INTERNATIONAL STANDARD

ISO/IEC 15757

First edition
1998-07-15

Information technology — Data interchange on 8 mm wide magnetic tape cartridge — Helical scan recording — DA-2 format

Technologies de l'information — Échange de données sur cartouche de bande magnétique de 8 mm *de large — Enregistrement par balayage en spirale — Format DA-2*

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Reference number
ISO/IEC 15757:1998(E)

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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 15757 was prepared by ECMA (as ECMA-249) 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 J form an integral part of this International Standard. Annex K is for information only.

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Information technology — Data interchange on 8 mm wide magnetic tape cartridge — Helical scan recording — DA-2 format

Section 1 - General

1 Scope

This International Standard specifies the physical and magnetic characteristics of a 8 mm wide magnetic tape cartridge to enable physical interchange of such cartridges between drives. It also specifies the quality of the recorded signals, the recording method and the recorded format, thereby allowing data interchange between drives by means of such magnetic tape cartridges.

Information interchange between systems also requires, at 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

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2.1 Magnetic tape cartridges

A magnetic tape cartridge shall be in conformance with this International Standard if it satisfies all mandatory requirements of this International Standard throughout the extent of the tape.

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2.2 Generating drive

A drive generating a magnetic tape cartridge for interchange shall be entitled to claim conformance with this International Standard if all the recordings that it makes on a tape meet the mandatory requirements of this International Standard. A claim of conformance shall state whether or not one or more registered compression algorithm(s) are implemented within the system to process data from the host prior to allocating data to physical blocks.

2.3 Receiving drive

A system receiving a magnetic tape cartridge for interchange shall be entitled to claim conformance with the International Standard if it is able to handle any recording on this tape according to this International Standard. A receiving drive shall be able to recognize the use of a data compression algorithm and make the algorithm registration number available to the host.

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, *Plastics — Determination of tensile properties — Part 1: General principles.*

ISO 1302:1992, *Technical drawings — Method of indicating surface texture.*

ISO/IEC 11576:1995, *Information technology — Procedure for the registration of algorithms for the lossless compression of data.*

IEC 950:1991, *Safety of information technology equipment.*

4 Definitions

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

4.1 a.c. erase: A process of erasure utilizing alternating magnetic fields of decaying intensity.

4.2 algorithm: A set of rules for transforming the logical representation of data.

4.3 append point: The first physical block on the first track 1 following the two gap stripes that precede a Long File Mark, Set Mark, or EOD and follow the last track pair containing any portion of a logical block

4.4 Average Signal Amplitude: The average peak-to-peak value of the signal of a read head measured over a minimum of 3 000 flux transitions, exclusive of missing pulses.

4.5 azimuth: The angular deviation, in degrees of arc, of the recorded flux transitions on a track from a line normal to the track centreline.

4.6 back surface: The surface of the tape opposite to the magnetic coating used to record data.

4.7 bit cell: A distance along the track allocated for the recording of a channel bit.

4.8 byte: An ordered set of bits acted upon as a unit.

4.9 cartridge: A case containing magnetic tape stored on twin reels.

4.10 Channel bit: A bit after 8-10 transformation.

4.11 Cluster: A group of sequential blocks of the same block type.

4.12 Cyclic Redundancy Check (CRC) character: A character derived from information contained in data bytes that are used for error detection.

4.13 Digital Sum Variation (DSV): The integrated value of Channel bits taken from the beginning of each track counting a ONE as +1 and a ZERO as -1.

4.14 Error Correcting Code (ECC): A mathematical procedure yielding bytes used for the detection and correction of errors.

4.15 File Mark: A mark recorded on the tape at the request of the host system to separate files or to provide a splice point. This format provides for Long or Short File Marks.

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4.16 flux transition spacing: The distance along a track between successive flux transitions.

4.17 Logical Beginning of Partition (LBOP): The point in a partition where a recording of data for interchange commences.

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4.18 Logical Block: Information (data, file marks, or set marks) sent from the host to the tape drive to be recorded.

4.19 magnetic tape: A tape that accepts and retains magnetic signals intended for input, output, and storage of data for information processing.

