Technical requirements

for programme material commissioned by ITV

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This note of the Technical requirements for programme material commissioned by ITV is intended to give guidance to producers and their technical support staff and to assist them in ensuring that they are able to deliver programmes that meet ITV's requirements.

This note is based on the regulatory technical requirements imposed on ITV plc. within the terms of its licenses from OFCOM and will also include standards and practices that are established within these companies.

Advances in production techniques and changes in operational requirements will necessitate review of its content from time to time.

James Robinson

Senior Manager, Technology Planning & Development

ITV plc

Technical Requirements For Programme Material Commissioned By ITV

1 INTRODUCTION

Under the Broadcasting Act 1990, OFCOM is charged with maintaining high technical standards throughout the Independent Television system. The responsibility for the maintenance of standards is delegated to the licensee who is answerable to OFCOM. The following stipulates the technical quality standards required by ITV to achieve the requirements of OFCOM.

1.1 Technical Quality

Prior to acceptance, all programme material will be technically assessed to ensure that it meets ITV's delivery requirements and will be graded using the ITU-R five-point quality scale as shown below: -

Quality Grade	Assessment
5	Excellent
4	Good
3	Fair
2	Poor
1	Bad

ITV plc. licensees are required by their license to transmit programme material conforming to the following guidelines: -

(a) Live programmes should achieve a sound and vision grade of 5.

(b) Recorded programmes should achieve a sound and vision grade of 4.

1.2 Technical Exemption

Special circumstances may arise where material of a lower ITU grade may be accepted because of its intrinsic historical or artistic merit or where special production requirements apply. In these cases prior approval must be sought via your ITV technical contact, who will seek Technical Exemption if appropriate.

1.3 Technical Contacts

ITV has more than one delivery point. These will normally be stipulated in contracts, but general technical enquiries should be made to the following:

James Robinson

Senior Manager, Technology Planning & Development
ITV plc
200 Grays Inn Road
London WC1X 8HF
Tel: 084488 14704
From outside the UK Tel: +4420 8528 2000
Email: james.robinson@itv.com

For all other ITV contacts, please see Appendix 15.

2 PRODUCTION STANDARDS

Except when specific agreement has been obtained in advance from the ITV technical contact, all programme material produced for ITV must be originated and post-produced on equipment compatible with the 625-line PAL system I and which meets the performance specifications as laid down in the 'OFCOM Handbook of Technical Standards for Television Production' as well as specific requirements contained within this delivery document. Documentary evidence of proof of performance may be required.

2.1 Vision Quality

Pictures must be of the appropriate quality for television transmission, attaining at least grade 4 on the ITU-R 5 point scale.

The vision modulation levels should use the full video signal range and should be free of black crushing or highlight compression and be consistent throughout the programme. Resolution of fine detail in low-luminance areas of the picture should be maintained. The insertion of black lift to improve details near black level is not acceptable.

Transient response should be such that ringing, smear and echoes are not noticeable. Moiré and other patterning should not be visible under any circumstances. You should be aware of Moiré patterning that may not have been visible if component monitoring has been used in the production process but may be visible in PAL. Particular attention must be given to the preservation of colour balance and the rendition of skin tones.

Lighting conditions during productions should be appropriate to television and allowance must be made for the differences in reproduced contrast ratios of television and theatrical displays.

No luminance going below blanking level is acceptable.

Transcoding between component and composite video or digital to analogue and analogue to digital should normally be limited to one codec pair.

Particular care must be taken to avoid illegal colours when using caption generators, graphics equipment and video clippers, etc. This can be achieved by adhering to EBU recommendation R103-2000.

It is not possible to assess the legality of video components directly from a waveform monitor displaying YUV signals. This measurement must be undertaken in RGB form, preferably using a broadcast standard lightning, diamond or RGB parade display.

Compared with the recorded colour bar line up signal:
* R, G and B signals must lie in the range -5% to +105%, and
* The resultant luminance signal must lie in the range -1% to +103%.

For more information see EBU recommendation R103-2000.
http://www.ebu.ch/CMSimages/en/tec_text_r103-2000_tcm6-4677.pdf

2.2 Video Compression

Video compression during the production process should only be used after prior approval, which should be sought via the ITV Commissioning Editor. Where a particular system and compression ratio has been approved the production path should be organised to limit any noticeable effect on the resulting quality of the final edited version. Any compression greater than 2:1 must be clearly shown on the recording report, indicating the system used and the

compression ratio. This information must be carried forward to the edited master showing it contains material that has been previously compressed. When transmitted as part of the D3/4 Multiplex and the Sky Digital platform the programmes will be compressed to lower bit rates, which should be born in mind.

Mini DV, DVCAM and Hi8 are considered non-professional formats for programme making. Permission must be sought from an ITV Technology contact before shooting on these formats.

The HDV format can be used in standard definition mode to good effect, however it is still considered to be a non-professional format and should be treated in the same way as DVCAM.

Using a DVD as insert material into a programme is not acceptable. If you have problems sourcing suitable quality inserts, please contact the ITV technical contact for advice.

Line 23 Signalling:
Some of these formats above insert a line 23 signal onto the tape. This signal must not be present on the final edited master tape for transmission.

2.3 Technical Exemption

Under some circumstances there may be a justification to delivery a transmission master that may have certain sections that are of a lower technical quality than usually expected by ITV. These may include:

- News Inserts
- Archive material
- Actuality material
- Editorial/Directors intent e.g. Video diaries or hidden camera material

The programme maker must seek permission for exemption from an ITV Technology contact directly (see Page 2). This should happen before the programme has been shot or at the very latest, before final editing.
Every attempt must be made to improve the quality of lower quality footage to meet the ITV guidelines within this document.

2.4 Vision & Special Effects

The use of some special effects may conflict with engineering requirements. We would ask that Special Effects processes be discussed before they are committed to the programme. Examples of this are: “Film Effect” (field doubling) or the reduction of resolution by the use of filters or electronic effects. It is good practice to produce a high quality master (without effects) so that substitutions/alterations can be made easily. In all cases it is suggested that approval must be sought via your Commissioning Editor or relevant Technology contact, who will seek Technical Exemption if appropriate.

