
**Information technology — Data interchange
on 8 mm wide magnetic tape cartridge —
Helical scan recording — HH-1 format**

*Technologies de l'information — Échange de données sur cartouche de
bande magnétique de 8 mm de large — Enregistrement par balayage en
spirale — Format HH-1*

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 15718 was prepared by JISC (as Standard JIS X.6143-1997) with document support and contribution from ECMA (ECMA-247) and was adopted, under a special “fast-track procedure”, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

Annexes A to E form an integral part of this International Standard. Annexes F and G are for information only.

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Information technology — Data interchange on 8 mm wide magnetic tape cartridge — Helical scan recording — HH-1 format

Section 1 - General

1 Scope

This International Standard specifies the physical and magnetic characteristics of an 8 mm wide magnetic tape cartridge so as to provide physical interchange of such cartridges between drives. It also specifies the quality of the recorded signals, the recording method and the recorded format - called HH-1 format - thereby allowing for full data interchange between drives by means of such magnetic tape cartridges.

Information interchange between systems also requires, as a minimum, agreement between the interchange parties upon the interchange code(s) and the specifications of the structure and labelling of the information on the interchanged cartridge.

2 Conformance

2.1 Magnetic tape cartridge

A tape cartridge shall be in conformance with this International Standard if it meets all the mandatory requirements specified herein. The tape requirements shall be satisfied throughout the extent of the tape.

2.2 Generating drive

A drive generating a magnetic tape cartridge for interchange shall be in conformance with this International Standard if all recordings on the tape meet the mandatory requirements of this International Standard.

A claim of conformance shall state which of the following optional features are implemented and which are not

- the performing of a Read-After-Write check and the recording of any necessary rewritten frames;
- the generation of ECC3 Blocks.

In addition a claim of conformance shall state

- whether or not, registered data compression algorithm(s) are implemented within the system and are able to compress data received from the host, and
- the registered identification number(s) of the implemented algorithm(s).

2.3 Receiving drive

A drive receiving a magnetic tape cartridge for interchange shall be in conformance with this International Standard if it is able to handle any recording made on the tape according to this International Standard. In particular it shall

- be able to recognize rewritten frames and to make available to the host, data and File Marks from only one of these frames;
- be able to recognize a ECC3 Block, and ignore it if the system is not capable of using ECC3 check bytes in a process of error correction;
- be able to recognize compressed data, identify the algorithm used, and make the algorithm registration number available to the host;
- be able to make compressed data available to the host.

In addition a claim of conformance shall state

- whether or not the system is capable of using ECC3 check bytes in a process of error correction;
- whether or not one or more decompression algorithm(s) are implemented within the system, and are able to be applied to compressed data prior to making such data available to the host;
- the registered identification number(s) of the data compression algorithm(s) for which a complementary data decompression algorithm is implemented.
- whether or not the system is capable of updating the System Log(s) if the Write-inhibit Hole state so permits.

3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 527-1:1993,	<i>Plastics — Determination of tensile properties — Part 1: General principles.</i>
ISO 1302:1992,	<i>Technical drawings — Method of indicating surface texture.</i>
ISO/IEC 11576:1995,	<i>Information technology — Procedure for the registration of algorithms for the lossless compression of data.</i>
IEC 950:1991,	<i>Safety of information technology equipment.</i>

4 Definitions

For the purposes of this International Standard, the following definitions apply.

