PROPOSED SMPTE RECOMMENDED PRACTICE

RP 103
Revision of RP 103-1982

Care, Storage, Operation, Handling and Shipping of Magnetic Recording Tape for Television

1 Scope

This practice provides guidance to technical managers, archivists, and technicians for the care, storage, operation, handling, and shipping conditions that help maximize life expectancy and interchange performance for television (video) magnetic recording tape.

2 Storage conditions

2.1 Temperature and humidity

Tapes should not be stored in areas of extreme temperature and/or extreme humidity for long periods of time (see table 1). Temperature and humidity in the storage area should be selected as follows:

For short- and medium-term storage (up to 10 years):

Temperature	+15°C to +23°C
Humidity	40% RH to 55% RH

For long-term storage (over 10 years):

Temperature	+17°C
Humidity	30% RH

2.1.1 Variation from selected storage temperature and humidity from above values should be kept within ± 2°C and ± 5% RH throughout the storage period.

2.2 Airborne contaminants

Floors should be finished so that dust and debris are minimized due to pedestrian traffic. Cement floors should be sealed. Tile floors should not be waxed. Floor covering materials should be selected to minimize airborne debris and static generation. Air entering the storage area should be filtered to ensure or approach a class 100,000 environment as defined by Federal Standard 209D. Air pressure in the storage area shall be maintained at a positive pressure relative to adjacent hallways and rooms.

2.3 Physical characteristics

2.3.1 To minimize the possibility of the tape taking an unwanted set due to stepped or scattered winding, the tape be given a continuous, full-length wind or rewind before storage. All magnetic recording cassettes may be stored in a fully wound or rewound condition, with the exception of SMPTE type E (3/4-in video cassettes) which must be stored in a fully rewound condition.

Table 1 – Summary of environmental conditions

		Storage		
	Operations	Medium term <10 years	Long term >10 years	Shipping
Temperature*	+17°C to +25°C ± 2°C	+15°C to +23°C ± 2°C	+17°C ± 2°C	–20°C to +45°C
Humidity*	30% to 70% ± 5%	40% to 55% ± 5%	30% ± 5%	5% to 80%
Temperature gradient/hour	10°C per hour	n/a	n/a	10°C per hour
Humidity gradient/hour	10% per hour	n/a	n/a	10% per hour
Stray magnetic fields	800 A/m (10 Oe)	800 A/m (10 Oe)	800 A/m (10 Oe)	4000 A/m (50 Oe)

*NOTE – For operations or medium-term storage, the center point for temperature and humidity can be selected anywhere within the allowable range, but the variation cannot exceed the allowable range.

2.3.2 Tape destined for long-term storage should have very few record/playback passes to maximize playback performance and minimize the probability of head clogging and physical damage.

2.3.3 Open reel and cassette tapes should be stored in such a manner that they are supported by the hub by maintaining the plane of the flange perpendicular to the horizontal storage surface.

2.3.4 The tape should be stored in a clean, inert plastic container that provides protection from dust, atmospheric pollutants, and excessive moisture. Sealed plastic bags, cardboard containers, and sleeves are not recommended for storage. Except for labels, paper should not be stored inside a storage container .

2.3.5 The outer end of open reel tapes should be secured by an adhesive tab which leaves no residue on the tape after removal. Tab material is usually obtainable from the tape manufacturer.

2.3.6 No splices, other than the splices attaching the leader and trailer to the tape, shall be used in tapes that are placed in long-term storage.

2.4 Stray magnetic fields

The stray magnetic field at any point on the surface of the tape should not exceed a field strength of 800 A/m (10 Oe).

