X.X.X.X ≠ document

Date: 28 May 1986

Working Paper for Information Processing — Volume and File Structure of Compact Read Only Optical Discs for Information Interchange

This document is subject to change without notice, and may not be referred to as a standard until approved by an accredited standards body. Distribution of this document does not represent/warrant any degree of completeness/correctness of this document.

The information in this document is subject to change without notice and shall not be construed as a commitment by any individual or organization participating in the development of this document. The individuals and organizations participating in the development of this document assume no responsibility for any errors that may appear in this document, nor is responsibility assumed for the use or reliability of products based on the specifications of this document.

This paper [1] is a working paper of the CDROM Ad Hoc Advisory Committee.

---

[1] Technical Editor:

Howard Kaikow
ZKO1-3/C23
Digital Equipment Corporation
110 Spit Brook Road
Nashua, New Hampshire 03062
USA
Telex: 948457

TABLE OF CONTENTS

Preface

(Not Part of the Standard)

This **Preface** is not intended to be included in the standard. It is provided only for the information of the reader during the process of approving the standard.

This paper [1] *is a working paper of the CDROM Ad Hoc Advisory Committee.*

---

1) Technical Editor:

Howard Kaikow
ZKO1-3/C23
Digital Equipment Corporation
110 Spit Brook Road
Nashua, New Hampshire 03062
USA
Telex: 948457

Section I: General

Scope and Field of Application
Conformance
References
Definitions
Notation

1 Scope and Field of Application

This standard specifies the volume and file structure of compact read only optical discs (CDROM) for the interchange of information between users of information processing systems.

This standard is applicable to CDROM, including those identified in 3 and other types which may be the subject of future standards.

This standard specifies a set of recorded descriptors which identify:

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

— the placement of files;

— the attributes of the files.

Furthermore, this standard specifies 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 a set of records.

This standard also specifies three nested levels of interchange.

2 Conformance

2.1 Conformance of a CDROM

A CDROM shall be in conformance with this standard when all information recorded on it conforms to the specifications of Section II of this standard. A statement of conformance shall identify the lowest level of interchange to which the contents of the CDROM conform.

A prerequisite to such conformance is conformance of the CDROM to a standard for recording.

3 References

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

ISO 1539, *Programming languages—FORTRAN (Endorsement by ISO of ANSI standard X3.9-1978)*

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*

Standards for recording, *This standard assumes the existence of a recording standard, i.e. one based on the specification of the Philips/Sony "Yellow Book", which is not yet in the public domain.*

4 Definitions

For the purposes of this 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 it is recorded.

NOTE 1: *An application program is a specific class of user, as defined in this 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 recorded on a volume set.

NOTE 2: *A data preparer is a specific class of user as defined in this 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 Extent

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

4.9 File Set

A collection of one or more files recorded on a volume set.

4.10 Logical Block

A group of $2^M \cdot 512$ bytes treated as a logical unit, where M is 0 or a positive integer.

4.11 Originating System

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

4.12 Record

A sequence of bytes treated as a unit of information.

4.13 Receiving System

An 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.

4.14 Sector

The smallest addressable part of the recorded area on a CDROM 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 recordable area of a CDROM.

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 CDROM.

4.18 Volume Partition

That part of a volume that is recorded in any one extent.

4.19 Volume Set

A collection of one or more volumes, on which a file set is recorded.

5 Notation

The following notation is used in this standard:

Notation	Significance
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

5.1 Numerical representation

5.1.1 Hexadecimal Notation

A value enclosed in parentheses shall be interpreted as a hexadecimal number using the following notation:

```
Hexadecimal digit:  0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
Decimal value:      0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
```

5.1.2 Decimal Notation

A value not enclosed in parentheses shall be interpreted as a decimal number.

Section II: Media Requirements

Volume Structure
File Structure
Directory Structure
Record Structure
Recording of Descriptor Fields
Volume Descriptors
Directory Descriptors
File Descriptors
Levels of Interchange

6 Volume Structure

6.1 Arrangement of Data on a CDROM

6.1.1 Physical Addresses

Each sector shall be identified by a physical address as specified in the relevant standard for recording.

6.1.2 Logical Sector

The sectors of a volume shall be organized into units of allocation called Logical Sectors. Each Logical Sector shall consist of the greater of 2048 or 2^N bytes, 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 comprising a Logical Sector shall be referred to as Logical Sector Length. Each Logical Sector shall begin in a different sector than any other Logical Sector. If a Logical Sector comprises more than one sector, the set of the physical addresses of its constituent sectors shall form a consecutive ascending sequence.

Each Logical Sector shall be identified by a unique Logical Sector Number (LSN). 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 with the lowest physical address which may contain recorded information. The numbering shall continue through successive, if any, 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.

6.2 Volume Space

The information on a volume shall be recorded in the Data Fields of the set of all Logical Sectors on the volume. This set shall be known as the Volume Space of the volume. The order of the Data Fields within the set shall be specified by the ascending order of the Logical Sector Numbers of the Logical Sectors containing the Data Fields.

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 (if any) of the Volume Space.

6.2.1 Logical Block

The Volume Space shall be organized into units of allocation called Logical Blocks. Each Logical Block shall consist of $2^M \cdot 512$ bytes, where M is 0 or a positive integer. The number of bytes comprising a Logical Block shall be referred to as Logical Block Size which shall not be greater than Logical Sector Length. The data of a Logical Block shall be recorded in the Data Fields of its constituent Logical Sectors.

Each Logical Block shall be identified by a unique Logical Block Number (LBN). 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, if any, 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 Volume Space

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 standard.

The Data Area shall occupy the remaining Logical Sectors of the Volume Space. The Data Area shall contain descriptors which describe the use of the Data Area.

6.3.1 Volume Descriptors

A Volume Descriptor shall be one of the following types:

— Standard File Structure Volume Descriptor

— Coded Character Set File Structure Volume Descriptor

— Unspecified Structure Volume Descriptor

— Boot Record

— Volume Descriptor Sequence Terminator

Volume Descriptors shall be recorded in a sequence of 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 LSN than that of the Logical Sector in which the previous Volume Descriptor is recorded. The sequence shall consist of any number of Volume Descriptors consecutively recorded as follows.

6.3.1.1 The sequence shall contain at least one Standard File Structure Volume Descriptor (see 11.4). The contents of the fields of any Standard File Structure Volume Descriptor shall be identical with the contents of the corresponding fields of all other Standard File Structure Volume Descriptors, except that the Volume Descriptor LBN field shall be as specified in this standard.

6.3.1.2 The sequence may contain any number of Coded Character Set File Structure Volume Descriptors (see 11.5). These Volume Descriptors may be ignored in interchange.

6.3.1.3 The sequence may contain any number of Unspecified Structure Volume Descriptors (see 11.6). These Volume Descriptors may be ignored in interchange.

6.3.1.4 The sequence may contain any number of Boot Records (see 11.2). Boot Records may be ignored in interchange.

6.3.1.5 The sequence shall be terminated by the recording of one or more Volume Descriptor Sequence Terminators (see 11.3).

6.3.2 Standard File Structure Volume Descriptor

There shall be at least one Standard File Structure Volume Descriptor recorded on a volume. This Volume Descriptor shall describe the Volume Space in which all information on the volume shall be recorded, and shall describe the file structure specified by this standard.

The coded character set of the International Reference Version of ISO 646 shall be used to interpret the contents of the following descriptor fields:

— In a Standard File Structure Volume Descriptor
  - Volume Structure Standard Identifier
  - System Identifier
  - Volume Identifier
  - Volume Set Identifier
  - Publisher Identifier
  - Data Preparer Identifier
  - Application Identifier
  - Copyright File Identifier
  - Abstract File Identifier

— The date and time fields in a Standard File Structure Volume Descriptor and in all Extended Attribute Records identified by a Standard File Structure Volume Descriptor.

— File Identifier in all Directory Records identified by a Standard File Structure Volume Descriptor.

— System Identifier in all Extended Attribute Records identified by a Standard File Structure Volume Descriptor.

— Directory Identifier in all Path Table Records identified by a Standard File Structure Volume Descriptor.

6.3.3 Coded Character Set File Structure Volume Descriptor

There shall be zero or more Coded Character Set File Structure Volume Descriptors recorded on a volume. Each such Volume Descriptor shall describe the Volume Space in which all information on the volume shall be recorded, shall describe the file structure specified by this standard, and may specify a coded character set other than the International Reference Version of ISO 646 for the interpretation of the contents of the following descriptor fields:

— In the Coded Character Set File Structure Volume Descriptor
  - System Identifier
  - Volume Identifier
  - Volume Set Identifier
  - Publisher Identifier
  - Data Preparer Identifier
  - Application Identifier
  - Copyright File Identifier
  - Abstract File Identifier

— File Identifier in all Directory Records identified by the Coded Character Set File Structure Volume Descriptor.

— System Identifier in all Extended Attribute Records identified by the Coded Character Set File Structure Volume Descriptor.

— Directory Identifier in all Path Table Records identified by the Coded Character Set File Structure Volume Descriptor.

