

APTN TECHNICAL PROGRAM DELIVERY STANDARDS

HD BROADCAST MASTER VIDEO SPECIFICATION

1.1 HD Production Format

All HD programs must be produced with an aspect ratio of 16:9; however, it must be produced in 4:3 safe, as per section 1.7 in the APTN Technical Program Delivery Standards. The video signals whether originating from video cameras or Telecines must comply with either SMPTE 274M or SMPTE-296M-1997 standards for HD Programs. Programs submitted for broadcast on APTN HD must be shot in formats acceptable to APTN HD, using broadcast quality media.

The following video recording formats are considered acceptable for shooting and edit mastering. However, please note that, as a delivery format, APTN will **only** accept Sony HD CAM at 1080i 59.94.

HD Formats	Film Formats	Acceptable Upconversion Formats (with restrictions)
<ul style="list-style-type: none"> • Sony HD CAM • Sony HD CAM SR • Panasonic DVC PRO 100 mb HD • Panasonic HD-D5 (film transfers) • XD HD CAM 4:2:0 • XD HD CAM 4:2:2 • Panasonic P2 HD 	<ul style="list-style-type: none"> • 35 mm Film • 70 mm Film (IMAX) 	<ul style="list-style-type: none"> • Sony Digital Betacam • Sony Betacam SP • Sony MPEG IMX 50 mb (tape or XDCam) • Panasonic DVC Pro 50 (tape) • Panasonic P2

Other broadcast grade formats are introduced from time to time which may also prove acceptable. Additionally the above recording formats may be used with different camera heads e.g. Red, Hitachi, Ikegami and Thompson GVG.

APTN does not intend to promote any particular production format but we do recommend 4:2:2 format with at least 50Mb/s recording. We recommend cameras with 3-chip 2/3 inch sensors but consider ½ inch sensors generally acceptable. Producers should bear in mind the demands of all their potential customers when considering HD production equipment purposes.

USE OF HDV™ AND “PRO-SUMER” FORMATS

Use of visual sequences originated on HDV™ and other “Pro-sumer” formats generally will not be accepted within an HD program unless unusual circumstances warrant its use; for example, shooting in high-risk conditions which are dangerous to either the cameraman or the camera itself.

The use of any such material must be discussed with and approved by the regional Program Manager in advance. (See appendix B for a brief explanation of why HDV and Prosumer recording formats are only allowed in limited circumstances.)

Programs may not contain any more than 15% HDV footage. The combined percentage of HDV and SD up-converted footage shall not exceed 25%.

USE OF SD MATERIAL IN HD PROGRAMS

Use of native SD visual sequences, including NTSC, PAL or SECAM, or ITU-BT R.601 digital video, is accepted only in special cases; for example, insertion of archival material. The producer shall inform APTN of, among other things, the total anticipated length of up-converted SD video material to be inserted into the HD program, and clearly justify its use. **Any use of SD sequences in an HD program must be discussed with and approved by the regional Program Manager in advance.**

When the use of 4:3 SD materials is essential and has been approved by APTN, two basic modes of aspect ratio conversion may be used: pillar-box and top-bottom crop.

In all cases of SD to HD up-conversion:

- No alteration of horizontal versus vertical proportions (geometric distortion) will be tolerated. Conversion by horizontal stretching is therefore prohibited.
- Care must be taken to ensure that the main elements of the original 4:3 composition (e.g., principal action, graphic) are preserved.
- A maximum of 25% non-HD material is allowed in production, with no more than 1 minute of continuous non-HD footage in any sequence.

1.2 HD Program Delivery Format

HD programming shall be delivered on Sony HD CAM video cassette tapes with a 1080i / 59.94 interlaced video field rate.

1.3 Audio Reference Signals

The APTN digital audio reference level is set at -20dBFS as defined in SMPTE recommended practice RP 155-2004. It corresponds to an analog alignment level of +4dBu. The reference tone level shall be consistent with the recorded program. In other words program audio levels should average out at approximately 20dBFS with occasional peaks at -10dBFS.