2.5 Environmental pollutants

Certain gaseous impurities commonly found in the atmosphere should be filtered out of the long-term storage environment in order to minimize the deterioration of the recording media and the paper labels and other documentation stored with the media. The recommended maximum levels are as follows:

Sulfur dioxide (SO_2)	1.0 µg/m^3	0.35 ppb
Nitrogen dioxide (NO_2)	5.0 µg/m^3	2.43 ppb
Ozone (O_3)	25.0 µg/m^3	11.70 ppb
Acetic acid (CH_3COOH)	Use best control technology	

2.6 Storage shelves

2.6.1 Shelving used for storage of magnetic media should allow the tapes to be stored vertically in their shipping and storage cases with the tape identification label visible from the front.

2.6.2 Shelves should allow for adequate air flow so that the conditioned environment can be maintained throughout the storage area.

2.6.3 To avoid catastrophic damage, shelves should not be placed too close to heat sources, water pipes, and sprinkler heads.

2.6.4 Shelves should be designed to support the weight of tape when fully loaded. Additionally, the shelves should be placed on a floor that can support the weight of a fully loaded shelving system.

2.6.5 The shelves should possess a lip of sufficient depth to prevent dripping of melted plastic and burning plastic onto lower shelves in case of fire.

2.6.6 Magnetic latches on tape storage cabinets should not be used, since they could cause partial erasure of tapes if brought closer than 7 cm to the magnetic latch.

2.7 Periodic physical inspection

Every tape in an archive should be physically inspected at least every 3 to 5 years for such things as tape playback performance, debris, contaminants, container gasket deterioration, or other problems. This can be carried out by inspection of one-third to one-fifth of the archive each year. A full length wind/rewind should be completed on each tape at least once in every ten years, preferably during the periodic physical inspection.

2.8 Identification

Records containing proper date, control-number information, location, title, and other required information shall be maintained.

2.9 Smoking

To minimize airborne debris and reduce fire hazard, smoking should not be allowed in the tape storage area.

3 Operating conditions

3.1 Temperature and humidity

The temperature and humidity in the operations area should be selected and maintained as follows:

Temperature	+17°C to +25°C ± 2°C
Humidity:	30% RH to 70% RH

3.1.1 Tapes that have been exposed to environmental conditions that are significantly different from planned operating conditions should be allowed to acclimate in the operating environment for at least 24 hours before usage. The maximum temperature and humidity gradient during transition should not exceed 10°C/hour or 10% RH/hour. This gradient refers to the maximum temperature and humidity change that the tape (not the reel, cassette or container) is subjected to. The tape should remain in its container during acclimation to help control RH and temperature gradient extremes.

3.2 Physical conditions

The operations area should be maintained as closely as possible to clean-room conditions. The following guidelines will ensure that clean-room conditions are met:

3.2.1 Airborne debris

Air entering the operations area should be filtered to ensure or approach a class 100,000 environment, as defined by Federal Standard 209D. Air pressure in the operations area shall be maintained at a positive pressure relative to adjacent hallways and rooms.

3.2.2 Floors

Floors should be finished so that dust and debris due to pedestrian traffic are minimized. Cement floors should be sealed. Tile floors should not be waxed. Carpeted floors shall utilize carpeting that minimizes debris and static generation.

3.2.3 Surfaces

All surfaces of the tape transport that touch either side of the tape or carrier shall be cleaned in accordance with the method and frequency recommended by the tape transport manufacturer. Isopropyl or ethyl alcohol is an acceptable cleaning fluid for routine cleaning. Other cleaning agents may be acceptable. Care should be taken so that the cleaning fluid does not contact the tape. For other than routine cleaning, such as removal of head clogs, use the transport manufacturer's recommended cleaning procedures.

3.2.4 Tapes

Tapes should be kept in appropriate containers that provide a barrier to water and debris when not on the tape transport.

3.2.5 Restrictions

Smoking, eating, and drinking should not be allowed in the operations area.

3.2.6 Threading

For threading open reel tapes, the tape should only be handled by the ends. Doors on cassette and cartridge tapes shall not be opened unless the tape is inserted into the transport.

