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Information technology — Volume and file structure of read-only and write-once compact disk media for information interchange —

Part 1: General

Technologies de l'information — Structure de volume et de fichier de supports disque compact à lecture seule et à écriture unique pour l'échange d'information —

Partie 1: Généralités

Reference number
ISO/IEC 13490-1:1995(E)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialised system for worldwide standardisation. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organisation to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organisations, 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 13490 was prepared by the European Association for Standardizing Information and Communication Systems, ECMA, (as ECMA-168) 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.

ISO/IEC 13490 consists of the following parts, under the general title *Information technology – Volume and file structure of read-only and write-once compact disk media for information interchange*

- *Part 1*: *General*
- *Part 2*: *Volume and File Structure*

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Introduction

ISO/IEC 13490 can be used for both CD-ROM and CD-WO media for interchanging files. ISO/IEC 13490 is an enhancement of ISO 9660 for CD-ROM applications that has eliminated several restrictions and performance problems of ISO 9660.

ISO/IEC 13346 and ISO/IEC 13490 follow the same volume and file structure framework. ISO/IEC 13490 has common definitions with ISO/IEC 13346 regarding volume and boot block recognition, file attributes, registration procedures and record structure.

ISO/IEC 13490 is published in two parts. Part 1 - General - specifies references, definitions, notations and basic structures used in the other part. Part 2 - Volume and File Structure - specifies how to record various volume-related entities such as volumes and volume sets, and how to record and interpret files, both file data and file attributes, and file hierarchies within a volume set.

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Information technology - Volume and file structure of read-only and write-once compact disk media for information interchange -

Part 1:
General

1 Scope

ISO/IEC 13490 specifies a format and associated system requirements for volume and boot block recognition, volume structure, file structure and record structure for the interchange of information between users of information processing systems using CD-WO (a write-once compact disk medium), hybrid CD-WO (a write-once compact disk with a read-only area) and CD-ROM disks.

NOTE 1 — CD-WO is an evolution of CD-ROM technology which allows the recording of information on a write-once compact disk medium.

The volume and boot block recognition is specified in ISO/IEC 13346-2. The record structure is specified in ISO/IEC 13346-5.

NOTE 2 —A volume set may be recorded that is in conformance with both ISO 9660 and ISO/IEC 13490. ISO/IEC 13490 is an enhancement of ISO 9660. ISO/IEC 13490 allows greater information interchange using CD-ROM. In addition, it supports incremental recording and updating of information stored on a CD-WO disk. Under certain restrictions (see 2/B.2.1), all of the files may be read by both a receiving system conforming to ISO 9660 and by a receiving system conforming to ISO/IEC 13490.

This part of ISO/IEC 13490 specifies references, definitions, notation and basic structures that apply to ISO/IEC 13490-2.

2 Parts references

The first digit of a reference in ISO/IEC 13490 identifies the part. If the digit is preceded by "R", the reference is to a part and clause of ISO/IEC 13346. For example, 2/5 refers to clause 5 in ISO/IEC 13490-2 and R2/5 refers to clause 5 in ISO/IEC 13346-2. If the reference is preceded by "figure", the reference is to a figure. For example, figure 2/5 refers to figure 5 in ISO/IEC 13490-2. If the reference is preceded by "table", the reference is to a table. For example, table 2/5 refers to table 5 in ISO/IEC 13490-2.

3 Conformance

3.1 Conformance of a medium

A medium shall be in conformance with ISO/IEC 13490 when it conforms to a standard for recording (see 1/5.13) and all information recorded on it conforms to the specifications of ISO/IEC 13490, ISO/IEC 13346-2 and ISO/IEC 13346-5, or to ISO/IEC 13490 and ISO/IEC 13346-2. A statement of conformance shall identify the parts of ISO/IEC 13346, and the levels of medium interchange (see R2/10 and 2/16) to which the contents of the medium conform.

3.2 Conformance of an information processing system

An information processing system shall be in conformance with ISO/IEC 13490 if it meets the requirements specified in ISO/IEC 13490, ISO/IEC 13346-2 and ISO/IEC 13346-5, or in ISO/IEC 13490 and ISO/IEC 13346-2 either for an originating system (see R2/12, 2/18 and R5/11) or for a receiving system (see R2/13, 2/19 and R5/12) or for both types of system. A statement of conformance shall identify the parts of ISO/IEC 13346 and the levels of the requirements for the parts of ISO/IEC 13346 and ISO/IEC 13490 which can be met by the system.