2.4a Flashing Images and Repetitive Patterns

Flickering or intermittent lights and certain types of repetitive visual patterns can cause problems for some viewers who have photosensitive epilepsy. The television companies, together with OFCOM, have consulted with leading medical opinion in this area to draw up guidelines aimed at reducing the risk of exposure to potentially harmful stimuli. For further notes see Appendix 6.

2.5 Widescreen Aspect Ratios

The use of widescreen in production is now the normal with the advent of Digital Broadcasting.

If produced in 16:9 full height a programme should be framed for 14:9 safe action and graphics that meet the specification set by the EBU. This safe area has no further tolerances, so you must

keep all graphics within these limits which will also allow for the programme to be utilised in most transmission markets. When delivery is approved in 16:9 full height, a full height 16:9 master should be delivered. It may be necessary to supply end credits, rollers etc. in both 4:3 and 16:9 compatible forms at the end of the tape, especially if overseas sales are approved in 4:3 only.

Transmission of widescreen programmes will be from the 16:9 full height master. This tape can also be used to derive any 14:9 (slight letterbox) or 4:3 master if required through the use of an aspect ratio converter. We appreciate that for widescreen transmissions, advice may be necessary. It is also essential that the clocks for all parts are in the same aspect ratio as the programme and should be idented with 16:9 FH. *For an example see Appendix 15*. This is necessary for easy identification purposes. Please contact ITV Technology for advice.

Delivery of widescreen programmes in 16:9 letterbox must be avoided. The recording report, tape shell, case and clocks should all be clearly marked with the aspect ratio. The clock and all relevant paperwork should also be clearly marked with the Active Format Descriptor of the programme. For further notes see Appendix 14

The shooting of 16:9 full height widescreen on a 4:3 CCD is discouraged. Please seek advice from the ITV Technology contact.

Some cameras insert Line 23 widescreen data onto tape. This data must not be on the final edited transmission master delivered to the broadcaster.

2.6 Sound Quality

The audio signal shall have a tonal balance that is correct in the context of the programme and should be free of noticeable noise or spurious signals such as hum, distortion, sibilance, wow and flutter and acoustically produced interference.

Stereo programmes must have correct left/right spatial relationship. Left and right channels should also have the correct phase relationship throughout the programme including line-up tone.

All recordings using microphones should use appropriate techniques and particular care should be taken with phasing when using multiple microphones. The placing of microphones should minimize the pick up of extraneous background noise. Care should be taken with personal microphones to minimize rustle from clothing.

Care must be taken on studio recordings that talkback is not recorded on tape either through acoustic or electronic pickup.
The dynamic range of programme sound must not be excessive and should be suitable for the television medium. When mixing audio, care should be taken to give a correct balance between music & effects and the programme dialogue as well as making sure that the mix is acceptable using mono TV speakers.
For guidance, examples of typically suitable sound levels are included in Appendix 7.

While the use of volume compression may be appropriate for some types of programme material, it should be used only with extreme care.

Surround sound effects can only be used after prior approval, which must be sought from your ITV Commissioning Editor.

2.7 Tape Formats - Acquisition and Post Production

During the acquisition and post production stages we would expect producers to be seeking to maximize benefits from modern technology. This would mean entering the digital domain as

soon as possible; this could be by acquiring on broadcast quality digital formats or editing to a digital tape format and ensuring that any postproduction applied thereafter was as transparent as possible. Documentary evidence of proof of performance may be required. See Appendix 9. Analogue outputs from DV equipment should not be used.

If analogue component or analogue composite tape is used as the acquisition and/or postproduction format, the maximum number of generations must normally be limited to 2 before delivery. Exceptions to this are to be agreed in advance with your ITV commissioning editor.

Other tape formats for acquisition, including formats not normally considered as broadcast quality, may be acceptable but only after prior approval, which must be sought from an ITV Technical contact (see page 2).

For DELIVERY REQUIREMENTS see Section 4.

2.8 Subtitles

Programmes may be commissioned with teletext subtitles to assist the hearing impaired. The subtitle/caption information may be recorded as text data conforming to World System Teletext with subtitles on page 888, recorded on TV line 335 in field blanking on the videotape. Alternatively subtitles may be supplied on a 3.5" floppy disc, Data CD or as an e-mail attachment containing data conforming to EBU TECH 3264-E, with reference timecode matching that of the Programme tape.

Subtitles must be produced in accordance with OFCOM's document 'Guidance on Standards for Subtitling'.

The technical specification for subtitles is in Appendix 4.

2.9 Programmes Produced on Film

The gauge, aspect ratio and film stock to be used must be discussed with your ITV commissioning editor or technical contact in advance of shooting. Constant improvements in stocks and differing location requirements will be taken into consideration when agreeing film stocks.

There should be sufficient lighting for the stock used. If not, unacceptable changes in grain and picture quality may occur when the programme is edited. On some newer stock overexposure may cause increase in grain and tests should be made to establish the normal range for the stock to be used.

All film must be telecine transferred at 25 frames/second.

Low contrast stock must be used for television prints.

Location sound must be recorded using equipment and techniques capable of producing sound quality commensurate with the quality achieved by the Nicam and digital stereo transmission systems. The use of timecode locking techniques is preferred to pilot-tone.

The production path for programmes commissioned to be produced on film should be agreed with ITV in advance and should be transferred to videotape for delivery. See Section 4 for DELIVERY REQUIREMENTS.

When an existing programme originally filmed on Super16 and delivered and transmitted in 4:3 is to be re-transmitted, it is preferred that the film is re-telecine transferred into a 16:9 frame and a new transmission master is submitted.

2.9a Film to Tape Transfer

Film must be transferred using flying spot or CCD telecine at 25 frames/second.

The use of "varispeed" to modify running times is not permitted.

Film must not be transferred via standards conversion.

Particular attention must be given to the preservation of colour balance and the resolution of fine detail in low-luminance areas of the picture. Black crushing is to be avoided and the insertion of black lift to improve details near black level is not acceptable.

2.10 Standards Conversion

Standards Converters shall be high quality and employ motion interpolation to reduce movement judder and loss of resolution.

2.11 International Versions

Programmes commissioned to include versions for International distribution may have different requirements from UK versions. Full details should be agreed with your ITV commissioning editor. See Appendix 12.

2.12 High Definition Television

Due to the number of formats available to shoot HDTV pictures, it is recommended that you contact ITV to discuss which format is best for your production. Generally we will only accept ITV commissioned HD shot in either 25 or 24 frames per second formats.