4.20 Master Standard Reference Tape: A tape selected as the standard for Signal Amplitude, Typical Field, Overwrite and Resolution.

NOTE - The Master Standard Reference Tape has been established by Pericomp Corporation.

4.21 Partition: A formatted length of tape used to record data. Partitions are used to divide the tape into shorter updatable areas.

4.22 Physical Beginning of Partition (PBOP): The point along the length of tape at which a partition begins.

4.23 Physical Beginning of Tape (PBOT): The transition from the tape leader to the opaque area of the splice by which the translucent leader tape is joined to the magnetic tape.

4.24 Physical End of Partition (PEOP): The point along the length of tape at which a partition ends.

4.25 Physical End of Tape (PEOT): The transition from the opaque area of the splice to the translucent trailer tape.

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

4.27 Read Back Check (RBC): A Read Back Check occurs when, while writing, the data is read by trailing heads and checked for errors.

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 under the Part Number SSRT/M.AME/PC97, from Pericomp Corporation, 14 Huron Drive, Natick, MA 01760, USA.

In principle, such tapes will be available for a period of 10 years from the first edition of this International Standard. However, by agreement between ISO/IEC JTC 1 and Pericomp, this period may be shortened or extended to take account of demand for such tapes.

It is intended that these be used for calibrating Tertiary Reference Tapes for use in routine calibration.

4.30 Set Mark: A mark recorded on the tape at the request of the host system to separate a set of data or to provide a splice point.

4.31 Standard Reference Amplitude (SRA): The Average Signal Amplitude derived from the Master Standard Reference Tape, using the Test Recording Current at 3 819 ftpmm.

4.32 Standard Reference Current (Ir): The current that produces the Reference Field.

4.33 Tape Reference Edge: The lower edge of tape as seen when viewing the recording surface of the tape with the supply reel to the observer's right.

4.34 Test Recording Current (TRC): The current used to record the SRA. The TRC is 1,5 times the Standard Reference Current.

4.35 Track: A diagonally positioned area on the tape along which a series of magnetic transitions may be recorded.

4.36 Typical Field: In the plot of the Average Signal Amplitude against the recording field at the physical recording density of 3 819 ftpmm, the minimum field that causes an Average Signal Amplitude equal to 90% of the maximum Average Signal Amplitude.

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 specific 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 digits 0 and 1.
- 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, least significant bit is numbered 0 and is processed last. This order of processing applies also to the data input to the Error Detection and Correction circuits and to their output, unless otherwise stated.

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5.2 Names

The names of entities, e.g. specific tracks, fields, etc., are given with a capital initial.

5.3 Reserved fields

Fields marked resv are reserved for future format extensions and all bits in these fields shall be set to ZERO.

6 Acronyms

CRC	Cyclic Redundancy Check
BID	Block Identifier
ECC	Error Correction Code
EOD	End of Data
FID	File Identifier
LBOP	Logical Beginning of Partition
LID	Logical Block Identifier
lsb	Least Significant Bit
LSB	Least Significant Byte
msb	Most Significant Bit
MSB	Most significant Byte
PBOP	Physical Beginning of Partition

PBOT Physical Beginning of Tape
PEOP Physical End of Partition
PEOT Physical End of Tape
PID Physical Identifier
RBC Read Back Check
SID Stream Identifier
SMID Set Mark Identifier
SRA Standard Reference Amplitude
SSRT Secondary Standard Reference Tape
TRC Test Recording Current

7 Environment and Safety

The conditions specified below refer to the 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°C ± 2°C

relative humidity: 40 % to 60 %

conditioning period before testing: 24 h

7.2 Operating environment

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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.

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The average temperature of the air immediately surrounding the tape shall not exceed 45°C.

Conditioning before operating: If a cartridge has been exposed during storage and/or transportation to conditions 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..

7.3 Storage environment

The following conditions shall be observed during storage

temperature: 5°C to 32°C

relative humidity: 20 % to 60 %

stray magnetic field: shall not exceed 4 000 A/m at any point on the tape.

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

7.4 Transportation

Recommended limits for the environments 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 K.