4 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 13490. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 13490 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.

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ISO/IEC 646:1991, *Information technology — ISO 7-bit coded character set for information interchange.*

ISO/IEC 2022:1994, *Information technology — Character code structure and extension techniques.*

ISO/IEC 6429:1992, *Information technology — Control functions for coded character sets.*

ISO 8859-1:1987, *Information processing — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No. 1.*

ISO 9660:1988, *Information processing — Volume and file structure of CD-ROM for information interchange.*

ISO/IEC 9945-1:1990, *Information technology — Portable Operating System Interface (POSIX) — Part 1: System Application Program Interface (API) [C Language].*

ISO/IEC 10149:1995, *Information technology — Data interchange on read-only 120 mm optical data disks (CD-ROM).*

ISO/IEC 10646-1:1993, *Information technology — Universal Multiple-Octet Coded Character Set (UCS) — Part 1: Architecture and Basic Multilingual Plane.*

ISO/IEC 13346-2:1995, *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.*

ISO/IEC 13346-5:1995, *Information technology — Volume and file structure of write-once and rewritable media using non-sequential recording for information interchange —Part 5: Record structure.*

ISO/IEC 13490-2:1995, *Information technology – Volume and file structure of read-only and write-once compact disk media for information interchange — Part 2: Volume and file structure.*

ISO/IEC 13800[1)], *Information technology – Procedure for the registration of identifiers and attributes for volume and file structure.*

IEC 908:1987, *Compact disc digital audio system.*

5 Definitions

For the purposes of ISO/IEC 13490, the following definitions apply.

[1)] To be published

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

5.2 byte: A string of eight binary digits operated upon as a unit. If the standard for recording (see 1/5.13) specifies that the container for the recording of a byte has more than eight bits, a byte shall be recorded in the least significant eight bits of the container with the remaining bits of the container set to ZERO.

5.3 CD-ROM: A read-only compact disk (see 1/5.5).

5.4 CD-WO: A write-once compact disk (see 1/5.5) that conforms to a standard for recording (see 1/5.13).

5.5 compact disk: An optical disk that is recorded according to IEC 908 and ISO/IEC 10149.

5.6 descriptor: A structure containing descriptive information about a volume or a file.

5.7 file: A collection of information.

5.8 implementation: A set of processes which enable an information processing system to behave as an originating system, or as a receiving system, or as both types of system.

5.9 originating system: An information processing system which can create a set of files on a volume set for the purpose of data interchange with another system.

5.10 receiving system: An information processing system which can read a set of files from a volume set which has been created by another system for the purpose of data interchange.

5.11 record: A sequence of bytes treated as a unit of information.

5.12 sector: The data field of an addressable part of the medium that can be accessed independently of other addressable parts of the medium as specified in the standard for recording (see 1/5.13).

5.13 standard for recording: A standard that specifies the recording method and the addressing method for the information recorded on a medium. Annex A of ISO/IEC 13490-2 specifies the restrictions on a standard for recording that are relevant for ISO/IEC 13490.

The standard for recording used in conjunction with ISO/IEC 13490 is subject to agreement between the originator and recipient of the medium.

5.14 user: A person or other entity (for example, an application) that causes the invocation of the services provided by an implementation.

5.15 volume: A sector address space as specified in the standard for recording (see 1/5.13).

NOTE 3 — A medium usually has a single set of sector addresses, and is therefore a single volume. A medium may have a separate set of addresses for each side of the medium, and is therefore two volumes.

5.16 volume set: A collection of one or more volumes with identical volume set identification.

6 Notation

The following notation is used in ISO/IEC 13490.

6.1 Numerical notation

6.1.1 Decimal notation

Numbers in decimal notation are represented by decimal digits.

6.1.2 Hexadecimal notation

Numbers in hexadecimal notation are represented as a sequence of one or more hexadecimal digits prefixed by "#":

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

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6.2 Bit fields

Certain fields containing an integral value, or parts of fields containing an integral value, are intended to be interpreted as an array of bits. This array of bits shall be referred to as a bit field.

