

Specification for

Volume and file structure of compact read only optical disks (CD-ROM) for information interchange —

[ISO title: Information processing —
Volume and file structure of CD-ROM
for information interchange]

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- Local Authority Organizations
- National Centre for Information Media and Technology (CIMTECH)
- National Computing Centre Ltd.
- User Standards Forum for Information Technology (Institute of Data Processing Management)

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National foreword

This British Standard, prepared under the direction of the Information Systems Technology Standards Committee, is identical with ISO 9660:1988 “*Information processing — Volume and file structure of CD-ROM for information interchange*”, published by the International Organization for Standardization (ISO).

Terminology and conventions. The text of the international standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

Wherever the words “International Standard” appear, referring to this standard, they should be read as “British Standard”.

Cross-references

International standard	Corresponding British Standard
ISO 646:1983	BS 4730:1985 Specification for UK 7-bit coded character set (Identical, exercising national options)
ISO 2022:1986	BS 6856:1987 Specification for code extension techniques for United Kingdom 7-bit and 8-bit coded character sets (Identical)
ISO 4873:1986	BS 6006:1987 Specification for structure and rules for implementation of United Kingdom 8-bit coded character set (Identical)

The Technical Committee has reviewed the provisions of ISO 1539 and ISO 2375, to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 34, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General

1 Scope and field of application

This International Standard specifies the volume and file structure of compact read only optical disks (CD-ROM) for the interchange of information between users of information processing systems.

This International Standard specifies

- the attributes of the volume and the descriptors recorded on it;
- the relationship among volumes of a volume set;
- the placement of 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 it specifies the functions to be provided within systems which are intended to originate or receive CD-ROM which conform to this International Standard.

2 Conformance

2.1 Conformance of a CD-ROM

A CD-ROM shall be in conformance with this International Standard when all information recorded on it conforms to the requirements of section 2 of this International Standard. 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 a standard for recording (see 4.15).

2.2 Conformance of an information processing system

An information processing system shall be in conformance with this International Standard if it meets the requirements specified in sections 2 and 3 of 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 level of these requirements can be met by the system.

3 References

ISO 646, *Information processing — ISO 7-bit coded character set for information interchange*.

ISO 1539, *Programming languages — FORTRAN*.

ISO 2022, *Information processing — ISO 7-bit and 8-bit coded character sets — Code extension techniques*.

ISO 2375, *Data processing — Procedure for registration of escape sequences*.

ISO 4873, *Information processing — ISO 8-bit code for information interchange — Structure and rules for implementation*.

International Register of Coded Character Sets to Be Used With Escape Sequences.

Standards for recording: This International Standard assumes the existence of a standard for recording (see 4.15).

4 Definitions

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

4.1

application program

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

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

4.2

byte

a string of eight binary digits operated upon as a unit

4.3

data field of a sector

a fixed-length field containing the data of a sector

4.4

data preparer

a person or other entity which controls the preparation of the data to be recorded on a volume group

NOTE A data preparer is a specific class of user as defined in this International Standard.

4.5

descriptor

a structure containing descriptive information about a volume or a file

4.6

extent

a set of logical blocks, the logical block numbers of which form a continuous ascending sequence

4.7 file

a named collection of information

4.8 file section

that part of a file that is recorded in any one extent

4.9 implementation

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

4.10 logical block

a group of 2^{n+9} bytes treated as a logical unit, where n equals 0 or a positive integer

4.11 originating system

an information processing system which can create a set of files on a volume set for the purpose of data interchange with another system

4.12 receiving system

an information processing system which can read a set of files from a volume set which has been created by another system for the purpose of data interchange

4.13 record

a sequence of bytes treated as a unit of information

4.14 sector

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

4.15 standard for recording

a standard that specifies the recording method and the addressing method for the information recorded on a CD-ROM

the specifications of the standard for recording that are relevant for this International Standard are

- a unique Physical Address for each recorded sector;

- the location of the Data Field within each sector;

- the length of the Data Field within each sector.