3.2.7 Cassette and open reel tapes

Cassette and open reel tapes should be transported so that the tape is supported by the hub. Open reel tape flanges should never be squeezed together. The cassette loading door should never be used as a carrying handle

3.2.8 Tape ends

Frayed or wrinkled ends of open reel tapes should be cut off, using nonmagnetic scissors, prior to thread up.

3.2.9 Opening cartons

Cardboard cartons, such as master shipping cartons, should not be ripped open in the tape operations area, and cardboard use in the operations area should be avoided.

3.2.10 Dust and debris

Tape containers should be wiped clean prior to opening or transportation to the operations area.

3.3 Stray magnetic fields

The stray magnetic field at any point on the surface of the tape should not exceed a field strength of 800 A/m (10 Oe).

3.4 Winding

All tapes should be uniformly wound or rewound as described in 2.3.1 whenever the tape comes out of long-term storage or has been subjected to significant temperature and humidity variations.

3.5 Cassette removal from transport

Cassettes should be fully wound or rewound before removal from a transport. In cases where this is not immediately possible, such as during an editing session, cassette load/eject cycles should be minimized. Cassettes should be fully wound or rewound at the end of the day.

4 Shipping conditions

4.1 Winding

All tapes should be uniformly wound or rewound before shipment, as described in 2.3.1.

4.2 Containers

Tapes should be shipped in containers designed to withstand rugged handling and adverse environments, and should contain adequate shock-absorbing material. Heavy reels, such as those used for 1-in and 2-in open reel television magnetic recording tapes, should be supported by the hub and allowed to rotate freely inside the container. SMPTE type E (3/4-in) cassette tapes that do not provide self-locking reels shall be shipped in containers that provide hub locks.

4.3 Fastening

Open reel tapes should be secured at the outer end as specified in 2.3.4.

4.4 Shipment marking

Shipment of tape shall be marked with appropriate symbols or wording to indicate that the package should be handled with care, protected from excessive heat, cold, and moisture, and protected from magnetic fields.

4.5 Vibration and impact loads

Handling and transporting tapes should be done in a manner that will prevent excessive mechanical loads that would distort or damage the tape or components.

4.6 Temperature and humidity

Tape should be protected from excessive temperature and excessive humidity during transportation. The following limits should not be exceeded and the extremes of these limits should be very short in duration:

Temperature	–20°C to +45°C
Humidity	5% RH to 80% RH

4.6.1 The maximum temperature and humidity gradient during transportation should not exceed 10°C/hour or 10% RH/hour. This gradient is the maximum temperature and humidity change that the tape is subjected to, not the reel, container, or cassette.

4.7 Stray magnetic fields

The stray magnetic field at any point on the surface of the tape should not exceed a field strength of 4000 A/m (50 Oe).

4.8 Packing for transportation

Sealed cardboard boxes are recommended for packing approved tape containers for transportation. While shipping video magnetic tape in the tape manufacturer's shipping container assures that the tape will arrive undamaged, shipping that container inside a cardboard box assures that the tape container itself will arrive clean and undamaged.

4.9 Packing fill

If packed in cardboard boxes, use large, clean packing material such as bubble sheets for fill. Do not use styrofoam peanuts, shredded paper, or other small packing material, as the material can cause contamination and/or static problems.

5 Other conditions

5.1 Health and safety

The operation, storage, and transportation of television magnetic recording tape shall be conducted in a manner that is consistent with the appropriate health and safety regulatory agencies.

5.2 Tape pack wind

Tapes should be uniformly wound or rewound as described in 2.3.1 to minimize physical damage.

5.3 Labels

Tape labels should be sufficient in size to adequately identify the tape. Labels should have adhesive backings that will continue to adhere the label to the shell, reel, or container during long-term storage. Labels should be constructed of inert materials. Label marking should be accomplished with nonfading ink.

5.4 Electrostatic charge/discharge

Maintaining the relative humidity within the operating conditions specified in 3.1 will minimize the impact of electrostatic charge and discharge on tapes and cassettes.