- 4.1 Absolute Frame Address:** A sequence number, encoded in the Frame.
- 4.2 a.c. erase:** A process of erasure utilising alternating magnetic fields of decaying intensity.
- 4.3 algorithm:** A set of rules for transforming the logical representation of data.
- 4.4 Area ID:** Identifier of an area of the tape.
- 4.5 Average Signal Amplitude:** The average peak-to-peak value of the output signal from the read head at the specified physical recording density over a minimum of 20,7 mm of track, exclusive of missing pulses.
- 4.6 azimuth:** The angular deviation, in degrees of arc, made by the mean flux transition line with a line normal to the centreline of the recorded track.
- 4.7 back surface:** The surface of the tape opposite to the magnetic coating which is used to record data.
- 4.8 bit cell:** A distance along the track allocated for the recording of a Channel bit.
- 4.9 byte:** An ordered set of bits acted upon as a unit.
- 4.10 cartridge:** A case containing magnetic tape stored on twin hubs.
- 4.11 Channel bit:** A bit after 8-10 transformation.
- 4.12 compressed data:** Data which has been subjected to a compression algorithm.
- 4.13 Cyclic Redundancy Check (CRC) character:** A 16-bit character obtained from a mathematical calculation and used for error detection.
- 4.14 Data Format ID:** An identifier specifying which data format is being used on the tape.
- 4.15 End of Data (EOD):** The point on the tape at the end of the Frame which contains the last user data.
- 4.16 Error Correcting Code:** A mathematical computation yielding check bytes used for the detection and correction of errors.
- 4.17 flux transition position:** That point on a magnetic tape which exhibits the maximum free-space flux density normal to the magnetic tape surface.
- 4.18 flux transition spacing:** The distance along a track between successive flux transitions.
- 4.19 Frame:** A pair of adjacent tracks with azimuths of opposite polarity, in which the track with the positive azimuth precedes that with the negative azimuth.
- 4.20 Logical Beginning of Tape (LBOT):** The point along the length of the tape where a recording of data for interchange commences.
- 4.21 Logical Record:** Related data, from the host, treated as a unit of information.
- 4.22 magnetic tape:** A tape which will accept and retain the magnetic signals intended for input, output and storage purposes on computers and associated equipment.

A tape selected as the standard for a Reference Field, Signal Amplitude, Resolution, Overwrite and Signal-to-Noise Ratio.

Note - The Master Standard Reference Tape has been established by the Reliability Center for Electronic Components of Japan (RCJ).

4.24 Partition Boundary: The point along the length of a magnetic tape at which partition 1 ends and partition 0 commences.

4.25 Physical Beginning of Tape (PBOT): The point where the leader tape is joined to the magnetic tape.

4.26 Physical End of Tape (PEOT): The point where the trailer tape is joined to the magnetic tape.

4.27 physical recording density: The number of recorded flux transitions per unit length of track, expressed in flux transitions per millimetre (ftpm).

4.28 Reference Field: The Typical Field of the Master Standard Reference Tape.

4.29 Secondary Standard Reference Tape (SSRT): A tape the performance of which is known and stated in relation to that of the Master Standard Reference Tape.

Note - Secondary Standard Reference Tapes can be ordered from RCJ, 1-1-12 Hachiman-cho, Higashikurume, Tokyo 203, Japan, under Part Number JRM 6143 until the year 2006. In principle such tapes will be available for a period of 10 years from the first version of this Standard. However, by agreement between ECMA and RCJ, this period may be shortened or extended to take account of demand for such SSRTs.

It is intended that these be used for calibrating tertiary reference tapes for use in routine calibration.

4.30 Standard Reference Amplitude (SRA): The Average Signal Amplitude derived from the Master Standard Reference Tape when using the Test Recording Current and the recording density of 3 658,1 ftpmm.

Traceability to the SRA is provided by the calibration factors supplied with each Secondary Standard Reference Tape.

4.31 Standard Reference Current: The current that produces the Reference Field.

4.32 Tape Reference Edge: The lower edge of the tape when viewing the recording surface of the tape, with the BOT splice to the observer's left.

4.33 Test Recording Current: The current that is used to record an SRA. It is 1,3 times the Standard Reference Current.

4.34 track: A diagonally positioned area on the tape along which a series of magnetic signals may be recorded.

4.35 Typical Field: In the plot of Average Signal Amplitude against the recording field at the physical recording density of 3 658,1 ftpmm, the minimum field that causes the Average Signal Amplitude equal to 90% of the maximum Average Signal Amplitude.

4.36 uncompressed data: Data which has not been subjected to a compression algorithm.