NOTE The standard for recording used in conjunction with this International Standard is subject to agreement between the originator and the recipient of the volumes.

4.16 user

a person or other entity (for example, an application program) that causes the invocation of the services provided by an implementation

4.17 volume

a dismountable CD-ROM

4.18 volume set

a collection of one or more volumes, on which a set of files is recorded

5 Notation

The following notation is used in this International Standard.

5.1 Decimal and hexadecimal notations

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.

5.2 Other notation

- BP : Byte position within a descriptor, starting with 1
- RBP : Byte position within a descriptor field, starting with 1
- ZERO : A single bit with the value 0
- ONE : A single bit with the value 1
- Digit(s) : Any digit from DIGIT ZERO to DIGIT NINE

Section 2. Requirements for the medium

6 Volume structure

6.1 Arrangement of data on a CD-ROM

6.1.1 *Physical Addresses*

Each sector shall be identified by a unique Physical Address as specified in the relevant standard for recording.

6.1.2 *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.

6.1.3 *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.

6.2 Arrangement of the Volume Space

6.2.1 *System Area and Data Area*

The Volume Space shall be divided into a System Area and a Data Area.

The System Area shall occupy the Logical Sectors with Logical Sector Numbers 0 to 15. The System Area shall be reserved for system use. Its content is not specified by this International Standard.

The Data Area shall occupy the remaining Logical Sectors of the Volume Space.

6.2.2 *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.

6.3 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 Descriptors
- Path Tables

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.

6.4 Arrangement of Extents

6.4.1 Extent

An Extent shall be a set of Logical Blocks, the Logical Block Numbers of which form a continuous ascending sequence.

6.4.2 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.

6.4.3 Interleaved mode

6.4.3.1 File Unit

A File Unit shall comprise a set of Logical Blocks that are within an Extent and the Logical Block Numbers of which form a continuous ascending sequence.

When a File Section is recorded in interleaved mode, one or more File Units, each consisting of the same number of Logical Blocks, shall be assigned to the File Section within the same Extent. The number of Logical Blocks in the File Unit shall be the assigned File Unit Size for the File Section.

The first Logical Block of each File Unit shall have a Logical Block Number which is the lowest Logical Block Number in the Logical Sector that contains that Logical Block.

The sequence of the File Units in an Extent shall correspond to the sequence of the Logical Block Numbers of the first Logical Block of each File Unit.

NOTE The Logical Blocks comprising a File Unit assigned to a File Section may

- also each be assigned to a different File Section, and/or
- comprise part of one or more Volume Partitions.

6.4.3.2 Interleave Gap

An Interleave Gap shall comprise the set of Logical Blocks that are within an Extent and the Logical Block Numbers of which lie between the last Logical Block Number of a File Unit and the first Logical Block Number of the next File Unit, if any, in the sequence. All Interleave Gaps between the File Units assigned to a File Section shall comprise the same number of Logical Blocks. This number shall be the assigned Interleave Gap Size for the File Section.

NOTE The Logical Blocks comprising an Interleave Gap between the File Units assigned to a File Section may

- also each be assigned to a different File Section, and/or
- comprise part of one or more Volume Partitions.

6.4.3.3 Relation of File Section to File Unit

When a File Section is recorded in interleaved mode, the File Section, and its associated Extended Attribute Record, if any, shall be recorded over the sequence of File Units assigned to the File Section.

6.4.3.4 Recording of an Extended Attribute Record

If an Extended Attribute Record is recorded it shall be recorded in the first File Unit of the sequence. The recording shall begin at the first byte of the first Logical Block of the File Unit. It shall continue through successive bytes of that Logical Block, and then through successive bytes of successive Logical Blocks, if any, of the File Unit, until all of the Extended Attribute Record is recorded.

The assigned Extended Attribute Record length shall be equal to the assigned File Unit Size.

