Technical Standards for Delivery of Television Programmes to S4C
23.01.20

Document changes	Page	Date
File Naming Requirements – PROGRAMMES	2	23-1-20
Contacts	31	23-1-20

This document is a complete guide to the technical standards required of its programme suppliers by S4C..

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 broadcaster.
- **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 S4C. This applies equally to any promotional material or commercials supplied direct to S4C. Any programme failing the QC process on tape or file may be rejected and returned to the supplier for repair. It should be noted that in the case of tape delivery S4C will accept PSE compliance confirmed by either the Harding or BPR Flash/HD Gordon products.
In the case of file delivery a recognised auto QC report is required such as Baton or Vidchecker

Technical Responsibility and Contacts:

General Responsibility
S4C's Content Management Services and Transmission Services groups are required to ensure that broadcast programme technical quality is maintained to a satisfactory standard.
Any queries should in the first instance be directed to Content Management Services at: Tel. +44(0) 29 20741 431

Technical Liaison
The Duty MCR control room staff at S4C are the main round-the-clock point of contact for technical enquiries affecting immediate (defined as "on the day") delivery.

For all other enquiries please contact your Content Editor, or the Content Management Services Section, or visit the S4C production web site:
http://www.s4c.cymru/en/production/page/1154/guidelines/

File Type Requirements

Programme files delivered to S4C should be AS-11 DPP compliant unless by special agreement with the Broadcaster

File Naming Requirements – PROGRAMMES

It should be noted that the DSP/AS11 format specifies that every programme must have a unique production number in the metadata it is important that this is adhered to. The field for the AS11 production number must follow the following format (using the contract *production number* which should not be confused with the AS11 production number): -

Programme Production Number Format	Example Filename	Notes
XXXXXX_XXX_Vnn_Dsc	I26555_004_V02_MAS	

Production Number (5 to 10Characters)_Episode Number(3 digits), Version Number (3digits)_Type descriptor (3 Characters)

The AS11 production number is now the same as the Requested Programme File Name, this is correct and still conforms to the DPP/AS11 standard.

Programme files delivered to S4C must be named thus:

Requested Programme File Name Format	Example Filename	Notes
XXXXXX_XXX_Vnn_Dsc.mxf	I26555_004_V02_MAS.mxf	

Production Number (5 to 10Characters)_Episode Number(3 digits), Version Number (3digits)_Type descriptor (3 Characters)_. For example, a file with production number I26555, Episode Number 4, Version 2, would be named as shown as above.
Note that the "V" for Version must be uppercase and the extension names must be lowercase.

File Naming Requirements – QC reports

All reporting files will follow the same naming convention as the MXF programme files with the report name as a further identifier after the underscore.

- The PSE Report = _PSE
- The AQC Report = _AQC
- The Eyeball QC Report = _EYE

Some AQC devices combine the PSE and AQC reports and others allow manual entry for comments from the Eyeball QC test. Broadcasters can accept all options as long as it is clear from the file name what is included.

Quality Control (AQC, Eyeball QC and PSE) reports must be delivered as PDF reports and must have the same Programme ID and Version Number as the programme file; as per below.

Requested Report Name Format	Example Filename	Notes
XXXXXX_YYY_Vnn_Dsc_PSE.pdf	I26555_004_V02_MAS_PSE.pdf	A PSE Report for that Programme Production Number_ Episode Number_ Version Number_

		PSE signifies PSE Report And it is in PDF Format.
XXXXXX_YYY_Vnn_Dsc_AQC.pdf	I26555_004_V02_MAS_AQC.pdf	As above but for AQC
XXXXXX_YYY_Vnn_Dsc_EYE.pdf	I26555_004_V02_MAS_EYE.pdf	As above but as an Eyeball tes
XXXXXX_YYY_Vnn_Dsc_AQC_PSE.pdf	I26555_004_V02_MAS_AQC_PSE.pdf	As above but in the case of AQC and PSE reports

Synopsis

The 256 file synopsis should be in Welsh only

File Naming Requirements – Descriptor

All reporting files will follow the same naming convention as the MXF programme files with the descriptor as a further identifier after the underscore.

The type field descriptor (Dsc) must be one of the following:

MAS Master
ADS Audio description
NAB No advert break
IVS In vision signing
BST Burnt in subtitling

XXXXXX_YYY_Vnn_ADS	I26555_004_V02_ADS	Audio Description
XXXXXX_YYY_Vnn_NAB	I26555_004_V02_NAB	No advert break
XXXXXX_YYY_Vnn_IVS	I26555_004_V02_IVS	In vision signing
XXXXXX_YYY_Vnn_BST	I26555_004_V02_BST	Burnt in subtitle
	I26555_004_V02_MAS	

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

Time-code	Duration	Picture	Sound
09.59.30.00	20”	EBU Bars (100/0/75/0 or 100/0/100/0)	Line-up tone
09.59.50.00	7”	Ident Clock	Silence
09.59.57.00 (optional)	2fr	2 Frames peak white	1 Frame tone (on first video white frame)
09.59.57.00	3”	Black	Silence
10.00.00.00		Programme	Programme
end of part hold (multipart programmes)	5” min	freeze or ‘living hold’ after end of part	fade or cut to silence by end of part
end of prog hold	10” min	freeze or ‘living hold’	fade or cut to silence

S4C File Delivery Detail

The programme mxf and all the QC pdf files are normally delivered to S4C via

1 **Signiant Agent**
For companies that already have a Signiant service
You will need to supply portal login details to S4C and inform S4C FileDelivery@S4C.cymru (CyfieuFfeiliau@S4C.cymru)

2 **S4C Signiant Media Shuttle**
You will need to contact S4C to be given access to an S4C portal

3 By other arrangement agreed in advance with Head of Transmission services.

Currently S4C still accept programmes delivered on tape upon request and written permission.

