BS ISO/IEC 9660:2023

BSI Standards Publication

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

Documents
Document Sharing Hub

Full document details: BS ISO/IEC 9660:2023

National foreword

This British Standard is the UK implementation of ISO/IEC 9660:2023.

The UK participation in its preparation was entrusted to Technical Committee W/-, Consumer Products and Services Sector Policy and Strategy Committee.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

© The British Standards Institution 2023
Published by BSI Standards Limited 2023

ISBN 978 0 539 16004 8

ICS 35.220.30

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 28 February 2023.

Amendments/corrigenda issued since publication

Date	Text affected

Documents
Document Sharing Hub

Full document details: BS ISO/IEC 9660:2023

INTERNATIONAL STANDARD

ISO/IEC 9660

First edition
2023-01

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

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

Reference number
ISO/IEC 9660:2023(E)

Documents
Document Sharing Hub
© ISO/IEC 2023

Full document details: BS ISO/IEC 9660:2023

COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

© ISO/IEC 2023 – All rights reserved

Documents
Document Sharing Hub

Full document details: BS ISO/IEC 9660:2023

Contents

Page

Foreword ... **viii**
Introduction ... **x**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Notation ... **3**
4.1 Decimal and hexadecimal notations ... 3
4.2 Other notations ... 3
5 Conformance ... **3**
5.1 Conformance of a CD-ROM ... 3
5.2 Conformance of an information processing system ... 3
6 Requirements for a medium ... **4**
7 Volume structure ... **4**
7.1 Arrangement of data on a CD-ROM ... 4
7.1.1 Physical addresses ... 4
7.1.2 Logical sector ... 4
7.1.3 Volume space ... 4
7.2 Arrangement of the volume space ... 4
7.2.1 System area and data area ... 4
7.2.2 Logical block ... 5
7.3 Arrangement of the data area ... 5
7.4 Arrangement of an extent ... 5
7.4.1 Extent ... 5
7.4.2 Mode of recording a file section ... 5
7.4.3 Interleaved mode ... 6
7.4.4 Non-interleaved mode ... 7
7.4.5 Data length of a file section ... 8
7.4.6 Relation of extended attribute record to file section ... 8
7.4.7 Recording of a volume partition ... 8
7.5 File structure ... 8
7.5.1 Relation to file sections ... 8
7.5.2 Numbering of bytes in a file ... 8
7.5.3 Contents of a file ... 9
7.5.4 Associated file ... 9
7.6 Volume set ... 9
7.7 Volume descriptors ... 9
7.7.1 General ... 9
7.7.2 Volume descriptor set ... 9
7.8 Directory structure ... 10
7.8.1 Directory ... 10
7.8.2 Directory hierarchy ... 11
7.8.3 Relation of directory hierarchies ... 12
7.9 Path table ... 13
7.9.1 General ... 13
7.9.2 Order of path table records ... 13
7.9.3 Path table group ... 13
7.9.4 Recorded occurrences of the path table ... 13
7.9.5 Consistency of path tables between volumes of a volume group ... 14
7.10 Record structure ... 14
7.10.1 General ... 14
7.10.2 Characteristics ... 14
7.10.3 Measured data units (MDU) ... 14

© ISO/IEC 2023 – All rights reserved

AVA Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

7.10.4 Fixed-length records ... 15
7.10.5 Variable-length records ... 15

8 Recording of descriptor fields ... 15
8.1 8-bit numerical values ... 15
8.1.1 General ... 15
8.1.2 8-bit unsigned numerical values ... 15
8.1.3 8-bit signed numerical values ... 15
8.2 16-bit numerical value ... 16
8.2.1 General ... 16
8.2.2 Least significant byte first ... 16
8.2.3 Most significant byte first ... 16
8.2.4 Both-byte orders ... 16
8.3 32-bit numerical value ... 16
8.3.1 General ... 16
8.3.2 Least significant byte first ... 16
8.3.3 Most significant byte first ... 16
8.3.4 Both-byte orders ... 17
8.4 Character sets and coding ... 17
8.4.1 d-characters and a-characters ... 17
8.4.2 c-characters ... 17
8.4.3 Separators and filler ... 18
8.4.4 Use of characters in descriptor fields ... 18
8.4.5 Justification of characters ... 19
8.5 File identifier ... 19
8.5.1 File identifier format ... 19
8.5.2 File identifier length ... 19
8.6 Directory identifier ... 20
8.6.1 Directory identifier format ... 20
8.6.2 Reserved directory identifiers ... 20
8.6.3 Directory identifier length ... 20

