

ECMA

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

STANDARD ECMA-67

130 mm

**FLEXIBLE DISK CARTRIDGE LABELLING
AND FILE STRUCTURE FOR
INFORMATION INTERCHANGE**

January 1981

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BRIEF HISTORY

Technical Committee TC15 for Labelling and File Structure set up in 1976 a Task Group for the development of an ECMA standard for 200 mm flexible disk labelling. This work was conducted in close co-operation with ISO/TC97/SC15.

It was agreed that the standard as a whole should contain all elements needed for a description of disk labelling and file structure in general, with a specific chapter defining levels. Whilst there was soon a relatively broad agreement on the first level called Basic Interchange, it was clear that complete and full definition of all levels would require extensive discussion. In order not to delay the issue of an urgently needed standard for Basic Interchange, it was agreed to limit the 1st edition of the standard to one level only: namely Basic Interchange. This first edition was issued in August 1979.

With the adoption of standards ECMA-66 and ECMA-70 for the two types of 130 mm flexible disk cartridges and of ECMA-54, ECMA-59 and ECMA-69 for three types of 200 mm flexible disk cartridges, it became necessary to produce standards for Labelling and File Structure of all thus standardized types of flexible disk cartridges. As a result of this activity two standards have been produced:

ECMA-58 : Labelling and File Structure for 200 mm Flexible Disk Cartridge, 2nd Edition, dated January 1981

ECMA-67 : Labelling and File Structure for 130 mm Flexible Disk Cartridge

Considerable attention has been given to structure both standards in the same way and to select the specific features of each level so that they are substantially the same for the two kinds of flexible disk cartridges, but for the inherent differences of the two media.

ECMA-67 contains three levels of interchange, viz. Basic Interchange (BI), Extended Interchange Level 1 (E1) and Extended Interchange Level 2 (E2). ECMA-58, 2nd Edition, contains a third level: Extended Interchange Level 3 (E3). Care has been taken that BI, E1 and E2 are in essence the same in both standards.

This Standard ECMA-67 has been adopted by the General Assembly of ECMA on December 18, 1980.

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1. SCOPE AND FIELD OF APPLICATION

The aim of this Standard ECMA-67 is to facilitate the interchange of information recorded on both types of 130 mm flexible disk cartridges between users of different systems. This is accomplished by defining the basic characteristics of the blocks containing the records which constitute the file, as well as the file structure, and by specifying recorded labels to identify files, file sections, and volumes of flexible disk cartridges.

This Standard provides specifications for file and labelling facilities. It defines three nested levels of interchange:

- at the first level, called BASIC INTERCHANGE (BI), it is possible to interchange data by using a minimum set of the facilities provided,
- at a second level, called EXTENDED INTERCHANGE LEVEL 1 (E1), it is possible to interchange data using this minimum set together with blocks having a length greater than that of the physical records and with blocked records,
- at the third level, called EXTENDED INTERCHANGE LEVEL 2 (E2), it is possible to interchange data by using the complete set of the facilities provided.

2. CONFORMANCE

A flexible disk cartridge conforms to this Standard when all files and all labels recorded on it conform to the specifications of this Standard. A statement of conformity must identify one or more levels of interchange to which the contents of the flexible disk cartridge conform.

3. REFERENCES

ECMA-6	7-Bit Input/Output Coded Character Set
ECMA-35	Extension of the 7-Bit Coded Character Set
ECMA-43	8-Bit Coded Character Set
ECMA-66	Data Interchange on 130 mm Flexible Disk Cartridges Using Two-Frequency Recording at 7958 ftprad On One Side
ECMA-70	Data Interchange on 130 mm Flexible Disk Cartridges Using Modified Frequency Recording at 7958 ftprad On Both Sides

4. DEFINITIONS

For the purposes of this Standard the following definitions apply.

4.1 Block

A group of characters written or read as a unit.

4.2 Blocked Records

A record contained in a file in which each block may contain more than one record.

4.3 Cylinder

A pair of tracks, one on each side, having the same track number.

