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Information processing — Volume and file structure of CD-ROM for information interchange

Traitement de l'information — Structure de volume et de fichier des disques optiques compacts à mémoire fixe (CD-ROM) destinés à l'échange d'information

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

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ISO/IEC 9660:2023

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

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This first edition cancels and replaces the first edition (ISO 9660:1988), which has been technically revised. It also incorporates the Amendments ISO 9660:1988/Amd. 1:2013 and ISO 9660:1988/Amd. 2:2020.

The main changes are as follows:

— the term “standard for recording” has been removed from Clause 3 as it is no longer considered necessary. Reference to a "standard for recording" have been replaced with cross-references to ISO/IEC 10149;

— the enhanced volume descriptor has been added in order to harmonize with the "Joliet Specification" widely used on PC (see Clause B.1). Specific details are as follows:

  a) the volume descriptor version has been changed to indicate the new structure,

  b) the file structure version has been changed to indicate the new structure,

  c) the limitation in the depth of hierarchy has been lifted,

  d) the file identifier has not been separated into components,

  e) the file identifier does not have file version numbers,

  f) the character used for filling byte positions which are specified to be characters is subject to agreement between the originator and the recipient of the volume,

  g) the length of the file identifier has been limited to 207, and

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h) the length of a directory identifier has been limited to 207;

— details of modifications for the "Joliet Specification" have been described in Clause B.2;

— various editorial modifications have been made to bring the document in line with current drafting rules.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

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Introduction

In the late 1980s, the compact disk, originally developed for recording music, began to also be used for recording data, as it could record large amounts of information in a reliable and economic manner. In addition, due to the feature of read-only medium, it seemed to be particularly suitable for use in applications such as auditing and legal documents. Therefore, there was an urgent need for stable standards for structures of the compact disk and of the files recorded thereon.

As a result, methods of "*Data interchange on read-only 120 mm optical data disks (CD-ROM)*" and "*Volume and file structure of CD-ROM for information interchange*" were internationally standardized as ISO/IEC 10149 in 1989 and ISO 9660 in 1988 respectively.

Since the publication of ISO 9660:1988, two Amendments were issued in 2013 and 2020 in order to include the "Joliet Specification", which was widely used on PC.

This document has been developed in order to make ISO/IEC 10149 the normative reference specifying recording and addressing methods for the compact disk and to consolidate the two Amendments.

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Information processing — Volume and file structure of CD-ROM for information interchange

1 Scope

This document specifies the volume and file structure of compact disc read-only memory (CD-ROM) for the interchange of information between users of information processing systems.

This document specifies:

— the attributes of the volume and the descriptors recorded on it;

— the relationship among volumes of a volume set;

— the placement of the files;

— the attributes of the files;

— record structures intended for use in the input or output data streams of an application program when such data streams are required to be organized as sets of records;

— three nested levels of medium interchange;

— two nested levels of implementation;

— requirements for the processes which are provided within information processing systems, to enable information to be interchanged between different systems, utilizing recorded CD-ROM as the medium of interchange; for this purpose, this document specifies the functions to be provided within systems which are intended to originate or receive CD-ROM which conform to this document.

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2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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*

ISO/IEC 1539-1, *Information technology — Programming languages — Fortran — Part 1: Base language*

ISO/IEC 2022, *Information technology — Character code structure and extension techniques*

ISO/IEC 2375, *Information technology — Procedure for registration of escape sequences and coded character sets*

ISO/IEC 10149, *Information technology — Data interchange on read-only 120 mm optical data disks (CD-ROM)*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

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— IEC Electropedia: available at https://www.electropedia.org/

3.1
application program
program that processes contents of a *file* (3.7), and may also process selected attribute data relating to a file or to a *volume(s)* (3.16) on which a file is recorded

Note 1 to entry: An application program is a specific class of *user* (3.15), as defined in this document.

3.2
byte
string of eight binary digits operated upon as a unit

[SOURCE: ISO 7665:1983, 4.3]

3.3
data field
fixed-length field containing data of a *sector* (3.14)

[SOURCE: ISO/IEC 9293:1994, 4.2, modified — Preferred term changed from "data field of a sector" to "data field".]

3.4
data preparer
person or other entity which controls the preparation of data to be recorded on a *volume* (3.16) group

Note 1 to entry: A data preparer is a specific class of *user* (3.15) as defined in this document.

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3.5
descriptor
structure containing descriptive information about a *volume* (3.16) or a *file* (3.7)

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3.6
extent
set of *logical blocks* (3.10), the logical block numbers of which form a continuous ascending sequence

3.7
file
named collection of information

3.8
file section
part of a *file* (3.7) that is recorded in any one *extent* (3.6)

3.9
implementation
set of processes which enable an information processing system to behave as an *originating system* (3.11), or as a *receiving system* (3.12), or as both types of system

3.10
logical block
group of 2^{n+9} *bytes* (3.2) treated as a logical unit, where n equals 0 or a positive integer

3.11
originating system
information processing system which can create a set of *files* (3.7) on a *volume set* (3.17) for a purpose of data interchange with another system

3.12
receiving system
information processing system which can read a set of *files* (3.7) from a *volume set* (3.17) created by another system for a purpose of data interchange

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3.13
record
sequence of *bytes* (3.2) treated as a unit of information

3.14
sector
smallest addressable part of a recorded area on a CD-ROM that can be accessed independently of other addressable parts of the recorded area

3.15
user
person or other entity [for example, *application program* (3.1)] that causes an invocation of services provided by *implementation* (3.9)

3.16
volume
dismountable CD-ROM

3.17
volume set
collection of one or more *volumes* (3.16), on which a set of *files* (3.7) is recorded

4 Notation

4.1 Decimal and hexadecimal notations

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Numbers in decimal notation are represented by decimal digits, namely 0 to 9.