6.4.3.5 Recording of a File Section

The successive parts, if any, of the File Section shall be recorded in successive File Units, starting from the second File Unit in the sequence if an Extended Attribute Record is recorded, and starting from the first File Unit in the sequence if no Extended Attribute Record is recorded.

6.4.3.6 Data Space

The set of File Units in which the successive parts of the File Section are recorded shall be the Data Space of the File Section.

The bytes in the Data Space shall be numbered consecutively. The numbering shall start from 1 which shall be assigned to the first byte of the first Logical Block of the first File Unit, if any, of the Data Space. The numbering shall continue through successive bytes of that Logical Block, then through successive bytes of each successive Logical Block, if any, of the first File Unit, and then through successive bytes of the Logical Block(s) of each successive File Unit, if any, assigned to the File Section.

The numbering shall end with a number equal to the number of bytes in which the File Section is recorded in the Data Space; or this number shall equal zero if there are no bytes of the file recorded in the Data Space.

6.4.4 Non-interleaved mode

When a File Section is recorded in non-interleaved mode the File Section, and its associated Extended Attribute Record, if any, shall be recorded over the sequence of Logical Blocks in an Extent.

6.4.4.1 Recording of an Extended Attribute Record

If an Extended Attribute Record is recorded, it shall be recorded over one or more Logical Blocks, the Logical Block Numbers of which form a continuous ascending sequence. The recording shall begin at the first byte of the first Logical Block of the Extent. It shall continue through successive bytes of that Logical Block, and then through successive bytes of successive Logical Blocks, if any, of the Extent, until all of the Extended Attribute Record is recorded.

The number of Logical Blocks over which the Extended Attribute Record is recorded shall be the assigned Extended Attribute Record length for the File Section.

NOTE The Logical Blocks comprising an Extended Attribute Record assigned to a File Section may

- also each be assigned to a different File Section, and/or
- comprise part of one or more Volume Partitions.

6.4.4.2 Recording of a File Section

The File Section shall be recorded over zero or more Logical Blocks, the Logical Block Numbers of which form a continuous ascending sequence. If no Extended Attribute Record is recorded, the sequence shall start with the first Logical Block of the Extent. If an Extended Attribute Record is recorded, the sequence shall start with the first Logical Block, if any, immediately following the last Logical Block over which the Extended Attribute Record is recorded.

6.4.4.3 Data Space

The set of Logical Blocks over which the File Section is recorded shall be the Data Space of the File Section.

The bytes in the Data Space shall be numbered consecutively. The numbering shall start from 1 which shall be assigned to the first byte of the first Logical Block, if any, of the Data Space. The numbering shall continue through successive bytes of that Logical Block, and then through successive bytes of each successive Logical Block, if any, of the Data Space.

The numbering shall end with a number equal to the number of bytes in which the File Section is recorded in the Data Space; or this number shall equal zero if there are no bytes of the file recorded in the Data Space.

6.4.5 Data length of a File Section

The data length of a File Section shall be the number of bytes in which the File Section is recorded in the Data Space. If this number is less than the number of bytes in the Data Space, then any remaining bytes in the Data Space shall be ignored in interchange.

6.4.6 Relation of Extended Attribute Record to File Section

An Extended Attribute Record may be associated with a File Section. If present, the Extended Attribute Record shall identify certain attributes of the file of which the File Section forms a part.

A subset of those attributes shall apply to all File Sections of a file that contains records according to 6.10. If any of those attributes are assigned to the file, an Extended Attribute Record shall be recorded in association with each of the File Sections of the file.

The other attributes identified in an Extended Attribute Record shall apply to that File Section and all preceding File Sections of the file (see 6.5.1). If no Extended Attribute Record is recorded in association with the last File Section of a file, then these attributes are not specified for the file.

