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Information technology — File structure and labelling of magnetic tapes for information interchange

Technologies de l'information — Structure des fichiers et étiquetage des bandes magnétiques pour l'échange d'information

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 1001 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 23, *Digitally Recorded Media for Information Interchange and Storage*.

This first edition of ISO/IEC 1001 cancels and replaces the second edition of ISO 1001:1986, which has been technically revised.

Information technology — File structure and labelling of magnetic tapes for information interchange

1 Scope

This International Standard specifies the file structure and the labelling of magnetic tapes for the interchange of information between users of information processing systems.

This International Standard also specifies

— volume and file structure;

— basic characteristics of the blocks containing the records constituting the file;

— recorded labels for identifying files, file sections and volumes of magnetic tapes;

— four nested levels of interchange.

Furthermore, this International Standard specifies requirements for the processes which are provided within information processing systems, to enable information to be interchanged between different systems, utilizing recorded magnetic tape as the medium of interchange. For this purpose it specifies the functions to be provided within systems which are intended to originate or receive magnetic tape volumes which conform to this International Standard.

2 Conformance

2.1 Conformance of a magnetic tape volume set

A magnetic tape volume set conforms to this International Standard when all information recorded on it conforms to the specifications of this International Standard. A Statement of conformance shall identify the lowest level of interchange to which the contents of the magnetic tapes conform.

A prerequisite to such conformance is conformance of each volume of the volume set to the same International Standard for information interchange on magnetic tapes.

2.2 Conformance of an information processing system

An information processing system conforms to this International Standard if it meets all the requirements specified in this International Standard either for an originating system, or for a receiving system, or for both types of system. A statement of conformance shall identify which of these sets of requirements can be met by the system.

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 646, *Information technology — ISO 7-bit coded character set for information interchange*

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1
application program
program that processes the contents of records belonging to a file, and may also process selected attribute data relating to the file or to the volume(s) on which it is recorded

NOTE An application program is a specific class of user as defined in this International Standard.

4.2
block
group of bytes recorded on a magnetic tape as a unit

4.3
blocked
attribute of records that indicates that they may begin at a byte that is not the first byte of a block

4.4
byte
string of eight binary digits operated upon as a unit

4.5
file
named collection of information consisting of zero or more records

4.6
file section
part of a file that is recorded on any one volume

4.7
file set
collection of one or more files recorded consecutively on a set of volumes

4.8
fixed-length record
record contained in a file in which all records must have the same length

4.9
implementation
set of processes within an information processing system which enable that system to behave as an originating system, or as a receiving system, or as both types of system

4.10
Initialized volumes
magnetic tape already recorded in the first label group on the volume although no valid file sections are recorded (See Annex C)

4.11
installation
person or other entity which controls the use of one or more implementations which process and interchange magnetic tapes

NOTE An installation is a specific class of user as defined in this International Standard.

4.12
label
record that identifies and characterizes a volume, or a file section on a volume

4.13
originating system
information processing system which can record a file set on a volume set for the purpose of data interchange with another system

4.14
originator
person who is responsible for issuing commands to an originating system

4.15
receiving system
information processing system which can read a file set from a volume set which has been recorded by another system for the purpose of data interchange

4.16
recipient
person who is responsible for issuing commands to a receiving system

4.17
record
related data treated as a unit of information

4.18
segmented record (only a-characters)
record contained in a file which is assigned to contain records that may have different lengths and that may be recorded entirely in one block or over more than one block

4.19
International Standard for information interchange (only a-characters)
standard that specifies the recording method and the track format of a magnetic tape (for example ISO 1863)

4.20
Tape Mark
control block used as a delimiter

4.21
user
person or other entity that causes the invocation of the services provided by an implementation

4.22
variable-length record
record contained in a file in which the records may have different lengths

4.23
volume
dismountable reel of magnetic tape

4.24
volume set
collection of one or more volumes, on which a file set is recorded

5 Notation

The following notation is used in this International Standard:

BP: Byte position within the label

L: Length of the field in number of byte positions

a-character(s): Any of the allowed characters (see 8.1.1)

e-character(s): Any of the allowed characters (see 8.2.1)

Digit(s): Any digit from ZERO to NINE.