Bit positions within an *n* bit field are numbered such that the least significant bit is numbered 0 and the most significant bit is numbered *n-1*.

6.3 Descriptor formats

Descriptor formats shall be specified by a table specifying the location, length, name and contents of each field. The interpretation of each field shall be given in the prose associated with the table.

Table 1 - Example descriptor format

Byte position	Length in bytes	Name	Contents
0	4	Data Length (=D_L)	`Uint32` (1/7.1.5)
4	32	Application Identifier	`regid` (1/7.4)
36	4	Reserved	#00 bytes
40	2	Type	`Int16` (1/7.1.4) =57
42	D_L	Implementation Use	bytes
[D_L+42]	*	Padding	#00 bytes

The descriptor specified by table 1/1 has six fields:

- The Data Length field shall be a 32-bit unsigned integer recorded according to 1/7.1.5 in byte positions 0 to 3 of the descriptor. The value of this field may be referred to as D_L.
- The Application Identifier field shall be a 32 byte field specifying an identification of an application recorded according to 1/7.4 in byte positions 4 to 35 of the descriptor.
- The Reserved field shall be 4 bytes, each with the value #00, recorded in byte positions 36 to 39 of the descriptor.
- The Type field shall be the number 57 as a 16-bit signed integer recorded according to 1/7.1.4 in byte positions 40 to 41 of the descriptor.
- The Implementation Use field shall be D_L bytes recorded in byte positions 42 to [41+D_L], where D_L is the value recorded in the Data Length field of this descriptor. A symbolic length referred to in a descriptor shall either be defined within that descriptor or be described in the interpretation of the field it is used in. The specification for the interpretation for this field might state that the interpretation of those bytes is not specified by ISO/IEC 13490, or could specify some specific interpretation for those bytes.
- The Padding field shall be a variable length field, as indicated by the asterisk "*", of bytes, each with a value of #00. The specification of the interpretation for the field shall specify the length of the field.

6.4 Character strings

A value for a sequence of bytes may be specified by a quoted sequence of characters, encoded according to the International Reference Version of ISO/IEC 646. For example, "Sheep" shall represent the bytes #53, #68, #65, #65, #70.

6.5 Arithmetic notation

The notation *ip(x)* shall mean the integer part of *x*.

The notation *rem(a,b)* shall mean $a-b \times ip(a/b)$, where *a* and *b* are integers.

6.6 Schema

The notation specified by this clause, hereafter referred to as schema, specifies the format of a structure, or sequence of structures, by construction. White space is unimportant. A structure shall be a sequence of terms. A term shall be either a name enclosed by `<>` or a structure definition enclosed by `{}`. A term may be given a name *label* by preceding the term with `[ label ]`. A term may be suffixed by one of the repetition operators in table 1/2.

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Table 2 - Repetition operators

Operator	Interpretation
n + *m*	*n* to *m* occurrences inclusive
n+	*n* or more occurrences
n	*n* occurrences exactly

The expression *term1* | *term2* means either *term1* or *term2* shall appear at this place in the sequence.

Names shall be resolved in one of the following three ways:

- the name is that of a descriptor or term defined in ISO/IEC 13490
- the name has been defined in this structure definition using the [ ] notation
- the name will be defined in the prose associated with the structure definition

If a term is followed by a clause enclosed in ( ), it shall refer to only those objects specified by the term for which the clause is true.

These operators shall be applied in increasing order of precedence with the | operator having lowest precedence:

| repetition operator [ ] ( )

As an example, the schema shown in figure 1/1 specifies that the term Set means zero or more Groups, where a Group is a sequence of two or more Group Headers, followed by a Group Element, which is one of three alternatives (one or two Type-1 Descriptors, or a single Type-2 Descriptor whose length is even, or one or more Type-3 Descriptors), followed by one or more Group Trailers.

```
[Set]{
        [Group]{
                <Group Header> 2+
                [Group Element]{
                        <Type-1 Descriptor> 1+2
                    |   <Type-2 Descriptor>(descriptor length is even)
                    |   <Type-3 Descriptor> 1+
                }
                <Group Trailer> 1+
        } 0+
}
```

Figure 1 - Example schema

6.7 Other notations

Other notations used in ISO/IEC 13490 are specified in table 1/3.