6.4.7 Recording of a Volume Partition

If a Volume Partition is recorded, it shall be recorded over one or more Logical Blocks, the Logical Block Numbers of which form a continuous ascending sequence. The recording shall begin at the first byte of the first Logical Block of the Extent. It shall continue through successive bytes of that Logical Block, and then through successive bytes of successive Logical Blocks, if any, of the Extent, until all of the Volume Partition is recorded. The first Logical Block of each Volume Partition shall have a Logical Block Number which is the lowest Logical Block Number in the Logical Sector that contains that Logical Block.

The number of Logical Blocks over which the Volume Partition is recorded shall be the assigned Volume Partition size for the Volume Partition.

6.5 File structure**6.5.1 Relation to File Sections**

Each file shall consist of one or more File Sections. Each File Section of a file shall be identified by a record in the same directory. The sequence of the File Sections of a file shall be identified by the order of the corresponding records in the directory.

A File Section may be part of more than one file and may occur more than once in the same file. A File Section may be identified by more than one record in the same or a different directory.

Each File Section of a file may be recorded on a different volume. More than one File Section of a file may be recorded on the same volume.

6.5.2 Numbering of bytes in a file

The bytes comprising a file shall be numbered consecutively. The numbering shall start from 1 which shall be assigned to the first byte of the first File Section, if any. The numbering shall continue through successive bytes of that File Section, and then through successive bytes of each successive File Section, if any, of the file.

The numbering shall end with a number equal to the sum of the number of bytes in all File Sections of the file.

6.5.3 Contents of a file

The information in a file shall be interpreted according to the relevant standards for the coded representation of information.

NOTE The identification of these standards is the subject of an agreement between the originator and the recipient of the file.

6.5.4 Associated File

An Associated File has a relationship not specified by this International Standard to another file that has been assigned the same File Identifier (see 7.5) as that of the Associated File in the same directory.

6.6 Volume Set

A Volume Set shall be the set of volumes on which a set of files is recorded.

A Volume Set shall consist of one or more volumes having common volume set identification and identifying the same coded graphic character sets for use within selected descriptor fields (see 7.4). All volumes in a Volume Set shall be numbered consecutively starting from 1.

A Volume Group within a Volume set shall consist of one or more consecutively numbered volumes the contents of which are established at the same time. The sequence number of the volume that has the highest sequence number within the Volume Group shall be the assigned Volume Set Size.

Each volume of a Volume Set shall contain a description of all the directories and files that are recorded on those volumes the sequence numbers of which are less than, or equal to, the assigned Volume Set Size of the volume.

NOTE Such description recorded on a volume shall supersede the description recorded on any volume of the Volume Set having a lower assigned Volume Set Size.

The Logical Block Size shall be the same for all volumes of a Volume Set.

6.7 Volume Descriptors

A Volume Descriptor shall be one of the following types:

- Primary Volume Descriptor
- Supplementary Volume Descriptor
- Volume Partition Descriptor

— Boot Record

— Volume Descriptor Set Terminator

6.7.1 Volume Descriptor Set

A Volume Descriptor Set shall be a sequence of volume descriptors recorded in consecutively numbered Logical Sectors starting with the Logical Sector with Logical Sector Number 16. Each successive Volume Descriptor shall be recorded in the Logical Sector with the next higher Logical Sector Number than that of the Logical Sector in which the previous Volume Descriptor is recorded. The sequence shall consist of two or more volume descriptors consecutively recorded as follows.

6.7.1.1 The sequence shall contain one Primary Volume Descriptor (see 8.4) recorded at least once.

The Primary Volume Descriptor shall describe the Volume Space, and identify the attributes of the volume, the locations of a Root Directory and of a group of Path Tables, and the number of volumes in the Volume Set.

6.7.1.2 The sequence may contain zero or more Supplementary Volume Descriptors (see 8.5) each recorded at least once.

A Supplementary Volume Descriptor shall describe the Volume Space, and identify the attributes of the volume, the locations of a Root Directory and of a group of Path Tables, and the number of volumes in the Volume Set. It shall also identify the coded graphic character set used within selected fields of this descriptor, and of the fields in associated File Descriptors, Directory Descriptors and Path Tables.

