which decode the file. It will include information about the compression codecs used and which audio tracks are present.

Descriptive

Descriptive metadata is usually added manually by the producer of the file. This includes information which will be read by the users of the file in order to identify the material and use the appropriate parts for further operations. It will include the titles and ID numbers for the programme, and the allocations of the audio tracks present.

4.11.1 Filenames

Filenames for the MXF and XML files must be supplied as specified by each broadcaster, and should contain the relevant programme identifier information. Filenames must be in upper case, with filename extensions in lowercase. Allowable characters are 'A-Z', '0-9', '-' & '_'.
The Broadcaster specific naming convention is shown on page 1.

4.11.2 UK DPP Metadata application

Metadata should initially be generated by the programme supplier using the **UK DPP Metadata application**, which will be available for download from the DPP website. This is an application which will allow entry and insertion of the metadata into the MXF programme file. It will also generate the required XML file, and a checksum which is used to verify delivery to the broadcaster.

These must be done after all post-production is complete and the file is ready for delivery to the broadcaster, as any changes whatsoever to the file will invalidate the metadata and cause the file to be rejected.

The XML file must be named identically, apart from the filename extension, to the principal MXF file.

4.11.3 Delivery Requirements in MXF

Metadata within the principal MXF file must be as described by the AMWA AS-11 specification with DPP shims, and must correctly reflect the material contained in the file.

Descriptive metadata must be included in the relevant metadata tracks within the file, and must be identical to that in the XML file.

4.11.4 Delivery requirements in XML

The XML file must be delivered with the MXF file according to the delivery method required by each broadcaster.

The metadata included in the MXF and XML files will be identical except that the XML contains the following additional fields, which are generated and filled by the UK DPP Metadata application:

- Associated Media Filename
- Media Checksum Type
- Media Checksum Value
- Part SOM
- Part Duration

4.11.5 Required Metadata

The metadata required is detailed in the table below. The mandatory column indicates which fields must be entered before delivery of the file. The entries highlighted as and bold in the Mandatory column should be entered by a production or technical representative. The remaining mandatory fields which are not highlighted will be derived by the DPP Metadata application from the MXF file structure.

More comprehensive details on these fields and allowable values can be found in the associated DPP Metadata spread-sheet v10

| Field Name | Definition and usage | Mandatory | Typical Values |
|------------|----------------------|-----------|----------------|
|------------|----------------------|-----------|----------------|

| Editorial | | | |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------------------------|
| Series Title | The final title of a grouping of publishable assets with shared identification and branding linked by common characters, subject matter, style or story. <ul style="list-style-type: none"> This could be a series, serial or themed grouping. May include a series or season number, or a year. One off programme titles must also be entered in this field | Yes | Coronation Street- Series 52 (2011) |
| Programme Title | The final title of a unique asset. <ul style="list-style-type: none"> One off programmes must repeat the title used as the Series Title. | Yes | 7507 |
| Episode Title / Episode No | The final episode title used to identify an individual episode or an editorially distinct version, and / or a number representing its transmission order within the series. | Yes | 7507 International Version |
| Production Number | A unique number used to identify an individual Programme Version. <ul style="list-style-type: none"> Also known as Clock Number, Programme number or Material ID. The commissioning broadcaster will inform you of their required number. | Yes | DRIB111P/01 |
| Synopsis | A brief descriptive summary of the content | No | |
| Originator | Company responsible for creating the programme. <ul style="list-style-type: none"> Programmes may also be delivered via a distributor - see below. | Yes | Angst Productions |
| Copyright Year | Year in which the production was completed | Yes | 2011 |
| Other Identifier | Usually a programme-specific code used by broadcasters for rights management or re-broadcast purposes, e.g. ISAN number, contract number, costing number or UMID. | No | |
| Other Identifier Type | Description of Other Identifier, e.g. ISAN number, costing number or contract number | No | ISAN number |
| Genre | A genre categorising the whole asset. | No | Comedy |
| Distributor | The name of the person or company providing the content, if this is not the originator. | No | Sony Pictures |

| Technical | | | |
|------------------|-------------------------------------------------------------------------------------|------------|----------------------------------------|
| Shim name | The name of the AS-11 shim specification to which the associated MXF file conforms. | Yes | UK DPP HD Rev.1.0 UK DPP SD Rev 1.0 |

| Video | | | |
|----------------|--------------------------------------------------------------------------|-----|----------------------|
| Video Bit Rate | Nominal video bit rate in bits per second | Yes | 100000000 |
| Video Codec | Name of the video codec | Yes | AVC-Intra 100 D10 50 |
| Video Codec | The detailed codec profile and level information used to create the file | Yes | |