The coded character set of the International Reference Version of ISO 646 shall be used to interpret the contents of the following descriptor fields:

— The Volume Structure Standard Identifier field of a Coded Character Set File Structure Volume Descriptor.

— The date and time fields in a Coded Character Set File Structure Volume Descriptor and in all Extended Attribute Records identified by a Coded Character Set File Structure Volume Descriptor.

6.3.4 Unspecified Structure Volume Descriptor

There shall be zero or more Unspecified Structure Volume Descriptors recorded on a volume. Each such Volume Descriptor shall describe a volume partition within the Volume Space described by the Standard File Structure Volume Descriptor. The contents of the volume partition are not specified by this standard. The following fields of the Unspecified Structure Volume Descriptor shall be interpreted according to the character set of the the International Reference Version of ISO 646:

- Volume Structure Standard Identifier
- System Identifier
- Volume Partition Identifier

6.3.5 Boot Records

There shall be zero or more Boot Records recorded on a volume. Each Boot Record shall contain information which is used to achieve a desired state for a system or an application. The following fields of a Boot Record shall be interpreted according to the character set of the the International Reference Version of ISO 646:

- Volume Structure Standard Identifier
- Boot System Identifier
- Boot Identifier

6.3.6 Consistency of Volume Descriptor Attributes Between Volume Descriptors

The following fields of a Coded Character Set File Structure Volume Descriptor shall contain the same values as in a Standard File Structure Volume Descriptor:

— Volume Structure Standard Identifier

— Volume Structure Standard Version

— Volume Space Size

— Volume Set Size

— Volume Set Sequence Number

— Logical Block Size

— Volume Creation Date and Time
— Volume Modification Date and Time
— Volume Expiration Date and Time
— Volume Effective Date and Time
— File Structure Standard Version
— Reserved field (BP 856)
— Reserved for future standardization

The following fields of an Unspecified Structure Volume Descriptor shall contain the same values as in a Standard File Structure Volume Descriptor:

— Volume Structure Standard Identifier
— Volume Structure Standard Version

The following fields of a Boot Record shall contain the same values as in a Standard File Structure Volume Descriptor:

— Volume Structure Standard Identifier
— Volume Structure Standard Version

The following fields of a Volume Descriptor Sequence Terminator shall contain the same values as in a Standard File Structure Volume Descriptor:

— Volume Structure Standard Identifier
— Volume Structure Standard Version

6.4 Volume Set

A volume set shall be the set of volumes on which a file set is recorded.

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

A volume of a volume set shall contain a description of the directory hierarchy and the files in each directory for those volumes of the volume set which have the same or lower number in the Volume Set Size field of the Standard File Structure Volume Descriptor as that of the volume containing the description.

NOTE 3: *Such description recorded on a volume shall supersede the description recorded on any lower numbered volume of the volume set not containing the same value in the Volume Set Size field.*

7 File Structure

Each file shall be recorded in one or more file extents.

Each file extent shall be identified by an entry in a directory.

All file extents of the same file shall be identified in the same directory.

7.1 File Extent

A file extent shall be recorded in a sequence of zero or more Logical Blocks the Logical Block Numbers of which form a consecutive ascending sequence.

7.2 File Space

Each file shall be recorded in a set of Logical Blocks. This set shall be known as the File Space of the file. The order of the Logical Blocks within the set shall be specified by the order of the Directory Records associated with the file.

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

7.3 Relation to File Extents

The order of the file extents in which the file is recorded shall be specified by the order of the Directory Records associated with the file.

7.4 File Length

The length of a file shall be the number of bytes of recorded information in the file.

7.5 Contents of a File

The information in a file shall be reserved for application use. Its content is not specified by this standard.

7.6 Consistency of File Attributes Between File Extents

The following fields of a Directory Record for each file extent of the same file shall contain the same values:

- Existence bit of File Flags
- Directory bit of File Flags
- Associated File bit of File Flags
- Reserved bits of File Flags
- Reserved for future standardization
- Length of File Identifier
- File Identifier
- Reserved field

8 Directory Structure

A Path Table shall contain a set of entries identifying the directory hierarchy recorded in the volume set.

8.1 Directory Hierarchy

For the Root directory, which shall be its own parent and shall have a Directory Identifier consisting of only a (00) byte:

— there shall be a record in the Path Table which identifies the Root directory and its location;

— the Directory Record describing the Root directory shall be contained in the Directory Record for Root Directory field of all Standard File Structure Volume Descriptors and of all Coded Character Set File Structure Volume Descriptors;

— the first Directory Record of the Root directory shall describe the Root directory and shall have a Directory Identifier consisting of only a (00) byte;

— the second Directory Record of the Root directory shall describe the parent directory for the Root directory, which shall be the Root directory itself, for the Root directory and shall have a Directory Identifier consisting of only a (01) byte.

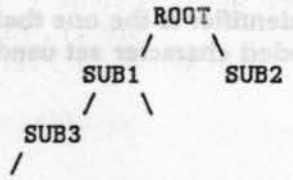
For each directory other than the Root directory:

— there shall be a record in the Path Table which identifies the directory, its parent directory and its location;

— the first Directory Record of the directory shall describe that directory and shall have a Directory Identifier consisting of only a (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 only a (01) byte.

Different directories may have the same parent directory. The Directory Identifier for a directory shall be different than that of all other directories with the same parent directory. A hierarchial 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 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 shall be the Root.

8.1.1 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 name,

— the length of the file name extension plus 1,

— the length of the file version number plus 1,

— the length of the Directory Identifiers of all relevant directories,

— the number of relevant directories.

8.2 Path Table

A Path Table recorded on a volume of a volume set shall contain a set of records describing the directory hierarchy for those volumes of the volume set which have the same or lower number in the Volume Set Size field of the Standard File Structure Volume Descriptor as that of the volume containing the Path Table.

NOTE 4: *A Path Table recorded on a volume shall supersede a Path Table recorded on any lower numbered volume of the volume set not containing the same value in the Volume Set Size field.*

The directory number of a directory shall be the ordinal number of the record in the Path Table describing that directory.

8.2.1 Order of Path Table Records

The records in a Path Table shall be numbered starting from 1. They shall be ordered using a level order traversal, starting with the Root, of the tree representing the directory hierarchy. The records shall be ordered as follows:

- in ascending order according to level in the directory hierarchy;
- in ascending order according to Parent Directory Number;
- in ascending order according to the relative value of Directory Identifier, where 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 SPACEs 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 character 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 character set used to interpret the Directory Identifier field of the Path Table Record.

8.3 Directory

A Directory shall contain a set of records which specify the identification, location, size and certain attributes of all files for which the Directory is the parent directory. A File Identifier for a file in a directory shall be different than all other File Identifiers in the same directory, unless as specified for the Associated File bit of the File Flags field of a Directory Record.

8.3.1 Directory Record

A Directory Record shall contain information used to locate an extent of a file, file identification, any Extended Attribute Records associated with the file extent, and certain attributes of the file extent.

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).

8.3.2 Order of Directory Records

The records of a Directory shall be ordered as follows:

— in ascending order according to the relative value of File Name, where File Names shall be valued as follows:

  + If two File Names have the same content in all byte positions, then these two File Names are said to be equal in value.

  + If two File Names do not contain the same number of byte positions, the shorter File Name shall be treated as if it were padded on the right with SPACEs as if both File Names contained the identical number of byte positions.

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

— in ascending order according to the relative value of File Name Extension, where File Name Extensions shall be valued as follows:

  + If two File Name Extensions have the same content in all byte positions, then these two File Name Extensions are said to be equal in value.

  + If two File Name Extensions do not contain the same number of byte positions, the shorter File Name Extension shall be treated as if it were padded on the right with SPACEs as if both File Name Extensions contained the identical number of byte positions.

    After any padding necessary to treat the File Name Extensions as if they were of equal length, the character in the corresponding byte positions, starting with the first position, of the File Name Extensions are compared until a byte position is found that does not contain the same character in both File Name Extensions. The greater File Name Extension is the one that contains the character with the higher code position value in the coded character set used to interpret the File Name Extension field of the Directory Record.

— in descending order according to the relative value of File Version Number, where File Version Numbers shall be valued as follows:

  + If two File Version Numbers have the same content in all byte positions, then these two File Version Numbers are said to be equal in value.

  + If two File Version Numbers do not contain the same number of byte positions, the shorter File Version number shall be treated as if it were padded on the left with DIGIT ZEROs as if both File Version Numbers contained the identical number of byte positions.

    After any padding necessary to treat the File Version Numbers as if they were of equal length, the character in the corresponding byte positions, starting with the first position, of the File Version Numbers are compared until a byte position is found that does not contain the same character in both File Version Numbers. The greater File Version Number is the one that contains the character with the higher code position value in the coded character set used to interpret the File Version Number field of the Directory Record.

— in ascending order according to the value of the Associated File bit of the File Flags field.

— The order of the Directory Records for a file shall specify the order of the Logical Blocks in the File Space of the file.

8.3.3 Directory Length

The length of a Directory shall be the sum of:

— the lengths of all Directory Records described by the Directory;

— the number of unused positions after the last Directory Record in all Logical Sectors in which the Directory is recorded.

8.4 Extended Attributes

Extended Attribute Records may optionally be associated with each Directory Record.