With the exception of SPACE, a group of capital letters in the content column of a table specifying label contents indicates that these characters shall appear in the order given and in the corresponding byte positions of the field specified, for example VOL in BP 1 to 3 of the Volume Header Labels. In the tables and thoughout this International Standard, SPACE signifies the character coded in position 2/0 of ISO 646 or 4/0 of e-character(s).

6 Arrangement of labels and files

6.1 Arrangement of data on a volume

A volume shall be recorded with a sequence of blocks and Tape Marks. The sequence shall commence with a block, and shall terminate within the usable recording area.

6.2 Arrangement of label groups

6.2.1 Labels

A label shall be a record that shall have a length of 80 bytes. Each label shall be recorded within the first or only 80 byte positions of a block. If the block contains any additional bytes, they shall be recorded with any desired bit combinations.

Each label shall be of one of the following types:

Volume Header

Installation Volume (only a-characters)

File Header

User File Header

End of File

End of Volume

User File Trailer

6.2.2 Label sets

A sequence of one or more labels of the same type, recorded in consecutive blocks, shall be a label set of that type. All labels in a set shall be numbered consecutively starting from 1, except those labels in the User File Header and User File Trailer Label Sets.

6.2.3 Label groups

A label group shall consist of a mandatory label set, optionally followed by a second label set of a different type. Each label group shall be of one of the types listed in Table 1, and shall include only those label sets listed in the corresponding entry of the table. The first set listed in each table entry is the mandatory set, and the second set listed is the optional set.

Table 1 — Label groups

Label group	Label sets
Beginning of Volume	Volume Header Installation Volume (only a-characters)
Beginning of File Section	File Header User File Header
End of File Section	End of Volume User File Trailer
End of File	End of File User File Trailer

6.3 Arrangement of file sections

6.3.1 File section

A file section shall be recorded in a sequence of one or more blocks, or no blocks. If no blocks are recorded, the file section is regarded as empty.

6.3.2 Labelled-Sequence

6.3.2.1

A Labelled-Sequence shall consist of the sequence of blocks and Tape Marks as listed below, recorded consecutively:

a) Beginning of File Section Label Group;

b) Tape Mark;

c) a file section;

d) Tape Mark;

e) either an End of File Label Group or an End of File Section Label Group, as required in 6.3.2.2;

f) Tape Mark.

6.3.2.2

If the file section is the last or only file section of a file, then the label group that follows it shall be an End of File Label Group. Otherwise the label group shall be an End of File Section Label Group.

NOTE An End of File Section Label Group can only be the last label group on a volume because of the requirements of 6.5.1.

6.3.2.3

Within a Labelled-Sequence the information contained in the File Header Label Set, and in the End of File or End of Volume Label Set, shall apply to the file section that is recorded within the sequence.

6.3.2.4

Within a Labelled-Sequence the number of labels in an End of Volume or End of File Label Set shall be equal to the number of labels in the File Header Label Set. Within all Labelled-Sequences in which the file sections of a file are recorded, the number of File Header Labels shall be the same.

6.4 Relationship of file sections to a volume

The information on a volume shall consist of the sequence of blocks and Tape Marks as listed below, recorded consecutively:

- Beginning of Volume Label Group;
- one or more Labelled-Sequences;
- Tape Mark.

Any recording following the last Tape Mark of the sequence shall be ignored in interchange.

The information that identifies and describes the volume shall be contained in the Volume Header Label Set, within the Beginning of Volume Label Group.

6.5 Arrangement of files and file sets

6.5.1 Files

If a file is recorded entirely within one volume it shall consist of only one file section.

If a file is recorded over more than one volume, then only one file section of the file shall be recorded on any one volume, and

- the first file section shall be recorded as the last or only file section on a volume;
- any intermediate file section shall be recorded as the only file section on a volume;
- the last file section shall be recorded as the first or only file section on a volume.

All sections of a file shall be numbered consecutively starting from 1.

