



WORLD AIRLINE ENTERTAINMENT ASSOCIATION TECHNOLOGY COMMITTEE

WAEA SPECIFICATION 1289-1

GENERAL REQUIREMENTS FOR RECORDING AND DUPLICATING AIRBORNE VIDEO CASSETTES

**Revision 2
January 28, 2004**

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GENERAL REQUIREMENTS FOR RECORDING AND DUPLICATING OF AIRBORNE VIDEO CASSETTES

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1.0 PURPOSE

The purpose of this document is to define required procedures and parameters for the generation of video masters that can be used by duplicating laboratories for dubbing to a video cassette format that will be played on aircraft video cassette players (VHS, Video 8, SVHS, and High Band Video 8). This document also specifies procedures and parameters for the duplicated video cassettes themselves.

All of the specifications and workmanship standards set forth here seek to provide high quality video cassettes for presentation in an airborne environment. The duplicated format must be compatible with standard television monitors and large screen (30" X 40" nominal) video projection presentation systems.

2.0 GENERAL BACKGROUND

In the past, the majority of the original movie sound tracks were recorded on three separate audio tracks (dialogue, music and effects) for subsequent mix down to a single composite track for mono or to two composite tracks for stereo or dual language presentation.

Currently, duplication labs frequently receive masters in a four-channel format: channels 1 and 2, English language dialog, channels 3 and 4, music and effects. Foreign language masters may be received with a 5.1 surround mix, left and right stereo tracks, or separate elements. The preferred format is three separate elements mixed to a composite track. The type of mix down that is specifically tailored for a theater environment is unacceptable in an airborne environment that has different acoustical characteristics. Some of the major problem areas with a theatrical mix down are excessive dynamic range of 60 to 70 dB with an unequal ratio between dialogue, music and effects. This type of mix down when played in an environment with 45 to 50 dB noise level in the distribution system, coupled with the cabin noise of 70 to 75 dB can result in an inaudible dialog element.

3.0 ORIGINAL MASTERS

3.1 Master Formats

3.1.1 The following formats are acceptable sources for producing a cassette production master, listed in order of preference:

- a. D-1 / DCT / Digital Betacam / D-5 (digital component 4:2:2)
- b. D-2 / D-3 (digital composite)
- c. Betacam SP and M-II (analog component)

- d. DV, DVCAM, DVC Pro (digital component 4:1:1)
- e. 1-inch Type C and Type B (analog composite)

3.1.2 Master Formats Normative References

The following industry standards contain provisions that, through reference in this text, constitute provisions of this specification. The master format sources and cassette production master shall conform to the technical requirements of the standards cited below (e.g., phase, color space, RF level, etc.).

At the time of publication, the editions indicated were valid. All of these referenced standards are subject to revision, and parties are encouraged to investigate the possibility of applying the most recent editions of the referenced standards indicated below.

Rec. ITU-R BT.601.4	“Encoding parameters of digital television for studios” (equivalent to CCIR 601).
Rec. ITU-R BR.648	“Digital recording of audio signals”.
EIA RS-170A	"NTSC Color, Timing"

3.2 Film Elements

The film elements required for producing high quality video masters should be 35 mm color corrected internegative or interpositive. If these film elements are not available, then a good quality unreleased color corrected print made from a high quality negative may be used with approval of the content owner.

3.3 Audio Mix Down

3.3.1 Ideally, three audio elements (dialogue, music and effects) should be used to produce a video production master.

3.3.2 Before transfer to a production master format, a review of the audio elements must be made to establish basic ratios between the three sound elements for later mix down to a single composite track. The ratio must be established considering the airborne operating environment, noise level, and headset response to achieve the best sound quality with maximum dialogue intelligibility in an airborne environment. This may require reduction in amplitude of sound effects and music in relationship to the actual dialogue.

3.3.3 Once the relationship between sound tracks is established, then in the transfer process to a production master from analog or digital master formats, appropriate audio compressors, limiters, de-essers must be utilized to achieve an overall composite sound

track with desired dynamic range of 35 to 50 dBs, and frequency response of 50 Hz to 10 kHz at standard line output levels (ØVU or +4 dB). For digital master formats, Dolby Digital™ or similar software should be used to apply equalization, dynamic range compression, de-noising and dialogue normalization to achieve equal levels of dialogue, music and effects. Peak digital audio levels should be Ø dBFS. For PCM or digital audio frequency, response can be extended to 50 Hz to 15 kHz.

If a dialogue track is very low, then additional compression or expansion may be necessary to tailor dynamic range to 30 dB. Since each feature film has its own unique characteristics, then each mix down will be unique to achieve desired results.