- The cylinder number is a two-digit number identical to the track number.
- On flexible disk cartridges which are recorded only on one side, cylinders comprise one track only.

4.4 Extent

A set of physical records the address of which form a continuous ascending sequence and which, on a flexible disk cartridge, contains a complete file or a section of a multivolume file.

4.5 File

A named collection of information consisting of records pertaining to a single subject.

4.6 File Section

For a file recorded over more than one volume, that part of the file that is recorded in any one volume.

4.7 Fixed-Length Record

A record contained in a file in which all the records shall have the same length.

4.8 Formatting

Writing the proper control information establishing the 35 physical cylinders and designating addresses of physical records on the flexible disk's surfaces.

4.9 Initialization

Writing of the Volume Label, the ERMAP label, and any other information initially required to be on the flexible disk cartridge, prior to the commencement of general processing or use.

4.10 Label

A record that identifies, characterizes and or delimits that volume or a file on that volume.

4.11 Physical Record

A fixed-length field containing the data of a sector.

NOTE 1:

In Standards ECMA-66 and ECMA-70 this field is named "Data Field".

4.12 Record

Related data treated as a unit of information.

4.13 Sector

That part of a track on a flexible disk cartridge that can be accessed by the magnetic heads in the course of predetermined angular displacements of the disk.

4.14 Track

That part of a flexible disk which can be accessed by a single magnetic head, that is stationary, while the disk makes a complete revolution.

4.15 Unblocked Record

A record contained in a file in which each block shall contain only one record.

4.16 Unspanned Record

A record contained in a file in which each record shall end in the block in which it begins.

4.17 Variable-Length Record

A record contained in a file in which the records may have different lengths.

4.18 Volume

A dismountable physical unit of storage media, e.g. a flexible disk cartridge.

5. ARRANGEMENT OF LABELS AND DATA

5.1 Notation

The following notation is used hereafter:

- CP : Character position within the label
- L : Length of the field in number of character positions
- a-character(s) : Any of the allowed characters (see 7.1)
- Digit(s) : Any digit from ZERO to NINE

With the exception of SPACE, a group of capital letters in the content column of a table specifying label contents indicates that the corresponding characters shall appear in the order given and in the corresponding character positions of the field specified, e.g. VOL in CP 1-3 of the Volume Label.

5.2 Justification of Characters

In the label fields, characters shall be justified as follows:

- i) in numerical fields, characters shall be right-justified, and any remaining positions on the left shall be filled either only with ZEROS or only with SPACES;

ii) in other fields, characters shall be left-justified, and any remaining positions on the right shall be filled with SPACES.

5.3 Applicability to Flexible Disk Cartridge According to ECMA-66

Where this Standard ECMA-67 states requirements for labels and data on side 0, such requirements shall apply. Where this Standard states requirements for labels and data on side 1 such requirements shall not apply.

5.4 Applicability to Flexible Disk Cartridge According to ECMA-70

Where this Standard ECMA-67 states requirements for labels and data on side 0 and on side 1, such requirements shall apply.

5.5 Organization of Space on a Flexible Disk Cartridge

Available space on a flexible disk cartridge shall be organized so that 33 cylinders numbered from 00 to 32 can be used at a time, 32 of them being used for data:

- An Index Cylinder (cylinder 00) shall be reserved for descriptive information about the volume, and the data recorded on the volume.
- Cylinders 33 and 34 shall be reserved as alternative cylinders, intended to be used when logically replacing defective cylinders.
- The remaining cylinders (01-32) shall be available for data.

