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Information technology — System-Independent Data Format (SIDF)

Technologies de l'information — Format de données indépendantes du système (SIDF)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 14863 was prepared by ECMA (as Standard ECMA-208) and was adopted, under a special “fast-track procedure”, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

Annexes A to C form an integral part of this International Standard. Annexes D and E are for information only.

Introduction

The System Independent Data Format Association (SIDF) was formed in early 1993 by a consortium of industries. ECMA TC15 adopted the work of this committee in early 1994 and developed Standard ECMA-208 on the basis of the SIDF specification.

Information technology – System-Independent Data Format (SIDF)

Section 1 - General

1 Scope

This International Standard specifies a logical format for information interchange and secondary data storage. The format provides a System-Independent Data Format (SIDF) for the representation of primary file system information. This information includes, among other things, data, attributes and characteristics. This International Standard specifies

- the organization of the information on target media,
- requirements for originating and receiving systems for the processing of the information.

2 Conformance

2.1 Conformance of Media Volumes

A Volume shall be in conformance with this International Standard if all information recorded on it meets the relevant requirements of sections 2 and 3 for the level of partition claimed.

2.2 Conformance of an originating system

An originating system shall be in conformance with this International Standard if it meets the requirements of 14.2.

2.3 Conformance of a receiving system

A receiving system shall be in conformance with this International Standard if it meets the requirements of 14.3 for the Level of conformance claimed.

3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/IEC 646:1991,	<i>Information technology -- ISO 7-bit coded character set for information interchange.</i>
ISO/IEC 2022:1994,	<i>Information technology -- Character code structure and extension techniques.</i>
ISO 8859-1:1987,	<i>Information processing -- 8-bit single-byte coded graphic character sets -- Part 1: Latin alphabet No. 1.</i>
ISO 8859-2:1987,	<i>Information processing -- 8-bit single-byte coded graphic character sets -- Part 2: Latin alphabet No. 2.</i>
ISO 8859-3:1988,	<i>Information processing -- 8-bit single-byte coded graphic character sets -- Part 3: Latin alphabet No. 3.</i>
ISO 8859-4:1988,	<i>Information processing -- 8-bit single-byte coded graphic character sets -- Part 4: Latin alphabet No. 4.</i>
ISO 9660:1988,	<i>Information processing -- Volume and file structure of CD-ROM for information interchange</i>
ISO/IEC 13346-1:1995,	<i>Information technology -- Volume and file structure of write-once and rewritable media using non-sequential recording for information interchange -- Part 1: General.</i>
ISO/IEC 13346-2:1995,	<i>Information technology -- Volume and file structure of write-once and rewritable media using non-sequential recording for information interchange -- Part 2: Volume and boot block recognition.</i>
ISO/IEC 13346-3:1995,	<i>Information technology -- Volume and file structure of write-once and rewritable media using non-sequential recording for information interchange -- Part 3: Volume structure.</i>

ISO/IEC 13346-4:1995,	<i>Information technology -- Volume and file structure of write-once and rewritable media using non-sequential recording for information interchange -- Part 4: File structure.</i>
ISO/IEC 13346-5:1995,	<i>Information technology -- Volume and file structure of write-once and rewritable media using non-sequential recording for information interchange -- Part 5: Record structure.</i>
ISO/IEC 9945-1:1996,	<i>Information technology -- Portable Operating System Interface (POSIX) -- Part 1: System Application Program Interface (API) [C Language].</i>
ISO/IEC 10646-1:1993,	<i>Information technology -- Universal Multiple-Octet Coded Character Set (UCS) -- Part 1: Architecture and Basic Multilingual Plane.</i>
ISO/IEC 13800:1996,	<i>Information technology -- Procedure for the Registration of identifiers and attributes for volume and file structure.</i>
ITU Rec. X.25 (1993),	<i>Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit.</i>

4 Definitions

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

- 4.1 Blank Space:** Either one or more NULL Fields, or a BLANK SPACE Field Table.
- 4.2 Buffer:** A set of adjacent sectors, which are logically related. A common use of buffers is to encapsulate subsets of file set data so that it can be treated as a whole.
- 4.3 byte:** A string of eight binary digits operated upon as a unit.
- 4.4 Byte Sequence:** An ordered set of bytes.
- 4.5 Field:** The basic logical grouping of data.
- 4.6 Field Identifier (FID):** A Byte Sequence which identifies a Field.
- 4.7 Field Table:** A set of logically associated Fields.
- 4.8 File:** A collection of data that is stored as a single unit. A File contains a representation of a single primary file system entity, such as a Source directory, file, data base object, or data base.
- 4.9 file mark:** A sector containing a control block used as a delimiter to facilitate positioning, as defined by the relevant standard for recording.
- Note 1 - Some media may not support file marks.
- 4.10 File Set:** A set of associated Files, sourced from a single Source, recorded within a Volume Set.
- 4.11 Interleaved File Sets:** Two or more File Sets are interleaved if any part of at least one is recorded between any parts of another.
- 4.12 Iterated Field Set:** A sequence of one or more Fields, which may be repeated within a Field Table.
- 4.13 operating system:** The software which controls the file system of the Source.
- 4.14 originating system:** An information processing system which can create a File Set in a Volume Set for the purpose of data interchange with another system.
- 4.15 Relative Byte Position:** Indicates the byte position in a number.
- 4.16 receiving system:** An information processing system which can process a File Set of a Volume Set which has been created by another system for the purpose of data interchange.

4.17 Sector: The data field of the smallest addressable part of the medium that can be accessed independently of other addressable parts of the medium.

Note 2 - This Sector is different from the physical sectors of a physical track.

4.18 Sector Number: The ordinal sequence number of a Sector within a Volume, starting with 0 (0, 1, 2, 3, ..., n).

4.19 Source: The primary system (e.g. file system, data base) which is the source of the Files that are recorded as a File Set for secondary storage. The name of the Source is specified for the File Set, and is not included in the Source path information of the individual Files.

4.20 standard for recording: A standard that specifies the recording method and the addressing method for the information recorded on a medium.

4.21 Volume: A set of Sectors which resides within one physical partition on a secondary storage medium.

4.22 Volume Set: One Volume, or multiple logically related Volumes.

4.23 Volume Set Sequence Number: The ordinal sequence number of each Volume within a Volume Set, starting with 1 (1, 2, 3, ..., n).

5 General conventions and notations

5.1 Representation of numbers

- Numbers in decimal notation are shown as decimal digits.
- Numbers in hexadecimal notation are shown as a sequence of hexadecimal digits preceded by #.
- The setting of bits is denoted by ZERO or ONE.
- Numbers in binary notation and bit combinations are represented by sequences of ZEROs or ONES.
- Bit combinations are shown with the most significant bit to the left.
- Bits are indicated with the small letter b.
- Bytes are indicated with the capital letter B.

5.2 Names

The names of formally defined entities, such as a Volume, are shown with a capital initial.

The name of Fields, such as VOLUME HEADER, are written in capitals.

5.3 Structures

Data structures are shown in tables indicating the Relative Byte Position (RBP), purpose and size of the entities that comprise the structure.

5.4 Fields

Fields are denoted by names shown in capital letters.

5.5 Field Identifiers (FIDs)

A Byte Sequence in hexadecimal notation uniquely identifying a Field.

5.6 Field Tables

The name of a Field Table is that of its first Field, it is shown with capital initials. Field Tables list each Field with its name, its FID and a brief description of the data. The normative definition of each Field is specified in annex C. The Data Description reads "empty" if no Data part is included in the Field. Iterated Field Sets within a Field Table are shown indented, with a bar alongside. Nested Iterated Field Sets are shown with each inner level of nesting further indented than the outer level(s).

