Technical Standards for Delivery of TV Programmes to LNK group

Version 1.1

Contents

The LNK group 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 LNK group.

• 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 LNK group 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 (QC) process specified by LNK group.

Any programme failing the QC process may be rejected and returned to the supplier for repair.

Technical Responsibility

General Responsibility

LNK's Technical department has the responsibility for this document. Questions, remarks and thoughts are appreciated and could be directed to our mailbox:

Mail to: delivery@lnk.lt

This document does not cover any specific requirements for delivery of programmes to co-producers.

File programme delivery

The MCS operators at LNK are the main point of contact for technical enquiries affecting **immediate** (defined as "on the day") delivery.

MCS at LNK:

+370 680 60073

+370 680 60070

For all other enquiries please contact Production Supervisor named in your specific agreement with LNK group.

File Naming Requirements

Programme files delivered to LNK must be named as follows:

Any spaces in the programme title must be replaced with underscore " _ ". The maximum length of the title is 230 characters.

Filename extensions must be in lowercase.

Characters that are not permitted :
anywhere in name \ backward slash, / forward slash, : colon, * asterisk, ? question mark, < less than, >
greater than, % percent sign, | pipe, " double quote
at beginning of name: ~ tilde, space
at the end of name: space,

Diacritic characters (e.g. Å, Ä etc.) are not permitted.

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.

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 must reflect the spatial properties of the picture (left/right and front/rear).

Audibility has to be ensured at all times, regardless of the consumer equipment used, such as a small mono television set or a home cinema. Even viewers with slightly impaired hearing should be able to hear what is said. Particular care needs to be taken when adding background music and sound effects to passages with dialogue.

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, and in a multichannel case, in stereo and mono down mix.

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.

2   Technical Requirements – Video

2.1 Video Format

LNK group is a "25i HD broadcaster" 1080i/25 for the time being, in addition simulcasting down-converted 576i/25.

Material delivered for LNK group transmission must be:

1920 x 1080 pixels in an aspect ratio of 16:9

25 frames per second, interlaced – known as 1080i/25 (25 fps; 50 Hz field rate, top (1) field first) as defined in **EBU TECH 3299 System 2**

Colour sub-sampled at a ratio of 4:2:2

Colour - **ITU-R BT.709**

The HD format is fully specified in **ITU-R BT.709**

Where agreed by the broadcaster, legacy SD material delivered for LNK group transmission must be:

720 x 576 pixels in an aspect ratio of 16:9

25 frames per second (50 fields) interlaced - known as 576i/25, top field first

Colour sub-sampled at a preferred ratio of 4:2:2, optional 4:2:0

Colour space – **ITU-R BT.601**

The SD format is fully specified in **ITU-R BT.601**

2.2 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.

2.3 Post-production

HD and SD projects must be set to export progressively shot material as interlaced.

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.

2.4 Film motion or "film effect"

It is not acceptable to shoot 1080i/25 and add a film motion effect in post-production. 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.

Conversion from 50 progressive frames per second material to 25 progressive frames per second is permitted, provided that the frame conversion process does not produce excessive motion judder or image softening or visible frame blending; and that an appropriate shutter speed has been used. The process must be agreed with the broadcaster in advance.

2.5 Field dominance

Cuts in interlaced scanned material must happen on frame boundaries (i.e. between field 2 and field 1). Motion on psf (Progressive scan Segmented Frame) material must always occur between field 2 and field 1 (i.e. field 1 dominance).

If material is shot at 50 frames a second, the correct 2-frame marker phasing must be maintained when converting to 1080i/25 or 1080PsF/25.

2.6 Blanking

Images must fill the active picture area. No „blanking errors" are permitted on new, up-converted, or archive material.

A two-pixel tolerance is 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.

2.7 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 75 % (100/0/75/0), or optionally 100 % (100/0/100/0), and filling the 16:9 raster. SMPTE pattern bars are not acceptable.

2.8 Video Levels and Gamut (illegal signals)

HD digital signals will be assessed according to the recommendations **ITU-R BT.709**

SD digital signals will be assessed according to the recommendations **ITU-R BT.601**.

Measuring equipment should indicate an "Out-of-Gamut" occurrence only after the error exceeds 1% of an integrated area of the active image.

2.8.1 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 0 mV) and white level is all three components at 100 % or 700 mV.