For productions wishing to acquire using an HD format and down-convert to SD, please discuss this with an ITV technology contact. All finished programme material must comply with the SD delivery requirements.

3 MONITORING CONDITIONS

3.1 Video

It is important that control rooms and viewing rooms used to assess programme quality during post-production, recording and telecine transfers do not affect subjective impressions of the luminance, resolution and colour attributes of the picture. It is important therefore that the viewing conditions should closely correspond to ITU-R Recommendation BT500 (CCIR Rec. 500).

It is particularly important that picture monitor's are set up to a peak output of 90 Cd/m^2 and brightness should be adjusted (under the ambient lighting conditions that will be used for viewing) using a picture line-up signal with ± l4mV pedestal step.

Productions should be checked on PAL composite monitoring to ensure compatibility in PAL domain.

3.2 Audio

Assessment of sound quality should be carried out in controlled listening conditions. Parameters requiring critical appraisal are volume and loudness balance, stereophonic image, and the compatibility and intelligibility of the audio mix for the listener's of Dolby Surround (if encoded), Nicam and monophonic receivers.

EBU publication 'TECH. 3276-E' recommends technical standards that should be adopted for the acoustic properties of control and listening rooms.

4 DELIVERY REQUIREMENTS

ITV requires its standard definition recorded programmes to be delivered on Digital Betacam videotape. The production process must be agreed in advance with your ITV Commissioning Editor. The tape supplied must be the final edited master tape, (see 2.8a). The technical specification for the configuration of Digital Betacam is in Appendix 1.

Under certain circumstances programmes will be accepted on Betacam SX. This will only be after prior agreement with your ITV commissioning editor. The technical configuration of Betacam SX is in Appendix 2.

The cassettes supplied must be of the highest professional quality and must be a first pass recording and of a type appropriate to the format used, otherwise malfunction of equipment may occur or poor technical quality may result. Inter-machine alignment tests may be required. See Appendix 9.

As tapes maybe used in a fully automatic transmission system - approved tape types are listed in Appendices 1 and 2.

Tapes must be in the manufacturer's cases and should be protected by suitable packaging material, and they must be clearly labelled.

Note: Flock filled padded envelopes are not suitable since a failure in the packaging can lead to contamination of the tape.

4.1 VTR Leaders

Immediately prior to the start of the programme an alignment/identification leader is required. See Appendix 3 for details.

The vision at every end of part must be frozen for a minimum of 10 seconds.
Following on from this, a minimum of 15 seconds of black and silence must be inserted between each programme part.

4.2 Video Signal

The recorded video signal shall be compatible with the 'Specification of Television Standards for 625-line PAL System I Transmissions in the United Kingdom' published by the United Kingdom Department of Trade and Industry. The video signal must be accurately related to the line-up signal recorded at the head of the tape. The Active Picture boundaries (horizontal and vertical) must have constant timing and not be less than the specified blanking tolerance. See Appendix 12.

4.3 Audio Signals

The recorded audio level must be related accurately to the line-up tones recorded at the head of the tape. Peak programme levels must not exceed line-up levels by more than 8dB. The sound shall be recorded on the two designated tracks as in Appendices 1 and 2. All tracks must be suitably mixed for television transmission. Separate dialogue and M & E tracks are NOT acceptable on Audio tracks 1 and 2.

4.4 Sound/Vision Synchronisation

Under no circumstances may audio and video be out of synchronisation by any noticeable amount i.e. audio leading vision by no more than one field and lagging vision by no more than two fields. The use of dialogue replacement should not produce any such effects.

4.5 EBU Timecode

Timecode should be locked to the video signal and should be continuous throughout the tape including the header section and breaks. It must be present in the Vertical Interval (VITC) on lines 19/332 and 21/334 ONLY, and on the designated linear track (LTC) at a level corresponding to the line up tape. The LTC and VITC must be frame accurate and co-incident.

Code 00.00.00.00 should correspond to field 1.

The preferred timecode for the first frame of the programme shall be 10.00.00.00. Under no circumstances should the timecode run through 23.59.59.24.

Any start of parts should be at full minutes i.e. xx:xx:00:00 Seconds and Frames.

4.6 Documentation

Information should be presented on a "Recording Report", an example of which is reproduced in Appendix 8.

The following information should be included on the form, which should accompany transmission tapes:

- Programme/episode title.
- Programme number.
- Aspect Ratio
- Active Format Descriptor
- Total running time with details of breaks
- Programme production company or agent.
- Information regarding acquisition and postproduction formats used
- Names of recording/post production facility house and technical contact name
- Teletext subtitles on line 335 or accompanying disc (where applicable).
- Surround/stereo/dual-channel mono audio
- International additions See Appendix 11.
- Any known impairments.
- Date of recording.
- Details of any compressed video content.

Note: All previous labels/barcodes must be removed, with the box and tape clearly labelled for delivery. Record lockout should be enabled on all transmission masters delivered.

4.7 Transmission Centres, Live Programmes and Outside Broadcasts

ITV Transmission Centres
There are two transmission centres for ITV plc. They are as follows:

ITV London for ITV Network or London local programmes are transmitted from The Southern Transmission Centre situated at The London Television Centre, Upper Ground, Southbank, London SE1 9LT.
The following regions are also transmitted from The Southern Transmission Centre:
ITV Meridian
ITV Anglia
ITV Westcountry
ITV Wales
ITV West

ITV Yorkshire local programmes are transmitted from The Northern Transmission Centre situated at The Television Centre, Kirkstall Road, Leeds, West Yorkshire, LS3 1JS.
The following regions are also transmitted from The Northern Transmission Centre:
ITV Granada
ITV Central
ITV Tyne Tees
ITV Border

There are two methods of line delivery of programmes:

1. ITV Network, London, Meridian, Anglia, Westcountry, West and Wales regions, to ITV London – The Southern Transmission Centre

2. ITV Yorkshire, Central, Granada, Tyne Tees and Border Regions to ITV Yorkshire – The Northern Transmission Centre.

Please confirm the point of delivery with your ITV Commissioning Editor.

Producers should be aware of their delivery point from their ITV Commissioning Editor who will advise on the procedures to be followed.

4.8 Technical Requirements for line feeds

Please see Appendix 10 for details on delivery of live and pre-recorded programmes from remote sources

Backup Circuits for live programmes
A backup circuit must be supplied for all live programmes which are remotely fed to ITV transmission centres. This circuit must be totally separate from the main feed and should be of equal quality to the main.