5.7 Headers

The term "File Set (Continuation) Header" is used to express: File Set Header and/or File Set Continuation Header. The term "File Record (Continuation) Header" is used to express: File Record Header and/or File Record Continuation Header.

5.8 Indices

The term "Volume (Sub)Index" is used to express: Volume Index and/or Volume Subindex. The term "File Set (Sub)Index" is used to express: File Set Index and/or File Set Subindex.

5.9 Structure description schema

Requirements for recording the different elements of the format are summarized by means of a structure description.

A structure shall be a sequence of terms. A term shall be either:

- a name, enclosed by [], followed by a definition enclosed by {}, or
- a name, enclosed by <>, of a term defined in the structure or of a descriptor defined elsewhere in this International Standard in the text associated with the structure.

Within a definition enclosed by {}, the Or Operator and Repetition Operators may be applied to the terms therein.

The Or Operator is represented by the character VERTICAL LINE: |. It is placed between the terms to which it applies and indicates that either term, but not both simultaneously, is valid at that point in the definition.

There are three Repetition Operators, which shall be interpreted as shown in figure 1, where *n* and *m* are decimal digits.

Repetition Operator	Interpretation
<i>n</i>	<i>n</i> occurrences of the preceding term
<i>n</i> +	<i>n</i> or more occurrences of the preceding term
<i>n</i> + <i>m</i>	<i>n</i> to <i>m</i> occurrences of the preceding term

Figure 1 - Repetition Operators

The Repetition Operators shall apply only to the preceding term.

The operators are listed in increasing order of precedence:

| repetition operator [] ()

Higher precedence operators shall be applied before lower precedence operators.

As an example, the schema shown in figure 2 specifies that the entity "Concert" shall be organized as zero or one Introduction, followed by one or more Pieces, an Intermission, one or more Pieces, and zero or more Encores. A Piece consists either of one Song or three to five Movements.

```
[Concert] {
    <Introduction> 0+1
    [Piece] {
        <Song>
        | <Movement> 3+5
    } 1+
    <Intermission>
    <Piece> 1+
    <Encore> 0+
}
```

Figure 2 - Example of the syntax of the structure description schema

Section 2 - Requirements for the media

6 Specific conventions and notations for the recorded format

6.1 Recording of numbers

- In each Field the field data is recorded so that the least significant byte (denoted byte B0) is recorded first. Within each byte the least significant bit is denoted bit b0, the most significant bit is denoted b7, and is recorded first. This order of recording also applies to the data of the cyclic redundancy code (CRC) and to its output (CRC bits).

- Negative values are recorded in TWO's complement notation.

6.2 Character sets and coding

Except as specified in this clause and in 6.13, the characters used in the Fields specified by this International Standard shall be coded according to the International Reference Version (IRV) of ISO/IEC 646. The CS4 character set described in 6.8 shall be the default character set, and shall be used if no other is explicitly specified. The specification of the characters allowed in these Fields and the method of recording shall be recorded as a CHAR SPEC Field (see 6.3).

Note 3 - Support for a variety of character sets is a requirement of this International Standard. Ideally, there should be only one character standard used. In practice, several standards, including ISO/IEC 646, ISO/IEC 2022, ISO 8859 and ISO/IEC 10646-1 are used. This International Standard accommodates current practice by specifying several character sets and providing a mechanism for specifying other character sets.

As an example, CS2 (see 6.6) uses the IRV of ISO/IEC 646 as the basic character set but restricts Fields containing characters to a widely usable subset of this character set.

6.3 Character set specification (CHAR SPEC)

The data part of the CHAR SPEC Field consists of two parts, Character Set Type and Character Set Information, recorded as a sequence of bytes. The Character Set Type shall be recorded as the first byte of the sequence; the Character Set Information shall consist of any remaining bytes.

The set of characters allowed in certain Fields and/or Field Tables shall be specified by a one-byte Character Set Type, and additional Character Set Information appended immediately after as needed.

6.3.1 Character Set Type

The Character Set Type identifies the allowed set of characters as shown in figure 3.

Type	Allowed characters
0	The CS0 coded character set (see 6.4).
1	The CS1 coded character set (see 6.5).
2	The CS2 coded character set (see 6.6).
3	The CS3 coded character set (see 6.7).
4	The CS4 coded character set (see 6.8).
5	The CS5 coded character set (see 6.9).
6	The CS6 coded character set (see 6.10).
7	The CS7 coded character set (see 6.11).
8	The CS8 coded character set (see 6.12).
9 to 255	Reserved for future standardization

Figure 3 - Sets of allowed characters

6.3.2 Character Set Information

The interpretation of the contents of this field, if any, is specified by the value of the Character Set Type as described in 6.4 to 6.12.

6.4 CS0 character set

The CS0 character set shall be subject to agreement between the originator and recipient of the medium.

The character set is undefined for interchange. However, the agreed character set can be identified in the Character Set Information, if so desired.

6.5 CS1 character set

The CS1 character set shall be the graphic characters of the character sets specified by the Character Set Information Field.

The Character Set Information Field shall specify one or more escape sequences, to be used in an 8-bit environment according to ISO/IEC 2022 that designate and implicitly invoke graphic character sets specified in ISO/IEC 10646-1. These sequences shall be recorded contiguously from the start of the Field.

6.6 CS2 character set

The CS2 character set shall be the 38 characters in positions 02/14, 03/00 to 03/09, 04/01 to 05/10, and 05/15 of the IRV of ISO/IEC 646.

Note 4 - These characters are: FULL STOP, DIGITS, LATIN CAPITAL LETTERS and LOW LINE.

6.7 CS3 character set

The CS3 character set shall be the 65 characters in positions 02/13 to 02/14, 03/00 to 03/09, 04/01 to 05/10, 05/15, and 06/01 to 07/10 of the IRV of ISO/IEC 646.

Note 5 - These characters are: HYPHEN-MINUS, FULL STOP, DIGITS, LATIN CAPITAL LETTERS, LATIN SMALL LETTERS and LOW LINE.

6.8 CS4 character set

The CS4 character set shall be the 95 characters in positions 02/00 to 07/14 of the IRV of ISO/IEC 646.

6.9 CS5 character set

The CS5 character set shall be the 191 characters in positions 02/00 to 07/14 and 10/00 to 15/15 of Latin Alphabet No. 1 in ISO 8859-1.

6.10 CS6 character set

The CS6 character set shall be the graphic characters of the character sets specified by the Character Set Information Field.

The Character Set Information field shall specify one or more escape sequences according to ISO/IEC 2022 that designate and implicitly invoke the graphic character sets to be used in an 8-bit environment according to ISO/IEC 2022 or ISO/IEC 10646-1. These sequences shall be recorded contiguously from the start of the Field.

6.11 CS7 character set

The CS7 character set shall be the graphic characters of the character sets specified by the Character Set Information Field and code extension characters (see 6.11.1).

The Character Set Information field shall specify one or more escape sequences according to ISO/IEC 2022 that designate and implicitly invoke the graphic character sets to be used in an 8-bit environment according to ISO/IEC 2022 or ISO/IEC 10646-1. These sequences shall be recorded contiguously from the start of the field.

6.11.1 Code extension characters

Characters specified by the CS7 Character Set may include one or more of the following, referred to as code extension characters, to allow alternative character sets to be recorded.

- Escape sequences according to ISO/IEC 2022 or ISO/IEC 10646-1
- Shift functions according to ISO/IEC 2022

6.12 CS8 character set

The CS8 character set shall be the 53 characters in positions 02/01, 02/03 to 02/09, 02/13 to 02/14, 03/00 to 03/09, 04/00 to 05/10, 05/14 to 06/00, 07/11 and 07/13 to 07/14 of the IRV of ISO/IEC 646.