6 Definition of terms

6.1 cassette: A device containing magnetic tape on one or two reels within a protective shell.

6.2 container, shipping: A box or case that is designed to protect a magnetic tape from shock, moisture, and debris during transportation.

6.3 container, storage: A box or case that is designed to protect a magnetic tape from shock, moisture, and debris during storage.

6.4 long-term storage conditions: The storage conditions suitable for preservation of recorded information for a period of greater than ten years.

6.5 maximum life expectancy: The length of time that information is predicted to be retrievable in a system under storage conditions.

6.6 medium term storage conditions: The storage conditions suitable for preservation of recorded information from two to ten years.

6.7 open reel tapes: Tape that is wound on a hub that is not enclosed in a shell.

6.8 short-term storage conditions: The storage conditions suitable for preservation of recorded information for less than two years.

6.9 television magnetic recording tape: Magnetic recording tape used to record video and synchronizing signals. The tape may also record other signals such as audio or time code.

6.10 transport: A device designed to carry and guide magnetic recording tapes.

NOTE – The recommendations contained herein assume that all tape transports and recording tapes meet appropriate SMPTE format specifications and that the transports are set up and operating properly.

Annex A (informative)
Bibliography

Federal Standard 209D, Airborne Particulate Cleanliness Classes in Clean Rooms and Clean Zones

Cavanagh, T. Herman, R.N., and Nolan, M. Rewriting RP 103: Handling and care of magnetic tape for television. SMPTE Journal 103: 677-681; October 1994.

PROPOSED SMPTE RECOMMENDED PRACTICE

Reference Signals for the Synchronization of 525-Line Video Equipment

Introduction

Composite or component video equipment frequently requires an external reference signal for synchronization. Color black is the commonly used external reference signal for NTSC equipment. This practice specifies the use of a color black signal meeting or bettering the tolerances defined herein as a reference signal for all forms of composite or component, digital or analog equipment using the 525-line system.

1 Scope

This practice defines a synchronization signal to be used as an external timing reference for video equipment using a 525-line, 59.94-Hz field rate, 2:1 interlace standard.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this practice. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this practice are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

SMPTE 170M, Television — Composite Analog Video Signal — NTSC for Studio Applications

IEC 169-8 (1978), R.F. Coaxial Connectors with Inner Diameter of Outer Conductor 6.5 mm (0.256 in) with Bayonet Lock — Characteristic Impedance 50 Ohms (Type BNC), and Appendix A (1993), Information for Interface Dimensions of 75-Ohm Characteristic Impedance Connectors with Unspecified Reflection Factors.

3 Timing reference

3.1 Output reference

Where a separate reference is required for the output function, the equipment shall derive its timing reference for the output function from a signal as defined in clause 6.

3.2 Input reference

For equipment that stores video with variable delay (i.e., video recorders, synchronizers, timebase correctors) or that monitors video, the equipment may derive its timing reference for the input function from the input video or from a reference signal as defined in clause 6.

4 Connector

BNC connectors shall be in accordance with IEC 169-8.

5 Impedance

The reference signal shall operate in a 75-ohm environment.

6 Reference signal

The reference signal is defined as follows:

6.1 Signal characteristics

The signal waveform shall conform to the specifications for system NTSC as defined in SMPTE 170M, except as noted herein.

6.2 Picture signal level

The signal level throughout the active picture period shall correspond to blanking or black level (0 IRE or 7.5 IRE ± 2.5 IRE, respectively (see note 1).

6.3 Signal amplitude

The amplitude of the synchronizing pulses shall be 286 mV + 100 mV – 50 mV. The peak-to-peak amplitude of the subcarrier burst shall be nominally equal in amplitude to that of the synchronizing pulse.

6.4 Rise and fall time of horizontal synchronizing pulses

The rise and fall time of the horizontal synchronizing pulses shall be 140 ns ± 20 ns, measured between the 10% and 90% amplitude levels.