1.4 HD Time Code

The Vertical Interval Time Code (VITC) must match the Longitudinal Time Code (LTC) for the entire length of the tape. Vertical interval timecode must be contained within lines 12 through 17 inclusive and line 21 field 1 which may be used for English or French language CC1 captions. Each program tape must have continuous control track and timecode from tape head to tape end. NTSC drop-frame timecode is the accepted format in compliance with APTN production standards.

The actual program start must have time code starting at 10:00:00:00.

E.g.	Bars & Tone	=	09:59:00:00 to 09:59:30:00
	▪ Visual Slate	=	09:59:30:00 to 09:59:40:00
	Black	=	09:59:40:00 to 09:59:50:00
	Countdown	=	09:59:50:00 to 10:00:00:00

1.5 HD Program Length & Commercial Blacks

Duration of taped or live programs for broadcast will be:

22:00 minutes (3 segments) for a half-hour program (with 2 commercial breaks)
 45:00 minutes (6 segments) for a one-hour program (with 5 commercial breaks)
 70:00 minutes (8 segments) for a 1.5 hour program (with 7 commercial breaks)

94:00 minutes (10 segments) for a 2 hour program (with 9 commercial breaks)

Commercial Breaks should be laid in real-time or have a real-time duration of no less than 10 seconds of black between program segments. All commercial break locations are to be clearly identified on the accompanying program cue sheet. Please refer to Appendix C.

Standards for format and actual lengths of programs are determined by the Programming Department, and can change yearly. The Programming Department should always be consulted to confirm status of current and up to date standards.

1.6 HD Additional Program Deliverables

Until further notice to the contrary, HD masters must be accompanied by a closed captioned Betacam SX or Digital Betacam standard definition down-converted dub. This standard definition dub shall contain a 4:3 center cut image obtained from the HD master. The program content shall be exactly the same on both versions of the master and the time codes shall match exactly. The audio tracks must be stereo with descriptive video, if applicable, on channel 3, alternative language for SAP on channel 4. For this format, Closed Captioning shall be on line 21. And conform to SMPTE standard 608.

1.7 HD Safe Area Protection

Most APTN viewers receive our programming on standard definition television sets that have a 4:3 aspect ratio. To maximize the viewable area on these receivers, APTN will down-convert and center cut (crop) any HD originated programs that are played out on SD. **Therefore the program supplier must ensure that a full vertical height 4:3 safe area is protected in the horizontal center of the HD image at all times.** Consequently all supers, graphics, credits, subtitling and opening & closing animation sequences must fit in this 4:3 central area. Likewise the critical action components of the scene itself should also fit in the central 4:3 safe area. Most **broadcast** cameras including camera-recorders have the ability to display a 4:3 safe area box in the viewfinder precisely for this purpose. Similarly most Edit Systems can also display a 4:3 safe area on the edit monitor(s).

HD BROADCAST MASTER AUDIO SPECIFICATION

2.1 HD Audio Specification

Unless discussed with and approved by the regional Program Manager in advance, the audio mix provided shall be in stereo and it must conform to the channel allocations listed in Section 2.2 and be consistent throughout (with the exception of leaders and black segment delimiters). Stereo audio must be fully mono compatible and producers should perform a monaural check of their stereo mix. The audio channels must be in the proper phase. When the left and right stereo channels are actively combined to mono there should be no discernible change in audio level or fidelity.

In the special cases where the program contract calls for a surround audio mix please refer to Appendix A. If the contract calls for more than one primary broadcast language, each version must be sent on a separate tape synched and striped with identical time code.

2.2 HD Channel Allocations

Stereo HD Master

Channel 1 - Program left (Lt or Lo)

Channel 2 - Program right (Rt or Ro)

Channel 3 – Described Video

Channel 4 – Alternate Language (if applicable)

2.4 Standard Audio Reference Level

The APTN digital audio reference level is set at -20dBfs as defined in SMPTE recommended practice RP 155-2004. It corresponds to an analog alignment level of $+4\text{dBu}$. The reference tone level shall be consistent with the recorded program. In other words program audio levels should average out at approximately 20dBFS with occasional peaks at -10dBFS .

2.5 Subjective Audio Quality

The audio program shall be produced with reproduction in a domestic environment in mind.