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Table 3 - Other notation

Notation	Interpretation
BP	Byte position within a descriptor, starting with 0
RBP	Relative byte position within a descriptor, starting with 0
ZERO	A single bit with the value 0
ONE	A single bit with the value 1

7 Basic types

The following basic types are used in ISO/IEC 13490.

7.1 Numerical values

The recording format of a numerical value represented in binary notation by an *n*-bit number shall be denoted by a type name of `Int`*n* or `Uint`*n* where:

- *n* denotes the number of bits used in the binary number
- `Uint` denotes an unsigned integer *x*, in the range $0 \leq x < 2^n$, represented as a binary number
- `Int` denotes a signed integer *x*, in the range $-2^{n-1} < x < 2^{n-1}$, represented by a two's complement number

A numerical value shall be recorded in a field of a structure specified by ISO/IEC 13490 in one of the following formats. The applicable format shall be specified in the description of the structure.

7.1.1 8-bit unsigned numerical values

A `Uint8` value shall be recorded as an 8-bit unsigned number in a one-byte field.

7.1.2 8-bit signed numerical values

An `Int8` value shall be recorded as a two's complement number in a one-byte field.

7.1.3 16-bit unsigned numerical values

A `Uint16` value, represented by the hexadecimal representation #wxyz, shall be recorded in a two-byte field as #yz #wx.

NOTE 4 — For example, the decimal number 4 660 has #1234 as its hexadecimal representation and shall be recorded as #34 #12.

7.1.4 16-bit signed numerical values

An `Int16` value, represented in two's complement form by the hexadecimal representation #wxyz, shall be recorded in a two-byte field as #yz #wx.

NOTE 5 — For example, the decimal number -30 875 has #8765 as its hexadecimal representation and shall be recorded as #65 #87.

7.1.5 32-bit unsigned numerical values

A `Uint32` value, represented by the hexadecimal representation #stuvwxyz, shall be recorded in a four-byte field as #yz #wx #uv #st.

NOTE 6 — For example, the decimal number 305 419 896 has #12345678 as its hexadecimal representation and shall be recorded as #78 #56 #34 #12.

7.1.6 32-bit signed numerical values

An `Int32` value, represented in two's complement form by the hexadecimal representation #stuvwxyz, shall be recorded in a four-byte field as #yz #wx #uv #st.

NOTE 7 — For example, the decimal number -559 038 737 has #DEADBEEF as its hexadecimal representation and shall be recorded as #EF #BE #AD #DE.

7.1.7 64-bit unsigned numerical values

A `Uint64` value, represented by the hexadecimal representation #klmnopqrstuvwxyz, shall be recorded in an eight-byte field as #yz #wx #uv #st #qr #op #mn #kl.

NOTE 8 — For example, the decimal number 12 345 678 987 654 321 012 has #AB54A9A10A23D374 as its hexadecimal representation and shall be recorded as #74 #D3 #23 #0A #A1 #A9 #54 #AB.

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7.2 Character sets and coding

Except as specified in this clause, the characters in the descriptors specified by ISO/IEC 13490 shall be coded according to ISO/IEC 646.

Certain fields specifying character strings shall be designated as containing either a `dstring` (see 1/7.2.12) or d-characters. The specification of the characters allowed in these fields and the method of recording shall be specified by a `charspec`, defined in 1/7.2.1. The set of allowed characters shall be referred to as d-characters.

NOTE 9 — Support for a variety of character sets is a requirement for ISO/IEC 13490. Ideally, there would be only one character standard used. In practice, several standards, including ISO/IEC 646, ISO/IEC 2022, ISO 8859-1, and ISO/IEC 10646-1 are used. ISO/IEC 13490 accommodates current practice by specifying several character sets and providing a mechanism for specifying other character sets.

As an example, CS2 (see 1/7.2.4) uses ISO/IEC 646 as the base character set but restricts fields containing characters to a widely usable subset of this character set.