Numbers in hexadecimal notation are represented by hexadecimal digits, namely 0 to 9 and A to F, shown in parentheses.

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4.2 Other notations

BP	byte position within a descriptor, starting with 1
RBP	byte position within a descriptor field, starting with 1
ZERO	single bit with value 0
ONE	single bit with value 1
Digit(s)	any digit from ZERO to NINE

5 Conformance

5.1 Conformance of a CD-ROM

A CD-ROM is considered to conform to this document if all information recorded on it conforms to the requirements of Clauses 7 to 11. A statement of conformance shall identify the lowest level of interchange to which the contents of the CD-ROM conform.

A prerequisite to such conformance is conformance of the CD-ROM to ISO/IEC 10149.

5.2 Conformance of an information processing system

An information processing system is considered to conform to this document if it meets the requirements specified in Clauses 7 to 11 and 13 to 15, either for an originating system, or for a receiving system, or

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for both types of system. A statement of conformance shall identify which level of these requirements can be met by the system.

6 Requirements for a medium

The volume and file structure of CD-ROM are specified from the following two perspectives:

— requirements for the medium;

— requirements for systems.

The requirements for the medium are defined and specified in Clauses 7 to 11.

7 Volume structure

7.1 Arrangement of data on a CD-ROM

7.1.1 Physical addresses

Each sector shall be identified by a unique physical address in accordance with ISO/IEC 10149.

7.1.2 Logical sector

The sectors of a volume shall be organized into logical sectors. Each logical sector shall consist of a number of bytes equal to 2 048 or 2^n, whichever is larger, where n is the largest integer such that 2^n is less than, or equal to, the number of bytes in the data field of any sector recorded on the volume. The number of bytes in a logical sector shall be referred to as the logical sector size. Each logical sector shall begin in a different sector from any other logical sector and shall begin with the first byte of the data field of the sector in which it begins. If the number of bytes of the data field of each sector recorded on the volume is less than 2 048, a logical sector shall comprise more than one sector, and the set of the physical addresses of its constituent sectors shall form a consecutive ascending sequence. The data of a logical sector shall be recorded in the data fields of its constituent sectors.

Each logical sector shall be identified by a unique logical sector number. Logical sector numbers shall be integers assigned in an ascending sequence, in order of ascending physical addresses of the constituent sectors, starting with 0 for the logical sector containing the sector having the lowest physical address which may contain recorded information. The numbering shall continue through successive logical sectors, each of which begins with the sector with the next higher physical address than that of the last sector constituting the previous logical sector.

7.1.3 Volume space

The information on a volume shall be recorded in the set of all logical sectors on the volume. This set shall be referred to as the volume space of the volume.

The bytes in the volume space shall be numbered consecutively. The numbering shall start with 1, which shall be assigned to the first byte of the first logical sector of the volume space. The numbering shall continue through successive bytes of the first logical sector, and then through successive bytes of each successive logical sector, of the volume space.

7.2 Arrangement of the volume space

7.2.1 System area and data area

The volume space shall be divided into a system area and a data area.

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The system area shall occupy the logical sectors with logical sector numbers 0 to15. The system area shall be reserved for system use. Its content is not specified by this document.

The data area shall occupy the remaining logical sectors of the volume space.

7.2.2 Logical block

The volume space shall be organized into logical blocks. Each logical block shall consist of 2^{n+9} bytes, where n equals 0 or a positive integer. The number of bytes in a logical block shall be referred to as the logical block size which shall not be greater than the logical sector size.

Each logical block shall be identified by a unique logical block number. Logical block numbers shall be integers assigned in ascending order starting with 0. Logical block number 0 shall be assigned to the logical block which begins with the first byte of the volume space. Each successive logical block number shall be assigned to the logical block which begins with the byte in the volume space immediately following the last byte of the preceding logical block.

7.3 Arrangement of the data area

File sections shall be recorded in the data area.

The following types of descriptors shall be recorded in the data area to describe the use of the data area:

— volume descriptors;

— file descriptors;

— directory descriptor;

— path tables.

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The volume descriptors shall be recorded in consecutively numbered logical sectors starting with the logical sector having logical sector number 16. The logical sectors in the data area shall be available for the assignment of volume partitions and the recording of file sections, file descriptors, directory descriptors and path tables.

Each file section shall be recorded in an extent, and shall be identified by a descriptor in a directory. An extended attribute record can be associated with the file section. If present, it shall be recorded in the same extent as the associated file section, and shall be identified by the descriptor that identifies the associated file section. Each directory shall be recorded as a file in a single extent, and shall be identified by a directory descriptor either in another directory or in a volume descriptor. Each directory shall also be identified by a record in a path table. Each path table shall be identified in a volume descriptor.

Space within the data area may be assigned to one or more volume partitions. Each volume partition shall be recorded in an extent and shall be identified by a volume descriptor.

7.4 Arrangement of an extent

7.4.1 Extent

An extent shall be a set of logical blocks, the logical block numbers of which form a continuous ascending sequence.

7.4.2 Mode of recording a file section

A file section, and its associated extended attribute record, if any, shall be recorded in an extent either in interleaved mode or in non-interleaved mode.

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