5.6 Index Cylinder (Cylinder 00)

The Index Cylinder (cylinder 00) on a flexible disk cartridge shall be reserved for descriptive information about the volume and the data recorded on the volume. The Index Cylinder shall always be formatted with Physical Records that have a length of 128 data characters on side 0 and of 256 data characters on side 1. The allocation of sectors on the Index Cylinder shall be as follows:

SIDE	SECTOR	USE
0	01-04	reserved for system use
0	05	reserved for Error Map Label (ERMAP)
0	06	reserved for future standardization
0	07	reserved for Volume Label (VOL1)
0	08-16	reserved for File Labels (HDR1)
1	01-16	reserved for File Labels (HDR1)

5.6.1 Sectors reserved for system use

Sectors 01 to 04 of side 0 shall be reserved for system use and shall be ignored in interchange. Their contents are not

specified by this Standard and may not be overwritten, except if otherwise agreed by the sender and the recipient of the data. If workspace is required, the use of sector 04 of side 0 is recommended.

5.6.2 Sector reserved for future standardization

Sector 06 of side 0 is reserved for future standardization and shall be ignored in interchange.

5.6.3 Sectors reserved for Labels

Labels on the Index Cylinder shall be records which all have the same length. Sector 05 of side 0 is reserved for the Error Map Label (see 7.5). Sector 07 of side 0 is reserved for the Volume Label (VOL1). Sector 08-16 of side 0 and sector 01-16 of side 1 shall be reserved for File Labels (HDR1), one per Physical Record to describe the data files recorded on cylinders with addresses 01 to 32. A File Label shall be recorded within the first or only 128 character positions of the Physical Record.

If the number of File Labels to be recorded is less than the number of sectors reserved for File Labels, then the File Labels may be recorded anywhere among the reserved sectors.

Unused sectors shall be deleted according to 9.2.

5.7 Contents of Cylinders with Addresses 01 to 32

Cylinders with addresses 01 to 32 shall contain either data or allocated or unallocated available space. Data and allocated space on these cylinders shall be indicated in the extent limits of HDR1 labels contained in cylinder 00.

The contents of all unallocated space may be ignored in interchange.

6. FILE STRUCTURE FOR DATA INTERCHANGE

This clause describes the file structure for data interchange in terms of data blocks and data records and identifies the label fields defined for that purpose.

6.1 Blocks

6.1.1 Definition and characteristics

A block shall be a group of characters written or read as a unit having the following characteristics:

- A block shall be recorded in all or part of a Physical Record, or over more than one Physical Record in consecutive Physical Record address sequence.
- A block shall begin at the first byte of a Physical Record.
- A block may contain one or more complete records.

A block is a logical entity not to be confused with Data Block described in 9.1.

6.1.2 Block length

The length of a block shall be the number of characters in the block. Within a file all blocks shall have the same length.

The maximum length of a block that may be assigned on a flexible disk shall be equal to the total length of all Physical Records of a data track, i.e. to its data capacity.

The minimum block length of a block shall be:

- 1 character, when it contains a fixed-length record,
- 5 characters, when it contains a variable-length record.

6.1.3 Unused character positions

The space left between the end of a block and the end of the last or only Physical Record containing that block, shall not be used for data and shall be filled with NULs.

6.1.4 Relation to extents

Within each extent the data within the Physical Record shall be considered to be grouped into consecutive blocks.

The first block of an extent shall begin at the first byte of the first non-defective Physical Record in the extent. A block shall be completely contained in one extent only.

6.2 Records

6.2.1 Definition and characteristics

A record shall be related data treated as a unit of information having the following characteristics:

- A record may be recorded on all or part of a block.
- Within each block the data shall be considered to be grouped into consecutive records.
- Each record shall end in the block in which it begins, i.e. all records shall be unspanned.
- The first or only record of a block shall begin at the first byte of the block. Each successive record, if any, within the block shall begin at the byte immediately following the last data byte of the preceding record.
- The length of a record is the number of data characters of this record.

6.2.2 Fixed-length records

A fixed-length record shall be a record contained in a file which is assigned to contain records which all have

the same length. The minimum assigned length of a fixed-length record shall be one data character and the maximum assigned length shall be equal to the block length.

6.2.2.1 Unblocked fixed-length records

An unblocked fixed-length record shall be a record contained in a file in which each block contains only one record.

6.2.2.2 Blocked fixed-length records

A blocked fixed-length record shall be a record contained in a file in which each block, except possibly the last one, may contain more than one record, the block length being an integer multiple, greater than one, of the record length.