HD Tape Format Summary

- HD programmes will be delivered on HDCam or HDCam SR tapes
- 1920 x 1080 at 25 frames a second (see Section 2.1 on page 10)
- 110" Line up bars and 1KHz tone at -18Dbfs.
- Timecode of start of programme 10:00:00:00.
- Circular countdown clock of at least 10" with details *exactly* as Section 4.5. on page 22.
- Stereo audio on tracks 1&2 and 3&4. (see Section 4.6 on page 23)
- Fade to silence at end point, end slate held in vision for further 10" after end of programme.
- Graphics to be kept within 16:9 safe area

S4C Technical Information Requirements: Outside Broadcasts

General arrangements should be made known (and confirmed in writing) to the Head of Transmission Services at an early planning stage. These details should include the communication arrangements, the location and confirmation of the lines booking information. It should also be made clear which route is to be the main and which is to be the reserve circuit. For special live events the Producer and/or Technical Supervisor will be required to attend a technical production meeting at S4C to discuss details with the Broadcast and Presentation Units
and any other relevant party.
Once the relevant sections of this form have been completed it should be e-mailed to the following recipients:-

Head of Transmission Services
Jim.hennefer@s4c.cymru
Channel Supervisor
Anwen.Thomas@s4c.cymru

MCRsupervisors@s4c.cymru

Outside Broadcast Technical form can be found on the S4C website.

BLANK

Content

		Page
	Technical Responsibility and Contacts	2
	File Type Requirements Programmes	2
	File Type Requirements QC reports	3
	Synopsis	3
	File Naming Requirements – Descriptor	4
	File Delivery Details	5
1.	GENERAL QUALITY REQUIREMENTS	10
1.1	Picture Quality	10
1.2	Sound Quality	10
1.3	Access for People with Disabilities	10
2.	TECHNICAL REQUIREMENTS - VIDEO	11
2.1	High Definition Format	11
	Origination	11
	Post-production	11
	Film motion or film effect	11
	Field Dominance	11
2.2	Video Line-up	11
2.3	Video Levels and Gamut (illegal signals)	12
	Measuring signal levels	12
	Tolerance of out of gamut signals	12
2.4	'Blanking'	**12**
2.5	Aspect Ratio	12
	'Cinemascope ratio' letterbox	13
	Floating images	13
	'Pillarboxed' HD material	13
2.6	Archive Material	13
	General quality - archive	13
	Aspect ratio - archive	13

	Safe areas - archive	14
2.7	Use of Non-HD material	14
	Non-HD material	14
	Up-converted SD video material	14
2.8	Film for High Definition Acquisition	15
2.9	Photosensitive Epilepsy (PSE)	15
	Testing for flashes and patterning	15
	PSE warnings	15
2.10	Safe Areas for Captions	16
	14:9 Caption Safe Area	17
	16:9 Caption Safe Area	17
2.11	Standards Conversion	18
3.	TECHNICAL REQUIREMENTS - AUDIO	18
3.1	Stereo Audio Requirements	18
	Stereo line-up tones	18
	Stereo audio levels and measurement (loudness or volume)	19
	Stereo phase	19
3.2	Sound to Vision Synchronisation	19
	Audio / Video sync markers	19
4.	TAPE DELIVERY REQUIREMENTS	20
4.1	Tape format	20
4.2	'i' and 'psf' Flags	20
4.3	Time-code	20
4.4	Programme Layout / Format	20
	4.4.1 Start and end	21

	4.4.2 Programmes longer than a single tape	21
	4.4.3 Compilation tapes	21
	4.4.4 Ad breaks	22
4.5	The Ident Clock	22
	4.5.1 Paperwork	22
4.6	Audio Track layout	23
	4.6.1 Tape Format	23
	4.6.2 Live Delivery	23
5.	STANDARD DEFINITION DELIVERY (Legacy Only)	23

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 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

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.

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.

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.

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.

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.

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 omV and 700mV). This equates to digital sample levels 16 and 235 (8-bit systems) or 64 and 940 (10 bit systems).

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)
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 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.

'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 bar sin a 16:9 frame, filling the width of the frame, and with no geometric distortion.

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.

'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:

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).

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.

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 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 agered by the broadcaster. This includes archive material.

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 smaller than ½"
- Frame based (intra-frame) recording formats below 100Mbs
- Inter-frame based recording formats below 50Mbs
- Material generated or processed on 720 line equipment
- Film not meeting the requirement for HD in section 2.8 below

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 Use of Film for High-Definition aquisition

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:
https://www.ofcom.org.uk/__data/assets/pdf_file/0037/86788/section2-july15.pdf

Testing for flashes and patterning
All programmes for tape delivery must be tested using either a HD Gordon, or the Harding Flash Pattern Analyser v2.54b on an SD down-converted SDI feed. 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 either indication of a Gordon pass, or a relevant Harding FPA pass certificate to be delivered with the tape.