Note 6 - These characters are: EXCLAMATION MARK, NUMBER SIGN, DOLLAR SIGN, PERCENT SIGN, AMPERSAND, APOSTROPHE, LEFT PARENTHESIS, RIGHT PARENTHESIS, HYPHEN-MINUS, FULL STOP, DIGITS, LATIN CAPITAL LETTERS, CIRCUMFLEX ACCENT, LOW LINE, GRAVE ACCENT, LEFT CURLY BRACKET, RIGHT CURLY BRACKET, TILDE.

6.13 Source Name Space specification

The Source or originating system shall indicate the properties of path name information that is associated with a Source file or similar entity by the Field NAME SPACE. In some contexts other Fields may also use the same Name Space information, for example RESOURCE NAME SPACE in the File Set Header. The Name Space specifies the following characteristics of the file name:

- **Path element character set restrictions:** The characters used in the Source file path name shall be contained within this set.
- **Path element length restrictions:** Each element of the path name shall consist of at least one character, and shall not be longer than the number of characters specified.
- **Total path length restriction:** The entire path shall not be longer than the number of characters specified.
- **Path ordering (parent-first or child-first):** For complete paths in hierarchical file systems, if the parent-first path ordering is used, the parent node closest to the root shall be listed first, followed by its immediate child, and proceeding so forth to the path element furthest from the root. If the child-first path ordering is used, the node furthest from the root shall be listed first, followed by its immediate parent, and proceeding so forth to the path element nearest to the root.
- **Case-sensitive:** A CAPITAL LETTER is considered different from the corresponding SMALL LETTER.
- **Case retention:** A CAPITAL LETTER and the corresponding SMALL LETTER are stored and displayed distinctly.
- **Separators:** In the full path name, the separator(s) between any two elements of the path name.
- **Special requirements:** Any other characteristics not reflected above. For example, whether restrictions apply to the character FULL STOP (#2E), regarding its position or frequency of use in a path element name.

6.13.1 Name Space

Name Spaces shall be identified by an unsigned hexadecimal number. The Name Spaces specified by this International Standard are shown in figure 4.

Identifier	Name Space
#00	The NS0 Name Space (see 6.14).
#01	The NS1 Name Space (see 6.15).
#02	The NS2 Name Space (see 6.16).
#03	The NS3 Name Space (see 6.17).
#04	The NS4 Name Space (see 6.18).
#05	The NS5 Name Space (see 6.19).
#FFFFFFC	The NSFC Name Space (see 6.20).
#FFFFFFE	The NSFEE Name Space (see 6.21).

Figure 4 - Defined Name Spaces

6.14 NS0 Name Space

Path element character set restrictions: Characters of the NS0 Name Space path elements shall be members of the CS8 Character Set.

Path element length restrictions: A path element shall contain at most 12 characters. A path element shall not contain more than one FULL STOP. A path element shall contain at most 8 characters before a FULL STOP and at most 3 characters after a FULL STOP. If a path element does not contain a FULL STOP, that path element shall contain at most 8 characters.

Total path length restriction: No total path length restrictions shall apply.

Path ordering: The parent path element(s) of a complete (i.e. not relative) path shall be recorded before the child element.

Case-sensitive: FALSE.

Case retention: FALSE.

Separators: The separator between the first two elements of a complete path shall be COLON. The separator between all subsequent elements of the path shall be SOLIDUS.

Special requirements: A path element shall not contain more than one FULL STOP character. The first element of a complete path shall be a Source volume Name.

Note 7 - This Name Space may be associated with file systems of many personal computers. In some implementations the total path length is restricted to 256 characters, and the use of longer paths may yield unpredictable results. In some implementation the characters represented by #21, #23 to 29, #2D, #2E, #7D and #7E may not be supported, and their use may yield unpredictable results.

6.15 NS1 Name Space

Path element character set restrictions: Bytes #00 and #3A are not allowed for the NS1 Name Space path elements.

Path element length restriction: Each path element shall contain at most 32 characters.

Total path length restrictions: No total path length restrictions shall apply.

Path ordering: The parent path element(s) of a complete path shall be recorded before the child element.

Case-sensitive: TRUE.

Case retention: TRUE.

Separators: The separator between the first two elements of a complete path shall be two adjacent COLONs. The separator between all subsequent elements of the path shall be COLON.

Special requirements: The first element of a complete path shall be a Source volume Name.

6.16 NS2 Name Space

Path element character set restrictions: Characters of the NS2 Name Space path elements shall be represented by any single byte, except #00, #2F, #3A.

Path element length restriction: Each path element shall contain at most 300 characters.

Total path length restrictions: No total path length restrictions shall apply.

Path ordering: The parent path element(s) of a complete path shall be recorded before the child element.

Case-sensitive: TRUE.

Case retention: TRUE.

Separators: The separator between the first two elements of a fully qualified path shall be COLON. The separator between all subsequent elements of the path shall be SOLIDUS.

Special requirements: The first element of a complete path shall be a Source volume Name.

6.17 NS3 Name Space

Path element character set restrictions: Characters of the NS3 Name Space path elements shall be represented by any single byte within one of the following ranges: #01 to #2E, #30 to #39, #3B to #7E.

Path element length restriction: Each path element shall contain at most 255 characters.

Total path length restrictions: No total path length restrictions shall apply.

Path ordering: The parent path element(s) of a complete path shall be recorded before the child element.

Case-sensitive: TRUE.

Case retention: TRUE.

Separators: The separator between the first two elements of a complete path shall be COLON. The separator between all subsequent elements of the path shall be SOLIDUS.

Special requirements: The first element of a complete path shall be a Source volume Name.

6.18 NS4 Name Space

Path element character set restrictions: Characters of the NS4 Name Space path elements shall be represented by any single byte within one of the following ranges: #21 to #2E, #30 to #5B, #5D to #FF.

Path element length restriction: Each path element shall contain at most 300 characters.

Total path length restrictions: No total path length restrictions shall apply.

Path ordering: The parent path element(s) of a complete path shall be recorded before the child element.

Case-sensitive: FALSE.

Case retention: TRUE.

Separators: The separator between the first two elements of a complete path shall be COLON. The separator between all subsequent elements of the path shall be SOLIDUS.

Special requirements: The first element of a complete path shall be a Source volume Name.

6.19 NS5 Name Space

Path element character set restrictions: Characters of the NS5 Name Space path elements shall be represented by any single byte within one of the following ranges: #30 to #39, #40 to #5A, #5E to #60, #7B, #7D to #FF.

Path element length restriction: Each path element shall contain at most 256 characters.

Total path length restrictions: No total path length restrictions shall apply.

Path ordering: The parent path element(s) of a complete path shall be recorded before the child element.

Case-sensitive: FALSE.

Case retention: TRUE.

Separators: The separator between the first two elements of a complete path shall be COLON. The separator between all subsequent elements of the path shall be SOLIDUS.

Special requirements: The first element of a complete path shall be a Source volume Name.

Note 8 - In some implementations the total path length is restricted to 256 characters, and use of longer paths may yield unpredictable results.

6.20 NSFC Name Space

Path element character set restrictions: Characters of the NSFC Name Space path elements shall be represented by any single byte within one of the following ranges: #0 to #2A, #2C to #2D, #2F to #3C, #3E to #5B, #5D to #FF.

Path element length restriction: Each path element shall contain at most 256 characters.

Total path length restrictions: The total path shall contain at most 256 characters.

Path ordering: The child element of a complete path shall be recorded before the parent path element(s).

Case-sensitive: FALSE.

Case retention: TRUE.