| | | | |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------------------------------------------------|
| Parameters | | | |
| Picture Format | This describes the picture structure, using pre-defined codes. | Yes | 576i 50 1080i 50 |
| AFD | This will be used in conjunction with the picture ratio field to determine the complete aspect ratio of the asset. | Yes | 9 / 10 / 14 |
| Picture ratio | Used in addition to the AFD field to further determine the complete aspect ratio of the asset, e.g. where the image is letterboxed or pillarboxed. | Yes | 2.35:1 1.85:1 1.78:1 1.56:1 1.33:1 |
| 3D | Whether the programme is made for 3D transmission. | Yes | Yes / No |
| 3D type | This describes the type of 3D being delivered. A formal system of 3D type codes is being developed. | No | Left/Right Side by side |
| Product Placement | To be set if the content contains product placement. | No | Yes / No |
| FPA Pass | Status of any flashing and pattern analyser test carried out on the material for PSE. | Yes | Yes No Not tested |
| FPA Manufacturer | Product used to carry out the PSE analysis. | No | Harding FPA BPR Gordon |
| FPA Version | Version of algorithm used to carry out the PSE analysis. | No | FPA V2.5 FPA V3.4 Gordon V1.0.0 |
| Video Comments | The comments which illustrate the subjective quality and any known artefacts or defects (inc. intentional) within the video content discovered during production / post production / or any subsequent technical QC/Review process. | No | |

| Audio | | | |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------------------------------|
| Audio Sampling Frequency | The sampling frequency used in kHz (must be the same for all audio tracks) | Yes | 48.000 |
| Audio bit depth | No. of quantisation bits in the audio signal. (must be the same for all audio tracks) | Yes | 24 |
| Audio Codec parameters | The audio codec employed for the creation of the file. | Yes | PCM |
| Audio Track Layout | Code in accordance with EBU R123 and R48 <ul style="list-style-type: none"> The requirement is to always have 16 tracks (4 for SD) and digital silence must be encoded on tracks not used for audio | Yes | 4a, 4b, 4c, 16d, 16f |
| Primary Audio Language | Main language used on primary audio tracks <ul style="list-style-type: none"> Use ISO 639.2 values - three letter codes | Yes | none, eng, ita, wel etc. |
| Secondary Audio Language | Main language used on secondary audio tracks <ul style="list-style-type: none"> Use ISO 639.2 values - three letter codes | Yes | none, eng, ita, wel etc. |
| Tertiary Audio Language | Main language used on tertiary audio tracks <ul style="list-style-type: none"> Use ISO 639.2 values - three letter codes | Yes | none, eng, ita, wel etc. |
| Compliant Audio Standard | States the audio standard which defines the audio track layout | Yes | R48 R123 |
| Audio Comments | QC comments to illustrate subjective quality and any known artifacts or defects | No | Wide dynamic range in places |

| Timecodes | | | |
|----------------------------------|-------------------------------------------------------------------------------------|-----|--------------------|
| Line up start | Timecode for start of line up test signals. | Yes | 09:58:00:00 |
| Ident Clock Start | Timecode for start of countdown clock or static slate. | Yes | 09:59:30:00 |
| <i>Repeating Group: Timecode</i> | | | |
| Part Number | Identifier for the part no. | Yes | 1/1, 1/3, 2/3, 3/3 |
| Part Total | The total number of parts in the programme. (May be across more than one file) | Yes | 1, 3, 6 |
| Part SOM | SMPTE timecode for first frame of the part number. To be included in XML file only. | Yes | 10:00:00:00 |

| | | | |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-----|-------------|
| Part Duration | SMPTE timecode for the duration of the part number. To be included in XML file only. | Yes | 00:08:22:00 |
| <i>End of repeating group: Timecode</i> | | | |
| Total Number of Parts | The total no. of 'hard' parts contained within the file. (May not be the total for the programme, if on more than one file) | Yes | 1,3 |
| Total Programme duration | Total of all part durations | Yes | 00:57:22:00 |

| Access Services | | | |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------|
| Audio Description Present | Whether the programme contains an Audio Description soundtrack | Yes | Yes / No |
| Audio Description Type | Type of Audio Description soundtrack | Yes | Control Track and Data AD Mix |
| Closed Captions | Whether the programme contains closed captions. | Yes | Yes / No |
| Closed Captions Type | Type of closed captions used | No | Hard of Hearing, Translation |
| Closed Captions Language | Language used in closed captions <ul style="list-style-type: none"> Use ISO 639.2 values - three letter codes | No | eng, ita, wel etc. |
| Open Captions | Whether open captions are present | Yes | Yes / No |
| Open Captions Type | Type of open captions | Yes | Hard of Hearing, Translation |
| Open Captions Language | Language used in open captions <ul style="list-style-type: none"> Use ISO 639.2 values - three letter codes | No | eng, ita, wel etc. |
| Signing Present | Whether sign language interpreter is in vision | Yes | Yes / No / Signer only |
| Sign Language | The language used by a sign language interpreter e.g. BSL (British Sign Language) / Makaton | No | BSL / Makaton |