- The entire audio program shall be of superior quality, free of all noise and interference (buzz, hum, distortion, excessive sibilance)
- The entire audio program shall have an acceptable dynamic range. A compression rate sufficiently high to adversely affect the sound quality will not be accepted.
- The tonal quality of the audio shall be natural and pleasant.
- Dialogue must remain intelligible throughout the entire audio program.
- Audio-video synchronization shall be maintained throughout the program. The maximum tolerable misalignment of sound and picture shall be $\pm 16.6\text{ ms}$ (+ or – one field at 29.97 fps).
- The described video (audio) level shall be similar to the main program level. Each stereo program mix must be tested for proper phasing so that viewers with older monaural sets can still receive acceptable audio.

2.6 Close Captioning

Closed captioning and V-chip information shall conform to SMPTE Standard 334M-2000. APTN's reference device for verification of CC integrity is the Evertz 7760CCM-HD closed caption decoder. No EIA 608 type of closed caption signal, as usually found on line 21 in SD video, shall be present in the HD video signal, either in the active video area or on vertical interval. Lines 21 and 584; these are the top lines of the active picture area in HD video signals.

HD BROADCAST MASTER TAPE COMPONENTS

Prior to the start of program, key information will be presented on tape as follows:

3.1 Bars & Tone

Thirty seconds of SMPTE colour bars and 1 KHz tone at -20 dbfs digital, or $+4\text{ dbm}$ analog, as reference at the head of each tape or program. The colour bars, in HD 16:9 format, shall be compliant with the SMPTE recommended practice RP 219-2002. The colour bars should be generated from a test generator in the edit suite that produced the final edit, and to which the edit suite has been calibrated. The colour bars must not be generated by the internal test generator of the recording VCR.

3.2 Visual Slate

All programs will be identified on tape with a 10 second visual slate, indicating;

- Series title
- Program title
- Program start time code & duration
- Language of the broadcast including which audio channels if more than one language
- Audio is Stereo or Surround sound

3.3 Countdown

Use of a 10 second countdown leader immediately before the start of program is suggested. Countdown starts at 10 and dips to Black at the 2-second mark. Program follows immediately after. If countdown is not used, Black should be used for 10 seconds prior to program start.

All tapes will be **clear of false starts**. Beginnings and endings of programs will be clearly established and identifiable.

Safe title and safe area limits must be observed in programs, and with any electronic titling which appears on screen. (Please refer to section 1.7 in the APTN Technical Program Delivery Standards.)

3.4 Tape Labeling

All videotapes shall be properly labeled on both the cassette and the container. The **cassette label** shall indicate the following information:

- Producer Name
- Series Title
- Program Title
- Reel number of however many reels
- Audio track allocation
- Video format identification
- Whether master or dub of master
- Duplication Facility
- Closed Caption info

A Tape Cue Sheet shall accompany the cassette detailing the actual contents of each tape, with program lengths and any technical notes relating to the program. This document must accompany the tape when it is shipped or delivered to APTN for airing.

3.5 Tape Delivery

All program tapes will be delivered or shipped to **APTN's Winnipeg facility**, sufficiently in advance, as defined in the terms of the program licence agreement.

Aboriginal Peoples Television Network
339 Portage Avenue,
Winnipeg, Manitoba
CANADA, R3B 2C3

Attention: Scheduling and Creative Services
Tel: (204) 947-9331

SD BROADCAST MASTER VIDEO SPECIFICATION

4.1 [Additional Program Deliverables](#)

Until further notice to the contrary, HD masters must be accompanied by a closed captioned Betacam SX or Digital Betacam standard definition down-converted dub. This standard definition dub shall contain a 4:3 center cut image obtained from the HD master. The program content shall be exactly the same on both versions of the master and the time codes shall match exactly. The audio tracks must be stereo with descriptive video, if applicable, on channel 3, alternative language for SAP on channel 4. For this format, Closed Captioning shall be on line 21. And conform to SMPTE standard 608.

4.2 [Standard Definition Standards](#)

Video program material shall be produced using current industry standard accepted norm and procedures. All material on tape must conform to either SMPTE Specification 259M in the case of Digital or SMPTE Specification RS170A for Analogue. The broadcast masters submitted to APTN must be free of physical defects such as creases drop-outs, etc. These masters must be produced on properly maintained and aligned machines.