6.2.3 Variable-length records

A variable-length record shall be a record contained in a file which is assigned to contain records which may have different lengths.

The assigned maximum record length shall not be greater than the block length. The length of any record in the file shall not exceed this assigned value.

The record length shall be expressed as a four-digit decimal number recorded as the first four characters of the record. These four characters shall be counted as part of the record length.

The minimum length of a variable-length record shall be 5 characters.

6.2.3.1 Unblocked variable-length records

An unblocked variable-length record shall be a record contained in a file in which each block contains only one record.

6.2.3.2 Blocked variable-length records

A blocked variable-length record shall be a record contained in a file in which a block may contain more than one record.

6.2.3.3 Relation to blocks

The first or only record of a block shall begin at the first byte of the block. The space between the end of the last or only record of a block and the end of a block shall be filled with NULs.

6.2.4 Record deletion

The data of a record within a file that is not a Basic Interchange file shall be considered to be deleted if the character DEL appears in the first character position of the record, following the Record Length field, if any.

The data of a record within a Basic Interchange file shall be deleted only by the method specified in clause 9.2.

6.3 Files

6.3.1 Definition and characteristics

A file shall be a named collection of records having the following characteristics:

- A file shall be recorded in all or part of a volume, or over more than one volume.
- If a file is recorded over more than one volume only one file section of that file shall be recorded in any one volume. Either all sections of a file shall be numbered consecutively, starting with 01 or they shall all be unnumbered.
- On any one volume each file or file section that is recorded on it shall be contained within a single extent.

6.3.2 Relation to volumes

A volume may contain one or more complete files or file sections.

A volume shall not contain more than one section of the same file.

6.4 File Organization

This Standard does not allow file organizations other than sequential organization.

In a sequential file, if the records are unblocked, then no record shall appear in a block, unless the previous block, in Physical Record address sequence, contains a record. If the records are blocked, then no record shall appear in a block unless the preceding block, in Physical Record address sequence, contains insufficient space to accommodate the next record.

This does not apply to the first record of the file.

6.5 Relevant Formats for Interchange

Within a file for interchange records shall be in one of the following formats:

- fixed length, unblocked
- fixed length, blocked
- variable length, unblocked
- variable length, blocked.

6.6 Relevant Fields for File Structure

The following File Label (HDR1) fields are relevant for describing the file structure of the data to be interchanged:

- CP 23-27 : Block Length
- CP 40 : Record Format
- CP 54-57 : Record Length
- CP 58-62 : Offset to Next Record Space
- CP 63 : Record Attribute

7. FORMAT AND CONTENTS OF THE LABELS

7.1 Character Set and Coding

The characters allowed in the labels shall be coded according to the ECMA 7-bit Coded Character Set (ECMA-6).

These characters are those in the following positions of the International Reference Version:

- 2/0 to 2/2 4/1 to 4/15
- 2/5 to 2/15 5/0 to 5/10
- 3/0 to 3/15

Table 1 shows the International Reference Version. The characters not allowed in labels are shaded.