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

2.8.2 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 R 103**:

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

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

Full range video levels must not be used for delivered television programmes.

Colour gamut "legalisers" should be used with caution as they may create artefacts in the picture that are more disturbing than the gamut errors they are attempting to correct. It is advisable not to "legalise" video signals before all signal processing has been carried out.

2.9 Aspect Ratio

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

2.9.1 "Cinemascope ratio" letterbox

Movies and programmes with picture ratios of 2.35:1/2.39:1 (21:9) or 1.85:1 should be centred vertically between black bars in a 16:9 frame with no geometric distortion. If there are any variants of aspect ratio please contact the broadcaster to establish the required version.

2.9.2 "Pillarboxed" HD material

Some "pillarboxed" material is acceptable 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 according with no geometrical distortion.

2.10 Archive Material

Archive material must meet all the requirements in this document.

2.10.1 General quality

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.)

2.10.2 Up-Converted SD Material

Particular care must be taken with SD archive material in order to deliver the best possible quality after up-conversion. In general standard definition pictures must look no worse than the original after being up converted, post processed and down converted for delivery on SD services. 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 all SD material must be zoomed-in by a small amount during up-conversion.

2.10.3 Picture Aspect Ratio

Archive material that is not 16:9 should be zoomed to fill the 16:9 raster where possible without compromising the image quality or composition. Alternatively, it may be presented in a pillar-box or letterbox 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

2.11 Use of Lower Resolution Images

To maintain a high standard and meet audience expectations, the amount of material of a lower resolution than the commissioned format is limited to 25% of the programme's total duration.

Lower resolution material must not be used for large uninterrupted sections of the programme, unless agreed by the broadcaster.

2.11.1.Non-HD Material

Some HD programmes will contain some material from standard definition originals, and sources that do not meet the HD requirements. This material is all called 'non-HD' in this document. Non-HD material includes and material acquired using the following methods or formats:

HDV from all manufactures

All codecs with bit rates below those specified in **EBU R118 for HD Tier 2L**

Cameras that do not meet the requirements of **EBU R118 for HD Tier 2L**

Material generated or processed on 720-line equipment

Super16 film is not considered to be HD

2.12 Safe Areas for On-Screen Text

All on screen text must be clear and legible and must be within the safe areas specified. All font sizes must be legible after down conversion. At the discretion of the broadcaster, programmes such as feature films and some acquisitions may be excluded from this requirement.

2.12.1. Text Size

The minimum SD font height is 20 SD lines. Therefore where burnt in HD text will be down converted, the minimum height of the text should be no less than:

40 HD lines/pixels (to be legible after down conversion)

2.12.2 Safe Areas for SD On Screen Text
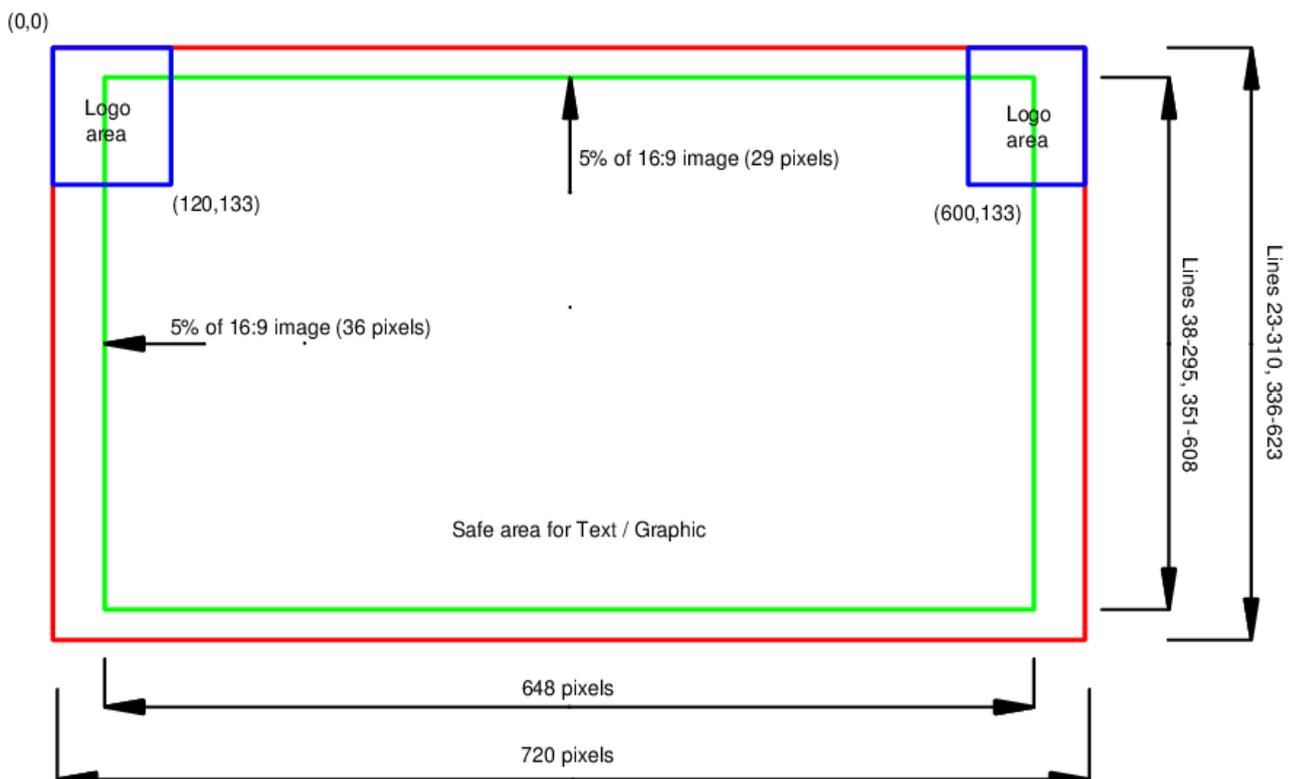
2.12.3   Safe Areas for HD On Screen Text