6.5 Jitter

The timing of individual leading edges of horizontal synchronizing pulses shall be within ± 2.5 ns of the timing of leading edges, as averaged over at least one field (see notes 2 and 3).

7 Digital representation

Where equipment will be operated primarily in a digital environment, a serial or parallel representation of a color black or other color video signal may be used as an additional or alternate reference. The digital signal need not conform to 6.2, as APL does not affect sync detection in a digital signal. Reference signals shall conform to appropriate SMPTE standards or recommended practices for digital interface of television signals. Where a composite digital signal is used, a 10-bit representation is recommended.

NOTES

1 Reference signals of higher constant APL are specifically not recommended because they may cause performance degradation related to APL variations between the vertical interval and other parts of the signal. Furthermore, reference signals with changing APL, such as moving video or switched test signals, are also specifically not recommended because they may cause disturbances to the video signal being processed by the equipment for which they are the reference.

2 In order to achieve the level of performance specified, it may be necessary to provide a synchronizing pulse generator to serve the local area. In the presence of hum and noise, it may also be necessary to take steps in the system design to prevent the reduction of the level of performance from that required.

3 Reference signals with less jitter are preferred for many applications. Usually, this is accomplished using a burst-referenced genlock since the burst has less jitter (as per SMPTE 170M) and provides more data for the locking oscillator. Horizontal synchronizing pulses with jitter of less than ± 1 ns may also be useful.

PROPOSED SMPTE STANDARD

SMPTE 267M
Revision of
ANSI/SMPTE 267M-1994

for Television —

Bit-Parallel Digital Interface — Component Video Signal 4:2:2 16×9 Aspect Ratio

Table of contents

1 Scope

This standard defines an interface for system M (525/59.94) wide screen, 16×9 aspect ratio, digital television equipment based on ITU-R 601-2. Two luminance sampling rates are provided, 13.5-MHz sampling providing full-signal compatibility with equipment operating in compliance with ANSI/SMPTE 125M, and 18-MHz sampling providing equivalent horizontal resolution for the 16×9 aspect ratio of this standard as compared to the 4×3 aspect ratio of ANSI/SMPTE 125M. Use of the 18-MHz sampling method also provides 16×9 to the 4×3 aspect ratio translation by sample selection rather than sample interpolation as would be required with 13.5-MHz sampling. The standard has application in the television studio over distances up to 300 m (1000 ft) for 13.5-MHz sampling and 225 m (750 ft) for 18-MHz sampling.

2 Interface characteristics

2.1 The video signal is transmitted in the form of one luminance (Y) and two color-difference components (scaled version of R–Y and B–Y).

2.2 The video signal is transmitted at the 4:2:2 family level of ITU-R 601-2, with a nominal luminance sampling frequency of 13.5 MHz or 18 MHz. Provision is made to convey signals at 10-bit precision. Because of the potential use of 8-bit data, all synchronizing signals (EAV, SAV, ANC) must be detected by reference to the eight most significant bits only.

2.3 The bits of the digital code words that describe the video signal are transmitted in a parallel arrangement using 10 conductor pairs as described in 6.2.2. Each pair carries a multiplexed stream of bits (of the same significance) of each of the component signals. Accordingly, the bit rate used in each pair is nominally 27 Mbits/s for 13.5-MHz sampling and 36 Mbits/s for 18-MHz sampling. An eleventh conductor pair carries a clock signal at 27 MHz or 36 MHz, respectively.

2.4 The signals on the interface are transmitted using balanced conductor pairs for a distance up to 50 m (160 ft) for 13.5-MHz sampling and 40 m (120 ft) for 18-MHz sampling without equalization, and up to 300 m (1000 ft) for 13.5-MHz sampling and 225 m (750 ft) for 18-MHz sampling with appropriate equalization.

2.5 The interface consists of one transmitter and one receiver in a point-to-point connection.