				b ₇	0	0	0	0	1	1	1	1
				b ₆	0	0	1	1	0	0	1	1
				b ₅	0	1	0	1	0	1	0	1
					0	1	2	3	4	5	6	7
b ₄	b ₃	b ₂	b ₁									
0	0	0	0	0	NUL	TC ₁ (DLE)	SP	0	@	P	'	p
0	0	0	1	1	TC ₂ (SOH)	DC ₁	!	1	A	Q	a	q
0	0	1	0	2	TC ₃ (STX)	DC ₂	"	2	B	R	b	r
0	0	1	1	3	TC ₄ (ETX)	DC ₃	#	3	C	S	c	s
0	1	0	0	4	TC ₅ (EOT)	DC ₄	\$	4	D	T	d	t
0	1	0	1	5	TC ₆ (END)	TC ₆ (NAK)	%	5	E	U	e	u
0	1	1	0	6	TC ₇ (ACK)	TC ₇ (SYN)	&	6	F	V	f	v
0	1	1	1	7	BEL	TC ₈ (ETB)	'	7	G	W	g	w
1	0	0	0	8	FE ₁ (BS)	CAN	(	8	H	X	h	x
1	0	0	1	9	FE ₂ (HT)	EM	)	9	I	Y	i	y
1	0	1	0	10	FE ₃ (LF)	SUB	*	:	J	Z	j	z
1	0	1	1	11	FE ₄ (VT)	ESC	+	;	K	[	k	{
1	1	0	0	12	FE ₅ (FF)	IS ₁ (FS)	,	<	L	\	l	|
1	1	0	1	13	FE ₆ (CR)	IS ₂ (GS)	-	=	M	]	m	}
1	1	1	0	14	SO	IS ₃ (RS)	.	>	N	^	n	~
1	1	1	1	15	SI	IS ₄ (US)	/	?	0	_	o	DEL

7.2 Labels

A volume shall contain a Volume Label (VOL1); each file or file section on the volume shall be identified through a File Header Label (HDR1). Each of these labels shall be recorded on cylinder 00, as a record with a length of 128 characters. A volume shall contain an Error Map Label (ERMAP).

A Label shall not be part of a file.

7.3 Volume Label (VOL1)

The Volume Label shall be used to identify the volume, the owner, the accessibility conditions, the version of this Standard which applies, and certain physical characteristics of the volume.

CP	Field Name	L	Content
1-3	Label Identifier	3	VOL
4	Label Number	1	1
5-10	Volume Identifier	6	a-characters
11	Volume Accessibility Indicator	1	a-character
12-37	(Reserved for future standardization)	26	SPACES
38-51	Owner Identifier	14	a-characters
52-71	(Reserved for future standardization)	20	SPACES
72	Surface Indicator	1	a-character
73-75	(Reserved for future standardization)	3	SPACES
76	Physical Record Length Identifier	1	Digit ONE
77-78	(Reserved for future standardization)	2	SPACES
79	File Label Allocation	1	SPACE and Digits
80	Label Standard Version	1	Digits
81-128	(Reserved for future standardization)	48	SPACES

7.3.1 Fields reserved for future standardization (CP 12-37, 52-71, 73-75, 77-78 and 81-128)

These fields shall be reserved for future standardization. The only character allowed in these fields shall be SPACE.

7.3.2 Label Identifier (CP 1-3)

This field shall specify the Label Identifier. The characters allowed in this field shall be VOL.

7.3.3 Label Number (CP 4)

This field shall specify the Label Number. The character allowed in this field shall be digit ONE.

7.3.4 Volume Identifier (CP 5-10)

This field shall specify an identification for the volume. The characters allowed in this field shall be a-characters. The identifier shall be permanently assigned by the owner of the volume.

7.3.5 Volume Accessibility Indicator (CP 11)

This field shall specify whether there are restrictions under which the volume may be accessed. The character allowed in this field shall be an a-character.

SPACE shall mean that there is no access restriction to any file label or data on the volume.

Another character shall mean that there are particular qualifications for access to the volume, which are subject to agreement between sender and recipient of the data.

If this field contains SPACE, then the File Accessibility Indicator (HDR1, CP 42) in all File Header Labels shall also contain SPACE.

7.3.6 Owner Identifier (CP 38-51)

This field shall specify the owner of the volume. The characters allowed in this field shall be a-characters.

7.3.7 Surface Indicator (CP 72)

This field shall specify the number of formatted surfaces of the volume and the type of format. The character allowed in this field shall be an a-character.

SPACE or ONE shall mean that only side 0 is formatted in this volume according to ECMA-66.

M shall mean that both sides are formatted in this volume according to ECMA-70.

7.3.8 Physical Record Length Identifier (CP 76)

This field shall specify the length of the Physical Records on all cylinders other than cylinder 00.

The character allowed in this field shall be digit ONE.

ONE shall mean that the length of all physical records is 256 character positions.