Any new stages in remote delivery due to either new technology or previously unused paths should be proven to the satisfaction of ITV well in advance of any delivery.

Any ISDN requirements must first be discussed with the ITV Network Operations Department who will then issue dial-in numbers as necessary.

There should be adequate 4 wire communications circuits booked for production and engineering as well as full provision of backup circuits (separate to the main feed) that must be arranged with ITV Network Operations (see Appendix 10).

Facilities operators must be familiar with standard procedures for lining up with the transmission centre and be equipped with necessary sound and vision test signal generating and measuring equipment.

Adequate rehearsal and line-up time must be included in the booking of lines. See Appendix 10.

For CUE DOTS see Appendix 5.

4.9 Widescreen Delivery

All programmes must be delivered in either 16:9 full height or 4:3 full height dependant on the original contract. The coded frame must not change at any time during the programme. If you are inserting a different sized coded frame picture into your programme, you must first aspect ratio convert the material to make it match the coded frame of the commissioned programme.

5 RADIO FREQUENCY EQUIPMENT

Producers may wish to make use of radio equipment for microphones, links or talkback systems in the course of the production of a programme. ITV share an allocation of channels with other broadcasters on a pool basis, as required by the DTI. The use of channels is co-ordinated by the Joint Frequency Management Group (JFMG). Requests for channels must be made via the relevant programme production manager who will discuss and agree requirements before sponsoring applications to the JFMG. Producers are reminded that it is a criminal offence to use radio frequency equipment without a license.

All equipment and apparatus used must comply with the latest Electromagnetic Compatibility Directive from the EEC.

It is an offence to use equipment that operates on Radio Frequencies allocated to broadcasters without clearance from the JFMG.

6. TECHNICAL APPENDICES

Technical Appendix 1
DIGITAL BETACAM DELIVERY

Technical Appendix 2
BETACAM SX DELIVERY

Technical Appendix 3
VTR LEADERS

Technical Appendix 4
SUBTITLES

Technical Appendix 5
CUE DOTS (LIVE FEEDS ONLY)

Technical Appendix 6
FLASHING IMAGES AND REPETITIVE PATTERNS

Technical Appendix 7
TYPICAL SOUND LEVELS

Technical Appendix 8
DOCUMENTATION

Technical Appendix 9
VTR ALIGNMENT

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REMOTE DELIVERY INCLUDING ITV SPORT REQUIREMENTS

Technical Appendix 11
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BLANKING TIMING

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16:9 FULL HEIGHT CLOCK

Technical Appendix 15
ITV plc CONTACTS

Technical Appendix 1

VTR DELIVERY FORMAT ALIGNMENT REQUIREMENTS
DIGITAL BETACAM FORMAT

	PARAMETER	REQUIREMENT
1	General	
1.1	Video Standard	625/50
1.2	Alignment Tape	Video line-up ZR5-1P, (part no. 8-960-073-51) -2dBu, -20dBfs
1.3	Tape Type	1570 oersted metal particle
1.4	Delivery Cassette Tabs	Set for Record lockout
1.5	Physical	Always use first pass tapes Error rate should be low & commensurate with modern tape technology Ship in manufacturers supplied cases
2	Audio	
2.1	Replay level of specified alignment tape	PPM3.5 (-2dBu)
2.2	Line-up at	- 18 dB wrt peak
2.3	Variation wrt standard tape	+/- 1.5 dB
2.4	Variation between tracks	0.25 dB
2.5	Phase deviation	No phase errors
2.6	Programme Peak Levels	Max 8 dB higher than ref tone
2.7	Noise reduction system	No preemphasis to be used
2.8	Track Allocation	
	A1	Stereo LEFT or Monophonic
	A2	Stereo RIGHT or Mono dupe of A1
	A3	Silence or dup. of track 1 (or M & E where available[1])
	A4	Silence or dup. of track 2 (or M & E where available[1])
	Cue track	Optional mix of tracks 1 and 2

2.9 Left and right channels shall be recorded in the correct phase relationship throughout the programme and at the head.

Care must be taken to ensure that the signal level recorded on the Cue Track, if used, is not excessive as a result of the mixing process.

3 Where programme material is supplied with a DUAL MONOPHONIC sound track, track layout shall be as follows:

Track Allocation	
A1	Programme sound
A2	Programme sound
A3	Silence or dup. of track 1 (or M & E where available[1])
A4	Silence or dup. of track 2 (or M & E where available[1])
Cue track	Optional mix of tracks 1 and 2

Audio recorded on tracks 1 and 2 shall have identical levels and phase at all frequencies. This should include the source reference tone recorded at the head of the tape. An electronic split should be made of the TX track to ensure that identical signals are presented to the mastering VTR.

Source tone for BOTH channels shall be interrupted simultaneously for 0.25 seconds every 3 seconds to permit rapid identification recording type and preferably slated.

4 Video

4.1	Peak white level variation wrt colour bars on leader	+/-2% (any signal Y, Pr, Pb)
4.2	Level variation wrt standard tape	+/-2%
4.3	Luminance/Chrominance coincidence	+/-10 ns
4.4	Luminance below black	None
4.5	Blanking[2]. See Appendix 13.	

5 Timecode

Programme Start	10.00.00.00[3] recorded on lines 19/332 & 21/334 & LTC

[1] See Appendix 12 for INTERNATIONAL ADDITIONS.

[2] Checking digital blanking alone is not sufficient. The recording may contain material that once had analogue blanking applied.

[3] Preferably, but must be engineered to occur at a timecode value which includes '00' minutes and '00' seconds at the start of each part.