6.7.1.3 The sequence may contain zero or more Volume Partition Descriptors (see 8.6).

A Volume Partition Descriptor shall identify a Volume Partition within the Volume Space, its position and size, and its attributes.

6.7.1.4 The sequence may contain zero or more Boot Records (see 8.2).

A Boot Record shall contain information which may be used to achieve a specific state in a receiving system or an application program.

6.7.1.5 The sequence shall be terminated by the recording of one or more Volume Descriptor Set Terminators (see 8.3).

6.8 Directory structure

6.8.1 Directory

A directory shall be recorded as a file containing a set of records each of which identifies a File Section or another directory. A directory shall not be recorded as an Associated File, shall not be recorded in interleaved mode and shall consist of only one File Section.

The identification of a file shall be different from the identification of any other file, unless the file is an Associated File (see 6.5.3), or of any directory identified in the same directory. The identification of a directory shall be different from the identification of any file or of any other directory identified in the same directory.

The first Logical Block of the Extent in which a directory is recorded shall have a Logical Block Number which is the lowest Logical Block Number in the Logical Sector that contains that Logical Block.

6.8.1.1 Directory Record

A Directory Record shall contain

- information to locate a File Section;
- information to locate any Extended Attribute Record associated with the File Section;
- the identification of the file;
- certain attributes of the file;
- certain attributes of the File Section.

The first or only Directory Record recorded in a Logical Sector shall begin at the first byte of the first Data Field of that Logical Sector. Each subsequent Directory Record recorded in that Logical Sector shall begin at the byte immediately following the last byte of the preceding Directory Record in that Logical Sector. Each Directory Record shall end in the Logical Sector in which it begins. Unused positions after the last Directory Record in a Logical Sector shall be set to (00).

6.8.1.2 Order of Directory Records

The records in a directory shall be ordered according to 9.3.

6.8.1.3 Directory length

The length of a directory shall be the sum of

- the lengths of all Directory Records in the directory;
- the number of unused positions after the last Directory Record in all Logical Sectors in which the directory is recorded.

6.8.2 Directory Hierarchy

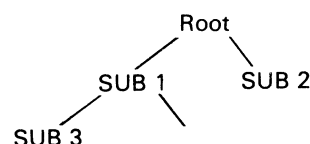
A Directory Hierarchy shall be a set of directories related to each other as follows.

The root of the hierarchy, called the Root Directory, shall be a directory identified either in a Primary Volume Descriptor or in a Supplementary Volume Descriptor.

Each directory, other than the Root Directory, shall be identified by a record in another directory.

A directory identifying another directory shall be called the Parent Directory of the identified directory. Each directory shall contain a record which identifies its Parent Directory. Different directories may have the same Parent Directory.

A hierarchical relationship shall exist between the Root Directory and all other directories:



The hierarchy shall consist of a number of levels (i.e. for n levels: level 1, level 2,..., level n). The Root Directory shall be the one and only directory at level 1 of the hierarchy.

If a directory is at level m of the hierarchy, its Parent Directory shall be at level $(m-1)$. The Parent Directory of the Root Directory shall be the Root Directory.

6.8.2.1 Depth of Directory Hierarchy

The number of levels in the hierarchy shall not exceed eight. In addition, for each file recorded, the sum of the following shall not exceed 255:

- the length of the File Identifier (see 7.5.2);
- the length of the Directory Identifiers (see 7.6) of all relevant directories;
- the number of relevant directories.

6.8.2.2 Identification of directories

For a Root Directory

- the first Directory Record of the Root Directory shall describe the Root Directory and shall have a Directory Identifier consisting of a single (00) byte;
- the second Directory Record of the Root Directory shall describe the Root Directory and shall have a Directory Identifier consisting of a single (01) byte;
- a Directory Record describing the Root Directory shall be contained in the Root Directory field of the volume descriptor that identifies the directory hierarchy.

