INTERNATIONAL STANDARD

ISO/IEC 11694-4

Third edition
2008-07-01

Identification cards — Optical memory cards — Linear recording method —

Part 4: Logical data structures

Cartes d'identification — Cartes à mémoire optique — Méthode d'enregistrement linéaire —

Partie 4: Structures de données logiques

Reference number
ISO/IEC 11694-4:2008(E)

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Published in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. 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.

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.

ISO/IEC 11694-4 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and personal identification*.

This third edition cancels and replaces the second edition (ISO/IEC 11694-4:2001), which has been technically revised.

ISO/IEC 11694 consists of the following parts, under the general title *Identification cards — Optical memory cards — Linear recording method*:

— *Part 1: Physical characteristics*

— *Part 2: Dimensions and location of the accessible optical area*

— *Part 3: Optical properties and characteristics*

— *Part 4: Logical data structures*

— *Part 5: Data format for information interchange for applications using ISO/IEC 11694-4, Annex B*

— *Part 6: Use of biometrics on an optical memory card*

Introduction

ISO/IEC 11694 defines the parameters for optical memory cards and the use of such cards for the storage and interchange of digital data.

ISO/IEC 11694 recognizes the existence of different methods for recording and reading information on optical memory cards, the characteristics of which are specific to the recording method employed. In general, these different recording methods will not be compatible with each other. Therefore, ISO/IEC 11694 is structured to accommodate the inclusion of existing and future recording methods in a consistent manner.

This part of ISO/IEC 11694 is specific to optical memory cards using the linear recording method. Characteristics which apply to other specific recording methods are defined in separate standards documents.

This part of ISO/IEC 11694 defines the logical data structures and the extent of compliance with, addition to, and/or deviation from the relevant base document ISO/IEC 11693.

Identification cards — Optical memory cards — Linear recording method —

Part 4:
Logical data structures

1 Scope

This part of ISO/IEC 11694 defines the logical data structures for optical memory cards necessary to allow compatibility and interchange between systems using the linear recording method.

2 Normative references

The following referenced documents are indispensible for the application 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 11693, *Identification cards — Optical memory cards — General characteristics*

ISO/IEC 11694-1, *Identification cards — Optical memory cards — Linear recording method — Part 1: Physical characteristics*

ISO/IEC 11694-2, *Identification cards — Optical memory cards — Linear recording method — Part 2: Dimensions and location of the accessible optical area*

ISO/IEC 11694-3, *Identification cards — Optical memory cards — Linear recording method — Part 3: Optical properties and characteristics*

ISO/IEC 10373-5, *Identification cards — Test methods — Part 5: Optical memory cards*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 11693, ISO/IEC 11694-1, ISO/IEC 11694-2, ISO/IEC 11694-3 and the following apply.

3.1
data bit
area which represents data on an optical memory card

NOTE It is usually a mark which has a different reflectivity and/or phase difference from the background reflectivity.

3.2
data track
area located between adjacent track guides where data are written and/or read

3.3
error correction code
ECC
code designed to correct certain kinds of errors in data

3.4
error detection and correction
EDAC
family of methods in which redundancy is added to a message block, at the time the message block is recorded, in known fashion, and in which, upon read back, a decoder removes the redundancy and uses the redundant information to detect and correct erroneous channel symbols

3.5
modulation code
system for coding which transforms information bits into some physical representation for recording onto the optical memory card

3.6
data pitch
distance between corresponding points on adjacent data spots

3.7
sector
minimum unit of data that can be accessed on a card for any read and/or write command

3.8
address
character or group of characters that identifies a register, a particular part of storage, or some other data source or destination

3.9
BEST code
Burst and random-Error correction-System for-Teletext code
272,190 majority-logic decodable cyclic error detection and correction code

3.10
code word
fixed length sequence of bits resulting from encoding a message block using some error detection and correction method

3.11
data area
portion of the accessible optical area that can be written and/or read under the control of the application software

3.12
error detection code
EDC
set of code words in which elements conform to specific rules

NOTE If errors occur, the resulting presentation will not conform to the rules, indicating that errors are present.

3.13
error message
message returned by a card drive unit to indicate that the card inserted in the drive cannot be processed

3.14
information
totality of data present on the card including service, system and user data for interchange independent of the method of recording

NOTE Information can be replicated or written by means of an optical beam.

3.15
interleaving
process of distributing the physical location of code words to render the data more immune to clustered bit errors

3.16
message block
fixed length sequence of data bits which is encoded using error detection and correction methods to form a code word

3.17
MFM-RZ
modified-frequency-modulation-return-to-zero
modification of MFM encoding with a return to zero so that a flux reversal is used to indicate a 1 bit and the lack of a flux reversal is used to indicate a 0 bit

NOTE Also referred to as 1,3 RLL.