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. To achieve this all text characters must be a minimum height of 26 (HD) scan lines.
There are three primary caption safe areas defined for 16:9 material for UK transmission:

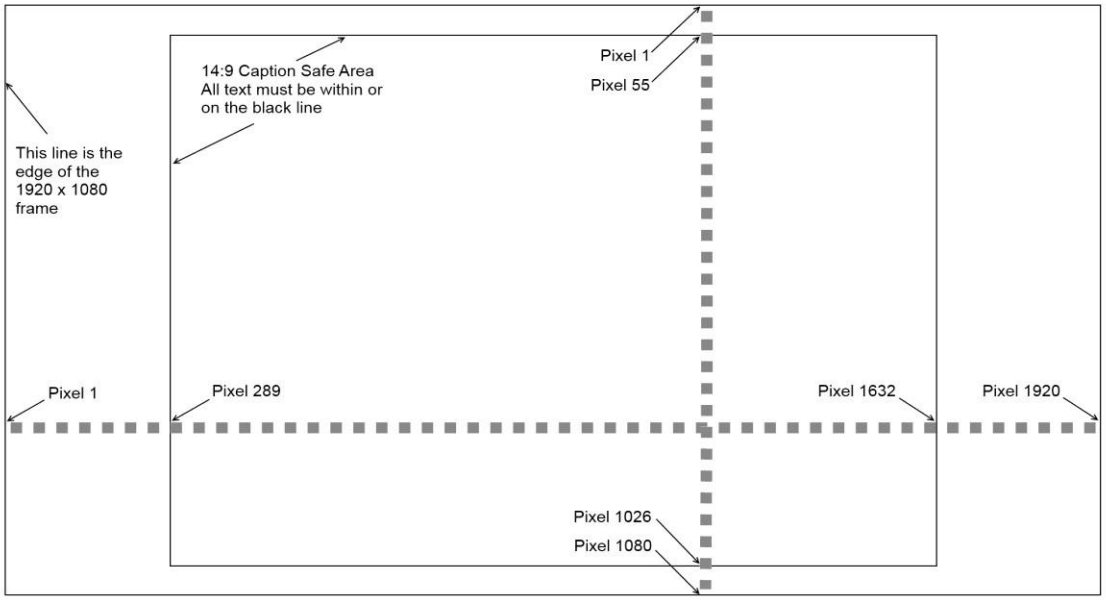
- [14:9 used by UK programmes/broadcasters for analogue transmission]
- 4:3 required for certain programmes/broadcasters or for programmes distributed internationally.
- 16:9 suitable for Digital-only transmission

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) & 611 to 1095 (F2)
4:3 Caption Safe	65% of Active Width 90% of Active Height	337 – 1584 55 – 1026	48 to 532 (F1) & 611 to 1095 (F2)
* 16:9 Caption Safe	80% of Active Width 90% of Active Height	192 – 1727 55 – 1026	48 to 532 (F1) & 611 to 1095 (F2)

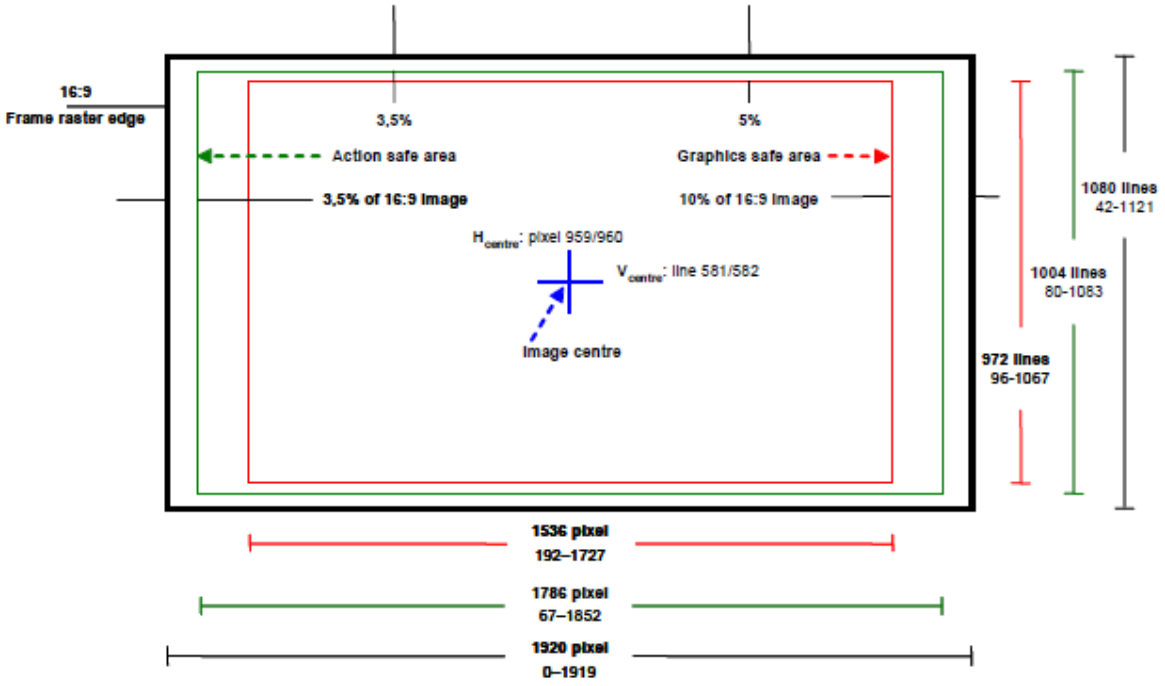
***** Current preferred safe area (Feb 2013)

At the discretion of the broadcaster, programmes such as feature films and some acquisitions may be excluded from this requirement.

14:9 Caption Safe Area



Man Diogel i Gapsiynau 16:9



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 4.6)

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.

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.

Stereo audio levels and measurement (loudness or volume)

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

Stereo programme audio levels are still monitored by QC staff using a Peak Programme Meters (PPM).

The following levels, as measured on a PPM meter to BS6840: Part 10 with reference level set at PPM 4, is indicative of typical levels suitable for television, and is given as guidance only.

Our main aims are to ensure that dialogue is always clear and not compromised by music and effects. That all programmes seem to be the same volume and therefore the viewer does not have to keep adjusting their volume.

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	

Stereo phase

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

3.2 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.