Technical Appendix 2

VTR DELIVERY FORMAT ALIGNMENT REQUIREMENTS
BETACAM SX FORMAT

	PARAMETER	REQUIREMENT
1	General	
1.1	Video Standard	625/50
1.2	Alignment Tape 20dBfs	Video line-up SR5-1P, (part no. 8-960-075-51) -2dBu, -
1.3	Tape Type	metal particle
1.4	Delivery Cassette Tabs	Set for Record lockout
1.5	Physical	Always use first pass tapes Error rate should be low & commensurate with modern tape technology Ship in manufacturers supplied cases
2	Audio	
2.1	Replay level of specified alignment tape	PPM3.5 (-2dBu)
2.2	Line-up at	- 18 dB wrt peak
2.3	Variation wrt standard tape	+/- 1.5 dB
2.4	Variation between tracks	0.25 dB
2.5	Phase deviation	No phase errors
2.6	Programme Peak Levels	Max 8 dB higher than ref tone
2.7	Noise reduction system	No preemphasis to be used
2.8	Track Allocation	
	A1	Stereo LEFT or Monophonic
	A2	Stereo RIGHT or Mono dupe of A1
	A3	Silence or dup. of track 1 (or M & E where available[1])
	A4	Silence or dup. of track 2 (or M & E where available[1])
	Cue track	Optional mix of tracks 1 and 2

2.9 Left and right channels shall be recorded in the correct phase relationship throughout the programme and at the head.
Care must be taken to ensure that the signal level recorded on the Cue Track, if used, is not excessive as a result of the mixing process.

3 Where programme material is supplied with a DUAL MONOPHONIC sound track, track layout shall be:

Track Allocation	
A1	Programme sound
A2	Programme sound
A3	Silence or dup. of track 1 (or M & E where available[1])
A4	Silence or dup. of track 2 (or M & E where available[1])
Cue track	Optional mix of tracks 1 and 2

Audio recorded on tracks 1 and 2 shall have identical levels and phase at all frequencies. This should include the source reference tone recorded at the head of the tape. An electronic split should be made of the TX track to ensure that identical signals are presented to the mastering VTR.

Source tone for BOTH channels shall be interrupted simultaneously for 0.25 seconds every 3 seconds to permit rapid identification recording type and preferably slated.

4 Video

4.1	Peak white level variation wrt colour bars on leader	+/-2% (any signal Y, Pr, Pb)
4.2	Level variation wrt standard tape	+/-2%
4.3	Luminance/Chrominance coincidence	+/-10 ns
4.4	Luminance below black	None
4.5	Blanking[2]. See Appendix 13.	

5 Timecode

Programme Start	10.00.00.00[3] recorded on lines 19/332 & 21/334 & LTC

[1] See Appendix 12 for INTERNATIONAL ADDITIONS.

[2] Checking digital blanking alone is not sufficient. The recording may contain material that once had analogue blanking applied.

[3] Preferably, but must be engineered to occur at a timecode value which includes '00' minutes and '00' seconds at the start of each part.

Technical Appendix 3

VTR LEADERS STEREO

Timecode	Dur (m:s)	Video	Audio 1	Audio 2	Audio 3	Audio 4
09:57:30:00	00:30	Black Level		Silence		
09:58:00:00	01:30	100/0/100/0 Colour Bars	Interrupted Tone 1 kHz	Continuous Tone 1kHz	Interrupted Tone 400Hz	Continuous Tone 400Hz
09:59:30:00	00:10	Ident & Clock		Silence		
09:59:40:00	00:05	Ident & Clock		Optional Verbal Ident		
09:57:45:00	00:12	Ident & Clock		Silence		
09:59:57:00	00:03	Black Level		Silence		
10:00:00:00	--	PROGRAMME		PROGRAMME START		

VTR LEADERS MONO

Timecode	Dur (m:s)	Video	Audio 1	Audio 2	Audio 3	Audio 4
09:57:30:00	00:30	Black Level		Silence		
09:58:00:00	01:30	100/0/100/0 Colour Bars	Interrupted Tone 1 kHz	Interrupted Tone 1 kHz	Interrupted Tone 1 kHz	Interrupted Tone 1 kHz
09:59:30:00	00:10	Ident & Clock		Silence		
09:59:40:00	00:05	Ident & Clock		Optional Verbal Ident		
09:57:45:00	00:12	Ident & Clock		Silence		
09:59:57:00	00:03	Black Level		Silence		
10:00:00:00	--	PROGRAMME		PROGRAMME START		

Technical Appendix 4

SUBTITLES

Subtitle data must conform to the requirements of the current 'World System Teletext Technical Specification' published by the UK Department of Trade and Industry. Where video tapes are provided with subtitle data on a floppy disc, the medium should be 3.5-inch high density portable magnetic disc (microfloppy) formatted for 1.44 Mbyte having a data file format defined for use with an IBM PC/XT/AT or compatible computer. If Data CDs are used, these should be CD-R 700MB. It should also meet the specification of the EBU subtitling data exchange format, defined in 'EBU TECH. 3264E'.

Delivery Requirements

Where subtitles are supplied on a separate disc its label must indicate the disc and file formats and the associated programme title and tape number.

Reference timecode must agree with timecodes on the Programme tape.

Where a tape is provided with integral teletext subtitle data in order to ensure satisfactory transfer of the teletext data to the viewer without further processing the following conditions must be met:-

Page Number	888 (i.e. page 88 in magazine 8)
Line Number	335 ONLY (Line 22 must not carry any teletext subtitle data signal.)

Position of Subtitles on the screen

Displayed subtitle rows must be located so that they never obscure any in-vision, superimposed, message or open caption. Care should also be taken to ensure that subtitle rows do not obscure key parts of the visual action.

Technical Appendix 5

CUE DOTS (Live Feeds Only)

It is important that Cue Dots are positioned so that they do not cause annoyance to the viewers. This will not be the case if they are centred on the safe action area limits of 5% in from blanking. They will not be visible on standard domestic receivers and should only just be visible on a correctly adjusted widescreen receiver.

A satisfactory condition will be achieved with the following:

1. Size to be not less than 2% of picture height with an aspect ratio of 4:3.

2. Position to be such that the centre dot lies between 4% and 5% of picture height below the top of picture and between 4% and 5% from the right hand or left hand edge of picture. The right hand cue dot is reserved for indication of the end of part or end of programme.

3. Modulation should be approx 1 MHz.

4. Amplitude should be not greater than 700mV.

5. The Cue Dot should be Inserted (keyed) into the picture rather than mixed over programme information.

6. The Cue Dot should disappear 5 seconds before the end of the sequence.

Technical Appendix 6

FLASHING IMAGES AND REPETITIVE PATTERNS

Television is by nature a flickering medium (because of the 50Hz refresh rate of typical TV receivers and the 25Hz effect of interlaced scanning). It is therefore not possible to completely eliminate the risk of television causing convulsions in viewers with photosensitive epilepsy. Steps can be taken, however, to reduce unnecessary risks. The following visual devices should be avoided in television programmes.