8.4.1 Extended Attribute Record

If present, Extended Attribute Records shall be recorded beginning with the first byte of the first Logical Block assigned to the extent described by the associated Directory Record.

An Extended Attribute Record recorded for an extent shall supersede an Extended Attribute Record recorded for an extent described earlier in the ordered Directory Records for the same file.

9 Record Structure

9.1 Characteristics

A record shall be a sequence of bytes treated as a unit of information.

The information in a file may be organized as a set of records.

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

A record shall be either a fixed-length record, or a variable-length record.

9.2 Measured Data Units (MDU)

A Measured Data Unit (MDU) shall either contain a fixed-length record, or shall contain a variable-length record.

9.2.1 Relationship to File Space

Each MDU shall be recorded in successive bytes of the file space. The first or only MDU shall begin at the first byte of the file space. Each successive MDU shall begin at the byte in the file space immediately following the last byte of the preceding MDU.

9.3 Fixed-Length Records

A fixed-length record shall be a record contained in a file that is assigned to contain records that all must have the same length. The format of the records in the file shall be fixed-length.

A fixed-length record shall be contained in an MDU. The MDU shall consist of the fixed-length record followed, if necessary to give the MDU an even length, immediately by a (00) byte.

The minimum assigned length of a fixed-length record shall be 1.

9.4 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. The format of the records in the file shall be variable-length. The value recorded in the Record Format field of an Extended Attribute Record for a file containing variable-length records shall contain the same value as that recorded in the Record Format field of any other Extended Attribute Record of that same file,

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 which, if necessary to give the MDU an even length, shall be immediately followed by a (00) byte.

The RCW shall specify as a 16-bit number the length of the record. The RCW shall be recorded according to:

— 10.2.1, if the value in the Record Format field of the Extended Attribute Record describing the extent is 2, or as;

— 10.2.2, if the value in the Record Format field of the Extended Attribute Record describing the extent is 3.

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 0, and shall not exceed 32767.

The minimum length of a variable-length record shall be 0.

10 Recording of Descriptor Fields

10.1 8-Bit Numeric Values

A numeric value in a one-byte field shall be an 8-bit number recorded in binary notation.

10.2 16-Bit Numeric Values

A 16-bit number shall be recorded in a field of a descriptor in one of the following three formats. The choice of format shall be specified by this standard in the description of each field.

10.2.1 Least Significant Byte First

The 16-bit number with the hexadecimal representation (wx yz) shall be recorded as (yz wx).

NOTE 5: *For example, the decimal number 4660 has (12 34) as its 16-bit hexadecimal representation and shall be recorded as (34 12).*

10.2.2 Most Significant Byte First

The 16-bit number with the hexadecimal representation (wx yz) shall be recorded as (wx yz).

NOTE 6: *For example, the decimal number 4660 has (12 34) as its 16-bit hexadecimal representation and shall be recorded as (12 34).*

10.2.3 Both Byte Orders

The 16-bit number with the hexadecimal representation (wx yz) shall be recorded as (yz wx wx yz).

NOTE 7: *For example, the decimal number 4660 has (12 34) as its 16-bit hexadecimal representation and shall be recorded as (34 12 12 34).*

10.3 32-Bit Numeric Values

A 32-bit number shall be recorded in a field of a descriptor in one of the following three formats. The choice of format shall be specified by this standard in the description of each field.

10.3.1 Least Significant Byte First

The 32-bit number with the hexadecimal representation (st uv wx yz) shall be recorded as (yz wx uv st).

NOTE 8: *For example, the decimal number 305419896 has (12 34 56 78) as its 32-bit hexadecimal representation and shall be recorded as (78 56 34 12).*

10.3.2 Most Significant Byte First

The 32-bit number with the hexadecimal representation (st uv wx yz) shall be recorded as (st uv wx yz).

NOTE 9: *For example, the decimal number 305419896 has (12 34 56 78) as its 32-bit hexadecimal representation and shall be recorded as (12 34 56 78).*

10.3.3 Both Byte Orders

The 32-bit number with the hexadecimal representation (st uv wx yz) shall be recorded as (yz wx uv st st uv wx yz).

NOTE 10: *For example, the decimal number 305419896 has (12 34 56 78) as its 32-bit hexadecimal representation and shall be recorded as (78 56 34 12 12 34 56 78).*

10.4 Descriptor Identifier Character Set and Coding

Unless otherwise specified, the characters in all descriptors in this standard shall be coded according to ISO 646.

10.4.1 d-characters

10.4.1.1 For all descriptors in this standard, other than those fields specified in 6.3.3, the 37 characters in the following positions of the International Reference Version are referred to as *d-characters*

Character	Graphic	Code Position
DIGITs ZERO to NINE	0 . . . 9	3/0-3/9
CAPITAL LETTERs A to Z	A . . . Z	4/1-5/10
LOW LINE	_	5/15

10.4.1.2 For the descriptor fields specified in 6.3.3, the character set specified by the Coded Character Set for Descriptor Identifiers field of the associated Coded Character Set File Structure Volume Descriptor are referred to as *d-characters*.

10.4.2 a-characters

10.4.2.1 For all descriptors in this standard, other than those fields specified in 6.3.3, the 57 characters in the following positions of the International Reference Version are referred to as *a-characters*.

Character	Graphic	Code Position
SPACE		2/0
EXCLAMATION MARK	!	2/1
QUOTATION MARK	"	2/2
PERCENT SIGN	%	2/5
AMPERSAND	&	2/6
APOSTROPHE	'	2/7
LEFT PARENTHESIS	(	2/8
RIGHT PARENTHESIS	)	2/9
ASTERISK	*	2/10
PLUS SIGN	+	2/11
COMMA	,	2/12
HYPHEN	-	2/13
FULL STOP	.	2/14
SOLIDUS	/	2/15
DIGITs ZERO to NINE	0 . . . 9	3/0-3/9
COLON	:	3/10
SEMICOLON	;	3/11
LESS-THAN SIGN	<	3/12
EQUALS SIGN	=	3/13
GREATER-THAN SIGN	>	3/14
QUESTION MARK	?	3/15
CAPITAL LETTERs A to Z	A . . . Z	4/1-5/10
LOW LINE	_	5/15

10.4.2.2 For the descriptor fields specified in 6.3.3, the character set specified by the Coded Character Set for Descriptor Identifiers field of the associated Coded Character Set File Structure Volume Descriptor are referred to as *a-characters*.

10.4.3 Justification of Characters

10.4.3.1 In each fixed-length field the content of which is specified by this standard to be d-characters, the d-characters shall be left-justified and any remaining positions on the right shall be set to (20).

10.4.3.2 In each fixed-length field the content of which is specified by this standard to be a-characters, the a-characters shall be left-justified and any remaining positions on the right shall be set to (20).

10.5 File Identifier

A File Identifier shall be specified as follows.

10.5.1 File Identifier Characters

In a File Identifier the characters allowed shall be the d-characters and those in the following positions of the International Reference Version.

Character	Graphic	Code Position
FULL STOP	.	2/14
SEMICOLON	;	3/11

10.5.2 File Identifier Format

A File Identifier shall consist of the following sequence:

— File Name: A sequence of zero or more d-characters;

— FULL STOP;

— File Name Extension: A sequence of zero or more d-characters;

— SEMICOLON;

— File Version Number: Digits representing a number from 1 to 32767

10.5.2.1 If the coded character set specifying the code positions for the d-characters does not have FULL STOP in code position 2/14 and SEMICOLON in code position 3/11, the File Identifier shall consist entirely of a File Name.

10.5.2.2 If no characters are specified for the File Name then the File Name Extension shall consist of at least one character.

10.5.2.3 If no characters are specified for the File Name Extension then the File Name shall consist of at least one character.

10.5.2.4 If the File Version Number is not specified then it shall be assumed to be 1.

10.5.2.5 If the File Name Extension is not specified then the FULL STOP shall be optional.

10.5.2.6 If the File Version Number is not specified then the SEMICOLON shall be optional.

10.5.3 Reserved File Identifiers

10.5.3.1 This standard does not reserve any File Identifiers for use by the standard.

10.6 Directory Identifier

A Directory Identifier shall be specified as follows.

10.6.1 Directory Identifier Characters

In a Directory Identifier the characters allowed shall be the d-characters.

10.6.2 Directory Identifier Format

A Directory Identifier shall consist of a sequence of one or more d-characters.

10.6.3 Reserved Directory Identifiers

10.6.3.1 The Directory Identifier of the Directory Record embedded in a Volume Descriptor describing the Root directory shall consist of only a (00) byte.

10.6.3.2 The Directory Identifier of the first Directory Record of each directory shall consist of only a (00) byte.

10.6.3.3 The Directory Identifier of the second Directory Record of each directory shall consist of only a (01) byte.

11 Volume Descriptors

The Volume Descriptors shall identify the volume, the partitions recorded on the volume, the volume creator(s), certain attributes of the volume, the location of other recorded descriptors and the version of the standard which applies to the volume structure.