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. Tape Delivery Requirements

4.1 Tape format

HDCam or HDCam SR are the only formats 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 rewound. 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.

4.2 '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.

4.3 Time-code

LTC and ancillary timecode (referred to as VITC on HDCam 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.

4.4 Programme Layout / Format

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

Time-code	Duration	Picture	Sound
09.58.00.00	110"	EBU Bars (100/0/75/0 or 100/0/100/0)	Line-up tone
09.59.50.00	7"	Ident Clock	Silence
09.59.57.00 (optional)	2fr	2 Frames peak white	1 Frame tone (on first video white frame)
09.59.57.00	3"	Black	Silence
10.00.00.00		Programme	Programme
end of part hold (multipart programmes)	5" min	freeze or 'living hold' after end of part	fade or cut to silence by end of part
end of prog hold	10" min	freeze or 'living hold'	fade or cut to silence

4.4.1 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 1 min after end of programme.

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 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.

4.4.2 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.

4.4.3 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

4.5 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.

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

4.5.1 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

4.6 Audio Track Layout

Audio tapes and files should be delivered in line with one of the options in the table below:

AES	Trac	Format	Content Options			
1	1	Digi/HDCam/SR	Main Stereo Ch L			
	2	Digi/HDCam/SR	Main Stereo Ch R			
2	3	Digi/HDCam/SR	Main Stereo Ch L	2nd Language L (Digi)	Audio description	Dolby E
	4	Digi/HDCam/SR	Main Stereo Ch R	2nd Language R (Digi)	Pan and fade byte	Dolby E

4.6.1 Tape Format

HDCam or HDCam SR are the only formats 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 rewound. 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.

4.6.2 Live Delivery

Please refer to the relevant section of the S4C Web site

5. STANDARD DEFINITION DELIVERY REQUIREMENTS

(Legacy only)

6. Introduction

The Broadcasting Act 1990 requires that signals carrying S4C shall attain high standards in terms of technical quality. Also, the 1996 Broadcasting Act, which is the statutory basis of digital broadcasting in the UK, requires that signals carrying the multiplex service attain high standards in terms of technical quality. Furthermore, S4C does not wish its output to compare unfavourably with the transmissions of any other UK broadcaster.

The purpose of this document is to provide the principal operational and technical specifications to those producing commissioned programmes for transmission by S4C so that they meet S4C's requirements and to ensure compliance with the Broadcasting Acts 1990 and 1996, in terms of technical quality. This document applies to all programmes

whether commissioned as full assignment or commissioned under licence.

Equipment used for making programmes shall be capable of achieving a grade 5 using the ITU/ CCIR-5 point grading scale.

Programme makers should find the technical requirements of S4C no more or less onerous than the requirements of other UK broadcasters.

Programmes of excellent technical quality have an inherent element of 'future-proofing' relative to those of a lower standard, and programme suppliers should bear this in mind

It should be noted that there are potential cost implications when programmes are returned prior to transmission to correct technical issues and that S4C may charge companies for any transfer or extra access services work that has to be done.

Similarly S4C reserves the right to charge companies for any remedial work to programmes that has to be undertaken should the imminent transmission of a programme prevent the return of a programme to the production company for amendment.

DELIVERABLES FOR RECORDED PROGRAMMES

- Master Tape in Digital Betacam format. All tapes delivered for transmission must be accompanied by documentation as defined below.
- Unless otherwise agreed 2 x DVD (-R) of master tape one with burnt-in timecode (BITC) which must match that on the master tape, and one without. These DVD copies will be used by the Commissioning Directorate (Content Editors) to review the programme, and by the others within S4C wishing to view programme material.
- If the programme is to be subtitled then a MPEG 1 File needs to be provided.
- MPEG1 Muxed, 320 x 184 25 FPS
- Data Rate 176K bytes/s, and script as per section on subtitles.
- Safety copy of master tape (of transmission quality) to be retained by the Production Company.

DOCUMENTATION

A recording report must accompany each recording and give the following details:

1. Name of Production Company and facility providing master tape.
2. The programme title and episode/subsidiary title and production number.
3. Video and colour standard used.
4. Mono/Stereo, audio track usage, Dolby surround sound.
5. Picture Format: 16:9 Full Height Anamorphic
6. Duration and timecode value for the start of each part.
7. Verification if subtitles present on line 335 or as open captions.
8. Confirmation that the tape/ programme has passed a PSE test. A valid test certificate should be supplied for Harding tests, or written confirmation on the recording report for a HD Gordon test.
9. Confirmation that the tape has been approved by the supplier for transmission.
10.

The cassette shell itself must be marked with items 2 & 6.

N.B.

Liquidated damages may be imposed on the production company if deliverables are not complete or are not supplied at the agreed time or do not conform to the requirements as specified in this document. The commissioning agreement will specify the nature and scale of such liquidated damages. Where a programme arrives prior to its transmission

and fails a technical review S4C will, if the transmission schedule allows, return the programme to the supplier for correction-if this is not possible the programme may be amended at S4C and the company charged for any work undertaken or it may dropped from the schedule.

QUALITY ASSESSMENT

Supplied programmes shall be capable of meeting the grading requirements as given by OFCOM using the CCIR 5point grading scale, namely: Live programmes using systems that meet the performance figures laid out by OFCOM should achieve a sound and vision grade of 5. Recorded programmes based on electronic production should achieve a grade of at least 4. The minimum quality that is normally acceptable is grade 3. S4C reserves the right not to broadcast programmes which in its opinion are technically unacceptable. The CCIR 5-point grading is:

CCIR 5-point grading is:

Quality	**Impairment**
5 – Excellent.	5 – Imperceptible
4 – Da	4 – Perceptible but not annoying
3 – Fair	3 – Slightly annoying.
2 – Poor	2 – Annoying
1 – Bad	1 – Very annoying

Picture monitors on which video parameters are assessed and gradings made should be grade 1 (reference EBU Tech 3263-E) and lined up to professional standards. A PLUGE (Picture Line Up Generating Equipment) signal shall be used prior to the assessment to ensure proper adjustment of brightness, contrast and grey scale.