7.3.9 File Label Allocation (CP 79)

This field shall specify whether File Labels (HDR1) may be recorded on side 1.

The characters allowed in this field shall be SPACE or digits.

SPACE shall mean that there are no labels on side 1.

ONE shall mean that sectors on side 1 are reserved for one File Label (HDR1) per Physical Record.

7.3.10 Label Standard Version (CP 80)

This field shall specify the version of this Standard to which the volume conforms.

The character allowed in this field shall be a digit.

ONE shall indicate the present version of this Standard ECMA-67, dated January 1981.

7.4 File Label (HDR1)

The File Label shall be used to identify the file, to specify its location on the volume, and to designate certain attributes and processing requirements of the file.

CP	Field Name	L	Content
1-3	Label Identifier	3	HDR
4	Label Number	1	1
5	(Reserved for future standardization)	1	SPACE
6-22	File Identifier	17	a-characters
23-27	Block Length	5	Digits
28	(Reserved for future standardization)	1	SPACE
29-33	Begin of Extent	5	Digits
34	(Reserved for future standardization)	1	SPACE

CP	Field Name	L	Content
35-39	End of Extent	5	Digits
40	Record Format	1	SPACE or F or V
41	Bypass Indicator	1	SPACE or B
42	File Accessibility	1	a-character
43	Write Protect	1	SPACE or P
44	Interchange Type	1	SPACE or capital letters or digits
45	Multivolume Indicator	1	SPACE or C or L
46-47	File Section Number	2	SPACEs or digits
48-53	Creation Date	6	SPACEs or digits
54-57	Record Length	4	SPACEs or digits
58-62	Offset to Next Record Space	5	SPACEs or digits
63	Record Attribute	1	SPACE or B
64	File Organization	1	SPACE or S
65-66	(Reserved for future standardization)	2	SPACEs
67-72	Expiration Date	6	SPACEs or digits
73	Verify/Copy Indicator	1	a-character
74	(Reserved for future standardization)	1	SPACE
75-79	End of Data	5	Digits
80-128	(Reserved for future standardization)	49	SPACEs

7.4.1 Fields reserved for future standardization (CP 5, 28, 34, 65, 66, 74 and 80 to 128)

These fields shall be reserved for future standardization. The only character allowed in these fields shall be SPACE.

7.4.2 Label Identifier (CP 1-3)

This field shall specify the Label Identifier. The characters allowed in this field shall be HDR.

7.4.3 Label Number (CP 4)

This field shall specify the Label Number.
The character allowed in this field shall be digit ONE.

7.4.4 File Identifier (CP 6-22)

This field shall specify the identifier of the file.
The characters allowed in this field shall be a-characters.
The File Identifier shall be assigned to the file by its originator at label creation time. There shall be no duplicate file identifiers on the same volume. If the volume contains one or more files having an interchange level for which the File Identifier field is required to contain a maximum of 8 characters, then the first eight characters of the File Identifier field of such a file shall not be a duplicate of the first eight characters of any other File Identifier field on the volume.

7.4.5 Block Length (CP 23-27)

This field shall specify the number of characters per block. The characters allowed in this field shall be digits.

7.4.6 Begin of Extent (CP 29-33)

This field shall specify the address of the first Physical Record of the extent.

The characters allowed in this field shall be digits.

The first two digits shall specify the cylinder address
(01 to 32).

The third digit shall specify the side number (0 or 1).

The last two digits shall specify the sector number (01 to 9 or 16).

7.4.7 End of Extent (CP 35-39)

This field shall specify the address of the last Physical Record of the extent.

The characters allowed in this field shall be digits.

The first two digits shall specify the cylinder address
(01 to 32).

The third digit shall specify the side number (0 or 1).

The last two digits shall specify the sector number (01 to 9 or 16).

7.4.8 Record Format (CP 40)

This field shall specify the format of the records in the file.

The characters allowed in this field shall be SPACE, F or V.

SPACE or F shall mean that all records are fixed-length records.