6.5.2 File sets

A file set shall consist of one or more files having a common file set identifier. All files in a file set shall be numbered consecutively starting from 1.

The files in a file set shall be recorded consecutively over a set of one or more volumes.

6.6 Structure of a volume set

A volume set shall be the set of volumes on which a file set is recorded. The volume set shall contain only one file set.

7 File structure for data interchange

This clause specifies the file structure for data interchange in terms of data blocks and data records, and identifies the label fields defined for that purpose.

7.1 File structure for data interchange for a-characters

7.1.1 Blocks

7.1.1.1 Characteristics

A block in which part of a file section is recorded shall contain one or more Measured Data Units (MDU). Each MDU shall either be a fixed-length record, or shall contain a variable-length record or a record segment.

A block in which part of a file section is recorded may contain

— an Offset field preceding the first or only MDU;

— a Padding field following the last or only MDU.

The first or only MDU in a block shall begin at the first byte of the block after the Offset field (if any). Each subsequent MDU shall begin at the byte immediately following the last byte of the preceding MDU in that block. Each MDU shall end in the block in which it begins.

7.1.1.2 Block length

The length of a block shall be the number of bytes in the block. Within a file, all blocks may have different lengths. The length of a block shall be the sum of

— the lengths of the MDUs in the block;

— the length of the Offset field;

— the length of the Padding field.

A maximum block length shall be assigned for a file. The block length shall not exceed the maximum value specified by the relevant International Standard for information interchange.

7.1.1.3 Offset field

This field shall consist of not more than 99 bytes. It shall be reserved for implementation use. Its contents are not specified by this International Standard and may be ignored in interchange.

7.1.1.4 Padding field

This field shall consist of a number of bytes sufficient to extend the length of a block either

a) to the minimum length required by the relevant International Standard for information interchange, or

b) to a greater length as required by the implementation.

Each byte of this field shall contain bit combination b_8 to b_1 = 0101 1110. This field shall be ignored in interchange.

7.1.2 Records

7.1.2.1 Characteristics

A record shall have the following characteristics:

a) A record may be either a fixed-length record, or a variable-length record, or a segmented record.

b) A fixed-length record or a variable-length record shall be recorded entirely within one block; a segmented record may be recorded in a part of one or more blocks.

c) The length of a record shall be the number of bytes in the record.

7.1.2.2 Fixed-length records

A fixed-length record shall be a record contained in a file that is assigned to contain only records of the same length. The minimum assigned length of a fixed-length record shall be one byte and the maximum assigned length shall not exceed the assigned block length less the length of the offset field. At least one byte of a fixed-length record shall not contain bit combination b_8 to b_1 = 0101 1110.

7.1.2.3 Variable-length records

A variable-length record shall be a record contained in a file that is assigned to contain records that may have different lengths.

A variable-length record shall be contained in an MDU. The MDU shall consist of a Record Control Word (RCW), followed immediately by the variable-length record. The RCW shall consist of four characters which shall be coded in accordance with ISO 646 and shall express the sum of the lengths of the record and of the RCW as a four-digit decimal number.

A maximum record length shall be assigned for a file. The length of any record in the file shall not exceed this value. The assigned maximum record length shall not be zero and shall not exceed the assigned block length less the length of the Offset field and less the length of the RCW.

The minimum length of a variable-length record shall be zero.

7.1.2.4 Segmented records

A segmented record shall be a record contained in a file that is assigned to contain records that may have different lengths and that may be recorded entirely in one block or over more than one block.

That part of a segmented record that is recorded in one block is a record segment. There shall be only one segment of the same record in a block.

Successive segments of the same record within the same file sections shall be recorded in successive blocks.

Different segments of the same record shall only be recorded in different file sections if one of the segments is recorded in the last block of a file section, and the next segment of the record is recorded in the first block of the next non-empty file section of that file.

A maximum record length shall be assigned for a file. The length of any record in the file shall not exceed this assigned value. The assigned maximum record length shall not be zero.

NOTE The assigned maximum record length is unbounded in that this International Standard specifies no limit to the number of record segments in a record.