9 Volume descriptors ... 20
9.1 Format of a volume descriptor ... 20
9.1.1 General ... 20
9.1.2 Volume descriptor type (BP 1) ... 20
9.1.3 Standard identifier (BP 2 to 6) ... 21
9.1.4 Volume descriptor version (BP 7) ... 21
9.1.5 Depends on volume descriptor type (BP 8 to 2 048) ... 21
9.2 Boot record ... 21
9.2.1 General ... 21
9.2.2 Volume descriptor type (BP 1) ... 21
9.2.3 Standard identifier (BP 2 to 6) ... 22
9.2.4 Volume descriptor version (BP 7) ... 22
9.2.5 Boot system identifier (BP 8 to 39) ... 22
9.2.6 Boot identifier (BP 40 to 71) ... 22
9.2.7 Boot system use (BP 72 to 2 048) ... 22
9.3 Volume descriptor set terminator ... 22
9.3.1 General ... 22
9.3.2 Volume descriptor type (BP 1) ... 22
9.3.3 Standard identifier (BP 2 to 6) ... 23
9.3.4 Volume descriptor version (BP 7) ... 23
9.3.5 Reserved for future standardization (BP 8 to 2 048) ... 23
9.4 Primary volume descriptor ... 23
9.4.1 General ... 23
9.4.2 Volume descriptor type (BP 1) ... 24
9.4.3 Standard identifier (BP 2 to 6) ... 24
9.4.4 Volume descriptor version (BP 7) ... 24
9.4.5 Unused field (BP 8) ... 24

AVA Documents
Document Sharing Hub

© ISO/IEC 2023 – All rights reserved

Full document details: BS ISO/IEC 9660:2023

9.4.6 System identifier (BP 9 to 40) 24
9.4.7 Volume identifier (BP 41 to 72) 25
9.4.8 Unused field (BP 73 to 80) 25
9.4.9 Volume space size (BP 81 to 88) 25
9.4.10 Unused field (BP 89 to 120) 25
9.4.11 Volume set size (BP 121 to 124) 25
9.4.12 Volume sequence number (BP 125 to 128) 25
9.4.13 Logical block size (BP 129 to 132) 25
9.4.14 Path table size (BP 133 to 140) 25
9.4.15 Location of occurrence of type L path table (BP 141 to 144) 25
9.4.16 Location of optional occurrence of type L path table (BP 145 to 148) 26
9.4.17 Location of occurrence of type M path table (BP 149 to 152) 26
9.4.18 Location of optional occurrence of type M path table (BP 153 to 156) 26
9.4.19 Directory record for root directory (BP 157 to 190) 26
9.4.20 Volume set identifier (BP 191 to 318) 26
9.4.21 Publisher identifier (BP 319 to 446) 26
9.4.22 Data preparer identifier (BP 447 to 574) 26
9.4.23 Application identifier (BP 575 to 702) 27
9.4.24 Copyright file identifier (BP 703 to 739) 27
9.4.25 Abstract file identifier (BP 740 to 776) 27
9.4.26 Bibliographic file identifier (BP 777 to 813) 27
9.4.27 Volume creation date and time (BP 814 to 830) 28
9.4.28 Volume modification date and time (BP 831 to 847) 28
9.4.29 Volume expiration date and time (BP 848 to 864) 28
9.4.30 Volume effective date and time (BP 865 to 881) 28
9.4.31 File structure version (BP 882) 28
9.4.32 Reserved for future standardization (BP 883) 29
9.4.33 Application use (BP 884 to 1 395) 29
9.4.34 Reserved for future standardization (BP 1 396 to 2 048) 29
9.5 Supplementary volume descriptor and enhanced volume descriptor 29
9.5.1 General 29
9.5.2 Volume descriptor type (BP 1) 30
9.5.3 Volume descriptor version (BP 7) 30
9.5.4 Volume flags (BP 8) 31
9.5.5 System identifier (BP 9 to 40) 31
9.5.6 Volume identifier (BP 41 to 72) 31
9.5.7 Escape sequences (BP 89 to 120) 31
9.5.8 Path table size (BP 133 to 140) 31
9.5.9 Location of occurrence of type L path table (BP 141 to 144) 32
9.5.10 Location of optional occurrence of type L path table (BP 145 to 148) 32
9.5.11 Location of occurrence of type M path table (BP 149 to 152) 32
9.5.12 Location of optional occurrence of type M path table (BP 153 to 156) 32
9.5.13 Directory record for root directory (BP 157 to 190) 32
9.5.14 Volume set identifier (BP 191 to 318) 32
9.5.15 Publisher identifier (BP 319 to 446) 32
9.5.16 Data preparer identifier (BP 447 to 574) 33
9.5.17 Application identifier (BP 575 to 702) 33
9.5.18 Copyright file identifier (BP 703 to 739) 33
9.5.19 Abstract file identifier (BP 740 to 776) 33
9.5.20 Bibliographic file identifier (BP 777 to 813) 34
9.5.21 Application use (BP 884 to 1 395) 34
9.6 Volume partition descriptor 34
9.6.1 General 34
9.6.2 Volume descriptor type (BP 1) 34
9.6.3 Standard identifier (BP 2 to 6) 34
9.6.4 Volume descriptor version (BP 7) 35
9.6.5 Unused field (BP 8) 35
9.6.6 System identifier (BP 9 to 40) 35