5 Conventions and notations

5.1 Representation of numbers

- A measured value is rounded off to the least significant digit of the corresponding specified value. It implies that a specified value of 1,26 with a positive tolerance of 0,01, and a negative tolerance of 0,02 allows a range of measured values from 1,235 to 1,275.
- Letters and digits in parentheses represent numbers in hexadecimal notation.
- The setting of a bit is denoted by ZERO or ONE.
- Numbers in binary notation and bit combinations are represented by strings of 0 and 1. Within such strings, X may be used to indicate that the setting of a bit is not specified within the string.
- Numbers in binary notation and bit combinations are shown with the most significant byte to the left and with the most significant bit in each byte to the left.
- Negative values of numbers in binary notation are given in TWO' s complement.
- In each field the data is processed so that the most significant byte (byte 0) is processed first. Within each byte the most significant bit (numbered 7 in an 8-bit byte) is processed first. This order of processing applies also to the data input to the Error Detection and Correction circuits and to their outputs, unless otherwise stated.

5.2 Names

The names of basic elements, e.g. specific fields, are given with a capital initial letter.

6 Acronyms

BOT	Beginning of Tape
CRC	Cyclic Redundancy Check
ECC	Error Correcting Code
EOD	End of Data
LBOP	Logical Beginning of Partition
LBOT	Logical Beginning of Tape
LEOP	Logical End of Partition
LEOT	Logical End of Tape
PBOP	Physical Beginning of Partition
PEOP	Physical End of Partition
PBOT	Physical Beginning of Tape
PEOT	Physical End of Tape
SNR	Signal-to-Noise-Ratio
SSRT	Secondary Standard Reference Tape

7 Environment and safety

The conditions specified below refer to ambient conditions immediately surrounding the cartridge. Cartridges exposed to environments outside these limits may still be able to function usefully; however, such exposure may cause permanent damage.

7.1 Testing environment

Unless otherwise specified, tests and measurements made on the cartridge to check the requirements of this International Standard shall be carried out under the following conditions:

temperature:	$23^{\circ}\text{C} \pm 2^{\circ}\text{C}$
relative humidity:	40 % to 60 %
conditioning period before testing:	24 h

7.2 Operating environment

Cartridges used for data interchange shall be capable of operating under the following conditions:

temperature:	5 °C to 45 °C
relative humidity:	20 % to 80 %
wet bulb temperature:	26 °C max.

There shall be no deposit of moisture on or in the cartridge.

Conditioning before operating:

If a cartridge has been exposed during storage and/or transportation to a condition outside the above values, before use the cartridge shall be conditioned in the operating environment for a time at least equal to the period during which it has been out of the operating environment, up to a maximum of 24 h.

Note - Rapid variations of temperature should be avoided.

7.3 Storage environment

The following conditions shall be observed during storage of cartridges :

temperature:	5 °C to 32 °C
relative humidity:	20 % to 60 %

The stray magnetic field at any point on the tape shall not exceed 4000 A/m. There shall be no deposit of moisture on or in the cartridge.

7.4 Transportation

Recommended limits for the environment to which a cartridge may be subjected during transportation, and the precautions to be taken to minimize the possibility of damage, are provided in annex F.

The cartridge and its components shall satisfy the requirements of IEC 950 when used in the intended manner or in any foreseeable use in an information processing system.

7.6 Flammability

The cartridge and its components shall be made from materials which, if ignited from a match flame, do not continue to burn in a still carbon dioxide atmosphere.

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Section 2 - Requirements for the case

8 Dimensional and mechanical characteristics of the case

8.1 General

The cartridge shall consist of the following elements:

- a case
- recognition holes
- a write inhibit mechanism
- twin reels containing magnetic tape
- a locking mechanism for the reels

Dimensional characteristics are specified for those parameters deemed to be mandatory for interchange and compatible use of the cartridge. Where there is freedom, of design, only the functional characteristics of the elements described are indicated. In the figures a typical implementation is represented in third angle projections.