| Additional | | | |
|---------------------------|----------------------------------------------------------------------|-----|----------------------------------------------------------|
| Completion Date | Date of completion of the edit before delivery of the programme | Yes | 15/12/2010 |
| Textless Elements Exist | Whether clean textless elements are present after the main programme | No | Yes / No |
| Programme Has Text | Used to identify if the main programme is free of any text. | No | Yes / No |
| Programme text language | Use ISO 639.2 values | No | eng, ita, wel etc. |
| Associated media filename | To be included in XML file only | Yes | 12345_001_001_V1.mxf |
| Media Checksum type | To be included in XML file only | Yes | MD5 / SHA-1 |
| Media Checksum value | To be included in XML file only. | Yes | 2fd4e1c6 7a2d28fc ed849ee1 bb76e739 1b93eb12 |

| Contact Information | | | |
|----------------------------|-----------------------------------------------------------------------------------------------------------------|-----|--|
| Contact Email | The contact details for the person in the company responsible for delivering the completed commission. | Yes | |
| Contact telephone no. | The contact telephone number for the person in the company responsible for delivering the completed commission. | Yes | |

5 Tape Delivery Requirements

Note that programmes delivered on tape must comply with all the requirements of this document other than those for file or live delivery.

5.1 Videotape recording

5.1.1 Tape format

HDCam SR is the only format acceptable for HD tape delivery. The recording must be fully compliant with the manufacturer's technical specification thereby ensuring format compatibility.

Tapes must be clean, new stock, in the manufacturer's case, protected by suitable packaging and clearly labelled. Note that flock filled padded envelopes are not suitable since a failure in the packaging can lead to contamination of the tape. All tapes must be supplied with the record lockout "on" and fully rewind. It is recommended to "double rewind" before shipping to ensure an even tape pack. Labels must be fixed to both the cassette case and cassette and must not obscure the spools or obstruct the flap mechanism.

5.1.2 'i' and 'psf' Flags

All programmes must be delivered with flags set to 'i' throughout the programme, even if the bulk of the programme has been originated progressively. This is because some equipment introduces processing to 'psf' flagged material which degrades some material. Broadcasters may accept certain material with 'psf' flags entirely at their discretion.

5.1.3 Time-code

LTC and ancillary timecode (referred to as VITC on HDCam SR VTRs) must be identical, contiguous and continuous throughout the recording.

It is recommended that assemble edits should not be used between the start of the clock and the end of the programme, as they may introduce LTC discontinuities.

5.2 Programme Layout / Format

All programmes delivered on file or tape must be laid out with elements in the following pattern relative to timecode:

| Time-code | Duration | Picture | Sound |
|------------------------------------|-------------------------------|-------------------------------------------|-------------------------------------------|
| 09.58.00.00 | 90' | EBU Bars (100/0/75/0 or 100/0/100/0) | Lineup tone |
| 09.59.30.00 | between 27" 00fr and 27" 05fr | Ident Clock | Silence |
| 09.59.57.06 (optional) | 2fr | 2 Frames peak white | 1 Frame tone (on first video white frame) |
| 09.59.57.06 | 2" 19fr | Black | Silence |
| 10.00.00.00 | | Programme | Programme |
| end of part (multipart programmes) | 5" | freeze or 'living hold' after end of part | fade or cut to silence by end of part |
| end of prog | 10" | freeze or 'living hold' | fade or cut to silence |
| end of prog + 10" (optional) | 2fr | 2 Frames peak white | 1 Frame tone (on first video white frame) |

5.2.1 Start and end

Note that it is usual for sound and vision to be automatically cut to air on transmission, so early vision or sound is not normally required. Vision may fade up from black starting at 10.00.00.00 if desired.

All programmes must end with a fade or cut to silence **before** the intended end point. Any fade out or reverb must be allowed for within the programme duration.

Vision freeze or 'living hold' must be held for a further 10" after the end point.

Any other programme elements after the end of the programme should not start less than 1min after end of programme.

5.2.2 Programmes longer than a single tape

If a programme must be delivered on two or more tapes because it is longer than the capacity of a single HDCam SR tape, the second part must begin at the next whole hour timecode after the end of the first part - e.g. 12:00:00:00 or 13:00:00:00 with appropriate continuous timecode throughout the line-up and clock sequence above.