Separators: The separator between all path elements shall be FULL STOP.

6.21 NSFEE Name Space

Name Space NSFEE shall be used to indicate that the characteristics associated with the Name Space shall be determined by the Source, and are not specified by this International Standard.

6.22 Strings

A string shall be recorded as a sequence of zero or more non-NULL characters, followed by a NULL character.

6.23 Resynchronization Pattern

The Resynchronization Pattern shall be the two-byte Byte Sequence #A55A.

7 Timestamp

A Timestamp specifies a date and time recorded in the format shown in figure 5. If the Year field has the value 0 the Timestamp shall be ignored; all other Fields in Timestamp shall be set to all ZEROS. Timestamps are established by the originating system and/or the Source. The accuracy of Timestamps is not specified by this International Standard. If a Timestamp is recorded in a Field the Data part of which is longer than 12 bytes, the Timestamp shall be recorded first, and all subsequent bytes shall be recorded as NULL(s).

RBP	Name	Representation
0	Timestamp type and time zone	16-bit integer
2	Year	16-bit integer
4	Month	8-bit integer
5	Day	8-bit integer
6	Hour	8-bit integer
7	Minute	8-bit integer
8	Second	8-bit integer
9	Centisecond	8-bit integer
10	Hundreds of microseconds	8-bit integer
11	Microseconds	8-bit integer

Figure 5 - Timestamp format

7.1 Type and Time Zone (RBP 0)

The most significant 4 bits of this integer, interpreted as a 4-bit number, shall specify the interpretation of the Timestamp.

- the value 0 shall indicate that the Timestamp specifies Coordinated Universal Time, timeZone shall be all ZEROs.
- the value 1 shall indicate that the Timestamp specifies local time.
- the value 2 shall indicate that the interpretation of the Timestamp is subject to agreement between the originator and recipient of the medium.
- no other value shall be recorded.

The least significant 12 bits of this field, interpreted as a signed 12-bit number in TWO’s complement form, shall be interpreted as follows:

- if the value is in the range -1440 to 1440, then the value specifies the offset, in minutes, of the date and time from Coordinated Universal Time.
- if the value is -2047, this shall mean that no such offset is specified.
- no other values shall be recorded.

7.2 Year (RBP 2)

This field shall specify the year as a number in the range 1 to 9999.

7.3 Month (RBP 4)

This field shall specify the month of the year as a number in the range 1 to 12.

7.4 Day (RBP 5)

This field shall specify the day of the month as a number in the range 1 to 31.

7.5 Hour (RBP6)

This field shall specify the hour of the day as a number in the range 0 to 23.

7.6 Minute (RBP 7)

This field shall specify the minute of the hour as a number in the range 0 to 59.

7.7 Second (RBP 8)

If the value of the Type field is 2, then this field shall specify the second of the minute as a number in the range 0 to 60. Otherwise, this field shall specify the second of the minute as a number in the range 0 to 59.

7.8 Centiseconds (RBP 9)

This field shall specify the hundredths of the second as a number in the range 0 to 99.

7.9 Hundreds of microseconds (RBP 10)

This field shall specify the hundreds of microseconds as a number in the range 0 to 99.

7.10 Microseconds (RBP 11)

This field shall specify the microseconds as a number in the range 0 to 99.

8 Requirements for a standard for recording

The media for recording shall meet the following requirements of a standard for recording.

The standard for recording shall specify:

- a unique address for each sector;
- the length of each sector;
- the means for determining whether a sector is rewritable or not;
- for media where sectors may only be recorded once, a means for detecting whether a sector has not yet been recorded;
- whether sectors or groups of sectors may require pre-processing prior to recording;
- a method for recording and detecting file marks, if file marks are supported.

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

9 Cyclic Redundancy Check (CRC)

A Cyclic Redundancy Check (CRC) as specified in this standard, where implemented, shall be computed in accordance with ITU Rec. X.25. CRC shall use the generating polynomial $x^{32} + x^{26} + x^{23} + x^{22} + x^{16} + x^{12} + x^{11} + x^{10} + x^8 + x^7 + x^5 + x^4 + x^2 + x + 1$. CRC shall use the seed value -1. CRC generates a 32-bit output.

10 Organization of Information on a Volume

10.1 Recording of Sectors

The physical sectors of a Volume shall be organized into logical Sectors of equal length. Sectors shall have a length of 2^{n+8} bytes, where n is a positive integer (i.e. Sector lengths of 512, 1024, 2048, 4096, ...). Each Sector of a Volume shall be identified by a unique Sector Number. Sector Number 0 shall be assigned to the Sector at the start of the Volume Header. This is not necessarily the sector with the lowest physical address of the partition.

10.2 Organization of a Volume

A Volume is a set of Sectors. The lowest numbered Sectors of the Volume, referred to as the Volume Preamble, shall contain only a Volume Header and zero or more File Set Continuation Headers. The remaining Sectors of the Volume, up to, but not including, the Volume Postamble, shall be referred to as the Volume Data Space of the Volume. Volume Data Space shall consist of File Sets (see clause 11) and, optionally, Volume Indices (see 13.5).

The Volume Postamble may contain one File Set Subindex and/or one Volume Set Subindex. If it contains both, the File Set Subindex shall precede the Volume Set Subindex. The Volume Postamble shall end with the Volume Terminator. The Volume Terminator shall be either a Volume Trailer, the physical end-of-partition, or the end of recorded data, which ever occurs at the lower numbered Sector. No more than one Volume shall be recorded in one physical partition.

Note 9 - Because a Volume, as specified by this International Standard, need not be located at the physical start of the partition, a Volume may be preceded by other information. The presence of such prefixed information is restricted to media at Level 2 of medium interchange (see 14.3.2).

Figure 6 summarizes the requirements for recording Volumes.

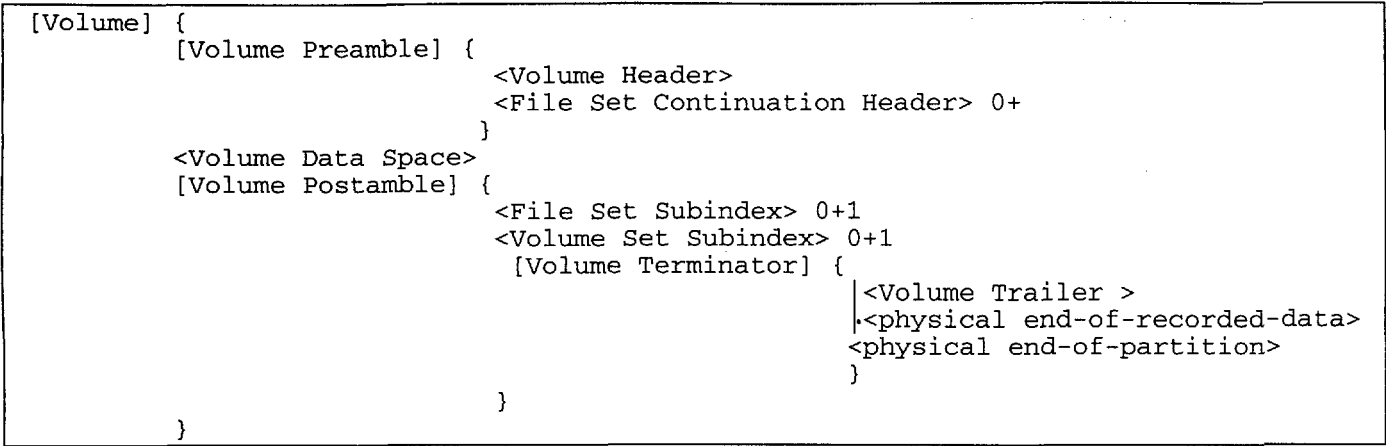


Figure 6 - Schema for Volumes

10.3 Volume Sets

A Volume Set shall consist of one or more Volumes having a Volume Set Label common to all Volumes.