7.5 Safety

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

7.6 Flammability

The cartridge shall be made from materials that comply with the flammability class for HB materials, or better, as specified in Standard IEC 950.

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.

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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

$l_4 = 47{,}35 \text{ mm} \pm 0{,}15 \text{ mm}$

The distance from the right side to Plane Y shall be

l_5 = 13,0 mm ± 0,1 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 mm max.

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

l_7 = 3,0 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 mm ± 0,2 mm

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

l_9 = 1,0 mm ± 0,1 mm

l_{16} = 1,5 mm ± 0,1 mm

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

l_{10} = 0,7 mm ± 0,1 mm

l_{17} = 1,0 mm ± 0,1 mm

l_{18} = 3,8 mm ± 0,1 mm

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The innermost width of the insertion channel shall be

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l_{11} = 1,0 mm min.

The thickness of the lid shall be

l_{12} = 1,2 mm ± 0,1 mm

There shall be a chamfer on the lid defined by

l_{13} = 0,8 mm ± 0,1 mm

l_{14} = 1,2 mm ± 0,1 mm

The lid shall extend from the case a distance of

l_{15} = 0,5 mm ± 0,1 mm

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

l_{19} = 0,2 mm ± 0,2 mm

The height of the insertion area shall be

l_{20} = 2,3 mm min.

l_{21} = 2,5 mm $^{+\ 0,2\ \text{mm}}_{-\ 0,0\ \text{mm}}$

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 mm max.

l_{23} = 11,0 mm ± 0,2 mm

l_{24} = 1,5 mm ± 0,1 mm

The depth of the recess shall be

l_{25} = 1,5 mm ± 0,1 mm

The incline (figure 13a) is part of the lid structure. The distance of the incline from Plane X shall be defined by

l_{26} = 7,7 mm $^{+\ 0,0\ mm}_{-\ 2,5\ mm}$

The angle of the incline shall be

$a_1 = 20^o \pm 1^o$

The incline shall end when it intersects the radius r_3 (see clause 8.13).

8.5 Window (figure 1)

A window may be provided on the top side so that parts of the reels are visible. The window, if provided, shall not extend beyond the height of the cartridge.

8.6 Loading grips (figures 5 and 7)

The cartridge shall have recessed loading grips on each side to aid an automatic loading mechanism.

The distance from Plane X to the centreline of the loading grip shall be

l_{28} = 39,35 mm ± 0,20 mm;

The distance from Plane Z on the bottom side and from the top side shall be

l_{29} = 1,5 mm ± 0,1 mm;

The width of the indent shall be

l_{30} = 5,0 mm ± 0,3 mm;

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The depth of the indent shall be

l_{31} = 2,0 mm ± 0,2 mm;

and the angle of the indent

$a_2 = 90^o \pm 5^o$.

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8.7 Label areas (figures 6 and 8)

A portion of the rear side of the cartridge and a portion of the top side of the cartridge may be used for labels. The position and the size of the labels shall not interfere with the operation or clearance requirements of the cartridge component parts.

The area used for labels on the top side shall not extend beyond the inner edge of the holding areas defined by l_6 and l_7.

The position and dimensions of the label area on the rear side shall be defined by

l_{32} = 0,5 mm min.

l_{33} = 1,5 mm min.

l_{34} = 80,0 mm max.

The depth of the label areas shall be 0,3 mm max.

8.8 Datum areas and datum holes

The annular datum areas A, B and C shall lie in Plane Z (see figures 9, 10 and 11). They determine the vertical position of the cartridge in the drive. Each shall have a diameter d_1 equal to 6,0 mm ± 0,1 mm and be concentric with the respective datum hole.

The centres of datum holes A and B lie in Plane X.

The centre of the circular datum hole A shall be at the intersection of planes X and Y (see figure 10).

The distance from the centre of datum hole B to Plane Y (see figure 9) shall be

l_{35} = 68,0 mm ± 0,1 mm

The distance from the centre of the circular datum hole C to Plane Y (see figure 11) shall be

l_{36} = 10,20 mm ± 0,05 mm