



Standard Guide for Storage of Magnetic Tape Media that Contains Analog or Digital Radioscopic Data¹

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1. Scope

1.1 This guide may be used for the control and maintenance of recorded and unrecorded magnetic and optical media of analog or digital electronic data from industrial radioscopy.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* For specific precautionary statements, see Section 6.

2. Referenced Documents

2.1 ASTM Standards:²

E1000 Guide for Radioscopy

E1255 Practice for Radioscopy

2.2 ANSI Standards:³

INCITS 40 Unrecorded Magnetic Tape

INCITS 39 Recorded Magnetic Tape

INCITS 125 Two-Sided, Double Density Disk

INCITS 46 Six-Disk Pack

INCITS 48 Magnetic Tape Cassettes

2.3 NIST Standard:

NBS Handbook, NBS SP 500.101⁴

¹ This guide is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.01 on Radiology (X and Gamma) Method.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁴ Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, <http://www.nist.gov>.

3. Significance and Use

3.1 The provisions of this guide are intended to control and maintain the quality of recorded industrial electronic data from radioscopy and unrecorded magnetic and optical media only, and are not intended to control the acceptability of the materials or products examined. It is further intended that this guide be used as an adjunct to Guide E1000 and Practice E1255.

3.2 The necessity for applying specific control procedures such as those described in this guide is dependent to a certain extent, on the degree to which the user adheres to good recording and storage practices as a matter of routine procedure.

4. Unrecorded Media Storage

4.1 Un-Opened Containers:

4.1.1 *Storage Recommendations*—Any media in containers sealed by the manufacturer and not opened should be stored as shipped, whenever possible, to avoid container damage and possible media damage. Storage temperature should be $60^{\circ} \pm 20^{\circ}\text{F}$ ($16 \pm 11^{\circ}\text{C}$), relative humidity range of $45 \pm 15\%$, at a pressure range of 12.5 ± 2.5 psi and a maximum magnetic field strength of 50 Oe. The optimum storage conditions are 65°F (18°C) at 40 % relative humidity, 14.7 psi and a maximum magnetic field strength of 30 Oe. Damaging stresses in the media can be produced by large temperature and humidity variations even if they remain within the specified ranges. Specific media manufacturer's recommendations should be consulted when large variations in temperature or humidity, or both, are anticipated or experienced.

4.1.2 *Higher or Lower Storage Conditions*—When temperature exceeds 90°F (32°C) or humidity exceeds 90 %, or pressure exceeds 15 psi, some unrecorded media should be used under normal existing conditions to test for degradation. If degradation is found on these samples, subsequent sampling may be done on other media to avoid unnecessary scrap. If storage temperature falls below 30°F (-1°C), media stored at these lower temperatures in unopened containers should be allowed to stabilize at a room temperature (60° to 90°F (16° to 32°C)) before opening the containers. The stabilization time will vary with the bulk of the stored media and the storage temperature. The lower the temperature and greater the bulk,

the longer the time required to reach room temperature. If containers are opened too soon, condensation could cause the media to stick to whatever is touching their surfaces. If the relative humidity falls below 10 % and the moisture in the media is reduced sufficiently, damage can occur during handling after opening the sealed containers, and the media may be subjected to static electrical discharges. Storage humidities over 60 % can also cause the media to stick to whatever is touching their surfaces.

4.2 Opened Containers—The same considerations described in 4.1 for un-opened containers apply. Opened containers are those on which the manufacturer's inner bag around the media has been opened. This can cause the unrecorded media to stick/degrade more rapidly when exposed to high humidity and temperature.

5. Recorded Media Storage

5.1 Recorded media are normally stored in some form of enclosures to exclude dust/dirt and protect them against physical deterioration and damage. Storage conditions can be designed for archival preservation, normally considered to be for at least 20 years or for moderate time periods by using the guidelines in 4.1; however, the recorded media must have been sufficiently recorded in accordance with manufacturer's recommendations and stored in suitable enclosures to ensure preservation. The storage enclosure should limit dust particles to 0.002 in. (0.05 mm) maximum.

5.1.1 Enclosure Materials for Recorded Media:

5.1.1.1 *General*—The enclosure material shall be free of acids and corrosives, and be chemically stable.

5.1.1.2 *Activity Test for Enclosure Materials*—At least three representative samples of recorded media to be stored together with the proposed enclosures shall be placed in close contact with each other and subjected to an accelerated aging test of $85 \pm 5^\circ\text{F}$ ($30 \pm 3^\circ\text{C}$), $70 \pm 10\%$ relative humidity for 30 days. No materials should be transferred from the enclosure material to the media and the recorded data should not be affected.

5.2 Storage Area Conditions:

5.2.1 *Air Impurities*—Inert or inactive solid particles can be deposited on recorded media and interfere with readability and produce degradation. Reactive types of solids may cause degradation of the media and gaseous impurities may cause data deterioration. Never smoke, wax the floors, use steel wool pads on a buffer machine, eat or drink in the media storage area. Solvents should not come into contact with the media, because they may soften the coatings and cause degradation.

5.2.2 *Temperature*—Continuous temperatures above 120°F (49°C) may accelerate degradation and temperatures below the dew point of the air may produce condensed moisture on the recorded data and cause sticking. In general, a moderate

temperature range, as described in 4.1, along with the minimization of large variations, is recommended.

5.2.3 *Humidity*—The extremes must be avoided as prolonged exposures to relative humidities over 60 % will tend to damage the media and may cause fungus growth and sticking. Under conditions of low or changing humidity, defects in the media may occur. Low humidities will also increase the potential of static charges on the recorded media attracting solids that could harm them. In general, a relative humidity range of 30 to 60 % is recommended.

5.3 *Fire Resistance*—Recorded media can withstand temperatures as high as 120°F (49°C) without significant loss of data quality, however, they may become distorted or stick to each other or to the enclosure material.

6. Special Precautions

6.1 Damaging stresses in a tape pack can be produced by large temperature and humidity variations even if they remain within the specified ranges. Excessive temperature and humidity conditions can also cause tape layer-to-layer adhesion (blocking) even if they are maintained constant. Extremely dry environment can cause layer-to-layer adhesion due to static build-up. Torn windings in the middle of a pack is a sure sign that the tape has been subjected to an extreme environment. The coatings on some storage media which have been subjected to very high humidities can breakdown and become gummy due to hydrolysis. This media coating deterioration can usually be reversed by storing the media in a cool and dry environment for an extended period of time.

6.2 Stray magnetic fields, which are of sufficient intensity to obliterate data on magnetic media, at a distance greater than 3 in. (76 mm) from the source are rarely, if ever, encountered in normal environments.

6.3 Some media contain integral sensors that indicate temperature excursions exceeding manufacturer's specifications. These indicators should be inspected before media use, then periodically during storage.

6.4 Further guidance for the storage and care of specific products may be found in ANSI standards, INCITS 40, INCITS 39, INCITS 125, INCITS 46, INCITS 48 and the NIST standard, NBS SP 500.101.

7. Precision and Bias

7.1 No statement is made about the precision or bias of this guide for measuring the amount of degradation of the media, since the results of the testing merely show whether the media are of sufficient quality to record and preserve radioscopic data.

8. Keywords

8.1 analog; data; digital; electronic; media; radioscopic; storage

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