The Volumes in a Volume Set shall be numbered ordinally (1, 2, 3, ..., n), their numbers constitute their Volume Set Sequence Numbers. All occurrences of Volume Set Time within a Volume Set shall be equivalent. The ordered concatenation of the Volume Data Spaces of the Volumes of a Volumes Set constitutes the Volume Set Data Space.

Note 10 - Volumes within a Volume Set may be of different physical media types.

File Set(s) shall be recorded within the Volume Set Data Space of a Volume Set. A Volume Index is optional, but if present shall be recorded within the Volume Set Data Space, immediately following a File Set.

Figure 7 summarizes the requirements for recording Volume Set Data Space.

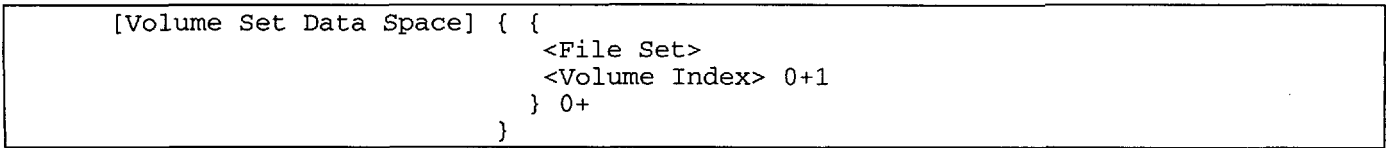


Figure 7 - Schema for Volume Set Data Space

Figure 8 to figure 10 show examples of the layout of the Volume organization.

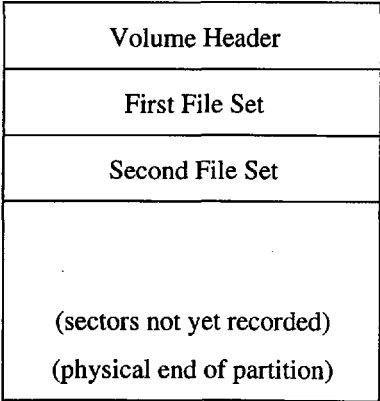


Figure 8 - Simplified view of a Volume

Two File Sets are recorded on the Volume, further File Sets can be appended.

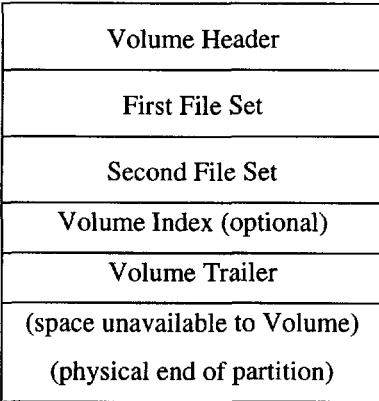
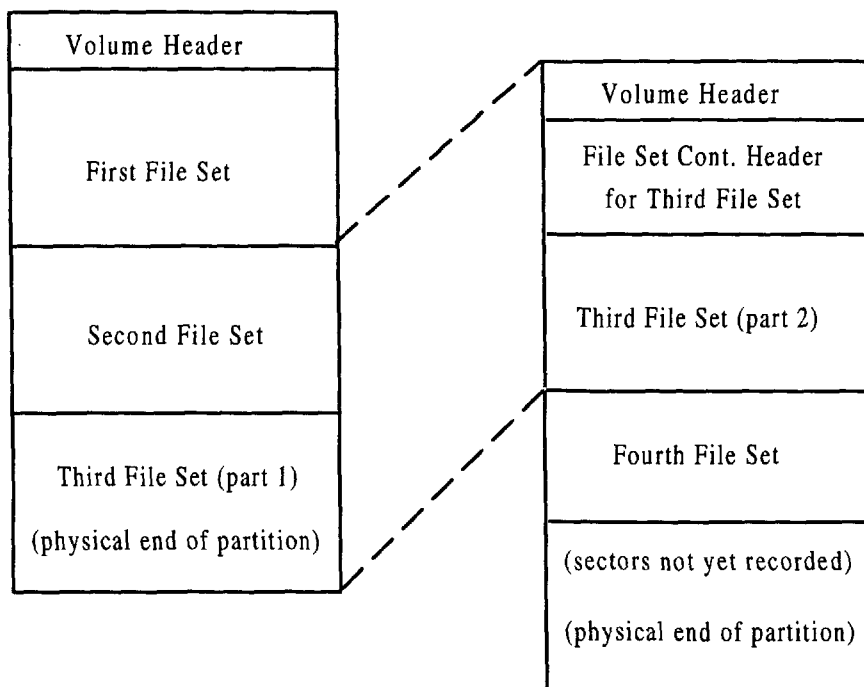


Figure 9 - Simplified view of a Volume

Two File Sets are recorded on the Volume, no further File Sets can be appended without overwriting the Volume Trailer.



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Figure 10 - Simplified view of a Volume Set, the Third File Set of which spans from one Volume to the next.

10.4 Recording of Fields

All data in the Volume, except for Streams (see 13.15.6), shall be expressed in Fields. A Field shall consist of a Field Identifier (FID) (see annex A), and may contain a Data Length part and a Data part.

Certain FIDs specify the length of the data implicitly, in which case the Data Length part shall be omitted. For all other FIDs, the Data Length part shall be present immediately after the FID. If data is present in the Field, the Data part of the Field shall immediately follow the Data Length part if present, or shall follow the FID if the Data Length part is omitted. The formal definition of each type of Field is specified in annex C.

FID	Data length	Data
-----	-------------	------

Figure 11 - Parts of a Field

Fields contained in Buffer(s) shall have both their FID and Data length part recorded entirely within a single Buffer.

10.4.1 NULL Field

The NULL Field shall consist only of its FID which consists of the single byte #00. It has no meaning, and functions merely as a placeholder.

10.5 Recording of Field Tables

A Field Table is a sequence of Fields. All Fields shall be recorded in Field Tables, except when the Null Field is used as Blank Space (see 13.3). A Field Table shall start and end with Fields identified by the same FID. The Data part of the first Field shall consist of the Resynchronization Pattern. The Data part of the last Field shall either contain CRC bits or be empty, as indicated by the Data Length part of this last Field. This Field shall not appear elsewhere in the Field Table. Each Field Table is given the name of its first Field. If the OFFSET TO END Field is included in a Field Table, it shall be the second Field.

Any set of Fields specified as an Iterated Field Set may be repeated within the Field Table. Each iteration is identified by the first Field listed in the Iterated Field Set.

Except for the first and last Field, OFFSET TO END, and any restrictions on Iterated Field Sets, or otherwise specified, Fields may be in any order within the Field Table; they need not be in the order shown in examples.

If the CRC bits are computed, they shall be calculated over the whole Field Table, except the last Field.

10.6 Recording of Buffers

All information recorded in a Volume, except

Volume Header
File Set Continuation Header(s)
File Set Header(s)
File Set Trailer(s)
file mark(s)
and Volume Trailer

shall be recorded within Buffers. A Buffer is a set of one or more contiguous Sectors. Buffers shall begin and end at Sector boundaries. A Buffer shall begin with a Buffer Header Field Table immediately followed by one of the following types of data: File, File Set Index, File Set Subindex, Volume Index, Volume Subindex, or implementation-use. If the above data does not occupy the entire Buffer, the remainder shall be padded with Blank Space (see 13.3).

The part of the Buffer between the Buffer Header and any ending Blank Space shall be referred to as Buffer Data Space.