11.1 Format of a Volume Descriptor

BP	Field	Content
1-8	Volume Descriptor LBN	numeric value
9	Volume Descriptor Type	numeric value
10-14	Volume Structure Standard Identifier	CDROM
15	Volume Structure Standard Version	numeric value
16-2048	(Depends on Volume Descriptor Type)	(Depends on Volume Descriptor Type)

11.1.1 Volume Descriptor LBN (BP 1-8)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the Volume Descriptor.

This field shall be recorded according to 10.3.3.

11.1.2 Volume Descriptor Type (BP 9)

This field shall specify as an 8-bit number the Volume Descriptor Type as follows.

Field Value	Meaning
0	The Volume Descriptor is a Boot Record.
1	The Volume Descriptor is a Standard File Structure Volume Descriptor.
2	The Volume Descriptor is a Coded Character Set File Structure Volume Descriptor.
3	The Volume Descriptor is an Unspecified Structure Volume Descriptor.
4-254	Reserved for future standardization.
255	The Volume Descriptor is a Volume Descriptor Sequence Terminator.

This field shall be recorded according to 10.1.

11.1.3 Volume Structure Standard Identifier (BP 10-14)

This field shall specify the standard to which the Volume Descriptor is expected to conform.

The characters in this field shall be CDROM.

11.1.4 Volume Structure Standard Version (BP 15)

This field shall specify as an 8-bit number the version of the volume structure standard to which the Volume Descriptor is expected to conform.

1 shall indicate the present standard.

This field shall be recorded according to 10.1.

11.1.5 Depends on Volume Descriptor Type (BP 16-2048)

The content and the interpretation of this field shall depend on the Volume Descriptor Type.

11.2 Boot Record

The Boot Record shall identify the system that specified the content of the reserved for boot system use field in the Boot Record, and shall contain information which is used to achieve a desired state for a system or for an application.

BP	Field	Content
1-8	Volume Descriptor LBN	numeric value
9	Volume Descriptor Type	numeric value
10-14	Volume Structure Standard Identifier	CDROM
15	Volume Structure Standard Version	numeric value
16-47	Boot System Identifier	a-characters
48-79	Boot Identifier	a-characters
80-2048	(Reserved for boot system use)	Not specified

11.2.1 Volume Descriptor LBN (BP 1-8)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the Volume Descriptor.

This field shall be recorded according to 10.3.3.

11.2.2 Volume Descriptor Type (BP 9)

This field shall specify an 8-bit number indicating that the Volume Descriptor is a Boot Record.

The number in this field shall be 0.

This field shall be recorded according to 10.1.

11.2.3 Volume Structure Standard Identifier (BP 10-14)

This field shall specify the standard to which the Volume Descriptor is expected to conform.

The characters in this field shall be CDROM.

11.2.4 Volume Structure Standard Version (BP 15)

This field shall specify as an 8-bit number the version of the volume structure standard to which the Volume Descriptor is expected to conform.

1 shall indicate the present standard.

This field shall be recorded according to 10.1.

11.2.5 Boot System Identifier (BP 16-47)

This field shall specify an identification of the system specifying the content of the Boot Identifier and reserved for boot system use fields in the Boot Record.

The characters in this field shall be a-characters.

11.2.6 Boot Identifier (BP 48-79)

This field shall specify an identification of the boot system specified in the reserved for boot system use field of the Boot Record.

The characters in this field shall be a-characters.

11.2.7 Reserved for boot system use (BP 80-2048)

This field shall be reserved for boot system use. Its content is not specified by this standard and shall be ignored in interchange.

11.3 Volume Descriptor Sequence Terminator

The recorded sequence of Volume Descriptors shall be terminated by a sequence of one or more Volume Descriptor Sequence Terminators.

BP	Field	Content
1-8	Volume Descriptor LBN	numeric value
9	Volume Descriptor Type	numeric value
10-14	Volume Structure Standard Identifier	CDROM
15	Volume Structure Standard Version	numeric value
16-2048	(Reserved for future standardization)	all (00) bytes

11.3.1 Volume Descriptor LBN (BP 1-8)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the Volume Descriptor.

This field shall be recorded according to 10.3.3.

11.3.2 Volume Descriptor Type (BP 9)

This field shall specify an 8-bit number indicating that the Volume Descriptor terminates the sequence of Volume Descriptors recorded on a volume.

The number in this field shall be 255.

This field shall be recorded according to 10.1.

11.3.3 Volume Structure Standard Identifier (BP 10-14)

This field shall specify the standard to which the Volume Descriptor is expected to conform.

The characters in this field shall be CDROM.

11.3.4 Volume Structure Standard Version (BP 15)

This field shall specify as an 8-bit number the version of the volume structure standard to which the Volume Descriptor is expected to conform.

1 shall indicate the present standard.

This field shall be recorded according to 10.1.

11.3.5 Reserved for future standardization (BP 16-2048)

The bytes in this field shall be set to (00).

11.4 Standard File Structure Volume Descriptor

The Standard File Structure Volume Descriptor shall identify the volume, the system specifying the content of the Logical Sectors with Logical Sector Numbers 0 to 15, the size of the Volume Space, the standard version to which the Volume Descriptor is expected to conform, the standard version to which the file structure is expected to conform and certain attributes of the volume.

BP	Field	Content
1-8	Volume Descriptor LBN	numeric value
9	Volume Descriptor Type	numeric value
10-14	Volume Structure Standard Identifier	CDROM
15	Volume Structure Standard Version	numeric value
16	Reserved Field	(00) byte
17-48	System Identifier	a-characters
49-80	Volume Identifier	d-characters
81-88	Reserved Field	all (00) bytes
89-96	Volume Space Size	numeric value
97-128	Reserved Field	all (00) bytes
129-132	Volume Set Size	numeric value
133-136	Volume Set Sequence Number	numeric value
137-140	Logical Block Size (LBS)	numeric value
141-148	Path Table Size	numeric value
149-152	Location of first mandatory occurrence of Path Table	numeric value
153-156	Location of optional occurrence of Path Table	numeric value
157-160	Location of optional occurrence of Path Table	numeric value
161-164	Location of optional occurrence of Path Table	numeric value
165-168	Location of second mandatory occurrence of Path Table	numeric value
169-172	Location of optional occurrence of Path Table	numeric value
173-176	Location of optional occurrence of Path Table	numeric value
177-180	Location of optional occurrence of Path Table	numeric value
181-214	Directory Record for Root Directory	34 bytes
215-342	Volume Set Identifier	d-characters
343-470	Publisher Identifier	a-characters
471-598	Data Preparer Identifier	a-characters
599-726	Application Identifier	a-characters
727-758	Copyright File Identifier	d-characters, FULL STOP
759-790	Abstract File Identifier	d-characters, FULL STOP
791-806	Volume Creation Date and Time	Digit(s)
807-822	Volume Modification Date and Time	Digit(s)
823-838	Volume Expiration Date and Time	Digit(s)
839-854	Volume Effective Date and Time	Digit(s)
855	File Structure Standard Version	numeric value
856	Reserved Field	(00) byte
857-1368	(Reserved for application use)	not specified
1369-2048	(Reserved for future standardization)	all (00) bytes

11.4.1 Volume Descriptor LBN (BP 1-8)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the Volume Descriptor.

This field shall be recorded according to 10.3.3.

11.4.2 Volume Descriptor Type (BP 9)

This field shall specify an 8-bit number indicating that the Volume Descriptor is a Standard File Structure Volume Descriptor.

The number in this field shall be 1.

This field shall be recorded according to 10.1.

11.4.3 Volume Structure Standard Identifier (BP 10-14)

This field shall specify the standard to which the Volume Descriptor is expected to conform.

The characters in this field shall be CDROM.

11.4.4 Volume Structure Standard Version (BP 15)

This field shall specify as an 8-bit number the version of the volume structure standard to which the Volume Descriptor is expected to conform.

1 shall indicate the present standard.

This field shall be recorded according to 10.1.

11.4.5 Reserved Field (BP 16)

This field shall be set to (00).

11.4.6 System Identifier (BP 17-48)

This field shall specify an identification of the system specifying the content of the Logical Sectors with Logical Sector Numbers 0 to 15.

The characters in this field shall be a-characters.

11.4.7 Volume Identifier (BP 49-80)

This field shall specify an identification of the volume.

The characters in this field shall be d-characters.

11.4.8 Reserved Field (BP 81-88)

All bytes shall be set to (00).

11.4.9 Volume Space Size (BP 89-96)

This field shall specify as a 32-bit number the number of Logical Blocks in which the Volume Space is recorded.

This field shall be recorded according to 10.3.3.

11.4.10 Reserved Field (BP 97-128)

All bytes shall be set to (00).

11.4.11 Volume Set Size (BP 129-132)

This field shall specify as a 16-bit number the number of volumes in the volume set of which the volume is a member.

This field shall be recorded according to 10.2.3.

11.4.12 Volume Set Sequence Number (BP 133-136)

This field shall specify as a 16-bit number the ordinal number of the volume in the volume set of which the volume is a member.

This field shall be recorded according to 10.2.3.

11.4.13 Logical Block Size [LBS] (BP 137-140)

This field shall specify as a 16-bit number the size, in bytes, of a Logical Block.

This field shall be recorded according to 10.2.3.