Flashing lights or rapidly changing of flickering images should be avoided if they were to be positioned near the centre of the screen or if occupy more than around 10% of the picture area and if they change in brightness by more than 10%. Changes in colour are not a problem as long as the luminance level doesn't change with the colour.

Prominent and regular patterns that cover large proportions of the picture area should also be avoided, especially if they represent bars, spirals or "dartboard" patterns. Moving or flickering regular patterns are particularly hazardous.

Care needs to be taken with computer generated images, which if highly detailed, can cause a high degree of 25Hz inter-line flicker in the displayed TV picture.

Examples of flashing images are:

Repeatedly cutting a caption background from light to dark or dark to light.
Mixing or cutting different images with different brightness levels in short sequences.
Stroboscopic lighting effects and the use of flash photography.

Please contact the relevant Engineering Department for guidance when necessary.

For further information, please consult OFCOM's website:
http://www.itc.org.uk/itc_publications/codes_guidance/flashing_images/index.asp

Technical Appendix 7

TYPICAL SOUND LEVELS

The following sound levels are indicative. Whilst not absolute, if used as a guide they will help producers to achieve a dynamic range of sound best suited to the broadcast television medium.

The numbers below refer to those on the meter display of a PPM to specification BS6840: Part 10.

MATERIAL	NORMAL PEAKS	FULL RANGE
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	-

In general, all compressed material delivered to ITV should not exceed 4 on a PPM.

Technical Appendix 8

DOCUMENTATION

VT Report

Your Facility Name:					
Your Facility Address:					
Prog Title:				Prog No:	
Episode Titles:				Tape No:	
Date:		Source Machine:		Record Machine:	
AFD:	DigiBeta	Beta SX	HDCAM	HDCAM-SR	Other
Stereo/Mono/M&E		A1		A2	
		A3		A4	

Tape Content	Start Timecode	End Timecode
Comments:		
Operator:		

Technical Appendix 9

VTR ALIGNMENT

1 Interchange

The recording machine used to produce the delivered tape copy to ITV must be correctly aligned to the manufacturers' specification. Alignment tapes suitable for the purposes must be employed wherever required.

Particular attention must be given to the following parameters:-

- low error rates Digital Betacam or Betacam SX
- tape tension and guide positions
- video record optimisation and levels
- control track continuity and phasing
- colour frame pulse positioning
- audio levels and equalisation
- audio track allocation.

2 Level Variations

Video levels of the recorded peak white signal shall not deviate by more than +2% throughout the recording including the line-up colour bar sections.

Audio levels throughout the recording shall not exceed +8 dB over the line-up source tones.

3 Timing Variations

The relative timing of luminance and chrominance shall not exceed +20 ns.

4 Sound to Vision Synchronisation

There shall be no loss of synchronisation between video and audio signal.

Technical Appendix 10

DELIVERY OF LIVE AND PRE-RECORDED PROGRAMMES FROM REMOTE SOURCES INCLUDING ITV SPORT ADDITIONAL REQUIREMENTS (SECTION 8)

All requirements for delivery from remote sources should be discussed with ITV Network Operations at the earliest possible stage of the production process to coordinate technical requirements. Below is a minimum set of standards that should be followed.

The production company will be responsible for delivering fully compliant signals to an agreed handover point. This is normally the OB/Studio output or BT Tower or the Southern Transmission Centre (STC) in London or the Northern Transmission Centre (NTC) in Leeds subject to contract.

1 Vision and Sound Systems

Vision signals shall conform to, or be compatible with, 625 Line serial digital 270Mbit/s ITU–R recommendation 656 or 140Mbit/s ITU-R recommendation 721. MPEG2 4:2:2 at main level with a 12 frame GOP structure can also be used with a minimum bit rate of 24Mbit/s. Any variations to these bit rates should be discussed with ITV at the commissioning stage.

Sound signals shall be Stereo or Dual Channel Mono, which may be carried via a suitable audio link. This can be ether embedded as part of the ITU-R recommendation 656 signal or a separate AES or analogue feed.
A routing schematic must be supplied to ITV Network Operations for all routes.
Encoding and decoding along the chain must be kept to a minimum to reduce concatenation effects.

2 Backup Circuits

A backup circuit must be supplied for all live programmes which are remotely fed to ITV transmission centres. This circuit must be totally separate from the main feed and should be of equal quality to the main.

3 System Stability

Signals (including VBI signals if appropriate) shall be stable and be present throughout the line-up and transmission of the broadcast. If remote cameras or contributions into the source are used, these must be stabilised by means of picture (frame) synchronisers.

It is fundamental to the design of the NICAM system that the dual channel SIS signal is carried on a stable vision signal. Particular care must be taken therefore to ensure that syncs remain stable and uninterrupted throughout line-up and during the transmission of the programme.

If this requirement cannot be guaranteed, for example over satellite paths or mobile radio links, then sound signals should be carried by a mutually acceptable alternative means, for example additional analogue channels.

4 Sound to Vision Synchronisation

Whenever vision signal processing (such as synchronisation) or separate vision and sound paths are employed, additional steps must be taken to ensure that the process does not introduce any sound to vision synchronisation errors. It is recommended that a device for validating digital streams including sound to vision synchronisation is used.

5 Line-up Signals and Testing

All circuits shall carry identification during the line up period. Line up should be present for at least 30 minutes before transmission begins. This must include aspect ratio information and individual identification of the video and audio circuits. Static test signals should be avoided and if used should contain a moving element. Additional required tests will need to include moving picture and synchronous sound tests. A technically competent person must also be assigned to conduct the line up.

All circuits must be tested in their final setup by a suitable time agreed with ITV before the first transmission.

The source must be capable of originating and sending the following signals by means of field interval switching:-

100/0/100/0 Colour Bars, Black and Sync and Programme sources

For stereo broadcasts:

Coherent 1kHz, 0dBu audio tone, interrupted on both channels 1 and continuous on channel 2

For mono broadcasts:

Coherent 1kHz, 0dBu audio tone, interrupted on both channels 1 and 2

The source may additionally be required to provide subtitles on line 335, whereupon details outlined in Appendix 4 shall be applicable.

6 Additional information regarding satellite delivery

Satellites in geostationary orbit positioned between 45 degrees East and 45 degrees West can be used. An inclined orbit is not acceptable.
RAS Encryption should be used at all times except during line up and testing.