A Buffer shall be contained entirely within one Volume. If a Buffer cannot be recorded in its entirety within the remaining space of a Volume, it shall be recorded again in its entirety on the next Volume of the Volume Set immediately after the Volume Preamble of the next Volume (see 11.2). A Buffer shall not be repeated in any other instance.

Figure 12 summarizes the requirements for recording Buffers.

```
[Buffer] {
  <Buffer Header>
  [Buffer Data Space] {
    [File Data Space] {
      [File Continuation Space] {
        <File Continuation Header>
        <File data>
          } 0+1
      [File Space] {
        <File Header>
        <File data>
          } 0+
      }
    [Volume or File Set (Sub) Index Data] |
    [implementation use] |
  }
  <Blank Space> 0+1
}
```

Figure 12 - Schema for a Buffer

10.7 Recording of file marks

The use of file marks shall be specified for each Volume by the Volume Header. The FILE MARK USAGE Field of the Volume Header specifies whether file marks shall be recorded

- before File Set Headers (see 11.1), except those that immediately follow either the Volume Preamble or other File Set Header(s) that immediately follow the Volume Preamble, and/or
- before File Set Trailers (see 11.1), and/or
- at specified regular intervals (see annex C: FILE MARK INTERVAL).

Once established by the originating system which records the Volume Header, file mark usage shall be maintained by any system(s) that record subsequent data in the Volume.

A file mark shall occupy one Sector. Contiguous file marks shall not be recorded. Other types of media marks, for example set marks, shall not be recorded. A file mark shall not be recorded within a Volume in any location other than those locations specified in the FILE MARK USAGE Field of the Volume Header.

11 Organization of Information within a File Set

11.1 Organization of a File Set

This International Standard specifies a recording methodology for information interchange and secondary data storage. As such, the data recorded in a File Set may be considered a representation of information of all or part of a primary storage file system, referred to as the Source. Any group of Files from a single Source may be recorded together as a File Set. A File Set shall reside within the Volume Set Data Space. A File Set shall begin with a File Set Preamble, contain zero or more Buffers, and end with a File Set Postamble.

The File Set Preamble shall contain only the File Set Header, and a file mark when required by the Volume Header, as specified in 10.7.

The Volume Header of the Volume containing the start of the File Set Postamble shall specify whether a file mark is to be recorded before the File Set Trailer. If so, the Postamble shall begin with a file mark and the File Set Trailer shall be recorded in the next Sector of the Volume. If not, the Postamble shall begin with the File Set Trailer. The File Set Postamble shall contain nothing after the File Set Trailer, unless the File Set Header specifies that a File Set Index shall be recorded. In this case the File Set Index shall be recorded, within Buffer(s), in the next Sectors of the Volume Set Data Space. If the end of the Volume Data Space containing the File Set Trailer is encountered before the remainder of the File Set Postamble (i.e. File Set Index Buffers) can be completely recorded, the Volume Data Space shall span onto the next Volume in the Volume Set. In that case, the remainder of the File Set Postamble shall be recorded at the beginning of the next Volume Data Space, immediately after its Volume Preamble.

Figure 13 summarizes the requirements for recording File Sets.

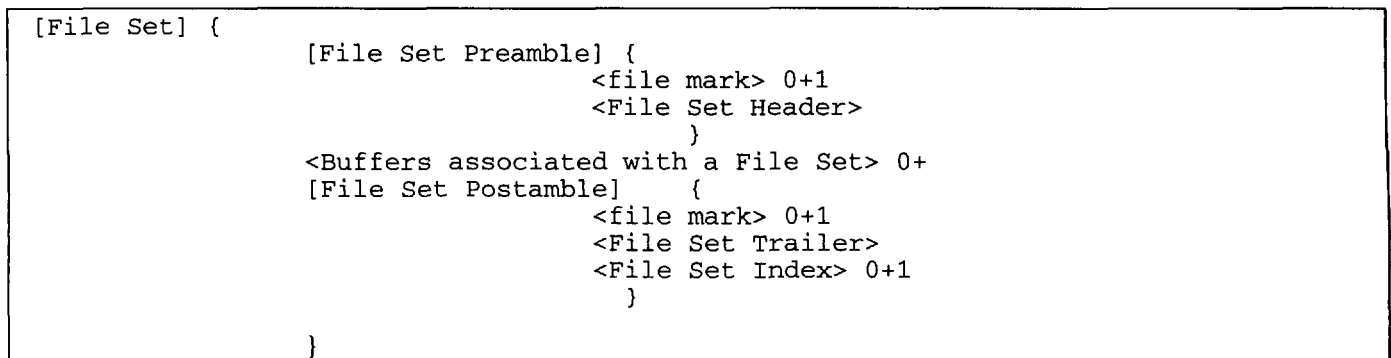


Figure 13 - Schema for File Sets

File Set Indices are optional. A File Set Index shall list all Files contained in the File Set, with their Volume and Sector Number. The File Set Index shall be contained within one or more Buffers.

File Sets that span multiple Volumes shall meet the requirements of 11.2. A File Set Preamble, the File Set Buffer(s) and the File Set Postamble need not be physically adjacent to each other. This allows interleaving of different File Sets.

A File Set Header, Continuation Headers, Buffers and Trailer shall all have the same File Set ID, File Set Time, File Set Label, Source Name Type, Source Name, Source operating system, and Source operating system version information, if recorded. If one or more Registered Identifiers are recorded in a File Set Header, they shall be re-recorded in all File Set Continuation Headers of that File Set.

Figures 14 and 15 show examples of the layout of the File Set organization.

Volume Header
First File Set Header
First File Set Buffers
First File Set Trailer
Second File Set Header
Second File Set Buffers
Second File Set Trailer
Second File Set Index (optional)
(sectors not yet recorded)
(physical end of partition)

Figure 14 - Simplified view of a Volume containing two File Sets

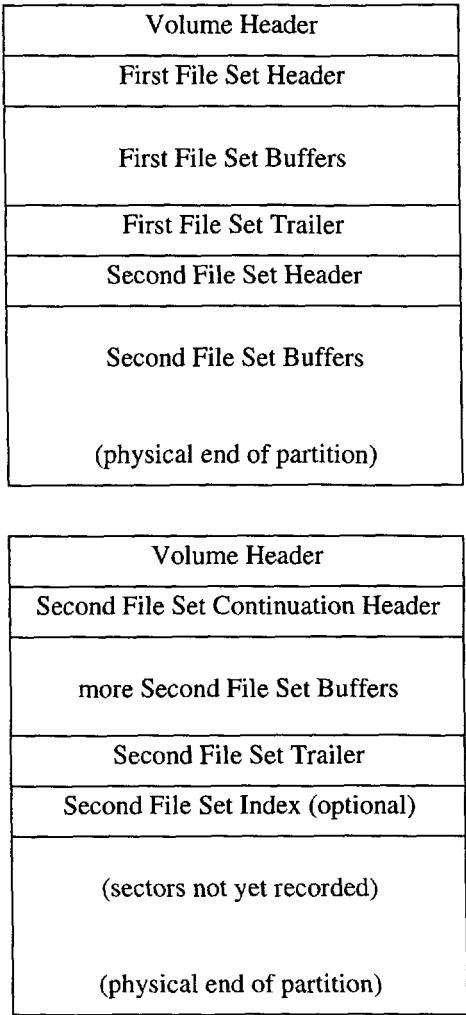


Figure 15 - Simplified view of a Volume Set containing two File Sets. The second File Set spans from the first Volume to the second Volume.

11.2 File Sets spanning multiple Volumes

A File Set shall be considered to span multiple Volumes if parts of the File Set are recorded on two or more Volumes of a Volume Set.