11.4.14 Path Table Size (BP 141-148)

This field shall specify as a 32-bit number the length in bytes of the Path Table.

This field shall be recorded according to 10.3.3.

11.4.15 Location of first mandatory occurrence of Path Table (BP 149-152)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the extent which contains the first mandatory occurrence of the Path Table. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the least significant byte first.

This field shall be recorded according to 10.3.1.

11.4.16 Location of optional occurrence of Path Table (BP 153-156)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the extent which contains an optional occurrence of the Path Table. If the value is 0, it shall mean that the extent shall not be expected to have been recorded. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the least significant byte first.

This field shall be recorded according to 10.3.1.

11.4.17 Location of optional occurrence of Path Table (BP 157-160)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the extent which contains an optional occurrence of the Path Table. If the value is 0, it shall mean that the extent shall not be expected to have been recorded. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the least significant byte first.

This field shall be recorded according to 10.3.1.

11.4.18 Location of optional occurrence of Path Table (BP 161-164)

This field shall specify the LBN as a 32-bit number of the first Logical Block allocated to the extent which contains an optional occurrence of the Path Table. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the least significant byte first. If the value is 0, it shall mean that the extent shall not be expected to have been recorded.

This field shall be recorded according to 10.3.1.

11.4.19 Location of second mandatory occurrence of Path Table (BP 165-168)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the extent which contains the second mandatory occurrence of the Path Table. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the most significant byte first.

This field shall be recorded according to 10.3.2.

11.4.20 Location of optional occurrence of Path Table (BP 169-172)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the extent which contains an optional occurrence of the Path Table. If the value is 0, it shall mean that the extent shall not be expected to have been recorded. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the most significant byte first.

This field shall be recorded according to 10.3.2.

11.4.21 Location of optional occurrence of Path Table (BP 173-176)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the extent which contains an optional occurrence of the Path Table. If the value is 0, it shall mean that the extent shall not be expected to have been recorded. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the most significant byte first.

This field shall be recorded according to 10.3.2.

11.4.22 Location of optional occurrence of Path Table (BP 177-180)

This field shall specify the LBN as a 32-bit number of the first Logical Block allocated to the extent which contains an optional occurrence of the Path Table. If the value is 0, it shall mean that the extent shall not be expected to have been recorded. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the most significant byte first.

This field shall be recorded according to 10.3.2.

11.4.23 Directory Record for Root Directory (BP 181-214)

This field shall contain an occurrence of the Directory Record for the Root directory.

This field shall be recorded according to 13.

11.4.24 Volume Set Identifier (BP 215-342)

This field shall specify an identification of the volume set of which the volume is a member.

The characters in this field shall be d-characters.

11.4.25 Publisher Identifier (BP 343-470)

This field shall specify an identification of the user who specified what shall be recorded on the volume.

The characters in this field shall be a-characters.

11.4.26 Data Preparer Identifier (BP 471-598)

This field shall specify an identification of the person or other entity which controls the preparation of the data recorded on the volume.

The characters in this field shall be a-characters.

11.4.27 Application Identifier (BP 599-726)

This field shall specify an identification of the specification for how the data are recorded on the volume.

The characters in this field shall be a-characters.

11.4.28 Copyright File Identifier (BP 727-758)

This field shall specify an identification for a file described by the Root Directory containing a copyright statement for the volume. If the value in this field is all SPACEs, it shall mean that the file shall not be expected to have been recorded.

The File Name of a Copyright File Identifier shall not contain more than 8 d-characters. The File Name Extension of a Copyright File Identifier shall not contain more than 3 d-characters.

The characters in this field shall be d-characters and FULL STOP.

The field shall be recorded as specified in 10.5.

11.4.29 Abstract File Identifier (BP 759-790)

This field shall specify an identification for a file described by the Root Directory containing an abstract statement for the volume. If the value in this field is all SPACEs, it shall mean that the file shall not be expected to have been recorded.

The File Name of a Abstract File Identifier shall not contain more than 8 d-characters. The File Name Extension of a Abstract File Identifier shall not contain more than 3-characters.

The characters in this field shall be d-characters and FULL STOP.

The field shall be recorded as specified in 10.5.

11.4.30 Volume Creation Date and Time (BP 791-806)

This field shall specify the date and the time of the day at which the information in the volume was created. It shall be recorded according to 11.4.30.1.

11.4.30.1 Date and Time Format

The date and time shall be represented by a 16 byte field recorded as follows.

RBP	Field	Content
1-4	Year from 1 to 9999	Digits
5-6	Month of the year from 1 to 12	Digits
7-8	Day of the month from 1 to 31	Digits
9-10	Hour of the day from 0 to 23	Digits
11-12	Minute of the hour from 0 to 59	Digits
13-14	Second of the minute from 0 to 59	Digits
15-16	Hundredths of a second	Digits

If all the characters of this field are the digit ZERO, it shall mean that the date and time are not specified.

11.4.31 Volume Modification Date and Time (BP 807-822)

This field shall specify the date and the time of the day at which the information in the volume was last modified. It shall be recorded according to 11.4.30.1.

11.4.32 Volume Expiration Date and Time (BP 823-838)

This field shall specify the date and the time of the day at which the information in the volume may be regarded as obsolete. If the date and time are not specified then the information shall not be regarded as obsolete. It shall be recorded according to 11.4.30.1.

11.4.33 Volume Effective Date and Time (BP 839-854)

This field shall specify the date and the time of the day at which the information in the volume may be used. If the date and time are not specified then the information may be used at once. It shall be recorded according to 11.4.30.1.

11.4.34 File Structure Standard Version (BP 855)

This field shall specify as an 8-bit number the version of the file structure standard to which all Directory Records and all Path Table Records are expected to conform.

1 shall indicate the present standard.

This field shall be recorded according to 10.1.

11.4.35 Reserved Field (BP 856)

This field shall be set (00).

11.4.36 Reserved for application use (BP 857-1368)

This field shall be reserved for application use. Its content is not specified by this standard.

11.4.37 Reserved for future standardization (BP 1369-2048)

The bytes in this field shall be set to (00).

11.5 Coded Character Set File Structure Volume Descriptor

The Coded Character Set File Structure Volume Descriptor shall identify the volume, the system specifying the content of the Logical Sectors with Logical Sector Numbers 0 to 15, the size of the Volume Space, the standard version to which the Volume Descriptor is expected to conform, the standard version to which the file structure is expected to conform, certain attributes of the volume and the coded character set used to interpret certain descriptor fields.

BP	Field	Content
1-8	Volume Descriptor LBN	numeric value
9	Volume Descriptor Type	numeric value
10-14	Volume Structure Standard Identifier	CDROM
15	Volume Structure Standard Version	numeric value
16	Volume Flags	8 bits
17-48	System Identifier	a-characters
49-80	Volume Identifier	d-characters
81-88	Reserved Field	all (00) bytes
89-96	Volume Space Size	numeric value
97-128	Coded Character Set for Descriptor Identifiers	32 bytes
129-132	Volume Set Size	numeric value
133-136	Volume Set Sequence Number	numeric value
137-140	Logical Block Size (LBS)	numeric value
141-148	Path Table Size	numeric value
149-152	Location of first mandatory occurrence of Path Table	numeric value
153-156	Location of optional occurrence of Path Table	numeric value
157-160	Location of optional occurrence of Path Table	numeric value
161-164	Location of optional occurrence of Path Table	numeric value
165-168	Location of second mandatory occurrence of Path Table	numeric value
169-172	Location of optional occurrence of Path Table	numeric value
173-176	Location of optional occurrence of Path Table	numeric value
177-180	Location of optional occurrence of Path Table	numeric value
181-214	Directory Record for Root Directory	34 bytes
215-342	Volume Set Identifier	d-characters
343-470	Publisher Identifier	a-characters
471-598	Data Preparer Identifier	a-characters
599-726	Application Identifier	a-characters
727-758	Copyright File Identifier	d-characters, FULL STOP
759-790	Abstract File Identifier	d-characters, FULL STOP
791-806	Volume Creation Date and Time	Digit(s)
807-822	Volume Modification Date and Time	Digit(s)
823-838	Volume Expiration Date and Time	Digit(s)
839-854	Volume Effective Date and Time	Digit(s)
855	File Structure Standard Version	numeric value
856	Reserved Field	(00) byte
857-1368	(Reserved for application use)	not specified
1369-2048	(Reserved for future standardization)	all (00) bytes

11.5.1 Volume Descriptor LBN (BP 1-8)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the Volume Descriptor.

This field shall be recorded according to 10.3.3.

11.5.2 Volume Descriptor Type (BP 9)

This field shall specify an 8-bit number indicating that the Volume Descriptor is a Coded Character Set Volume Descriptor.

The number in this field shall be 2.

This field shall be recorded according to 10.1.

11.5.3 Volume Structure Standard Identifier (BP 10-14)

This field shall specify the standard to which the Volume Descriptor is expected to conform.

The characters in this field shall be CDROM.

11.5.4 Volume Structure Standard Version (BP 15)

This field shall specify as an 8-bit number the version of the volume structure standard to which the Volume Descriptor is expected to conform.

1 shall indicate the present standard.

This field shall be recorded according to 10.1.