- Figure 1 is a perspective view of the cartridge seen from the top.
 Figure 2 is a perspective view of the cartridge seen from the bottom.
 Figure 3 is a perspective view of Reference Planes X, Y and Z.
 Figure 4 shows the front side with the lid closed.
 Figure 5 shows the left side with the lid closed.
 Figure 6 shows the top side with the lid closed.
 Figure 7 shows the right side with the lid closed.
 Figure 8 shows the rear side with the lid closed.
 Figure 9 shows the bottom side, datum and support areas.
 Figure 10 shows the bottom side with the lid removed.
 Figure 11 is the enlarged view of the datum and recognition holes.
 Figure 12 are the cross-sections through the light path holes, the recognition holes and the write-inhibit hole.
 Figure 13 shows details of the lid when closed, rotating and open.
 Figure 14 shows the details of the lid release insertion channel.
 Figure 15 shows the lid lock release requirements.
 Figure 16 shows the reel lock release requirements.
 Figure 17 shows the reel unlock force direction.
 Figure 18 shows the lid release force direction.
 Figure 19 shows the lid opening force direction.
 Figure 20 shows the light path and light window.
 Figure 21 shows the internal tape path and light path.
 Figure 22 shows the cartridge reel and a cross-section view of the cartridge reel.
 Figure 23 is a cross-section view of the cartridge reel interface with the drive spindle.
 Figure 24 shows the tape access cavity clearance requirements.

The dimension are referred to three orthogonal Reference Planes X, Y and Z (see figure 3).

Plane X is perpendicular to Plane Z and passes through the centres of the Datum Holes A and B.

Plane Y is perpendicular to Plane X and Plane Z and passes through the centre of Datum Hole A.

Datum area A, B and C shall lie in Plane Z.

8.2 Overall dimension (figures 5 and 6)

The length of the case shall be

$$l_1 = 62,5 \text{ mm} \pm 0,3 \text{ mm}$$

The width of the case shall be

$$l_2 = 95,0 \text{ mm} \pm 0,2 \text{ mm}$$

The distance from the top of the case to Plane Z shall be

$$l_3 = 15,0 \text{ mm} \pm 0,2 \text{ mm}$$

The distance from the rear side to Plane X shall be

$$l = 47,35 \text{ mm} \pm 0,15 \text{ mm}$$

The distance from the right side to Plane Y shall be

$$l_5 = 13,0 \text{ mm} \pm 0,1 \text{ mm}$$

8.3 Holding areas

The holding areas shown hatched in figure 6 shall be the areas along which the cartridge shall be held down when inserted into the drive. The distance of the holding areas from Plane X shall be

$$l_6 = 12,0 \text{ mm max.}$$

The width when measured from the edge of the case shall be

$$l_7 = 3,0 \text{ mm min.}$$

8.4 Cartridge insertion

The cartridge shall have asymmetrical features to prevent insertion into the drive in other than the correct orientation. These consist of an insertion channel, a recess and an incline.

The insertion channel (figures 4 and 14) shall provide for an unobstructed path, when the lid is closed and locked, to unlock the lid. The distance of the insertion channel from Plane Y shall be

$$l_8 = 79,7 \text{ mm} \pm 0,2 \text{ mm}$$

There shall be a chamfer at the beginning of the insertion channel defined by

$$l_9 = 1,0 \text{ mm} \pm 0,1 \text{ mm}$$

$$l = 1,5 \text{ mm} \pm 0,1 \text{ mm}$$

An additional chamfer further into the insertion channel shall be defined by

$$l_{10} = 0,7 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{17} = 1,0 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{18} = 3,8 \text{ mm} \pm 0,1 \text{ mm}$$

The innermost width of the channel shall be

$$l_{11} = 1,0 \text{ mm min.}$$

The thickness of the lid shall be

$$l_{12} = 1,2 \text{ mm} \pm 0,1 \text{ mm}$$

There shall be a chamfer on the lid defined by

$$l_{13} = 0,8 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{14} = 1,2 \text{ mm} \pm 0,1 \text{ mm}$$

The lid shall extend from the case a distance of

$$l_{15} = 0,5 \text{ mm} \pm 0,1 \text{ mm}$$

The distance from the left side of the case to the lid lock shall be

$$l_{19} = 0,2 \text{ mm} \pm 0,2 \text{ mm}$$

The height of the insertion area shall be

$$l_{20} = 2,3 \text{ mm min.}$$

$$l_{21} = 2,5 \text{ mm} \begin{array}{l} + 0,2 \text{ mm} \\ - 0,0 \text{ mm} \end{array}$$

The recess is located on the right side of the cartridge. The position and dimensions (figures 5, 7 and 10) shall be defined by

$$l_{22} = 7,5 \text{ mm max.}$$

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