The Volume Set Sequence Numbers of all Volumes of the File Set shall form a consecutive ascending sequence. If the originating system deems that a Buffer of a File Set could not be written in its entirety before the end of a Volume, the entire Buffer shall be recorded immediately after the Volume Preamble of the Volume having the next greater Volume Set Sequence Number.

Note 11 - In case of spanned Volumes a Buffer may be completely duplicated on the next Volume. The BUFFER SEQUENCE is the same in both instances. In this case the Buffer on the previous Volume is ignored.

A File Set Continuation Header shall be recorded within the Volume Preamble of all Volumes of the Volume Set after the Volume containing the File Set Header, up to and including the Volume containing the last Sector of the File Set Postamble.

11.3 Interleaving

Interleaving of File Set Preambles, File Set Postambles and File Set Buffers from different File Sets within the Volume Data Space is allowed. The FILE SET ID in each of these File Set entities indicates the File Set to which the entity belongs. The elements within each of these entities shall be logically contiguous.

The Buffers of a Volume Index shall be logically contiguous. A Volume Index shall be logically contiguous with the File Set Postamble that precedes it.

BUFFER SEQUENCE numbers shall be increased on an intra-File Set basis. Thus the interleaving of Buffers from other File Sets does not affect the BUFFER SEQUENCE numbers within a File Set. BUFFER ADDRESSES shall be maintained on an inter-File Set basis. Thus the interleaving of Buffers from other File Sets affects the addresses of subsequent Buffers of all File Sets.

Once a File Set Header has been recorded, the File Set shall be considered pending until the File Set Postamble is recorded. If any interleaved File Sets are pending in a Volume, File Set Continuation Headers for all such File Sets shall be recorded in the Volume Preamble of the next Volume of the Volume Set immediately following the Volume Header.

If a File Set has a File Set Index recorded, the Index shall be recorded immediately after the File Set Trailer within the Volume Set Data Space. Thus, no interleaving occurs within a File Set Postamble.

12 Organization of information within a File

Files and their Headers are contained within Buffer Data Space. A File shall consist of File Information and File Data, pertaining to a single entity from the Source. Each File shall be preceded by a File Header which specifies the type of file and the number of bytes of the File contained in the current Buffer. If the File does not fit entirely within a Buffer, it shall continue in the Buffer Data Space of the subsequent Buffer. In that Buffer, after the Buffer Header, a File Continuation Header shall be recorded, followed by more data of the File. This shall continue as needed until the entire File is recorded.

File Information shall be recorded as a single Field Table, specifying the attributes of the File. File Data (see 13.15) shall be recorded as a series of Field Tables, including path, characteristics, and the various Streams of the File. Additional Field Tables associated with the File may be recorded within the File Data.

Figure 16 summarizes the requirements for recording Files.

```
[File] {
    <File Information>
    [File Data] {
        <Header>
        <Path>
        <Characteristics>
        [Additional information associated with File] {
            [Stream]
                {
                    <Stream Header>
                    <Stream>
                    <Stream Trailer>
                }
            | <non-Stream information associated with
File>
                } 0+
        <Trailer>
    }
}
```

Figure 16 - Schema for Files

13 Field Table description

Field Tables consist of a number of mandatory Fields and any number of additional Fields deemed necessary for the application considered. In the following description, the mandatory Fields are specified. An example of a Field Table with additional Fields is given for illustration purposes. For each Field is indicated whether it is mandatory (Yes), not mandatory (No), or mandatory depending on a condition (Cond.).

13.1 Volume Header Field Table

In each Volume, the Volume Header Field Table is mandatory and shall be recorded beginning at the start of the first Sector of the Volume. This Sector need not be physically the first sector in the media partition. The Sector in which the Volume Header begins shall have Sector Number 0. If the Volume Header Field Table does not end exactly at a Sector boundary, the unused part of its last sector shall be padded with Blank Space.

The following ten Fields are mandatory in the Volume Header Field Table:

- VOLUME HEADER
- OFFSET TO END
- FORMAT VERSION
- SECTOR SIZE
- VOLUME SET TIME
- VOLUME TIME
- VOLUME SET LABEL
- VOLUME SET SEQUENCE
- VOLUME INDEX REQUIRED
- FILE MARK USAGE

If bit b2 in FILE MARK USAGE is set to ONE, signifying that file marks are to be used at regular intervals, the FILE MARK INTERVAL Field shall be present.

Figure 17 shows an example of a Volume Header Field Table.

Field Name	FID	Mandatory	Data Description
VOLUME HEADER	#808000	Yes	Resynchronization Pattern
OFFSET TO END	#01	Yes	Bytes from start of next Field to start of last Field
FORMAT NAME	#8052	No	The bytes sequence "SIDF"
FORMAT VERSION	#8062	Yes	Major, minor and subminor version number
SECTOR SIZE	#80800E	Yes	512, 1024, 2048, 4096, ... bytes
VOLUME SET TIME	#80F400	Yes	Timestamp of Volume Set creation
VOLUME TIME	#80F401	Yes	Timestamp of Volume creation
CHAR SPEC	#808040	No	Character type specification
REGISTERED IDENTIFIER	#808043	No	ID for extension to Standard, scope: this Volume
VOLUME SET LABEL	#808030	Yes	User-defined string, same for all Volumes in Set
VOLUME SET SEQUENCE	#80F100	Yes	Position of Volume within the Volume Set (1,2,3 ...)
CHAR SPEC	#808040	No 1)	Character type specification
VOLUME SET ALIAS	#808041	No 1)	User-defined string
VOLUME LABEL	#808027	No	Implementation use string
PARTITION NUMBER	#808012	No	Physical partition number of this Volume
VOLUME SIZE	#80F201	No	Capacity in sectors of the Volume (informative)
VOLUME INDEX REQUIRED	#80802F	Yes	Whether Volume Index is always at EOD
VOLUME INDEX LOCATION	#808042	No	Sector Number of last Volume Index on Volume
FILE MARK USAGE	#808020	Yes	Where file marks are recorded
FILE MARK INTERVAL	#808028	Cond.	Sectors between file marks recorded at regular intervals
VOLUME HEADER WRITE COUNT	#80F104	No	Number of times a Volume Header has been written to this physical partition.
AUTHENTICATION	#8002	No	Volume password
EXPIRATION TIME	#80F404	No	Timestamp of Volume expiration (informative)
DEVICE INFO	#808032	No	User-defined string
VOLUME HEADER	#808000	Yes	CRC value or empty

Note to figure 17

- 1) These Fields form an Iterated Field Set. This set may be used to specify zero or more VOLUME SET ALIASes which may utilize differing Character Specifications. It is recommended that the use of VOLUME SET ALIASes be consistent across a Volume Set.

Figure 17 - Example of a Volume Header Field Table

13.2 Volume Trailer Field Table

In each Volume, the Volume Trailer Field Table is not mandatory. If a Volume Trailer is recorded, then its last sector shall be (by definition) the last SIDF-defined sector in the partition. If the Volume Trailer Field Table does not end exactly at a Sector boundary, the unused part of its last sector shall be padded with Blank Space.

The VOLUME TRAILER Field is the only mandatory Field of the Volume Trailer Field Table. Figure 18 shows an example of a Volume Trailer Field Table.

Field Name	FID	Mandatory	Data Description
VOLUME TRAILER	#808003	Yes	Resynchronization Pattern
CLOSE TIME	#80F402	No	Timestamp when Volume Trailer written
VOLUME TRAILER	#808003	Yes	CRC value or empty

Figure 18 - Example of a Volume Trailer Field Table

13.3 Blank Space Field Table

In each Volume, the Blank Space Field Table is not mandatory. If present, it shall be used, space permitting:

- after all Field Tables not contained in Buffers, to pad to the next sector boundary, and
- at the end of Buffers.