V shall mean that all records are variable-length records.

7.4.9 Bypass Indicator (CP 41)

This field shall specify whether or not a file may be ignored in interchange.

The characters allowed in this field shall be SPACE or B.

SPACE shall mean that the file is intended for interchange.

B shall mean that the file is not intended for interchange.

7.4.10 File Accessibility Indicator (CP 42)

This field shall specify whether or not there are particular conditions under which the file can be accessed.

The character allowed in this field shall be an a-character.

SPACE shall mean that there is no access restriction.

Another character shall mean that there are particular qualifications for access to the file, which are subject to agreement between the sender and the recipient of the data. In this case the Volume Accessibility Indicator (CP 11) shall also not be SPACE.

7.4.11 Write Protect (CP 43)

This field shall specify whether or not there is a protection against alteration of the file.

The characters allowed in this field shall be SPACE and P.

SPACE shall mean that there is no protection.

P shall mean that the file is protected.

7.4.12 Interchange Type (CP 44)

This field shall specify the set of attributes that the file possesses.

The character allowed in this field shall be SPACE or capital letters or digits.

SPACE shall mean that the file is a Basic Interchange File.

ONE shall mean that the file is an Extended Interchange Level 1 (E1) File.

TWO shall mean that the file is an Extended Interchange Level 2 (E2) File.

Any capital letter shall mean that the file does not conform to any interchange level specified by this Standard.

7.4.13 Multivolume Indicator (CP 45)

This field shall specify whether the file is completely contained in the volume, is continued on another volume or finishes on this volume.

The characters allowed in this field shall be SPACE, C and L.

- SPACE shall mean that the file is entirely contained in the volume.
- C shall mean that the file continues on another volume.
- L shall mean that the file ends, but does not begin in the volume.

7.4.14 File Section Number (CP 46-47)

This field shall specify the ordinal number of the file sections (starting with 01) in a multivolume file if they are consecutively numbered. The characters allowed in this field shall be SPACE and digits.

- SPACES shall mean that the file sections are not numbered.
- Digits shall form this number (01 to 99).

If the file is not a multivolume file, this field shall contain SPACES or 01.

7.4.15 Creation Date (CP 48-53)

This field shall specify the date of the first creation of the file. The characters allowed in this field shall be SPACE and digits.

- SPACES shall mean that the creation date is not significant.

The first two digits shall specify the two low-order digits of the year (00 to 99).

The next two digits shall specify the month (01 to 12).

The last two digits shall specify the day (01 to 31).

7.4.16 Record Length (CP 54-57)

This field shall specify the maximum number of characters per record. The characters allowed in this field shall be SPACE and digits.

- SPACE shall mean that the maximum record length is equal to the block length.
- Digits shall specify the maximum number of characters per record.

If the Interchange Type field (HDR1, CP 44) contains a SPACE, then this field shall contain either SPACES or a number equal to that in the Block Length field (CP 23-27).

7.4.17 Offset to Next Record Space (CP 58-62)

This field shall be used with blocked records and shall specify the first position of the next sequential record by specifying the number of unused character positions in the block immediately preceding that addressed by End of Data (CP 75-79).

The characters allowed in this field shall be SPACE and digits.

SPACES shall mean that there are no unused positions in the last block.

Digits shall specify the number of unused positions in the last block.

With unblocked records, this field shall contain only SPACES or ZEROs.

7.4.18 Record Attribute (CP 63)

This field shall specify whether or not the records of the file are blocked or unblocked.

The characters allowed in this field shall be SPACE and B.

SPACE shall mean that the records are unblocked.

B shall mean that the records are blocked.

7.4.19 File Organization (CP 64)

This field shall specify the organization of the data.

The character allowed in this field shall be SPACE or S.

SPACE or S shall mean that the file is organized sequentially.

7.4.20 Expiration Date (CP 67-72)

This field shall specify if and when the file may be deleted.

The characters allowed in this field shall be SPACE and digits.

SPACE shall mean that the file may be deleted.

999999 shall mean that the file shall not be deleted.