AVA Documents
Document Sharing Hub

© ISO/IEC 2023 – All rights reserved

Full document details: BS ISO/IEC 9660:2023

9.6.7 Volume partition identifier (BP 41 to 72) 35
9.6.8 Volume partition location (BP 73 to 80) 35
9.6.9 Volume partition size (BP 81 to 88) 35
9.6.10 System use (BP 89 to 2 048) 35

10 File and directory descriptors 35
10.1 Format of a directory record 35
10.1.1 General 35
10.1.2 Length of directory record (LEN_DR) (BP 1) 36
10.1.3 Extended attribute record length (BP 2) 36
10.1.4 Location of extent (BP 3 to 10) 36
10.1.5 Data length (BP 11 to 18) 36
10.1.6 Recording date and time (BP 19 to 25) 36
10.1.7 File flags (BP 26) 37
10.1.8 File unit size (BP 27) 38
10.1.9 Interleave gap size (BP 28) 38
10.1.10 Volume sequence number (BP 29 to 32) 38
10.1.11 Length of file identifier (LEN_FI) (BP 33) 38
10.1.12 File identifier [BP 34 to (33 + LEN_FI)] 38
10.1.13 Padding field [BP (34 + LEN_FI)] 39
10.1.14 System use [BP (LEN_DR - LEN_SU + 1) to LEN_DR] 39
10.2 Consistency of file attributes between directory records of a file 39
10.3 Order of directory records 39
10.4 Format of a path table record 40
10.4.1 General 40
10.4.2 Length of directory identifier (LEN_DI) (BP 1) 41
10.4.3 Extended attribute record length (BP 2) 41
10.4.4 Location of extent (BP 3 to 6) 41
10.4.5 Parent directory number (BP 7 to 8) 41
10.4.6 Directory identifier [BP 9 to (8 + LEN_DI)] 41
10.4.7 Padding field [BP (9 + LEN_ DI)] 41
10.5 Format of an extended attribute record 42
10.5.1 General 42
10.5.2 Owner identification (BP 1 to 4) 42
10.5.3 Group identification (BP 5 to 8) 42
10.5.4 Permissions (BP 9 to 10) 43
10.5.5 File creation date and time (BP 11 to 27) 44
10.5.6 File modification date and time (BP 28 to 44) 44
10.5.7 File expiration date and time (BP 45 to 61) 44
10.5.8 File effective date and time (BP 62 to 78) 44
10.5.9 Record format (BP 79) 44
10.5.10 Record attributes (BP 80) 44
10.5.11 Record length (BP 81 to 84) 45
10.5.12 System identifier (BP 85 to 116) 45
10.5.13 System use (BP 117 to 180) 45
10.5.14 Extended attribute record version (BP 181) 45
10.5.15 Length of escape sequences (BP 182) 45
10.5.16 Reserved for future standardization (BP 183 to 246) 45
10.5.17 Length of application use (BP 247 to 250) 45
10.5.18 Application use [BP 251 to (250 + LEN_AU)] 46
10.5.19 Escape sequences [BP (251 + LEN_AU) to (250 + LEN_ESC + LEN_AU)] 46
10.6 Consistency of file attributes between extended attribute records of a file 46

11 Levels of interchange 46
11.1 General 46
11.2 Level 1 46
11.3 Level 2 46
11.4 Level 3 46

12 Requirements for systems 47

© ISO/IEC 2023 – All rights reserved
AVA Documents Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