The BLANK SPACE Field and the OFFSET TO END Field are mandatory in the Blank Space Field Table. The only additional Field allowed in the Blank Space Field Table is the NULL Field. Figure 19 shows an example of a Blank Space Field Table.

Field Name	FID	Mandatory	Data Description
BLANK SPACE	#808019	Yes	Resynchronization Pattern
OFFSET TO END	#01	Yes	Bytes from start of next Field to start of last Field
NULL Field	#00	Cond.	Empty
BLANK SPACE	#808019	Yes	CRC value or empty

Figure 19 - Example of a Blank Space Field Table

13.4 Buffer Header Field Table

In each Volume, the Buffer Header Field Table is mandatory and shall be recorded at the start of each Buffer, it specifies characteristics of that Buffer. The following six Fields are mandatory in the Buffer Header Field Table:

BUFFER HEADER
OFFSET TO END
BUFFER TYPE
BUFFER SIZE
BUFFER SEQUENCE
UNUSED IN THIS BUFFER

If the BUFFER TYPE Field is set to File, the Buffer Header Field Table shall contain the BUFFER ADDRESS Field.

If the BUFFER TYPE Field is set to either File, or File Set (Sub)Index, the Buffer Header Field Table shall contain the FILE SET ID Field and the FILE SET TIME Field.

The BUFFER SIZE shall be no larger than the length specified by BUFFER SIZE in the File Set Header.

The BUFFER SEQUENCE Field shall be set to 1 for the first Buffer of the File Set following the File Set Header. The BUFFER SEQUENCE Field shall be increased by 1 for each subsequent Buffer of that File Set except in the following case: if the originating system deems that a Buffer cannot be recorded in its entirety before the end of the Volume, the Buffer shall be recorded in its entirety at the start of the Volume Set Data Space of the next Volume in the Volume Set (see 11.2). Nothing shall be recorded in a Volume Data Space before a Buffer that is repeated.

If a File Set (Sub)Index exists for the File Set, the BUFFER SEQUENCE Field shall be further increased by 1 for each Buffer of the (Sub)Index. If a File Set Buffer follows a File Set Subindex, the BUFFER SEQUENCE Field shall be further increased by 1 for each File Set Buffer.

If the BUFFER TYPE Field is set to Volume (Sub)Index, it shall be associated only with any other Buffers containing data from the same Volume (Sub)Index, by satisfying the following requirements.

- The BUFFER SEQUENCE Field shall be set to 1 for the first Buffer of the Volume (Sub)Index. Each subsequent Buffer of that Volume (Sub)Index shall contain a BUFFER SEQUENCE Field increased by 1.
- The BUFFER ADDRESS, FILE SET ID, FILE SET TIME, FILE SET LABEL, SOURCE NAME TYPE, SOURCE NAME, SOURCE OPERATING SYSTEM, and SOURCE OPERATING SYSTEM VERSION Fields shall not be present.

Figure 20 shows an example of a Buffer Header Field Table.

Field Name	FID	Mandatory	Data Description
BUFFER HEADER	#05	Yes	Resynchronization Pattern
OFFSET TO END	#01	Yes	Bytes from start of next Field to start of last Field
BUFFER TYPE	#60	Yes	Buffer data type (File, File Set Index ...)
BUFFER SIZE	#06	Yes	Buffer size in bytes, incl. Buffer Header
BUFFER SEQUENCE	#07	Yes	Buffer Sequence number within File Set or Volume Index
BUFFER ADDRESS	#08	Cond.	Number of sectors counting from File Set (Sub) Header
BUFFER CRC	#8008	No	CRC, not including Buffer Header
UNUSED IN THIS BUFFER	#8000	Yes	Length of unused Blank Space
FILE SET ID	#8072	Cond.	ID of associated File Set and Buffer(s)
FILE SET TIME	#80F403	Cond.	Timestamp in Buffer of File Set
FILE SET LABEL	#808005	No	User-defined label of File Set
ORIGINATING SYSTEM SOFTWARE NAME	#808006	No	Originating application name string
ORIGINATING SYSTEM SOFTWARE TYPE	#808007	No	Originating application type string
ORIGINATING SYSTEM SOFTWARE VERSION	#808008	No	Originating application version string
SOURCE NAME TYPE	#8009	No	Source naming convention type
SOURCE NAME	#02	No	Source name string
SOURCE OPERATING SYSTEM	#03	No	Source operating system string
SOURCE OPERATING SYSTEM VERSION	#04	No	Source operating system version string
VOLUME SET TIME	#80F400	No	Timestamp of Volume Set creation
VOLUME SET LABEL	#808030	No	User-defined string
VOLUME SET SEQUENCE	#80F100	No	Volume position within Volume Set
BUFFER HEADER	#05	Yes	CRC value or empty

Figure 20 - Example of a Buffer Header Field Table

13.5 Volume Index Field Table

In each Volume, the Volume Index Field Table is not mandatory. If present, it shall be recorded within the Volume Set Data Space immediately after a File Set Postamble. A Volume Index stores information about File Sets previously recorded in the Volume or Volume Set. The VOLUME INDEX and NUMBER OF FILE SETS Fields are mandatory in Volume Index Field Tables.

If NUMBER OF FILE SETS is greater than 0, the following eleven additional Fields are also mandatory in the Volume Index Field Table for each File Set:

FILE SET ID
FILE SET TIME
FILE SET LABEL
SOURCE NAME TYPE
SOURCE NAME
SOURCE OPERATING SYSTEM
SOURCE OPERATING SYSTEM VERSION
FSH VOLUME SET SEQUENCE
FILE SET HEADER LOCATION
FST VOLUME SET SEQUENCE
FILE SET TRAILER LOCATION

A Volume Index is optional. If a Volume Index Field Table is written it shall conform to the following requirements.

- A Volume Index Field Table shall be contained in one or more Buffers, which are referred to below as the Volume Index Buffer(s). If the Volume Index Field Table is too large to fit into a single Buffer, it shall be continued into subsequent Buffer(s) which shall be recorded contiguously within the Volume Set Data Space.
- If VOLUME INDEX REQUIRED is set to a bit pattern other than all ZEROs in the Volume Header Field Table, and the Volume is not full, a Volume Index Buffer shall be the last information recorded in the Volume. If VOLUME INDEX REQUIRED is set to all ZEROs, Volume Indices may still be recorded in the location(s) specified above.
- A Volume Index Field Table shall reference all File Sets wholly or partially contained previously in the Volume, and may reference any File Set contained previously in the Volume Set.
- A Volume Index Field Table shall contain all of the File Set-specific information contained in all previous Volume Indices of the Volume.
- The Fields of a Volume Index Field Table shall be associated with either the Volume Index Field Table in general, or a specific File Set. Fields recorded before the first instance of the FILE SET ID Field shall be associated with the Volume Index Field Table in general. Fields in the Table, except the last Field, recorded after the n -th instance of the FILE SET ID Field, shall be associated with the n -th File Set referenced by the Volume Index Field Table.
- The NUMBER OF FILE SETS Field shall specify the number of times that the Iterated Field Set is repeated. An Iteration shall include all Fields starting with the FILE SET ID Field and ending immediately before another occurrence of the FILE SET ID Field or the final VOLUME INDEX Field. All Fields, including non-required Fields, within the n th Iteration shall reference the File Set specified by the n th occurrence of the FILE SET ID Field.
- File Set-specific Iterated Field Sets shall be recorded in the order that their File Set Trailers are recorded within the Volume Set.

Figure 21 shows an example of a Volume Index Field Table.