11.5.5 Volume Flags (BP 16)

The bits of this field shall be numbered from 0 to 7 starting with the least significant bit.

This field shall specify certain characteristics of the volume as follows.

Bit Position	Characteristic
0	ZERO shall mean that the Coded Character Set for Descriptor Identifiers field specifies only escape sequences registered according to ISO 2375. ONE shall mean that the Coded Character Set for Descriptor Identifiers field specifies at least one escape sequence not registered according to ISO 2375.
1-7	All ZERO bits (reserved for future standardization)

11.5.6 System Identifier (BP 17-48)

This field shall specify an identification of the system specifying the content of the Logical Sectors with Logical Sector Numbers 0 to 15.

The characters in this field shall be a-characters.

11.5.7 Volume Identifier (BP 49-80)

This field shall specify an identification of the volume.

The characters in this field shall be d-characters.

11.5.8 Reserved Field (BP 81-88)

All bytes shall be set to (00).

11.5.9 Volume Space Size (BP 89-96)

This field shall specify as a 32-bit number the number of Logical Blocks in which the Volume Space is recorded.

This field shall be recorded according to 10.3.3.

11.5.10 Coded Character Set for Descriptor Identifiers (BP 97-128)

This field shall specify one or more escape sequences according to ISO 2022 that designate the G0 graphic character set and, optionally, the G1 graphic character set to be be used in an 8-bit environment according to ISO 2022 to interpret the descriptor fields specified in 6.3.3.

These escape sequences shall conform to ISO 2022, except that the ESC shall be omitted from each designating escape sequence when recorded in this field. The first or only sequence shall begin at the first byte of the field. Each successive sequence shall begin at the byte in the field immediately following the last byte of the preceding sequence. Any unused positions following the last sequence shall be set to (00).

If the Volume Flags field contains the value 0, it shall mean that the Coded Character Set for Descriptor Identifiers field specifies only escape sequences registered according to ISO 2375.

If all the bytes of this field are (00), it shall mean that coded character set designated shall be the International Reference Version of ISO 646.

11.5.11 Volume Set Size (BP 129-132)

This field shall specify as a 16-bit number the number of volumes in the volume set of which the volume is a member.

This field shall be recorded according to 10.2.3.

11.5.12 Volume Set Sequence Number (BP 133-136)

This field shall specify as a 16-bit number the ordinal number of the volume in the volume set of which the volume is a member.

This field shall be recorded according to 10.2.3.

11.5.13 Logical Block Size [LBS] (BP 137-140)

This field shall specify as a 16-bit number the size, in bytes, of a Logical Block.

This field shall be recorded according to 10.2.3.

11.5.14 Path Table Size (BP 141-148)

This field shall specify as a 32-bit number the length in bytes of the Path Table.

This field shall be recorded according to 10.3.3.

11.5.15 Location of first mandatory occurrence of Path Table (BP 149-152)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the extent which contains the first mandatory occurrence of the Path Table. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the least significant byte first.

This field shall be recorded according to 10.3.1.

11.5.16 Location of optional occurrence of Path Table (BP 153-156)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the extent which contains an optional occurrence of the Path Table. If the value is 0, it shall mean that the extent shall not be expected to have been recorded. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the least significant byte first.

This field shall be recorded according to 10.3.1.

11.5.17 Location of optional occurrence of Path Table (BP 157-160)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the extent which contains an optional occurrence of the Path Table. If the value is 0, it shall mean that the extent shall not be expected to have been recorded. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the least significant byte first.

This field shall be recorded according to 10.3.1.

11.5.18 Location of optional occurrence of Path Table (BP 161-164)

This field shall specify the LBN as a 32-bit number of the first Logical Block allocated to the extent which contains an optional occurrence of the Path Table. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the least significant byte first. If the value is 0, it shall mean that the extent shall not be expected to have been recorded.

This field shall be recorded according to 10.3.1.

11.5.19 Location of second mandatory occurrence of Path Table (BP 165-168)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the extent which contains the second mandatory occurrence of the Path Table. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the most significant byte first.

This field shall be recorded according to 10.3.2.

11.5.20 Location of optional occurrence of Path Table (BP 169-172)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the extent which contains an optional occurrence of the Path Table. If the value is 0, it shall mean that the extent shall not be expected to have been recorded. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the most significant byte first.

This field shall be recorded according to 10.3.2.

11.5.21 Location of optional occurrence of Path Table (BP 173-176)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the extent which contains an optional occurrence of the Path Table. If the value is 0, it shall mean that the extent shall not be expected to have been recorded. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the most significant byte first.

This field shall be recorded according to 10.3.2.

11.5.22 Location of optional occurrence of Path Table (BP 177-180)

This field shall specify the LBN as a 32-bit number of the first Logical Block allocated to the extent which contains an optional occurrence of the Path Table. If the value is 0, it shall mean that the extent shall not be expected to have been recorded. Multibyte numeric values in a record of this occurrence of the Path Table shall be recorded with the most significant byte first.

This field shall be recorded according to 10.3.2.

11.5.23 Directory Record for Root Directory (BP 181-214)

This field shall contain an occurrence of the Directory Record for the Root directory.

This field shall be recorded according to 13.

11.5.24 Volume Set Identifier (BP 215-342)

This field shall specify an identification of the volume set of which the volume is a member.

The characters in this field shall be d-characters.

11.5.25 Publisher Identifier (BP 343-470)

This field shall specify an identification of the user who specified what shall be recorded on the volume.

The characters in this field shall be a-characters.

11.5.26 Data Preparer Identifier (BP 471-598)

This field shall specify an identification of the person or other entity which controls the preparation of the data recorded on the volume.

The characters in this field shall be a-characters.

11.5.27 Application Identifier (BP 599-726)

This field shall specify an identification of the specification for how the data are recorded on the volume.

The characters in this field shall be a-characters.

11.5.28 Copyright File Identifier (BP 727-758)

This field shall specify an identification for a file described by the Root Directory containing a copyright statement for the volume. If the value in this field is all SPACEs, it shall mean that the file shall not be expected to have been recorded.

The characters in this field shall be d-characters and FULL STOP.

The field shall be recorded as specified in 10.5.

11.5.29 Abstract File Identifier (BP 759-790)

This field shall specify an identification for a file described by the Root Directory containing an abstract statement for the volume. If the value in this field is all SPACEs, it shall mean that the file shall not be expected to have been recorded.

The characters in this field shall be d-characters and FULL STOP.

The field shall be recorded as specified in 10.5.

11.5.30 Volume Creation Date and Time (BP 791-806)

This field shall specify the date and the time of the day at which the information in the volume was created. It shall be recorded according to 11.4.30.1.

11.5.31 Volume Modification Date and Time (BP 807-822)

This field shall specify the date and the time of the day at which the information in the volume was last modified. It shall be recorded according to 11.4.30.1.

11.5.32 Volume Expiration Date and Time (BP 823-838)

This field shall specify the date and the time of the day at which the information in the volume may be regarded as obsolete. If the date and time are not specified then the information shall not be regarded as obsolete. It shall be recorded according to 11.4.30.1.

11.5.33 Volume Effective Date and Time (BP 839-854)

This field shall specify the date and the time of the day at which the information in the volume may be used. If the date and time are not specified then the information may be used at once. It shall be recorded according to 11.4.30.1.

11.5.34 File Structure Standard Version (BP 855)

This field shall specify as an 8-bit number the version of the file structure standard to which all Directory Records and all Path Table Records are expected to conform.

1 shall indicate the present standard.

This field shall be recorded according to 10.1.

11.5.35 Reserved Field (BP 856)

This field shall be set (00).

11.5.36 Reserved for application use (BP 857-1368)

This field shall be reserved for application use. Its content is not specified by this standard.

11.5.37 Reserved for future standardization (BP 1369-2048)

The bytes in this field shall be set to (00).

11.6 Unspecified Structure Volume Descriptor

The Unspecified Structure Volume Descriptor shall identify a volume partition, the system specifying the content of reserved for system use descriptor fields in the Volume Descriptor, the position and size of the volume partition, and the standard version to which the Volume Descriptor is expected to conform.

BP	Field	Content
1-8	Volume Descriptor LBN	numeric value
9	Volume Descriptor Type	numeric value
10-14	Volume Structure Standard Identifier	CDROM
15	Volume Structure Standard Version	numeric value
16	Reserved Field	(00) byte
17-48	System Identifier	a-characters
49-80	Volume Partition Identifier	d-characters
81-88	Volume Partition Location	numeric value
89-96	Volume Partition Size	numeric value
97-2048	(Reserved for system use)	Not specified

11.6.1 Volume Descriptor LBN (BP 1-8)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the Volume Descriptor.

This field shall be recorded according to 10.3.3.

11.6.2 Volume Descriptor Type (BP 5)

This field shall specify an 8-bit number indicating that the Volume Descriptor is an Unspecified Structure Volume Descriptor.

The number in this field shall be 3.

This field shall be recorded according to 10.1.

11.6.3 Volume Structure Standard Identifier (BP 10-14)

This field shall specify the standard to which the Volume Descriptor is expected to conform.

The characters in this field shall be CDROM.