3 Technical Requirements – Audio

LNK group transmits a stereo audio stream.

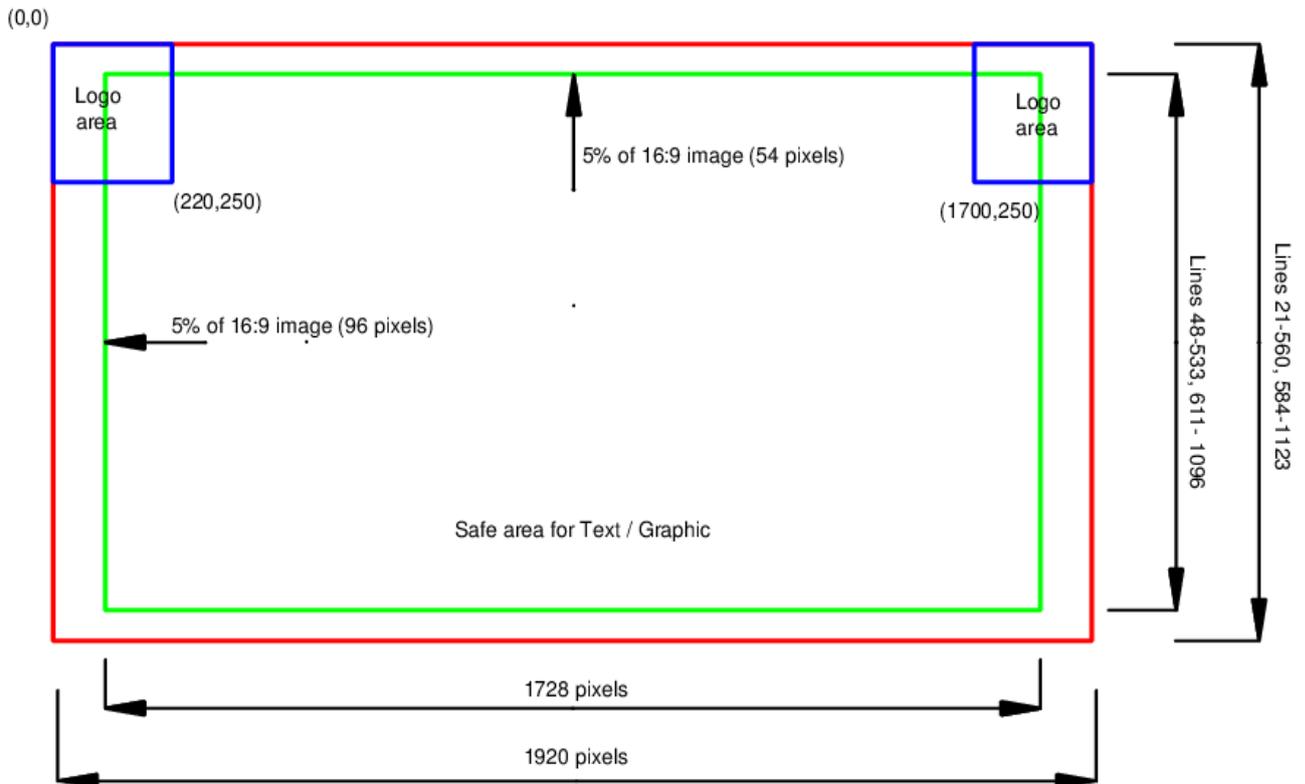**Audio should start 1 frame later the begin and should end 1 frame before the last frame.**