7 Communications

One 4 wire must be present as a minimum for transmission centre communications. An Engineering 4 wire is also preferred. All talkback must be keyed and DEL/Mobile numbers must be supplied for remote control rooms as well as key staff on site.

8 ITV Sport Additional Requirements

ITV Sport will assign a Technical Producer to act as the ITV technical point of contact and will liaise with the production company on all issues relating to technical compliance of the transmission from the point of commissioning onwards. This includes agreeing the specification of any technical systems used in the production of this commissioned programme.

It is essential that responsibility for circuits and programme delivery is agreed at the commissioning stage. All programming must comply with the ITV delivery standards set out previously in this document.

The production company must have a technical contact available prior to the event liaise with the ITV Technical Producer on technical specification of systems.

Incoming Signal

The location facility will be required to supply individual video and audio line up signals.

Live programming from remote sources must be fed in such a way as to ensure stable continuous signals are available at the transmission centre at all times.

The following systems are also required:

- Monitoring of all signals at all appropriate locations to ensure the integrity of the signals.
- Agreement over the responsibility of each element of the delivery chain.
- All organisations concerned with the delivery must be able to report accurately on the quality of all signals entering and leaving their area of responsibility.

Communications

Appropriate communication facilities will be agreed by the production company with the ITV Technical Producer. The Production Company is responsible for ensuring that adequate talkback/intercom facilities are available in their OB/Studio remote facility.

Contingency planning

The ITV Technical Producer will determine the delivery technology for the event/location and appropriate to the event/transmission/budget status. This will take into account resilience and contingency to ensure continuous transmission. This may involve standby feeds using diverse and separate routing.

Circuit Bookings

Subject to contract, ITV Sport will normally provide all circuits for transmission through the ITV Technical Producer. ITV will also send a representative to oversee the transmission on-site.

Some commissions may include programme delivery (by storage media or circuit) to one of ITV's transmission centres in which case the production company will be responsible for all circuit (contribution and communications) bookings and costs.

In all cases ITV Sport reserves the right to specify delivery systems.

ITV Technical Producer

ITV Sport may require their Technical Producer to be present on-site during production in which case travel and accommodation costs will be met by ITV. If there is an on-site handover of feeds, they will be responsible for delivery to ITV.

It remains the responsibility of the production company to organise library and archive handling of the production. This includes all storage for future re-use and any rights holder issues.

Technical Appendix 11

INTERNATIONAL ADDITIONS

Timecode	Video	Audio 1	Audio 2	Audio 3	Audio 4
10:00:00	PROGRAMME[1]	PROGRAMME		M&E[3]	
Prog End	End	End		End	
Prog End +1 min	--	--		--	
	Ident & Clock	Silence		Silence	
Next 00:00 (min:sec)	Opening TTB[2]	--		Optional M&E[3]	
	Ident & Clock	--		--	
Next 00:00 (min:sec)	Closing TTB[2]	--		Optional M&E[3]	

If the main programme contains any in-show captions and/or English open subtitles, a separate tape (see below) must be delivered "clean" excluding any in-show captions and/or open subtitles with audio as above.

1 Vision - must be full height 16:9 aspect ratio (1.77:1) or *full height 4:3 aspect ratio (1.33:1)*
Note: Textless main and end title backgrounds may be delivered on a separate tape. Separate tapes must be on a format as agreed.

2 TTB - Textless Title Background.

3 M & E - Complete and synchronised Music and Effects/International sound Track must synchronise to main programme.

Technical Appendix 12

VIDEO BLANKING SPECIFICATIONS

Material that is acquired as digital component must comply with EBU reference document ‘TECH 3267-E’.

Material that is acquired as digital composite must comply with EBU reference document ‘TECH 3280-E’.

All material - when analogue PAL blanking is applied, the active picture boundaries (horizontal and vertical) must have constant timing and not be less than the blanking tolerance as contained in the ‘IBA Code of Practice for Television Studio Centre and Outside Broadcast Performance’, 1980 Edition, Issue 3.

EBU address:
EBU
Case Postale 6/CH-1218 Grand-Saconnex-GE
Geneva
Switzerland

Technical Appendix 13

WIDESCREEN

Your programme will have been commissioned in one of the three following formats:
Active Format Descriptors (AFD) are described below

4:3 Shot & protected for14:9 (AFD 5)
This is a 4:3 coded frame picture. When being shot, the camera person should frame the action only in a 14:9 safe area. The graphics safe area should be 14:9 safe.

16:9 Shot & protected for 14:9 (AFD 6)
This is a 16:9 full height coded frame picture. The EBU safe area specification for 16:9 shoot and protect 14:9 should be followed. Please see further on in Appendix 14.

16:9 Shot & protected for 4:3 (AFD 7)
This is a 16:9 full height coded frame picture. When being shot, the camera person should frame the action only in a 4:3 safe picture area in a 16:9 coded frame. The graphics safe area should be 4:3 safe in a 16:9 coded frame.
This is particularly useful for programmes that will be used in an international market.

If your programme has been commissioned in any other format e.g. 4:3 unprotected, 14:9 letterbox etc. please contact your ITV commissioning editor for confirmation before proceeding with the production.

Active Format Descriptor (AFD)

This shows the aspect ratio of the actual picture in the MPEG coded raster. It will be used to adjust widescreen TV's automatically to display the picture in the most appropriate way. The relevant AFD for your programme should be documented on all paperwork, the tape and for London delivery, the programme clock. There are seven codes as follows:

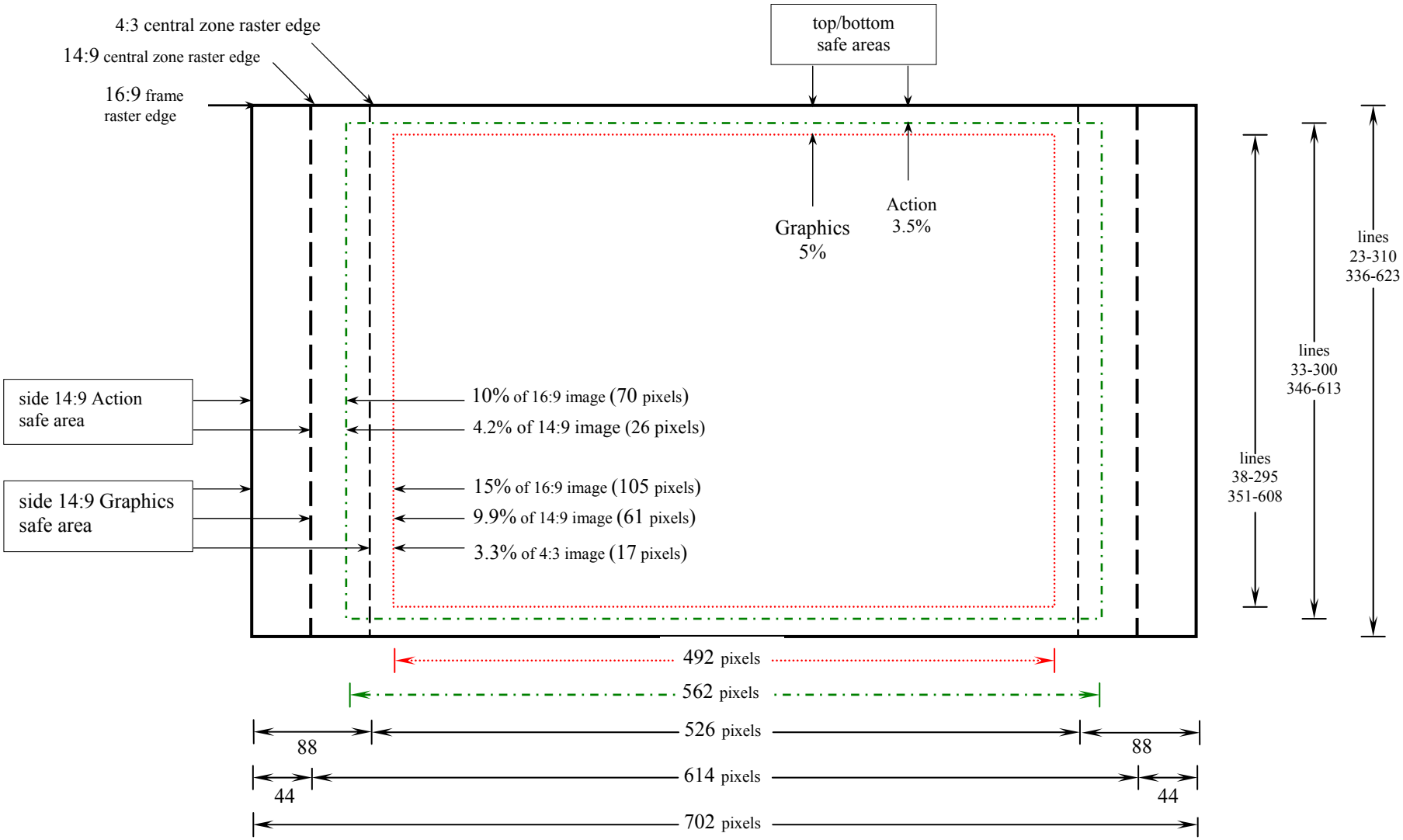
AFD	1	4:3 picture unprotected
	2	16:9 picture unprotected
	3	14:9 letterbox
	4	Reserved for future use
	5	4:3 Shot and protected 14:9
	6	16:9 Shot and protected 14:9
	7	16:9 Shot and protected 4:3

Having supplied the correct AFD, that information is then used to control the aspect ratio converter (ARC) on transmission, or to directly control the ITV Digital set top box.

Technical Appendix 14

16:9 FULL HEIGHT CLOCK

EBU SAFE AREA SPECIFICATION FOR 16:9 SHOOT AND PROTECT 14:9



Technical Appendix 15

ITV plc Contacts:

For specific issues arising directly from items within this document, the contacts are as follows:

ITV Technology

James Robinson

Senior Manager, Technology Planning & Development
ITV
200 Grays Inn Road
London WC1X 8HF
Tel: 084488 14704
Email: james.robinson@itv.com

ITV Transmission
Ian Cottrell
Head of Transmission
ITV
The Television Centre
Kirkstall Road, Leeds
West Yorkshire, LS3 1JS
Tel: 084488 19778
Email: ian.cottrell@itv.com

ITV Sport
Jon Pearce
Technical Producer
ITV Sport
The London Television Centre
Upper Ground, London SE1 9LT
Tel: 020 7261 3292
Email: jon.pearce@itv.com or sport.technical@itv.com

Broadcast - The Southern Transmission Centre

Ian Gill
Transmission Content Manager
The London Television Centre
Upper Ground, London SE1 9LT
Tel: 020 7827 7460
Fax: 020 7401 9838
Email: ian.gill@itv.com

Broadcast - The Northern Transmission Centre

Michael Lodmore
Transmission Operations Manager
The Television Centre,
ITV Yorkshire,
Kirkstall Road,
Leeds,
West Yorkshire,
LS3 1JS
Tel: 0113 222 7501
Email: michael.ludmore@itv.com

Within the ITV structure, Regional programmes come under the ITV News Technology division. Queries for all regional programmes should be directed to James Robinson in the first instance.

Main switchboard telephone numbers for all ITV plc. regions are as follows:

ITV London/The Southern Transmission Centre	020 7620 1620
ITV Yorkshire/The Northern Transmission Centre	0113 243 88283
ITV Central	0844 88 14000
ITV Meridian	0844 88 12000
ITV Anglia	01603 615151
ITV Westcountry	01752 333333
ITV Wales	0844 88 10100
ITV West	0844 88 12345
ITV Granada	0161 832 7211
ITV Border	01228 525101
ITV Tyne Tees	0844 88 1500

International callers can call +4420 8528 2000

DOCUMENT OWNER & REVISIONS

Original Version by Andy Lucas

Version	**Revision by**	**Date**
1	Andy Lucas	01/06/1999
2	Andy Lucas	04/01/2000
3	Andy Lucas	30/01/2002
4	Andy Lucas	01/11/2003
5	Andy Lucas	01/03/2004
6 (New ITV Version)	Andy Lucas	01/08/2004
6.1	Andy Lucas	01/04/2005
6.5 (Sport Requirements)	Andy Lucas	01/10/2005
7.1 (New ITV Brand)	Andy Lucas	01/04/2006
7.2 (Updated Contacts)	James Robinson	28/08/2007