DELIVERY FORMAT AND VIDEOTAPE
Master Tape is to be Digital Betacam format.
Tape is to be free from oxide shedding, creases or other physical defects.
S4C reserves the right to reject any tapes that do not meet its technical standards with respect to Error Rates etc.
Tapes should be protected by suitable packaging material for carriage.
Cassette shells will be suitable for automatic handling.

Care must be taken to avoid excessive changes in temperature or humidity during shipping. For example, avoid leaving tapes in a car overnight, in its boot on a winter journey, or in direct sunlight in summer. Either can cause damage and/or stiction when loaded in a playback machine.

VIDEO SIGNAL
It shall conform to the 'Specification of Television Standards for 625-Line System
720 x 576 pixels
50 fields per sec.

VIDEO CONTENT
The picture shall be sharp and free of excessive black crushing, highlight compression and noise. Transient response should be such that ringing, smear and echoes are not noticeable. Colour rendition, especially skin tones, shall be natural. Any departure for artistic effect should be understandable to the viewer.

USE OF FILM
S4C welcomes programmes made on film or videotape, however great care and considerable expertise needs to be exercised at each and every step of the production chain. The choice of film speed, lighting conditions, use of An MPEG 1 File needs to be provided on a DVD negative stock, type of telecine transfer etc., can have a profound effect on final image quality.

ISEL USE OF LOW CONTRAST STOCK
The television system is capable of handling a wide contrast range. However, ambient light in living rooms will crush out detail in the dark areas of the picture: Thus a theatre contrast print may not produce well on television, even though it is perfectly acceptable in a darkened cinema. Low contrast stock was introduced to overcome this problem and is very successful when used with high contrast negatives. However, it is not necessarily wise to use it for all television prints.

For example, when the original negative is relatively lacking in contrast, having been shot in natural light with overcast skies, the use of low contrast print stock may result in a flat and de saturated appearance. In a practical world, some shots will have more contrast than others will, and the choice of print stock has to be judged on extremes rather than the norm.

Lighting will significantly affect the look so the print stock decision is best made before the shoot. A test may be worthwhile at this stage.

In summary, the majority of cases will benefit from low contrast stock, but a careful decision needs to be taken dependent on the contrast of the negative and the look desired.

35mm FILM DELIVERY
S4C, from time to time on certain productions, may have agreed that a 35mm print will be made of a film so that it may use it for theatrical showings. In this case the film stock should be of normal contrast and the aspect ratio of the print should be 1.85:1. Unless otherwise agreed in advance with S4C. S4C will require that an Interpos and an Interneg are struck from the edited neg and that unless otherwise agreed three copies of the final print will be delivered. They will have a combined optical sound track and will be suitable for projection at a theatre or cinema.

PROGRAMMES MADE FOR TV AND CINEMA
It should be borne in mind that the optically large dynamic range of film, and the large audio dynamic range of cinema release productions, often may not be ideal for transmission on TV. Also it is possible that the S&P to 14:9 policy may not have been adhered to for artistic reasons, by special exemption, as it may have been deemed to be primarily a "Cinema Release" production. In such special cases, consideration must be given to optimising such commissions for transmission on TV at the Telecine Transfer stage.

This can be achieved by PAN and Scan, for the action and titles sequences, and by Audio processors to limit the Audio Dynamic range. In such special cases in order to avoid unnecessary re-transfers, liaison with S4C's Chief Technical Officer or Head of Transmission Services should be sought before the Telecine transfer takes place.

SUBTITLES
S4C has undertaken to subtitle a substantial number of programmes that are transmitted for linguistic understanding. To assist the development of this service, the following should be delivered with the programme tape:

1. MPEG1 Muxed, 320 x 184
   25 FPS
   Data Rate 176K bytes / second.
2. A copy of the script.

If there is a provision of open linguistic subtitles for all or even part of the programme, this should be made known to S4C's Head of Content Services so that it is properly co-ordinated with the closed caption service. Suppliers should also be aware that the use of the lower part of the picture frame for high volumes of graphic or caption content makes the programme unsuitable for subtitling. By Prior agreement subtitles may be incorporated in the VBI, they shall conform to CCIR Teletext System B and be inserted on TV line number 335.

LOGOS
We no longer put the S4C logo on all our programming. However, there is an animated Cyw logo during Cyw programming and a Stwnsh logo during Stwnsh. During children's programming the logo is placed in the top left of frame. The position of captions, logos or any other graphic images that might conflict with these logos should be considered at the production stage. It is likely that S4C may vary the use of and position of logos from time to time and producers are therefore advised to confirm the current logo position with the Head of Presentation Services.

TIMECODE
LTC to be supplied on all master tapes and shall conform to the relevant 625 EBU specification. It must be continuous, coherent and not pass through zero at any point. If VITC is supplied, it must be identical to LTC and be on lines 19, 21, 332, 334. Timecode must have the correct phase relationship with the video signal.

AUDIO CONTENT
The audio signal shall be free of noticeable or spurious signals such as hum, distortion or sibilance. It should not exhibit dynamic and frequency response artefacts as a result of the action of noise reduction or low bit rate coding systems.

Tonal balance shall be pleasing and neutral.

Audio should be in synchronisation with the video to a tolerance of + 1 field.