7.2.1 Character set specification

The set of characters allowed in certain descriptor fields shall be specified by a `charspec`, which shall be recorded in the format shown in table 1/4.

Table 4 - `charspec` format

RBP	Length	Name	Contents
0	1	Character Set Type	`Uint8` (1/7.1.1)
1	63	Character Set Information	bytes

7.2.1.1 Character Set Type (RBP 0)

This field shall specify the allowed characters by identifying a set of characters shown in table 1/5.

Table 5 - Sets of allowed characters

Type	Allowed characters
0	The CS0 coded character set (1/7.2.2).
1	The CS1 coded character set (1/7.2.3).
2	The CS2 coded character set (1/7.2.4).
3	The CS3 coded character set (1/7.2.5).
4	The CS4 coded character set (1/7.2.6).
5	The CS5 coded character set (1/7.2.7).
6	The CS6 coded character set (1/7.2.8).
7	The CS7 coded character set (1/7.2.9).
8	The CS8 coded character set (1/7.2.10).
9-255	Reserved for future standardisation.

NOTE 10 — Briefly, these character sets are:

CS0 – by agreement

CS1 – the whole or any subset of the graphic characters specified by ISO/IEC 10646-1

CS2 – a highly portable set of 38 graphic characters which include the characters in ISO 9660 file identifiers associated with a directory hierarchy identified by an ISO 9660 Primary Volume Descriptor

CS3 – the 63 graphic characters of the portable ISO/IEC 9945-1 file name set

CS4 – the 95 graphic characters of the International Reference Version of ISO/IEC 646

CS5 – the 191 graphic characters of ISO 8859-1

CS6 – a set of graphic characters that may be identified by ISO/IEC 2022 and ISO/IEC 6429

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CS7 – a set of graphic characters that may be identified by ISO/IEC 2022 and ISO/IEC 6429 and, optionally, code extension characters using ISO/IEC 2022 and ISO/IEC 6429

CS8 – a set of 53 graphic characters that are highly portable to most personal computers.

7.2.1.2 Character Set Information (RBP 1)

Except where specified in the following specifications of character sets CS0 through CS8, the contents of this field shall be set to all #00 bytes.

NOTE 11 — The Character Set Types CS0, CS1, CS6 and CS7 require the use of the Character Set Information field to specify a set of graphic characters. CS1 restricts the set of graphic characters to those specified by ISO/IEC 10646-1. CS0, CS6 and C7 are not restricted to any particular set of graphic characters. CS7 allows code extension characters (see 1/7.2.9.1) to be used in a descriptor field. The same set of graphic characters may be specified by using the CS0, CS1, CS6 or CS7 Character Set Types. The order of specifying the escape sequences and control sequences in a Character Set Information field is not specified by ISO/IEC 13490. For example, in specifying a character set, the escape sequence identifying the G1 character set may be recorded before the escape sequence specifying the G0 character set. Character Set Information fields with different byte sequences may actually be identifying the same set of graphic characters.

7.2.2 CS0 character set

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

An identification of the character set may be given in the Character Set Information field. Such identification shall be recorded contiguously from the start of the field and any unused bytes shall be set to #00.

7.2.3 CS1 character set

The CS1 d-characters 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, control sequences or both escape sequences and control sequences to be used in an 8-bit environment according to ISO/IEC 2022 and ISO/IEC 6429 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 and any unused bytes shall be set to #00.

7.2.4 CS2 character set

The CS2 d-characters shall be the 38 characters in positions 02/14, 03/00 to 03/09, 04/01 to 05/10, and 05/15 of the International Reference Version of ISO/IEC 646. The Character Set Information field shall be set to all #00 bytes.

NOTE 12 — These characters are: FULL STOP, DIGITs, LATIN CAPITAL LETTERs and LOW LINE.

7.2.5 CS3 character set

The CS3 d-characters 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 International Reference Version of ISO/IEC 646. The Character Set Information field shall be set to all #00 bytes.

NOTE 13 — These characters are: HYPHEN-MINUS, FULL STOP, DIGITs, LATIN CAPITAL LETTERs, LATIN SMALL LETTERs and LOW LINE.