11.6.4 Volume Structure Standard Version (BP 15)

This field shall specify as an 8-bit number the version of the volume structure standard to which the Volume Descriptor is expected to conform.

1 shall indicate the present standard.

This field shall be recorded according to 10.1.

11.6.5 Reserved Field (BP 16)

This field shall be set (00).

11.6.6 System Identifier (BP 17-48)

This field shall specify an identification of the system specifying the content of the the reserved for system use field in the Volume Descriptor.

The characters in this field shall be a-characters.

11.6.7 Volume Partition Identifier (BP 49-80)

This field shall specify an identification of the volume partition.

The characters in this field shall be d-characters.

11.6.8 Volume Partition Location (BP 112-119)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the volume partition. This LBN shall be specified such that the first Logical Block allocated to the volume partition shall be the Logical Block with the lowest Logical Block Number in the first Logical Sector allocated to the volume partition.

This field shall be recorded according to 10.3.3.

11.6.9 Volume Partition Size (BP 89-96)

This field shall specify as a 32-bit number the number of Logical Blocks in which the volume partition is recorded.

This field shall be recorded according to 10.3.3.

11.6.10 Reserved for system use (BP 97-2048)

This field shall be reserved for system use. Its content is not specified by this standard.

12 Directory Descriptors

12.1 Path Table

12.1.1 Format of a Path Table Record

BP	Field	Content
1-4	Location of Extent	numeric value
5	Extended Attribute Record Length	numeric value
6	Length of Directory Identifier [LEN_DI]	numeric value
7-8	Parent Directory Number	numeric value
9-[8 + LEN_DI]	Directory Identifier	d-characters
[9 + LEN_DI]	Reserved field	(00) byte

12.1.1.1 Location of Extent (BP 1-4)

This field shall specify as a 32-bit number the LBN of the first Logical Block allocated to the extent in which the directory is recorded. This LBN shall be specified such that the first Logical Block allocated to the extent shall be the Logical Block with the lowest Logical Block Number in the first Logical Sector allocated to the extent.

This field shall be recorded according to 10.3.

12.1.1.2 Extended Attribute Record Length (BP 5)

This field shall specify as an 8-bit number the number of Logical Blocks recorded comprising the Extended Attribute Record preceding the first Directory Record in the extent.

This field shall be recorded according to 10.1.

12.1.1.3 Length of Directory Identifier [LEN_DI] (BP 6)

This field shall specify as an 8-bit number the length of the Directory Identifier field of the Path Table Record.

This field shall be recorded according to 10.1.

12.1.1.4 Parent Directory Number (BP 7-8)

This field shall specify as a 16-bit number the record number in the Path Table for the parent directory of the directory.

This field shall be recorded according to 10.2.

12.1.1.5 Directory Identifier (BP 9-[8 + LEN_DI])

The field shall specify an identification for a directory.

The field shall be recorded as specified in 10.6.

The characters in this field shall be d-characters.

12.1.1.6 Reserved field (BP [9 + LEN_DI])

This field shall be present in the Path Table Record only if the number in the Length of Directory Identifier field is an odd number. If present, this field shall be set to (00).

This field shall be recorded according to 10.1.

13 File Descriptors

13.1 Format of a Directory Record

BP	Field	Content
1	Length of Directory Record [LEN_DR]	numeric value
2	Extended Attribute Record Length	numeric value
3-10	Location of Extent	numeric value
11-18	Data Length	numeric value
19-24	Recording Date and Time	numeric values
25	File Flags	8 bits
26	(Reserved for future standardization)	(00)
27	Interleave Size	numeric value
28	Interleave Skip Factor	numeric value
29-32	Volume Set Sequence Number	numeric value
33	Length of File Identifier [LEN_FI]	numeric value
34-[33 + LEN_FI]	File Identifier	d-characters, FULL STOP, SEMICOLON, (00), (01)
[34 + LEN_FI]	Reserved field	(00) byte
[LEN_DR-LEN_SU + 1]-LEN_DR	(Reserved for system use)	LEN_SU bytes

13.1.1 Length of Directory Record [LEN_DR] (BP 1)

This field shall specify as an 8-bit number the length of the Directory Record.

This field shall be recorded according to 10.1.

13.1.2 Extended Attribute Record Length (BP 2)

This field shall specify as an 8-bit number the number of Logical Blocks recorded comprising the Extended Attribute Record preceding the file data in the extent.

This field shall be recorded according to 10.1.

13.1.3 Location of Extent (BP 3-10)

This field shall specify as a 32-bit number a number which shall be the LBN of the first Logical Block allocated to the extent. If the value in the Interleave Size field is not 0, this field shall specify a number such that the first Logical Block allocated to the extent shall be the Logical Block with the lowest Logical Block Number in the first Logical Sector allocated to the extent.

This field shall be recorded according to 10.3.3.

13.1.4 Data Length (BP 11-18)

This field shall specify as a 32-bit number the number of data bytes recorded in the file extent described by the Directory Record.

This field shall be recorded according to 10.3.3.

NOTE 11: *This number does not include the length of any Extended Attribute Record.*

13.1.5 Recording Date and Time (BP 19-24)

This field shall indicate the date and the time of the day at which the information in the extent described by the Directory Record was recorded.

The date and time shall be represented by 6 8-bit numbers each of which shall be recorded according to 10.1 as follows.

RBP	Meaning	Content
1	Number of years since 1900	numeric value
2	Month of the year from 1 to 12	numeric value
3	Day of the month from 1 to 31	numeric value
4	Hour of the day from 0 to 23	numeric value
5	Minute of the hour from 0 to 59	numeric value
6	Second of the minute from 0 to 59	numeric value

If all 6 numbers are zero, it shall mean that the date and time are not specified.

13.1.6 File Flags (BP 25)

The bits of this field shall be numbered from 0 to 7 starting with the least significant bit.

This field shall specify certain characteristics of the file as follows.

Bit Position	Bit Name	Characteristic
0	Existence	ZERO shall mean that the existence of the file shall be made known to the user upon an inquiry by the user ONE shall mean that the existence of the file need not be made known to the user
1	Directory	ZERO shall mean that the Directory record does not identify a directory ONE shall mean that the Directory record identifies a directory and the Record bit shall contain ZERO
2	Associated File	ZERO shall mean that the file is not an Associated File ONE shall mean that the file is an Associated File, that shall be ignored in interchange, with content subject to system dependent interpretation
3	Record	ZERO mean that the structure of the information in the file does not have the record format specified by the Record Format Field of the Extended Attribute Record (see 13.2.8) ONE shall mean that the structure of the information in the file has the record format specified by the Record Format Field of the Extended Attribute Record (see 13.2.8)
4	Protection	ZERO shall mean that: — the Owner Identification and Group Identification fields in the associated Extended Attribute Record shall contain all ZEROs, and; — the Permissions field in the associated Extended Attribute Record shall contain (AAAA). ONE shall mean that: — the Owner Identification and Group Identification fields in the associated Extended Attribute Record shall not contain all ZEROs, and; — the Permissions field in the associated Extended Attribute Record shall contain values as specified by 13.2.3.
5-6	Reserved	ZERO bits (reserved for future standardization)
7	Multi-Extent	ZERO shall mean that this is the final Directory Record for the file ONE shall mean that this is not the final Directory Record for the file

13.1.7 Reserved for future standardization (BP 26)

The byte in this field shall be set to (00).

This field shall be recorded according to 10.1.

13.1.8 Interleave Size (BP 27)

This field shall contain an 8-bit number specifying the number of consecutive Logical Blocks in which each part of the file is recorded in the exent described by this Directory Record.

This field shall be recorded according to 10.1.

13.1.9 Interleave Skip Factor (BP 28)

This field shall contain an 8-bit number specifying the number of consecutive Logical Blocks allocated to other files separating each part of the file recorded in the extent described by this Directory Record.

The number in this field shall be zero if the Directory bit of the File Flags field contains ONE.

This field shall be recorded according to 10.1.

13.1.10 Volume Set Sequence Number (BP 29-32)

This field shall specify as an 16-bit number the ordinal number of the volume in the volume set on which the extent described by this Directory Record is recorded.

This field shall be recorded according to 10.2.3.

13.1.11 Length of File Identifier [LEN_FI] (BP 33)

This field shall specify as an 8-bit number the length of the File Identifier field of the Directory Record.

This field shall be recorded according to 10.1.

13.1.12 File Identifier (BP 34-[33 + LEN_FI])

This field shall have an interpretation dependent upon the value of the Directory bit of the File Flags field as follows.

Value of Directory bit of File Flags field	Interpretation
ZERO	The field shall specify an identification for the file. The characters in this field shall be d-characters, FULL STOP, SEMICOLON. The field shall be recorded as specified in 10.5.
ONE	The field shall specify an identification for the directory. The characters in this field shall be d-characters, or only a (00) byte, or only a (01) byte. The field shall be recorded as specified in 10.6.

13.1.13 Reserved field (BP [34 + LEN_FI])

This field shall be present in the Directory Record only if the number in the Length of the File Identifier field is an even number. If present, this field shall be set to (00).

This field shall be recorded according to 10.1.