Audio tracks must be suitable for reproduction on domestic television receivers. Sound that has been balanced at high levels is frequently found to have an unacceptably wide dynamic range for the home environment. The dynamic range of sound tracks should be limited so that it is suitable for the domestic environment and the loudness controlled so that viewers have no need to adjust volume during or between programmes, (see subsequent note on Levels in Relation to Other Channels). On stereo programmes, attention should be paid to the derived mono signal to ensure compatibility and freedom from phase cancellation effects. Stereo programmes must carry sound in A-B (Left-right) form. M-S is not acceptable

AUDIO SIGNAL
Stereo/Mono:
Programmes shall be provided with stereo sound unless this is impractical. Stereo signals shall be recorded:

Track 1 -Left Channel.
Track 2 -Right Channel.

Tracks 1 and track 2 shall be recorded in identical phase relationship throughout the programme [including line up tone signals at the head.

Tracks 3 and 4 shall be replicas of tracks 1 and 2 unless specified otherwise by S4C.

Mono signals shall be recorded:

Track 1 -mono mix.
Track 2 -shall be identical to Track1.

(Known as DUAL CHANNEL MONO).

Tracks 1 and track 2 shall be recorded in identical phase relationship throughout the programme, including line up tone signals at the head.
Tracks 3 and 4 shall be replicas of tracks 1 and 2 unless specified otherwise by S4C.

Documentation (see later) must unequivocally state whether the programme is stereo or dual channel mono. Programmes delivered by line, as opposed to videotape, shall conform to the above channel configurations.

Dual Language:

- Programmes delivered with Dual Language sound shall conform to the above specifications, with the addition that:
- Welsh programme sound will be on Tracks 1 and 2. English programme sound will be on Tracks 3 and 4.

Audio Description:
Programmes delivered with Audio Description shall conform to the above specifications, with the addition that:

Welsh programme sound will be on Tracks 1 and 2. Audio description will be on Track 3. Normal speech level (peaking PPM 5) Pan and Fade control signal will be on Track 4. Minus 12db wrt line up (peaking PPM 1)

Levels:
The sound source must be controlled to ensure that the peak audio level does not exceed 0dBu 1kHz reference level by more than 8dB (PPM 6)

Levels shall be in accordance with those specified in the ITC/Ofcom Handbook Section 3 page B3, reproduced here for the avoidance of doubt.

Material	Normal Peaks	Full Range
Speech:		
Talks, News, Drama, Documentaries.		
Discussions, Panel Games, Quiz Shows,		
Announcements.	5	1-6
Music:		
Variety, Dance Music	4½	2-6
Brass Bands, Military Bands	4	2-5
Orchestral Concerts		1-6
Light Music	5½	2-6
'Pop' Music	5	2-5
Programmes containing a high degree of compression	4	2-4

Volume compression, if used, should be restricted to 6dB of compression and the onset of compression should not occur below PPM 4.

Levels in Relation to Other Channels
Note that if, for most of the programme, peaks are less than the full range allowable, then it will sound ineffectively quiet to viewers who are channel hopping or in relation to material before and after.
Conversely, peaks consistently at the maximum of the full range may sound irritatingly loud to viewers in relation to other channels and to other programme material on S4C.

Recent guidelines issued by The Committee of Advertising Practice for OFCOM Licensees state:
"6.9 Sound levels in advertisements Advertisements must not be excessively noisy or strident. Studio transmission power must not be increased from normal levels during advertising breaks Note: The peak level of sound at the studio output should not exceed +8dBm. To ensure that the subjective volume is consistent with adjacent programming, whilst also preventing excessive loudness changes, highly compressed commercials should be limited to a Normal Peak of 4.5 (measured on a PPM Type IIa, specified in BS6840: Part 10, Programme Level Meters). A fairly constant average level of sound energy should be maintained in transitions from programmes to advertising breaks and vice versa so that listeners do not need to adjust the volume. A perceived loudness meter may be useful where sound levels might cause problems."

Emphasis:
Audio emphasis should be **off** when Digital Betacam recordings are made.

AUTOMATED REPLAY
It is of paramount importance that alignment and level control is as stated in this document. S4C uses automated replay machines for the transmission of recorded programmes and it is seldom possible to manually adjust levels on a programme by programme basis.

VTR ALIGNMENT TAPES – DIGITAL BETACAM

Video Sony ZR2-1P	Part 6007361
Sain Sony ZR5-1P	Part 96007351

Line up to be carried out in accordance with Sony Customer information Sheets VTR-107, VTR-109, VTR-113.

Audio line up being set to –18dbfs (EBU standard, used by UK broadcasters).
The result of the above is that 0dbu recorded on your machine gives 0dbu when played back on our machines

LINE-UP SIGNALS
Tapes must start with line-up reference signals as follows:

Time	Picture	Track 1	Track 2
-90 secs	100% colour bars	Interrupted '0'-level tone	Steady '0'-level tone
-30 secs	Countdown identification clock to include Caption showing: • programme title,	Silence	Silence
	• episode title, • production number, • part number and duration		
-3 secs	Black level	Silence	Silence

Interrupted tone is tone broken for approximately ½ second every 3 seconds.
The tones should be 1Khz at 0dbu

LIVE AND PRE-RECORDED OUTSIDE BROADCASTS

Arrangements for Linking to S4C:
The programme supplier is responsible for arranging the necessary broadcast quality links to carry the signal from the outside broadcast venue to S4C, unless expressly agreed otherwise. General arrangements should be made known to the Head of Transmission Services by email or telephone at an early planning stage, as per linked document

Communication procedures for delivery on the day/live transmissions:

Programmes delivered on tape:
Note that the Commissioning Agreement specifies an actual time at which tapes, delivered on the day of transmission, should take place.
It is expected that all programmes even where it is agreed, in advance, that a programme can be delivered close to transmission time, should be in the S4C building in sufficient time that technical checking by S4C Engineering staff can be completed a minimum of 2 hours prior to transmission.