4.3 [Standard Definition Formats](#)

All recordings will be to NTSC standard, on one of the following formats, in order of preference:

Digital Betacam
Betacam SX

SD BROADCAST MASTER AUDIO SPECIFICATION

5.1 [Standard Definition Audio Specifications](#)

The audio mix shall conform to the channel allocations of Section 5.5 and must be either stereo throughout or dual mono throughout (with the exception of leaders and black segment delimiters). The stereo mix on channels 1 and 2 shall be in the intended primary language of broadcast, as contracted with the production department. If more than one primary language is called for in the contract, a separate tape will be required for each language. A separate monaural alternate language (SAP) may be included on each master tape, on channel 4. This will give viewers unfamiliar with the primary broadcast language a second option.

5.2 [Standard Definition Channel Allocations](#)

Stereo SD Master

Channel 1 - Program left (Lt or Lo)
Channel 2 - Program right (Rt or Ro)
Channel 3 – Descriptive Video
Channel 4 – Alternate Language

ABORIGINAL LANGUAGE MASTER FORMATS & DELIVERABLES (IF APPLICABLE)

6.1 Language Masters Formats & Deliverables

Language masters should abide by the same video and audio specifications listed in APTN's Technical Specification. Depending on the original language in which the program(s) was produced, language masters consist of a voice over with English subtitles or French subtitles. On screen subtitles should be keyed into the video. Under no circumstances should the monitor output of a closed caption encoder be used to record a closed caption text box in the program video. Subtitled video programs do not require closed captioning in the same language as that of the subtitles. All language masters should be delivered in HD and SD. Consequently all supers, graphics, credits, subtitling must fit in the 4:3 central area and should not conflict with name keys. Please consider your backdrop when subtitling and avoid font color(s) blending into the background.

NON-COMPLIANCE

Written approval from APTN prior to broadcast will be required in circumstances where programs produced do not adhere to or meet these technical standards and parameters.

APTN RIGHT OF REFUSAL

Notwithstanding the technical specifications contained above, APTN reserves the right to reject any submitted program tape whose **perceived** or **subjective** technical quality is judged to be unacceptable.

UPDATES TO PROGRAM DELIVERY SPECIFICATIONS

APTN reserves the right to periodically review and modify this specification. Before submitting new programming, please check with your representative to confirm you have the latest version.

APPENDIX A

HD SURROUND SOUND MASTERS

As mentioned previously, all HD programming shall be delivered on Sony HD CAM video cassette tapes with a 1080i / 59.94 interlaced video field rate.

If the HD program contract calls for a surround sound audio mix delivery to APTN, the audio should be mixed directly from basic tracks in a proper surround sound monitoring environment. Passing a stereo mix through an up-mixing processor is not recommended since many give unpredictable results and consequently may cause the tape to be rejected by APTN.

Surround Sound masters must have audio tracks encoded into a Dolby E stream on channels 3/4 of a HD CAM master. The video to audio timing reference must be advanced by two frames to compensate for the Dolby E encode and decode processes. The audio track layouts shall conform to box at right.

<p>Surround HD Master Channel 1 - Left Total Channel 2 - Right Total Channel 3 - Dolby E Channel 4 - Dolby E</p>
<p>Dolby E Channel Assignment Channel 1 - Left Front Channel 2 - Right Front Channel 3 – Center Channel 4 - LFE Channel 5 - Left Surround Channel 6 - Right Surround Channel 7 – Descriptive Video or Lt Channel 8 – SAP or Rt</p>

APTN does not accept AC3 encoded audio, and cannot accept HD CAM SR masters.

Each surround sound audio mix shall be tested for acceptable quality reproduction in a stereo down-mix for viewers with stereo-only systems.

Likewise since some HD programs will be down-converted and down-mixed for broadcast on Standard Definition channels, the program supplier must also test his surround sound audio mix in a total down-mix to monaural sound for those viewers viewing on a simple television set.

If the contract calls for more than one primary broadcast language, each version must be sent on a separate tape synched and striped with identical time code.

APPENDIX B

BROADCAST PRODUCTION FORMATS VS HDV AND PROSUMER PRODUCTION FORMATS

B.1.1 Resolution

Broadcast HD sensor resolution is 1980x1080 for 1080i or 1080p and 1280x720 for 720p. For HDV the sensor resolution are 1440x1080 and 1280 x 720 respectively. To get to proper bit rate for 1080i or 1080p, interpolation is required.