3.18
NRZI-RZ
non-return-to-zero-inverted, return to zero
encoding similar to MFM-RZ (3.17) except that a transition does not occur between adjacent zeros

3.19
sector code word
sector data block encoded using an error detection and correction code

3.20
sector data block
block of data containing user data and system information

4 Format structure

This section details information which makes up the accessible optical area and is placed on cards during manufacture and/or at the time of card initialization.

Area	Subsets
Accessible optical area	Guard tracks and data area.
Data area	Format description tracks, test tracks, application description tracks and application area.
Application area	Application data and user data.

5 Track layout

Track layout information shall be preformatted on cards during manufacture and/or written to cards prior to use.

Tracks shall be arranged in reverse order beginning with the reference track, the last bottom guard track located nearest the reference edge.

The track layout is outlined below. Because the total number of tracks can vary, the numbers of all tracks located between the last user data track and the reference track are given in parametric form where *n* is the nominal number of tracks and *n+9* is the number of the last bottom guard track, the reference track.

Track Description	Track #	Hex
Guard track (last bottom)	*n*+9	
:	:	
Guard track (first bottom)	*n*	
Format description track	*n*-1 [a]	
Test track 1 (bottom)	*n*-2 [a]	
:	:	
Test track 4 (bottom)	*n*-5 [a]	
Application description track	*n*-6 [a,b]	
Last user data track	*n*-7 [a,b]	
:	:	
First user data track	6 [a,b]	0006
Application description track	5 [a,b]	0005
Test track 4 (top)	4 [a]	0004
:	:	:
Test track 1 (top)	1 [a]	0001
Format description track	0 [a]	0000
Guard track (last top)	-1	3FFF
:	:	:
Guard track (first top)	-10	3FF6
[a] Data area		
[b] Application area		

5.1 Track layout examples

This section provides information concerning data structures that support the optional card layouts described in ISO/IEC 11694-2.

5.1.1 Cards with moderate data capacity

NOTE These layouts support the inclusion of a magnetic stripe and/or signature panel.

5.1.1.1 Normal density mode

Nominal number of tracks 2583. This layout shall contain 2603 tracks, of which 2571 shall be user data tracks. Tracks shall be numbered sequentially, in reverse order, beginning with track 2592, the reference track.

5.1.1.2 High density mode

Nominal number of tracks 4144. This layout shall contain 4164 tracks, of which 4132 shall be user data tracks. Tracks shall be numbered sequentially, in reverse order, beginning with track 4153, the reference track.

5.1.2 Cards with small data capacity

NOTE These layout options support the inclusion of a magnetic stripe, IC chip with contacts, embossing and/or signature panel.

5.1.2.1 Normal density mode

Nominal number of tracks 1000. This layout shall contain 1020 tracks, of which 988 shall be user data tracks. Tracks shall be numbered sequentially, in reverse order, beginning with track 1009, the reference track.

5.1.2.2 High density mode

Nominal number of tracks 1612. This layout shall contain 1632 tracks, of which 1600 shall be user data tracks. Tracks shall be numbered sequentially, in reverse order, beginning with track 1621, the reference track.

5.1.3 Cards with maximum data capacity

NOTE These layouts support the inclusion of a magnetic stripe and/or signature panel.

5.1.3.1 Normal density mode

Nominal number of tracks 3425. This layout shall contain 3445 tracks, of which 3413 shall be user data tracks. Tracks shall be numbered sequentially, in reverse order, beginning with track 3434, the reference track.

5.1.3.2 High density mode

Nominal number of tracks 5492. This layout shall contain 5512 tracks, of which 5480 shall be user data tracks. Tracks shall be numbered sequentially, in reverse order, beginning with track 5501, the reference track.

The total number of tracks may vary dependent on the application requirements; however, in all cases, tracks shall be arranged in order, and numbered sequentially, beginning with the reference track.

6 Track guides

Track guides shall be uniformly spaced across the card and shall extend the length of the accessible optical area. The accumulated tolerances across the width of all track guides shall be less than or equal to 0,01 % at 25 °C.

The width of the track guides shall be 2,2 μm ± 0,5 μm. The distance from the centre of one track guide to the centre of an adjacent track guide shall be 12,0 μm ± 0,1 μm in the normal density mode and 7,5 μm ± 0,1 μm in the high density mode.

A maximum of ten track guides can have breaks exceeding 100 μm; no breaks shall exceed 500 μm.

7 Guard tracks

There shall be 20 guard tracks, ten located directly above and ten directly below the user data area to enable the optics to locate the user data tracks and prevent the optical head from over running the accessible optical area if auto-tracking is lost.

Guard tracks *-1* to *-10* and *n* to *n+9* shall contain a copy of the card manufacturing information from sector 0 of the format description track formatted using sector type 13. The excess bytes shall be filled with zeros.

8 Format description tracks

There shall be two format description tracks, one located at the top and the other at the bottom of the data area, that shall be preformatted with information that permits the card drive to automatically switch between formats and allows later generations of card formats to be introduced alongside earlier generations. To