Confirmation of the edit/facility location, a contact name (the producer or director) and number(s) should be made to the Content Management Unit at S4C 029 20 741209) **at least 24 hours beforehand** (or by 16:30 on the Friday afternoon if the delivery/transmission is over the weekend). This information will be circulated to the Head of Transmission Services, the Presentation Services Unit and MCR (PC's and Engineering).

After completing the editing work, the Producer should contact S4C's Presentation Services Unit to confirm the actual duration and content of the programme (029 20 741265 during S4C's office working hours or PCR Presentation Controllers (PC's) 029 20 741230 at other times).

If, on the day, the Producer is unable to meet the delivery terms, then he has a responsibility to contact S4C's Content Management Section during office hours; telephone number 029 20 741209 (or PCR on 029 20 741230 at other times), to explain the circumstances. Where appropriate S4C will agree to amend the delivery time and arrangements.

S4C will transmit a stand by programme if communication has not been established and/or if the tape has not arrived at the time specified in the Commissioning Agreement.

In accordance with the Commissioning Agreement, S4C will expect delivery of two DVD copies of the programme (one with and one without timecode) to S4C's Content Management Unit within two weeks of transmission or as noted in the Agreement.

CONTACTS

A contact numbers card is available to remind Producers of S4C's contact telephone numbers.

These cards can be obtained from the Business Affairs Unit on (029) 20 741 479.

Office working hours: 09:00 17:15 (Friday 09:00 16:45)		
Content Management Unit	029 20 741209	
Presentation Services Unit	029 20 741265	Ffacs 029 20 741259
Outside office working hours:		
PCR (Presentation Control)	029 20 741230	
MCR (Engineering)	029 20 741240	Ffacs 029 20 741375

Line-up / Signal Stability:
The on-site facility must be able to originate audio and video line-up signals. These should consist of 100% colour bars (75% if the vision signal is to be linked by satellite) together with zero level reference tone. For stereo origination, the left-hand channel tone should be intermittent. Video pulse and bar, preferably as an insertion test signal, will also be required to equalise the circuit.

Line-up signals must be available at least 30 minutes before the start of the programme and an engineer designated to liaise with S4C MCR.

The video signal must be stable and continuous throughout the broadcast.

STANDARDS CONVERSION
The 525 line NTSC signal has inherently less resolution than the corresponding 625-line PAL signal; therefore the use of pictures originating on the 525-line format is strongly discouraged. If cut film of the required material exists, direct telecine transfer to the 625-line format will always obtain the best results. When pictures exist only on 525-line videotape, standards conversion using broadcast quality; current generation equipment is mandatory. This means using advanced motion prediction and noise reduction or image enhancing techniques. Conventional conversions using interpolation techniques are not acceptable.

Proposals for programmes to incorporate more than a very small proportion of pictures originating in the 525-line format must be discussed with the Chief Technical Officer.

GUIDANCE ON THE USE OF NON-BROADCAST FORMATS

Occasions will arise when it will be necessary to use non-broadcast VTR formats with their reduced technical performance to provide a service to the television audience. These will usually involve the provision of local programme input or documentary items reporting events that are not planned and therefore not covered by a full ENG crew. An example of such events is the reporting of a fire or accident etc. covered by a 'stringer', newspaper journalist, the Police or Fire Brigade.

The duration of inserts to programmes obtained using these formats should not normally be more than about 3% of the total programme run time.

Cameras will normally be of a type capable of meeting the required ENG subjective performance of Grade 4 or better. This presently rules out the use of single sensor cameras although it is appreciated that such cameras may be used on rare occasions for important investigative reporting where they would bear an 'amateur video' caption.

It is essential that impairments introduced by the recording/playback process are kept to a minimum, which means that, in general, any subsequent editing and dubbing should be carried out using equipment that meets the full broadcast performance specification.

S4C requires any proposed use of non-broadcast format (NBF) equipment to be discussed first with the Director of Broadcast and Distribution. The following is intended to provide some background on where the use of NBF material is likely to be acceptable and some advice on how to achieve the best quality in the circumstances.

First, one should say that S4C's approach is not one of engineering purity. The principle objective is that the viewer should be satisfied with the quality in the overall context of the programme. This is not 'carte blanche' however, viewers do complain about quality matters and there is a difference between NBF's and broadcast formats. Use of NBF's should not be proposed simply to save money.

The differences can be assessed in terms of picture quality, of sound quality and in terms of operational facilities. Clearly they are interactive.

Picture quality in good lighting conditions can be very acceptable. Technically, the pictures will inherently lack definition, but on a sunny day the results will be perfectly satisfactory to the majority of viewers. When conditions are adverse, the quality will degrade much more quickly than the professional counterpart.

Sound quality is problematic. Recorded tracks on NBF's are sometimes adequate for actuality effects but may be found rather 'woolly' for important dialogue etc. The problem is partly the technical performance of the track but more importantly the proper control of sound recording with external microphones, mixer etc. are necessary to achieve an acceptable result, as is so with professional equipment.

Operational factors. The point is made that a professional crew on a shoot does contribute a great deal to the final picture quality. Factors such as use of tripods, lighting, camera skills and so on contribute as much as the recording format itself. Clearly, there would be little saving overall in employing a professional crew with a sub standard camcorder.