13 Description of systems ... **47**

14 Requirements for an originating system ... **47**
14.1 General ... 47
14.2 Files ... 47
14.3 Descriptors ... 47
14.3.1 Primary volume descriptor, path table record and directory record ... 47
14.3.2 Supplementary volume descriptor and enhanced volume descriptor ... 49
14.3.3 Volume partition descriptor ... 49
14.3.4 Boot record ... 50
14.3.5 Extended attribute record ... 50
14.4 System area ... 50

15 Requirements for a receiving system ... **51**
15.1 General ... 51
15.2 Files ... 51
15.3 Descriptors ... 51
15.3.1 Implementation ... 51
15.3.2 Descriptor information ... 51
15.4 Restrictions ... 52
15.5 Levels of implementation ... 52
15.5.1 General ... 52
15.5.2 Level 1 ... 52
15.5.3 Level 2 ... 52

Annex A (informative) **ISO/IEC 646: International reference version (IRV)** ... **53**

Annex B (informative) **ISO 9660:1988 and Joliet Specification: Modifications** ... **55**

Bibliography ... **58**

© ISO/IEC 2023 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

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.

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see https://patents.iec.ch).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

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

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

The main changes are as follows:

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

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

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

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

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

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

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

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

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

© ISO/IEC 2023 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

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

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

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

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

© ISO/IEC 2023 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

Introduction

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

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

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

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

© ISO/IEC 2023 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

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

1 Scope

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

This document specifies:

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

— the relationship among volumes of a volume set;

— the placement of the files;

— the attributes of the files;

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

— three nested levels of medium interchange;

— two nested levels of implementation;

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

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

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

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

3 Terms and definitions

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

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

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

© ISO/IEC 2023 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

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

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

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

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

[SOURCE: ISO 7665:1983, 4.3]

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

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

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

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

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

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

3.7
file
named collection of information

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

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

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

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

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

© ISO/IEC 2023 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

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

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

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

3.16
volume
dismountable CD-ROM

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

4 Notation

4.1 Decimal and hexadecimal notations

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

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

4.2 Other notations

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

5 Conformance

5.1 Conformance of a CD-ROM

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

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

5.2 Conformance of an information processing system

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

© ISO/IEC 2023 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

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

6 Requirements for a medium

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

— requirements for the medium;

— requirements for systems.

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

7 Volume structure

7.1 Arrangement of data on a CD-ROM

7.1.1 Physical addresses

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

7.1.2 Logical sector

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

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

7.1.3 Volume space

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

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

7.2 Arrangement of the volume space

7.2.1 System area and data area

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

© ISO/IEC 2023 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

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

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

7.2.2 Logical block

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

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

7.3 Arrangement of the data area

File sections shall be recorded in the data area.

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

— volume descriptors;

— file descriptors;

— directory descriptor;

— path tables.

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

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

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

7.4 Arrangement of an extent

7.4.1 Extent

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

7.4.2 Mode of recording a file section

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

© ISO/IEC 2023 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

7.4.3 Interleaved mode

7.4.3.1 File unit

A file unit shall comprise a set of logical blocks that are within an extent and the logical block numbers of which form a continuous ascending sequence.

When a file section is recorded in interleaved mode, one or more file units, each consisting of the same number of logical blocks, shall be assigned to the file section within the same extent. The number of logical blocks in the file unit shall be the assigned file unit size for the file section.

The first logical block of each file unit shall have a logical block number which is the lowest logical block number in the logical sector that contains that logical block.

The sequence of the file units in an extent shall correspond to the sequence of the logical block numbers of the first logical block of each file unit.

The logical blocks comprising a file unit assigned to a file section may:

— also each be assigned to a different file section; and/or

— comprise part of one or more volume partitions.

7.4.3.2 Interleave gap

An interleave gap shall comprise the set of logical blocks that are within an extent and the logical block numbers of which lie between the last logical block number of a file unit and the first logical block number of the next file unit, if any, in the sequence. All interleave gaps between the file units assigned to a file section shall comprise the same number of logical blocks. This number shall be the assigned interleave gap size for the file section.

The logical blocks comprising an interleave gap between the file units assigned to a file section may:

— also each be assigned to a different file section; and/or

— comprise part of one or more volume partitions.

7.4.3.3 Relation of file section to file unit

When a file section is recorded in interleaved mode, the file section, and its associated extended attribute record, if any, shall be recorded over the sequence of file units assigned to the file section.

7.4.3.4 Recording of an extended attribute record

If an extended attribute record is recorded, it shall be recorded in the first file unit of the sequence. The recording shall begin at the first byte of the first logical block of the file unit. It shall continue through successive bytes of that logical block, and then through successive bytes of successive logical blocks, if any, of the file unit, until all of the extended attribute record is recorded.