For each directory other than the Root Directory

- the first Directory Record of the directory shall describe that directory and shall have a Directory Identifier consisting of a single (00) byte;
- the second Directory Record of the directory shall describe the Parent Directory for that directory and shall have a Directory Identifier consisting of a single (01) byte;
- a Directory Record in its Parent Directory shall describe the directory.

6.8.3 Relation of Directory Hierarchies

One or more Directory Hierarchies shall be recorded on a volume.

A Directory Hierarchy shall be identified in the Primary Volume Descriptor.

Each additional Directory Hierarchy shall be identified in a Supplementary Volume Descriptor.

The directories within each hierarchy shall identify zero or more of the files that are recorded in those volumes, the sequence numbers of which are less than, or equal to, the assigned Volume Set Size of the volume.

A directory shall not be a part of more than one Directory Hierarchy.

6.9 Path Table

A Path Table recorded on a volume of a Volume Set shall contain a set of records describing a directory hierarchy for those volumes of the Volume Set the sequence numbers of which are less than, or equal to, the assigned Volume Set size of the volume.

For each directory in the directory hierarchy other than the Root Directory, the Path Table shall contain a record which identifies the directory, its Parent Directory and its location. The records in a Path Table shall be numbered starting from 1. The first record in the Path Table shall identify the Root Directory and its location.

The directory number of a directory shall be the ordinal number of the Path Table Record that identifies the directory.

6.9.1 Order of Path Table Records

The records in a Path Table shall be ordered by the following criteria in descending order of significance:

- in ascending order according to level in the directory hierarchy;
- in ascending order according to the directory number of the Parent Directory of the directory identified by the record;
- in ascending order according to the relative value of the Directory Identifier field in the record, where the Directory Identifiers shall be valued as follows:

If the two Directory Identifiers do not contain the same number of byte positions, the shorter Directory Identifier shall be treated as if it were padded on the right with all padding bytes set to (20), and as if both Directory Identifiers contained the identical number of byte positions.

After any padding necessary to treat the Directory Identifiers as if they were of equal length, the characters in the corresponding byte positions, starting with the first position, of the Directory Identifiers are compared until a byte position is found that does not contain the same character in both Directory Identifiers. The greater Directory Identifier is the one that contains the character with the higher code position value in the coded graphic character sets used to interpret the Directory Identifier of the Path Table Record.

6.9.2 Path Table Group

A Path Table shall be either a Type L Path Table or a Type M Path Table.

In a Type L Path Table, a numerical value shall be recorded according to 7.2.1 if represented as a 16-bit number and according to 7.3.1 if represented as a 32-bit number.

In a Type M Path Table, a numerical value shall be recorded according to 7.2.2 if represented as a 16-bit number and according to 7.3.2 if represented as a 32-bit number.

A Path Table Group shall comprise one or two identical Type L Path Tables and one or two identical Type M Path Tables.

6.9.3 Recorded Occurrences of the Path Table

One or more Path Table Groups shall be recorded on a volume. The Primary Volume Descriptor shall identify the size and locations of the constituent Path Tables of a Path Table Group. These Path Tables shall identify the directories in the Directory Hierarchy which is identified by the Primary Volume Descriptor.

Corresponding to each additional Directory Hierarchy recorded on a volume an additional Path Table Group shall be recorded on the volume. For each such Path Table Group, the corresponding Supplementary Volume Descriptor shall identify the size and locations of its constituent Path Tables. These Path Tables shall identify the directories in the corresponding Directory Hierarchy.

6.9.4 Consistency of Path Tables between volumes of a Volume Group

6.9.4.1 The contents of a Type L Path Table identified in a Primary Volume Descriptor shall be identical with the contents of any other Type L Path Table identified in a Primary Volume Descriptor on a volume of the same Volume Group.

The contents of a Type M Path Table identified in a Primary Volume Descriptor shall be identical with the contents of any other Type M Path Table identified in a Primary Volume Descriptor on a volume of the same Volume Group.