7.2.6 CS4 character set

The CS4 d-characters shall be the 95 characters in positions 02/00 to 07/14 of the International Reference Version of ISO/IEC 646. The Character Set Information field shall be set to all #00 bytes.

7.2.7 CS5 character set

The CS5 d-characters shall be the 191 characters in positions 02/00 to 07/14 and 10/00 to 15/15 of ISO 8859-1. The Character Set Information field shall be set to all #00 bytes.

7.2.8 CS6 character set

The CS6 d-characters 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, control sequences or both escape sequences and control sequences according to ISO/IEC 2022 and ISO/IEC 6429 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 and any unused bytes shall be set to #00.

7.2.9 CS7 character set

The CS7 d-characters shall be the graphic characters of the character sets specified by the Character Set Information field and code extension characters (see 1/7.2.9.1).

The Character Set Information field shall specify one or more escape sequences, control sequences or both escape sequences and control sequences according to ISO/IEC 2022 and ISO/IEC 6429 that designate and implicitly invoke the graphic character

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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 and any unused bytes shall be set to #00.

7.2.9.1 Code extension characters

A descriptor field which has been assigned to contain d-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 in the descriptor field.

- Escape sequences according to ISO/IEC 2022 or ISO/IEC 10646-1.
- Shift functions according to ISO/IEC 2022.
- Control functions according to ISO/IEC 6429 or ISO/IEC 10646-1.

7.2.10 CS8 character set

The CS8 d-characters 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 International Reference Version of ISO/IEC 646.

NOTE 14 — 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.

7.2.11 List of character sets

A list of Character Set Types (see 1/7.2.1.1) shall be recorded as a `Uint32` (see 1/7.1.5) where the bit for a Character Set Type shall be ONE if that Character Set Type belongs to the list and ZERO otherwise.

The bit for Character Set Type CS*n* shall be recorded in bit *n* of the `Uint32` (see 1/7.1.5). Bits 9-31 are reserved for future standardisation and shall be set to ZERO.

7.2.12 Fixed-length character fields

A `dstring` of length *n* is a field of *n* bytes where d-characters (see 1/7.2) are recorded. The number of bytes used to record the characters shall be recorded as a `Uint8` (see 1/7.1.1) in byte *n*, where *n* is the length of the field. The characters shall be recorded starting with the first byte of the field, and any remaining byte positions after the characters up until byte *n–1* inclusive shall be set to #00.

Unless otherwise specified, a `dstring` shall not be all #00 bytes.

7.3 Timestamp format

A timestamp shall be recorded either as a `timestamp` (see 1/7.3.1) or as a short`timestamp` (see 1/7.3.2).

7.3.1 Timestamp

A `timestamp` shall specify a date and time recorded in the format shown in table 1/6. If all fields are 0, it shall mean that the date and time are not specified.

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Table 6 - `timestamp` format

RBP	Length	Name	Contents
0	2	Type and Time Zone	`Uint16` (1/7.1.3)
2	2	Year	`Int16` (1/7.1.4)
4	1	Month	`Uint8` (1/7.1.1)
5	1	Day	`Uint8` (1/7.1.1)
6	1	Hour	`Uint8` (1/7.1.1)
7	1	Minute	`Uint8` (1/7.1.1)
8	1	Second	`Uint8` (1/7.1.1)
9	1	Centiseconds	`Uint8` (1/7.1.1)
10	1	Hundreds of Microseconds	`Uint8` (1/7.1.1)
11	1	Microseconds	`Uint8` (1/7.1.1)

7.3.1.1 Type and Time Zone (RBP 0)

The most significant 4 bits of this field, interpreted as a 4-bit number, shall specify the interpretation of the `timestamp` as shown in table 1/7. The least significant 12 bits, interpreted as a signed 12-bit number in two's complement form, shall be interpreted as follows:

- if the value is in the range –1 440 to 1 440 inclusive, then the value specifies the offset, in minutes, of the date and time of the day from Coordinated Universal Time.
- if the value of the number is -2 047, then no such offset is specified.

Table 7 - `timestamp` interpretation

Type	Interpretation
0	The `timestamp` specifies Coordinated Universal Time.
1	The `timestamp` specifies local time.
2	The interpretation of the `timestamp` is subject to agreement between the originator and recipient of the medium.
3-15	Reserved for future standardisation.