The assigned extended attribute record length shall be equal to the assigned file unit size.

7.4.3.5 Recording of a file section

The successive parts, if any, of the file section shall be recorded in successive file units, starting from the second file unit in the sequence if an extended attribute record is recorded, and starting from the first file unit in the sequence if no extended attribute record is recorded.

© ISO/IEC 2023 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

7.4.3.6 Data space

The set of file units in which the successive parts of the file section are recorded shall be the data space of the file section.

The bytes in the data space shall be numbered consecutively. The numbering shall start from 1 which shall be assigned to the first byte of the first logical block of the first file unit, if any, of the data space. The numbering shall continue through successive bytes of that logical block, then through successive bytes of each successive logical block, if any, of the first file unit, and then through successive bytes of the logical block(s) of each successive file unit, if any, assigned to the file section.

The numbering shall end with a number equal to the number of bytes in which the file section is recorded in the data space, or this number shall equal zero if there are no bytes of the file recorded in the data space.

7.4.4 Non-interleaved mode

7.4.4.1 General

When a file section is recorded in non-interleaved mode, the file section and its associated extended attribute record, if any, shall be recorded over the sequence of logical blocks in an extent.

7.4.4.2 Recording of an extended attribute record

If an extended attribute record is recorded, it shall be recorded over one or more logical blocks, the logical block numbers of which form a continuous ascending sequence. The recording shall begin at the first byte of the first logical block of the extent. It shall continue through successive bytes of that logical block, and then through successive bytes of successive logical blocks, if any, of the extent, until all of the extended attribute record is recorded.

The number of logical blocks over which the extended attribute record is recorded shall be the assigned extended attribute record length for the file section.

The logical blocks comprising an extended attribute record assigned to a file section may:

— also each be assigned to a different file section; and/or

— comprise part of one or more volume partitions.

7.4.4.3 Recording of a file section

The file section shall be recorded over zero or more logical blocks, the logical block numbers of which form a continuous ascending sequence. If no extended attribute record is recorded, the sequence shall start with the first logical block of the extent. If an extended attribute record is recorded, the sequence shall start with the first logical block, if any, immediately following the last logical block over which the extended attribute record is recorded.

7.4.4.4 Data space

The set of logical blocks over which the file section is recorded shall be the data space of the file section.

The bytes in the data space shall be numbered consecutively. The numbering shall start from 1 which shall be assigned to the first byte of the first logical block, if any, of the data space. The numbering shall continue through successive bytes of that logical block, and then through successive bytes of each successive logical block, if any, of the data space.

The numbering shall end with a number equal to the number of bytes in which the file section is recorded in the data space; or this number shall equal zero if there are no bytes of the file recorded in the data space.

© ISO/IEC 2023 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

7.4.5 Data length of a file section

The data length of a file section shall be the number of bytes in which the file section is recorded in the data space. If this number is less than the number of bytes in the data space, then any remaining bytes in the data space shall be ignored in interchange.

7.4.6 Relation of extended attribute record to file section

An extended attribute record may be associated with a file section. If present, the extended attribute record shall identify certain attributes of the file of which the file section forms a part.

A subset of those attributes shall apply to all file sections of a file that contains records according to 7.10. If any of those attributes are assigned to the file, an extended attribute record shall be recorded in association with each of the file sections of the file.

The other attributes identified in an extended attribute record shall apply to that file section and all preceding file sections of the file (see 7.5.1). If no extended attribute record is recorded in association with the last file section of a file, then these attributes are not specified for the file.

7.4.7 Recording of a volume partition

If a volume partition is recorded, it shall be recorded over one or more logical blocks, the logical block numbers of which form a continuous ascending sequence. The recording shall begin at the first byte of the first logical block of the extent. It shall continue through successive bytes of that logical block, and then through successive bytes of successive logical blocks, if any, of the extent, until all of the volume partition is recorded. The first logical block of each volume partition shall have a logical block number which is the lowest logical block number in the logical sector that contains that logical block.

The number of logical blocks over which the volume partition is recorded shall be the assigned volume partition size for the volume partition.

7.5 File structure

7.5.1 Relation to file sections

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

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

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

7.5.2 Numbering of bytes in a file

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

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

© ISO/IEC 2023 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

7.5.3 Contents of a file

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

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

7.5.4 Associated file

An associated file has a relationship not specified by this document to another file that has been assigned the same file identifier (see 8.5) as that of the associated file in the same directory.