13.1.14 Reserved for system use (BP [LEN_DR-LEN_SU + 1]-LEN_DR)

This field shall be optional. If present, this field shall be reserved for system use. Its content is not specified by this standard. If necessary to cause the Directory Record to comprise an even number of bytes, a (00) byte shall be added to terminate this field.

13.2 Format of an Extended Attribute Record

An Extended Attribute Record is optional. If present, it shall comprise at least one Logical Block. It shall have the following contents.

BP	Field	Content
1-4	Owner Identification Code	numeric value
5-8	Group Identification Code	numeric value
9-10	Permissions	16 bits
11-26	File Creation Date and Time	Digit(s)
27-42	File Modification Date and Time	Digit(s)
43-58	File Expiration Date and Time	Digit(s)
59-74	File Effective Date and Time	Digit(s)
75	Record Format	8 bits
76	Record Attributes	8 bits
77-80	Record Length	numeric value
81-112	System Identifier	a-characters
113-176	(Reserved for system use)	Not specified
177	Extended Attribute Record Structure Standard Version	numeric value
178-242	(Reserved for future standardization)	all (00) bytes
243-246	Parent Directory Number	numeric value
247-250	Length of Reserved for application use [LEN_AU]	numeric value
251-[250 + LEN_DR]	Directory Record	LEN_DR bytes
[251 + LEN_DR]-[250 + LEN_DR + LEN_AU]	(Reserved for application use)	LEN_AU bytes

13.2.1 Owner Identification Code (BP 1-4)

This field shall specify as a 16-bit number an identification of the member of the group identified by the Group Identifier field of the Extended Attribute Record who is the file owner.

If the number in this field is 0, this shall indicate that there is no owner identification specified for the file.

This field shall be recorded according to 10.2.3.

13.2.2 Group Identification Code (BP 5-8)

This field shall specify as a 16-bit number an identification of the group of which the file owner is a member.

The values for this number from 1 to a number subject to agreement between the data preparer and receiving system shall identify the group as belonging to the SYSTEM class of user.

If the number in this field is 0, this shall indicate that there is no group identification specified for the file. In this case, the Owner Identification Code shall contain zero.

This field shall be recorded according to 10.2.3.

13.2.3 Permissions (BP 9-10)

The bits of this 16-bit field shall be numbered from 0 to 15 starting with the least significant bit of the byte recorded in byte position 10.

Bits 0 to 3 may be ignored in interchange.

If requested by the owner, bits 4 to 7 may be ignored in interchange.

This field shall specify access permissions for certain classes of users as follows.

Bit Position	Meaning
0	ZERO shall mean that the SYSTEM class of user may read the file. ONE shall mean that the SYSTEM class of user may not read the file.
1	Reserved (must be ONE).
2	ZERO shall mean that the SYSTEM class of user may execute the file. ONE shall mean that the SYSTEM class of user may not execute the file.
3	Reserved (must be ONE).
4	ZERO shall mean that the owner may read the file. ONE shall mean that owner may not read the file.
5	Reserved (must be ONE).
6	ZERO shall mean that the owner may execute the file. ONE shall mean that owner may not execute the file.
7	Reserved (must be ONE).
8	ZERO shall mean that any user who is a member of the Group specified by the Group Identification Code field may read the file. ONE shall mean that of the users who are a member of the Group specified by the Group Identification Code field, only the owner may read the file.
9	Reserved (must be ONE).
10	ZERO shall mean that any user who is a member of the Group specified by the Group Identification Code field may execute the file. ONE shall mean that of the users who are a member of the Group specified by the Group Identification Code field, only the owner may execute the file.
11	Reserved (must be ONE).
12	ZERO shall mean that any user may read the file. ONE shall mean that a user not a member of the Group specified by the Group Identification Code field may not read the file.
13	Reserved (must be ONE).
14	ZERO shall mean that any user may execute the file. ONE shall mean that a user not a member of the Group specified by the Group Identification Code field may not execute the file.
15	Reserved (must be ONE).

13.2.4 File Creation Date and Time (BP 11-26)

This field shall specify the date and the time of the day at which the information in the file was created. It shall be recorded according to 11.4.30.1.

13.2.5 File Modification Date and Time (BP 27-42)

This field shall specify the date and the time of the day at which the information in the file was last modified. It shall be recorded according to 11.4.30.1.

13.2.6 File Expiration Date and Time (BP 43-58)

This field shall specify the date and the time of the day at which the information in the file may be regarded as obsolete. If the date and time are not specified then the information shall not be regarded as obsolete. It shall be recorded according to 11.4.30.1.

13.2.7 File Effective Date and Time (BP 59-74)

This field shall specify the date and the time of the day at which the information in the file may be used. If the date and time are not specified then the information may be used at once. It shall be recorded according to 11.4.30.1.

13.2.8 Record Format (BP 75)

This field shall contain an 8-bit number specifying the format of the information in the file.

Field Value	Format of the Information
0	shall mean that the structure of the information recorded in the file is not specified by this standard.
1	shall mean that the information in the file is a sequence of fixed-length records.
2	shall mean that the information in the file is a sequence of variable-length records (see 9.4).
3	shall mean that the information in the file is a sequence of variable-length records (see 9.4).
4-127	reserved for future standardization.
128-255	reserved for system use.

This field shall be recorded according to 10.1.

13.2.9 Record Attributes (BP 76)

This field shall contain an 8-bit number specifying certain characteristics of the records in a file.

Field Value	Attribute
0	shall mean that when displayed each record shall be preceded by a LINE FEED character and followed by a CARRIAGE RETURN character.
1	shall mean that the first byte of a record shall be interpreted as specified in ISO 1539 for vertical spacing before printing a record.
2	shall mean that the record contains the necessary form control information.
3-255	reserved for future standardization.

If the Record Format field contains zero then the Record Attribute field shall be ignored in interchange.

This field shall be recorded according to 10.1.

13.2.10 Record Length (BP 77-80)

This field shall specify a 16-bit number as follows.

If the Record Format field contains zero, the Record Length field shall contain zero.

If the Record Format field contains one, the Record Length field shall specify the length of each record in the file.

If the Record Format field contains two or three, the Record Length field shall specify the maximum length of a record in the file.

This field shall be recorded according to 10.2.3.

13.2.11 System Identifier (BP 81-112)

This field shall specify an identification of the system specifying the content of reserved for system use fields in the Directory Record and Extended Attribute Record associated with the extent.

The characters in this field shall be a-characters.

13.2.12 Reserved for system use (BP 113-176)

This field shall be reserved for system use. Its content is not specified by this standard.

13.2.13 Extended Attribute Record Structure Standard Version (BP 177)

This field shall specify as an 8-bit number the version of the Extended Attribute Record structure to which the Extended Attribute Record is expected to conform.

1 shall indicate the present structure.

This field shall be recorded according to 10.1.

13.2.14 Reserved for future standardization (BP 178-242)

The bytes in this field shall be set to (00).

This field shall be recorded according to 10.1.

13.2.15 Parent Directory Number (BP 243-246)

This field shall specify as a 16-bit number the record number in the Path Table for the parent directory of the file.

This field shall be recorded according to 10.2.3.

13.2.16 Length of Reserved for application use (BP 247-250)

This field shall specify as a 16-bit number the length in bytes of the Reserved for application use field in the Extended Attribute Record.

This field shall be recorded according to 10.2.3.

13.2.17 Directory Record (BP 251-[250 + LEN_DR])

This field shall contain a copy of the Directory Record recorded for the file.

13.2.18 Reserved for application use (BP [251 + LEN_DR]-[250 + LEN_DR + LEN_AU])

This field shall be reserved for application use. Its content is not specified by this standard.

14 Levels of Interchange

This standard specifies three nested levels of interchange.

14.1 Level 1

At Level 1 the following restrictions shall apply:

- The Volume Set Size field of a Standard File Structure Volume Descriptor shall contain 1;
- Existence bit of File Flags shall be ZERO;
- Associated File bit of File Flags shall be ZERO;
- Record bit of File Flags shall be ZERO;
- Protection bit of File Flags shall be ZERO;
- Multi-Extent bit of File Flags shall be ZERO;
- Interleave Size shall be zero;
- Interleave Skip Factor shall be zero;
- a Directory Identifier shall not contain more than 8 d-characters;
- a File Name shall not contain more than 8 d-characters;
- a File Name Extension shall not contain more than 3 d-characters;
- a File Identifier shall not include a SEMICOLON or a File Version Number.

14.2 Level 2

At Level 2 the following restrictions shall apply:

- The Volume Set Size field of a Standard File Structure Volume Descriptor shall contain 1;
- Existence bit of File Flags shall be ZERO;
- Associated File bit of File Flags shall be ZERO;
- Record bit of File Flags shall be ZERO;
- Protection bit of File Flags shall be ZERO;
- Multi-Extent bit of File Flags shall be ZERO;
- the length of a File Identifier shall not exceed 31;
- the length of a Directory Identifier shall not exceed 31;
- a File Identifier shall not include a SEMICOLON or a File Version Number.

14.3 Level 3

At Level 3 the following restriction shall apply:

- the length of a File Identifier shall not exceed 31;
- the length of a Directory Identifier shall not exceed 31.