The Chief Technical Officer is required to make judgements on individual cases and does so balancing the production advantage with the technical quality achieved and the duration of the material, in assessing the likely viewer reaction. It is important that the viewer can see an obvious reason for sub-standard pictures. For example, some reduction in quality is readily understood when an old feature or when actuality news

footage is shown. Likewise there are unlikely to be any objections when an NBF is used in a situation when it is obvious that the camera is in amateur hands, provided reasonable quality is achieved.

However, if poor quality is seen on general entertainment programmes or if it goes on for a long time, viewers can reach for their remote controls; the ease of 'channel hopping' must be kept in mind in these debates.

Where an NBF is approved for source recording, it is strongly recommended that it is dubbed immediately to a broadcast format for post production or edited from a suitable player directly to a broadcast format with no further generations on the NBF; quality losses and difficulties are compounded when editing on NBF's. Where possible, users should receive some training in the use of the camera (for example, setting colour balance, how to avoid unsteadiness, best use of available light etc.). A test or trial run may also help to avoid problems later.

FLASHING IMAGES OR REPETITIVE PATTERNS

Unless the tapes are delivered with a Harding certificate or a clearly statement that the programme has been tested successfully using a HD Gordon, S4C test all delivered transmission tapes for compliance with the OFCOM guide using an Electronic Flash Pattern analyser. It is very much recommended that such a device is used in the production process as it can save a great deal of time and money correcting programmes at a later stage.

The Broadcasting Code published by Ofcom in 2005 places a duty of care upon broadcasters and mentions Photosensitive Epilepsy in section 2.13;

*"**2.13** 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 full code can be found at:
http://stakeholders.ofcom.org.uk/broadcasting/broadcast-codes/broadcast-code/harmoffence/

1. OFCOM guidance on flashing images and repetitive patterns is as follows: Flashing lights and certain types of regular visual patterns can cause problems for some viewers who have photosensitive epilepsy. People below the age of 20 Years are the most susceptible group and many are unaware of their susceptibility. Care must be taken to minimise these risks in all programmes, but especially where young people are likely to be watching in significant numbers. This might mean cutting or amending certain scenes or sequences or rejecting entirely some material. At times difficulties in minimising the effects may be encountered, for example with some types of live coverage, such as a news report. Where there is likely to be significant risk, viewers should be given an appropriate warning at the start of the programme item.

2. Television is by nature a flickering medium (because of the 50Hz refresh rate of typical TV receivers and the 25Hz effects of interlaced scanning) and it is therefore not possible to completely eliminate the risk of television causing convulsions in those viewers with photosensitive epilepsy. There are certain types of visual stimuli that are most likely to cause these problems, however, and these should, therefore, be avoided in television programmes or advertisements where possible.

3. **Flashing and flickering images** in colour or black and white, which result in visible screen brightness changes of more than 10% screen area at a rate exceeding 3 flashes per second, should be avoided.

   3.1 Moderate repetitive changes in screen brightness exceeding 10% screen area are acceptable, provided the difference in brightness over any two consecutive frames in a sequence does not exceed 10%. This is measured as the difference in brightness between the lighter and corresponding darker image area expressed as a percentage of the brighter image. Brightness changes greater than 10% will produce a visible flash and this therefore represents a risk. In this case only one flash will be allowed in any nine-frame period.

   3.2 Brightness level changes exceeding 10% are also acceptable in small areas. Up to 10% of the screen, either a single area or a sum of smaller parts may change at any rate or brightness level.

   3.3 Flashes involving highly saturated red are particularly dangerous and should be avoided.

4. **Rapidly changing image sequences** are provocative when they result in a visible brightness change over more than 10% of the screen area, at a greater rate than 3 changes per second. An image, which changes every 9 frames or more, irrespective of its brightness or screen area, will comply with this guideline.

5. **Regular patterns**, which cover more than 10% of the screen area, should be avoided. A single pattern cycle may consist of distinct vertical, horizontal, diagonal, circular, radial line or bar segments followed by a segment of different brightness. Pattern cycles, which are repeated, can form grid patterns.

6. A pattern is considered provocative if it produces the equivalent of 10 to 40 cycles across the screen and the difference in screen brightness between any two adjacent segments exceeds 10%.

7. **Moving patterns**, which flow smoothly across, into or out of the screen in one direction, are not considered hazardous. However, a moving pattern, which changes direction, oscillates flashes or reverses in contrast is particularly hazardous. Pattern contrast reversals using fully saturated red are not allowed.

8. **Computer generated images** which are highly detailed can cause a high degree of inter-line flicker in the picture at a rate of 25 times per second and should be avoided.

Screen brightness refers to luminance intensity. This can be measured directly on a monitor screen using a spot photometer suitable for T.V display measurements. Video waveform luminance is not a direct measure of display screen brightness.

If in doubt please contact S4C.

If the programme was shot on 35mm film then the choice of aspect ratio for the shoot must be decided beforehand bearing in mind that it will have to be transferred to video tape in the ratio 16:9.
Finally it should be remembered that widescreen programmes should be delivered to S4C in their 'Full Height Anamorphic' from and that programmes delivered in any form of Letterbox format are **not acceptable to S4C.**

Broadcast and Distribution Contacts:

Chief Technical Officer : Steve Cowin
Steve.Cowin@s4c.cymru
02920 741201

Transmission Services : Jim Hennefer
Jim.Hennefer@s4c.cymru
02920 741217

Content Management : Jen Pappas
Jen.Pappas@s4c.cymru
02920 741431

Contact for Access Services:
Meleri Wyn Flint:
Access Services Co-ordinator
Meleri.Wyn.Flint@s4c.cymru

Content Support:
Rhys Bevan
Content Operations Manager
rhys.bevan@s4c.cymru

For any information regarding font, placement of closing credits, copyright notices etc please refer to the S4C Brand Guidelines on the Production website.

http://www.s4c.cymru/en/production/