7.6 Volume set

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

A volume set shall consist of one or more volumes having common volume set identification and identifying the same coded graphic character sets for use within selected descriptor fields (see 8.4). All volumes in a volume set shall be numbered consecutively starting from 1.

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

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

Such description recorded on a volume shall supersede the description recorded on any volume of the volume set having a lower assigned volume set size.

The logical block size shall be the same for all volumes of a volume set.

7.7 Volume descriptors

7.7.1 General

A volume descriptor shall be one of the following types:

— primary volume descriptor;

— supplementary volume descriptor;

— enhanced volume descriptor;

— volume partition descriptor;

— boot record;

— volume descriptor set terminator.

7.7.2 Volume descriptor set

A volume descriptor set shall be a sequence of volume descriptors recorded in consecutively numbered logical sectors starting with the logical sector number 16. Each successive volume descriptor shall be recorded in the logical sector with the next higher logical sector number than that of the logical sector

© ISO/IEC 2023 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

in which the previous volume descriptor is recorded. The sequence shall consist of two or more volume descriptors consecutively recorded as follows.

a) The sequence shall contain one primary volume descriptor (see 9.4) recorded at least once.

— The primary volume descriptor shall describe the volume space, and identify the attributes of the volume, the locations of a root directory and of a group of path tables, and the number of volumes in the volume set.

b) The sequence may contain zero or more supplementary volume descriptors (see 9.5) each recorded at least once.

— A supplementary volume descriptor shall describe the volume space, and identify the attributes of the volume, the locations of a root directory and of a group of path tables, and the number of volumes in the volume set. It shall also identify the coded graphic character sets used within selected fields of this descriptor, and of the fields in associated file descriptors, directory descriptors and path tables.

c) The sequence may contain zero or more enhanced volume descriptors (see 9.5) each recorded at least once.

— An enhanced volume descriptor shall describe the volume space, and identify the attributes of the volume, the locations of a root directory and of group path tables, and the number of volumes in the volume set. It shall also identify the coded graphic character sets used within selected fields of this descriptor, and of the fields in associated file descriptors, directory descriptors and path tables.

d) The sequence may contain zero or more volume partition descriptors (see 9.6).

— A volume partition descriptor shall identify a volume partition within the volume space, its position and size, and its attributes.

e) The sequence may contain zero or more boot records (see 9.2).

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

f) The sequence shall be terminated by the recording of one or more volume descriptor set terminators (see 9.3).

7.8 Directory structure

7.8.1 Directory

7.8.1.1 General

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

The identification of a file shall be different from the identification of any other file (unless the file is an associated file; see 7.5.3) or of any directory identified in the same directory. The identification of a directory shall be different from the identification of any file or of any other directory identified in the same directory.

The first logical block of the extent in which a directory is recorded shall have a logical block number which is the lowest logical block number in the logical sector that contains that logical block.

© ISO/IEC 2023 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023

7.8.1.2 Directory record

A directory record shall contain:

— information to locate a file section;

— information to locate any extended attribute record associated with the file section;

— the identification of the file;

— certain attributes of the file;

— certain attributes of the file section.

The first or only directory record recorded in a logical sector shall begin at the first byte of the first data field of that logical sector. Each subsequent directory record recorded in that logical sector shall begin at the byte immediately following the last byte of the preceding directory record in that logical sector. Each directory record shall end in the logical sector in which it begins. Unused byte positions after the last directory record in a logical sector shall be set to (00).

7.8.1.3 Order of directory records

The records in a directory shall be ordered according to 10.3.

7.8.1.4 Directory length

The length of a directory shall be the sum of:

— the lengths of all directory records in the directory;

— the number of unused byte positions after the last directory record in all logical sectors in which the directory is recorded.

7.8.2 Directory hierarchy

7.8.2.1 General

A directory hierarchy shall be a set of directories related to each other as follows.

— The root of the hierarchy, called the root directory, shall be a directory identified in a primary volume descriptor, supplementary volume descriptor or enhanced volume descriptor.

— Each directory, other than the root directory, shall be identified by a record in another directory.

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

— A hierarchical relationship shall exist between the root directory and all other directories as shown in Figure 1.

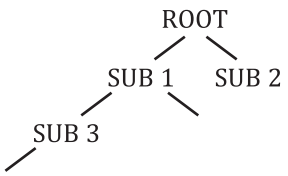

Figure 1 — Example of directory hierarchy

© ISO/IEC 2023 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO/IEC 9660:2023