3.1 Stereo Audio Requirements

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

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 1 kHz tone (left identification). 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 (-18 dBFS) as per EBU recommended practice **R68**.

3.1.2 Stereo audio levels and measurement (loudness or volume)

It is recommended that the maximum true peak level should not exceed - 3dBTP (True Peak). Content will fail if the maximum true peak exceeds -1dBTP

It is no longer acceptable to deliver new programmes mixed to the old PPM specifications. Programmes must be mixed to comply with **EBU R128**

Programme Loudness = -23 LUFS ±1 LU

For short programmes and trailers (~30 seconds), in addition to the requirements above, both of the following requirements apply (**EBU Tech 3343**, section 10.1):

Maximum permitted Short-Term loudness (3 seconds time window) must not exceed -20 LUFS (+3 LU) at any time.

Maximum permitted Momentary loudness (400 milliseconds time window) must not exceed -15 LUFS (+8 LU) at any time.

Loudness Range (LRA):

Programmes should aim for an LRA of no more than 18LU.

Speech content in factual programmes should aim for an LRA of no more than 6LU. A minimum separation of 4LU between dialogue and background is recommended

Note: Programmes that are deliberately mixed with programme loudness out of range will be checked and, if possible, corrected by LNK's internal quality control procedures – otherwise rejected.

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

When the right and left channels are mixed down to mono, there shall not be any marked difference in listening level or frequency reproduction. Full audibility is required of the mono down mix.

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

4 File Delivery Requirements
This part of the document details the additional technical requirements that programmes must comply with for the successful delivery of File programmes.

4.1 Programme Layout
All programmes delivered on file must be laid out with elements in the following pattern relative to timecode:

Timecode	Duration	Video	Audio
09.58.00.00	90"	EBU Bars 100% or 75%	Line-up 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 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 programme	10"		Freeze or "living hold"	Fade or cut to silence
End of programme + 10" (optional)		2fr	2 Frames peak white	1 Frame tone on first video frame

4.2 Programme parting

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.

4.2.1 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.
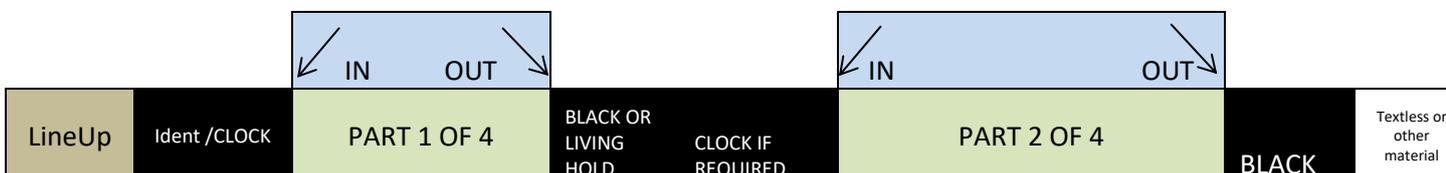

4.2.2 Hard-parted programme:

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, trailers etc. will be inserted. Hard Parted programmes should be formatted as shown. The start timecode and duration of each part must be included in the metadata.

4.2.3 Multi-part programme delivered on multiple files:

Where a programme's delivery must be split over more than one file, it must comply with the formatting below. The start timecode and duration of each part must be included in the metadata.