To ensure a conversational dialogue level that is compatible with music and sound effects, use of the Dolby LM100 Loudness Meter is recommended in the mastering process. Given the following reference standards,

Digital '0' Reference = - 20 db Full Scale
-20 dbfs = 0 VU
0 VU = +4 dbm

the target average reference level for conversational dialogue is - 27 dbFS. Absolute peak level should not exceed - 20 db FS. Average dialogue level should not measure lower than - 30 dbFS. Average differential level between dialogue level and music and effects levels should not exceed 10 db.

3.3.4 To achieve improved intelligibility, mid range frequencies (2 kHz to 5 kHz) may require boosting of 3 to 6 dB in reference to 1 kHz at Ø dBm to achieve desired results.

4.0 DUAL SOUND TRACK

Since dual language sound tracks are usually generated at a later date, mix down of music and effects elements shall comply with requirements listed in this document. Mix down of music and effects with a second language shall be in compliance with requirements given for single-track recording Section 3.3..

It is essential that multiple language tracks have balanced volume levels relative to each other.

5.0 DUPLICATION OF VIDEO CASSETTES

The purpose of this section is to define the basic parameters required for duplication to video cassette format (VHS, Video 8, SVHS, and High Band Video 8).

All of the requirements and standards set forth here are to assure high quality video and audio reproduction in an airborne environment. Duplicated cassettes must be compatible with large screen presentation (30" X 40" nominal).

5.1 Duplicated Video Cassettes

The duplicated video cassettes must be in compliance with requirements for NTSC, or PAL standards as cited in Section 3.1.2.

5.2 Resolution

Inferior resolution due to poor workmanship shall be a cause for rejection. Horizontal resolution for VHS and 8 mm should be 230 lines minimum, and 400 lines minimum for SVHS and Hi 8 mm.

5.3 Image Format

Unless otherwise specified, the aspect ratio of a duplicated cassette shall be 1.33:1 aspect ratio as specified in SMPTE RP187-1995. Other ratios such as 1.85:1 are acceptable with the agreement of the affected parties.

5.4 Color

Significant variations in color, hue, and video level on duplicated cassettes are a cause for rejection. After machine set-up, program material should be checked for conformance to color bars and other set-up test signals of that program material.

5.5 Video Drop-Outs

Video drop-outs on duplicated cassettes shall adhere to the allowable drop-out specifications of the duplication tape stock.

5.6 Radio Frequency (RF) Output

To maintain optimum composite video signal quality, the RF envelope peak-to-peak value should comply with the specification of the recording device. The envelope should remain consistent in shape throughout each field. The loss of level due to mechanical wear or tape path guidance should not cause mistracking or degradation of picture quality.

5.7 Audio Characteristics of Duplicated Cassettes

5.7.1 Frequency Response

Audio frequency response shall be within +/- 3 dB for frequency range of 50 Hz – 10 kHz for VHS and 8 mm AFM (linear tracks), and 50 Hz – 15 kHz for PCM digital or Hi-Fi

tracks. Frequency response shall be measured at -10 dBm referenced to 1 kHz at 0 dBm output.

5.7.2 Signal to Noise

Signal to noise on duplicated video cassettes for linear tracks (VHS, 8 mm) shall be 45 dB minimum, and other formats with digital audio tracks such as PCM or Hi-Fi shall be 60 dB minimum.

5.7.3 Audio Cross-Talk

Better than 43 dB for all formats.

5.7.4 Equalization

Standard NAB equalization shall be used. Reference 1965 NAB Standard "Magnetic Tape Recording and Reproducing".

5.7.5 Audio Output Level

Maximum playback level from duplicated cassettes as reproduced in a standard airborne playback VTR (VHS, SVHS, Video 8, Hi 8 mm) shall not exceed 0 dBm (2.2 Vpp) for sustained time periods in excess of 10 ms. Occasional peaks with less than a 10 ms time period may reach 3.5 Vpp, but never 4.0 Vpp. Average audio levels as reproduced shall be at minus 8 to minus 10 dB. Audio levels during average program material or conversation shall peak at 0 dBm (2.2 Vpp) on most occasions. Acceptance or rejection of the audio sound track shall be based on total program material rather than a single scene or section of the tape.

Since each playback model has its own playback characteristics, the actual record flux level (nanowebers/meter) should match the playback unit to reproduce the ARINC standard output level of 0 dBm as required for proper interface to the aircraft distribution system.

6.0 Quality Assurance

Compliance with this specification does not guarantee acceptable quality of the media, and does not replace the need for skill and judgment in the art and science of motion picture and video laboratory practices. Nothing in this specification is intended to replace normal quality assurance processes.