B.1.2 Sensitivity

The sensors for broadcast cameras are usually 2/3 inch (diagonal). The best prosumer cameras use 1/2 sensors resulting in a 50% (or one f stop) drop in light gathering ability. The remaining prosumer cameras and virtually all consumer cameras use 1/3 inch sensors. This results in two f stops reduction in sensitivity from broadcast grade. This reduction in sensitivity not only affects the ability to shoot in low light but it also affects the dynamic range of the camera. In a high contrast scene, either the blacks get crushed or the highlights get clipped. Additionally the lenses on these cameras are not usually changeable, have smaller apertures than broadcast grade cameras, and don't use the best quality glass, thus further compromising sensitivity.

B.1.3 Compression

To record HD video all camera recorders need to compress the video data to manageable levels. HD Broadcast cameras sample luminance information (Black and white) at 74.25 Mhz and two color channels of color information at 37.125 Mhz.each. This is known as 4:2:2 full bandwidth video Full bandwidth HD video requires 1.5 billion bits per second. A 16Gbyte memory card costing \$100 would only last a minute and a half. Even an XDCAM disc holds only 50 GBytes and would last only 5 minutes. To save 25% of the bandwidth off the top, Prosumer and HDV cameras sample the chroma channels every second frame. This is known as 4:2:0 but is still too high a bit rate to be practical. All classes of video camera can reduce their recording data rate by applying MPEG2 compression. HDV cameras record at 20 to 25 Million bits per second. Prosumer cameras can record at up to 35 million bits per second. Broadcast cameras generally record at 35 Mbits/sec and higher.MPEG2 compression has to be performed in real time which means it is done with hardware. The more sophisticated the hardware, the better the results.

B.1.4 Features

- HDV and most prosumer cameras do not have time code.
- They don't have external microphone inputs therefore no wireless microphone mounts.
- They don't have interchangeable lenses
- They generally made of plastic components that don't stand up as well to constant use.

It is important to consider the intended primary purpose of each class of camera. Consumer cameras are meant for consumers to record important personal and family events for a very limited audience. Prosumer cameras are intended for corporate videos, professional wedding videos, community college training, etc. The audience is larger and has higher expectations. Broadcast cameras are meant for broadcast use. The audiences are very large, the programs will be played many times, and the expectations of the customer are very high.

APPENDIX C

Videotape Cue Sheet

DATE SENT: _____ Master Record Date: _____

This Cue Sheet must be included with all Masters submitted (one per Master).

Production Co. name:			
Producer Name (s):		Phone #:	
Series/Show Title:		Season #:	
Episode Title:		Episode #:	
Closed Captioned	Yes	No	Language Version:

Special Instructions or Comments:

Indicate here if a disclaimer is required, and describe where the disclaimed action occurs:	
<input type="checkbox"/> Nudity	<input type="checkbox"/> Profanity or Obscene Gestures
<input type="checkbox"/> Sexual Situations	<input type="checkbox"/> Substance Abuse
<input type="checkbox"/> Violence	<input type="checkbox"/> Other: (i.e. explicit hunting scenes)

Indicate here what Program Classification symbol is required:	
<input type="checkbox"/> C Suitable for children 2-7.	<input type="checkbox"/> PG Suitable for a general audience, at the parents' discretion for younger children.
<input type="checkbox"/> C8+ Suitable for children 8 and older.	<input type="checkbox"/> 14+ Suitable for audiences 14 and older.
<input type="checkbox"/> G Suitable for a general audience.	<input type="checkbox"/> 18+ Suitable for audiences 18 and older.

Videotape Cue Sheet (CONTINUED)

Segment	Seg. Length	Time Code	Special Video & Audio Cues
1		In: Out:	
Comm. Pos.#1	Black	Time:	
2		In: Out:	
Comm. Pos.#2	Black	Time:	
3		In: Out:	
Comm. Pos.#3	Black	Time:	
4		In: Out:	
Comm. Pos.#4	Black	Time:	
5		In: Out:	
Comm. Pos.#5	Black	Time:	
6		In: Out:	
Program Length:			