LineUp | Ident /CLOCK | IN   OUT | PART 3 OF 4 | BLACK OR LIVING HOLD | CLOCK IF REQUIRED | IN   OUT | PART 4 OF 4 | BLACK | Textless or other material
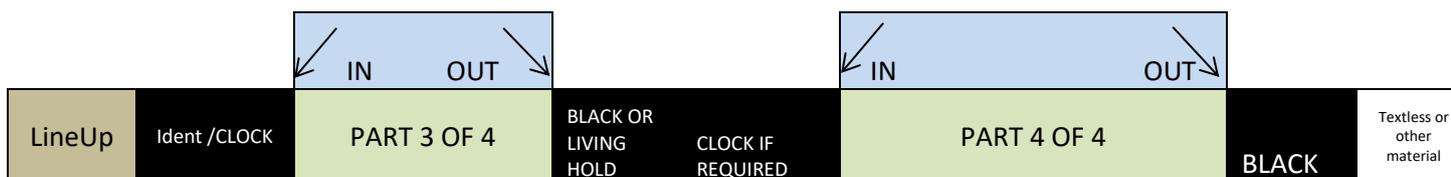
4.3 Start and End

It is usual for the 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 5" after the end point. Any other programme elements after the end of the programme should not start less than 1min after end of programme.

4.4 The Ident Clock or Slate

A countdown clock or slate clearly displaying the following information must precede the start of programme. A clock or slate is optional for subsequent parts of a multi-part programme:

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 7 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.

4.5 Audio Channel Allocations HD and SD

HD and SD files must contain 4 channels of audio (additional "deactivated" channels are technically stored in the file but these are not "usable" / "valid"). Audio content must be delivered in accordance with the table below. The EBU R48 or R123 code must be included in the metadata.

AUDIO TRACK NUMBERS																		
EBU Reference	Programme Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
R48: 2a	STEREO	Stereo Final Mix L	Stereo Final Mix R	Silence	Silence												
r123:4b	STEREO with M&E	Stereo Final Mix L	Stereo Final Mix R	Stereo M&E L	Stereo M&E R												

Any unused audio tracks (including where you do not have an M&E) in the 16 track groups above must contain digital silence, 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'

4.6 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.

The naming conventions used in all related documentation and metadata must match those specified above.

5. File Requirements

5.1 HD Files

The file format, i.e. the container/wrapper, shall preferably be MXF OP-1a (the layout options for a minimal simple MXF file according to **SMPTE 378M**, extension ".mxf"). Optionally a QuickTime Movie (extension ".mov") may be used.

5.1.1 Video codec

The video essence in the file must be encoded as:

1080i/25 preferably as (Sony) XDCAM MPEG HD422

optionally as (Panasonic) AVC-Intra 100, optionally as (Apple) ProRes 422 (HQ)

5.1.2 Image format

As described in the section 2.1.

5.1.3 HD Audio

All audio tracks must be encoded as PCM with a sample rate of 48kHz at a depth of 24bits/sample.

5.2 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.

The file format, i.e. the container/wrapper, shall preferably be MXF OP-1a (the layout options for a minimal simple MXF file according to **SMPTE 378M**, extension ".mxf"). Optionally a QuickTime Movie (extension ".mov") may be used.

5.2.1 Video codec

The video essence in the file must be encoded as:

576i25, preferably as DVCPRO50, optionally as DVCPRO25, both according to **SMPTE 314M**, optionally as MPEG2 Long GOP (IBBP, closed GOP, GOP size 12) at 15Mbps.

5.2.2 Image format

As described in the section 2.1.

5.2.3 SD Audio

All audio tracks should be encoded as PCM with a sample rate of 48 kHz at a depth of 24 bits/sample.

5.3 Timecode

For content with 25 Hz interlace as well as for content with 25 Hz progressive a 25 counting timecode (25 TC) must be used. To ensure compatibility with downstream systems it is very important that timecode is continuous and inserted in the file exactly as specified.

5.4 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. 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.

For each delivery of one or more files containing video essence for a specific programme, at least one Programme Metadata File containing metadata must also be included. If the metadata differs between episodes, several Programme Metadata Files can be provided.

5.5 File delivery options

The following provides guidance on the delivery options to LNK group. As this is intended to offer guidance only, please contact the Production Supervisor named in your specific agreement with LNK to discuss further details and options.

5.5.1 Hard Disk

Hard disks must have USB-interface, preferable USB3. NTFS and exFAT formatting are acceptable. The physical hard disk case must be clearly marked for easy identification.

5.5.2 File transfer over IP

Services as Aspera, SmartJog etc.

File transfer to LNK FTP server.