7.3.1.2 Year (RBP 2)

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

7.3.1.3 Month (RBP 4)

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

7.3.1.4 Day (RBP 5)

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

7.3.1.5 Hour (RBP 6)

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

7.3.1.6 Minute (RBP 7)

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

7.3.1.7 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.

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7.3.1.8 Centiseconds (RBP 9)

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

7.3.1.9 Hundreds of Microseconds (RBP 10)

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

7.3.1.10 Microseconds (RBP 11)

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

7.3.2 Short timestamp

A `shorttimestamp` shall specify a date and time recorded in the format shown in table 1/8. If all fields are 0, it shall mean that the date and time are not specified.

NOTE 15 — The `shorttimestamp` is defined for use in the Directory Record (see 2/15.1) so as to be compatible with the Directory Record specified in ISO 9660.

Table 8 - `shorttimestamp` format

RBP	Length	Name	Contents
0	1	Year	`Uint8` (1/7.1.1)
1	1	Month	`Uint8` (1/7.1.1)
2	1	Day	`Uint8` (1/7.1.1)
3	1	Hour	`Uint8` (1/7.1.1)
4	1	Minute	`Uint8` (1/7.1.1)
5	1	Second	`Uint8` (1/7.1.1)
6	1	Time Zone	`Int8` (1/7.1.2)

7.3.2.1 Year (RBP 0)

This field shall specify the number of years since 1900.

7.3.2.2 Month (RBP 1)

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

7.3.2.3 Day (RBP 2)

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

7.3.2.4 Hour (RBP 3)

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

7.3.2.5 Minute (RBP 4)

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

7.3.2.6 Second (RBP 5)

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

7.3.2.7 Time Zone (RBP 6)

This field shall specify the offset from Coordinated Universal Time, in 15 minute intervals, as a number in the range -48 (West) to +52 (East).

7.4 Entity Identifier

A `regid` specifies an entity identification and shall be recorded in the format shown in table 1/9. The identification in a `regid` pertains to certain information; this information shall be called the scope of the `regid`. The scope of a `regid` consists of the field in which the `regid` is recorded and any information specified by the description of that field to be part of the scope the `regid`.

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Table 9 - `regid` format

RBP	Length	Name	Contents
0	1	Flags	`Uint8` (1/7.1.1)
1	23	Identifier	bytes
24	8	Identifier Suffix	bytes

7.4.1 Flags (RBP 0)

This field shall specify certain characteristics of the `regid` as shown in table 1/10.

Table 10 - Characteristics of `regid`

Bit	Interpretation
0	Dirty: If an implementation modifies the information on the medium within the scope of this `regid` such that the identification specified by the `regid` might not be valid, then this bit shall be set to ONE, otherwise it shall be set to ZERO.
1	Protected If this bit is ONE, then the contents of this `regid` shall not be modified; if this bit is ZERO, then the contents of this `regid` may be modified (see 2/18.1).
2-7	shall be reserved for future standardisation and all bits shall be set to ZERO.

7.4.2 Identifier (RBP 1)

If the first byte of this field contains #2B, then this field contains an identifier specified by ISO/IEC 13490 or by ISO/IEC 13346-2. If the first byte of this field contains #2D, then this field contains an identifier that shall not be registered. If the first byte of this field is neither #2D nor #2B, then this field shall specify an identifier which may be registered according to ISO/IEC 13800. An identifier shall be a sequence of at most 23 octets, at least one of which shall be nonzero; these octets shall be recorded in ascending order as the least significant 8 bits of bytes 0 through 22 of this field respectively. Any unused bytes shall be set to #00.

The interpretation of the content of the Identifier field shall be specified in the description of the descriptor field in which the `regid` is recorded.

If this field contains all #00 bytes, then this field does not specify an identifier.

NOTE 16 — The values #2B and #2D do not represent characters. However, for most coded character sets using the value recorded in one byte to represent a character, such as ISO/IEC 646, the value #2B corresponds to "+" and the value #2D corresponds to "–".

7.4.3 Identifier Suffix (RBP 24)

This field shall specify further identification in a manner not specified by ISO/IEC 13490.

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