5.2.3 Compilation tapes

Where a broadcaster has agreed to accept short programmes on a compilation tape, there must be at least 15" of black and silence between the end of one programme and the start of the clock for the following programme. (i.e. after the 10" hold)

Each programme must be recorded to begin at a 'full minute' - i.e. Timecode HH:MM:00:00

5.2.4 Ad breaks

For hard-parted programmes, each part must be preceded by a countdown clock as below.

There must be at least 15" of black and silence between the end of one part and the start of the clock for the following part. (i.e. after the 10" freeze)

Each part must be recorded to begin at a 'full minute' - i.e. Timecode HH:MM:00:00

5.2.5 The Ident Clock

A countdown clock clearly displaying the following information must precede the start of programme and any subsequent part:

- Programme I.D. number
- Programme title (and series number if applicable)
- Episode number (if applicable)
- Episode subtitle (if applicable)
- Version (Pre/post watershed etc if necessary)
- Part number (if applicable)

No technical information may be included. This means HD format, tape format, aspect ratio, audio track allocations, safe area etc. Duration should not be included. The clock may display telephone contact numbers for the post-production facility and production company, and may display company branding. The clock must provide a clear countdown of at least 20 seconds, including a hand moving in 1 sec steps (i.e. **not** smooth motion) around a circular clock face. Clocks with only digital countdown are not acceptable.

There must be no audio tone or ident over the clock.

5.3 Paperwork

Each tape must have the following information on its box and cassette labels and on a VTRR (videotape Recording Report) included in its box:

- Programme I.D. number
- Programme title (and series number if applicable)
- Episode number (if applicable)
- Episode subtitle (if applicable)
- Version (Pre/post watershed etc if necessary)
-

In addition, the VTRR must include further information as specified by the broadcaster, which will include:

- Log of tape contents by timecode
- Editor's technical comments
- Audio track allocation
- Confirmation of PSE test pass

5.4 Audio Track layout

Audio must be delivered with track layouts as specified by the broadcaster, and will be one of the options available on the following table.

Channel 4 has a modification to this track layout for **tape** delivered HD programmes with surround sound. This is to maintain compatibility with archive programmes

| AES | Track | Format | Content Options | | |
|-----|-------|-------------|-----------------|-----------------------------------|----------------|
| 1 | 1 | Digi/SR/SDI | Main Stereo L | | |
| | 2 | Digi/SR/SDI | Main Stereo R | | |
| 2 | 3 | Digi/SR/SDI | M&E Stereo L | 2 nd Language L (Digi) | Main Dolby E* |
| | 4 | Digi/SR/SDI | M&E Stereo R | 2 nd Language R (Digi) | |
| 3 | 5 | SR/SDI | Main Front L | M&E Dolby E* | |
| | 6 | SR/SDI | Main Front R | | |
| 4 | 7 | SR/SDI | Main Centre | | |
| | 8 | SR/SDI | Main LFE | | |
| 5 | 9 | SR/SDI | Main Surround L | | |
| | 10 | SR/SDI | Main Surround R | | |
| 6 | 11 | SR/SDI | M&E Front L | 2 nd Language L (SR) | AD L (SR Only) |
| | 12 | SR/SDI | M&E Front R | 2 nd Language R (SR) | AD R (SR Only) |
| 7 | 13 | SDI | M&E Centre | | |
| | 14 | SDI | M&E LFE | | |
| 8 | 15 | SDI | M&E Surround L | | |
| | 16 | SDI | M&E Surround R | | |

Channel 4 Tape Delivery – HD programmes with Surround Sound

| AES | Track | Format | Content Options | | |
|-----|-------|--------|-----------------|--------------|-------------|
| 1 | 1 | SR | Main Stereo L | | |
| | 2 | SR | Main Stereo R | | |
| 2 | 3 | SR | Main Front L | | |
| | 4 | SR | Main Front R | | |
| 3 | 5 | SR | Main Centre | | |
| | 6 | SR | Main LFE | | |
| 4 | 7 | SR | Main Surround L | | |
| | 8 | SR | Main Surround R | | |
| 5 | 9 | SR | Main Dolby E* | If Required | |
| | 10 | SR | | If Required | |
| 6 | 11 | SR | AD L | M&E Stereo L | If Required |
| | 12 | SR | AD R | M&E Stereo R | If Required |

* Due to legacy issues there will be some variation between broadcasters for tape delivered programmes especially the position of Dolby E (if it is required). Dolby E will be at the request of the broadcaster.

6 Live Delivery Requirements

Common technical Standards for the live delivery of programmes are currently in development. In the interim, please contact the relevant broadcaster.