Digits other than 999999 shall specify the earliest date at which the file may be deleted.

The first two digits shall specify the two low-order digits of the year (00 to 99).

The next two digits shall specify the month (01 to 12).

The last two digits shall specify the day (01 to 31).

7.4.21 Verify/Copy Indicator (CP 73)

This field shall specify whether verification procedures have been applied with the data of the file or whether the file has been copied on another medium.

The character allowed in this field shall be an a-character.

SPACE shall mean that this file has not been verified or copied, or alternatively, that this information is not relevant in interchange.

The use of any other character shall be a matter for agreement between the sender and the recipient of the data.

7.4.22 End of Data (CP 75-79)

This field shall specify the address of the Physical Record containing the beginning of the next available unused block in the extent of sequential files, if such a block exists. The characters allowed in this field shall be digits.

The first two digits shall specify the cylinder address (01 to 33).

The third digit shall specify the side number (0 or 1).

The last two digits shall specify the sector number (01 to 09 or 16).

If this address is higher than that in the End of Extent field (CP 35-39), this shall mean that the data completely fills the extent. In this situation only, cylinder address 33 may occur.

7.5 ERMAP Label

The ERMAP label shall be used to identify up to two cylinders found defective during formatting.

CP	Field Name	L	Content
1-5	Label Identifier	5	ERMAP
6	(Reserved for future standardization)	1	SPACE
7-9	Defective Cylinder Identification 1	3	SPACEs or digits
10	(Reserved for future standardization)	1	SPACE
11-13	Defective Cylinder Identification 2	3	SPACEs or digits
14-128	(Reserved for future standardization)	115	SPACEs

7.5.1 Fields reserved for future standardization (CP 6, 10 and 14-128)

These fields shall be reserved for future standardization. The only character allowed in these fields shall be SPACE.

7.5.2 Label Identifier (CP 1-5)

This field shall specify the ERMAP label. The characters allowed in this field are ERMAP.

7.5.3 Defective Cylinder Identification 1 (CP 7-9)

This field shall specify the cylinder number of the first sequentially encountered defective cylinder on the volume, if any.

The characters allowed in this field shall be SPACE and digits.

SPACES shall mean that no defective cylinder has been encountered during formatting.

The first two digits shall specify the cylinder number (01 to 32) of the first defective cylinder.

The third digit shall be always ZERO.

7.5.4 Defective Cylinder Identification 2 (CP 11-13)

This field shall specify the cylinder number of the second sequentially encountered defective cylinder on the volume, if any.

The characters allowed in this field shall be SPACE and digits.

SPACES shall mean that there are not two defective cylinders on the volume (there may be one, if specified at CP 7-9).

The first two digits shall specify the cylinder number (02 to 33) of the second defective cylinder.

The third digit shall always be ZERO.

8. INITIALIZATION AND PROCESSING OF LABEL FIELDS

8.1 Use of Label Fields

When reading, the system may override the contents of the fields found in labels being processed by that system by using new characters obtained from other sources. The new characters may be supplied before the file is processed or after the processing has begun, which is at the option of the system implementors. However, the contents of the fields of the VOL1 label shall not be overridden.

8.2 Volume Label (VOL1)

The Volume Label, once created, shall be preserved, and shall not be changed unless authorized by the owner of the volume, and then only as prescribed by that owner.

The Volume Label shall be created when the volume is initialized; the following fields shall be properly set during this process:

- Label Identifier and Label Number (CP 1-4)
- Surface Indicator (CP 72)
- Physical Record Length Identifier (CP 76)
- Label Standard Version (CP 80)

Entry of other fields may be done with either the same initialization process or with subsequent process, under control of a system operator and/or a special program.

The following fields shall be assigned by the installation or the user of the installation:

- Volume Identifier (CP 5-10)
- Volume Accessibility Indicator (CP 11)
- Owner Identifier (CP 38-51)
- File Label Allocation (CP 79)

8.3 File Label (HDR1)

A file label, once created, shall be preserved, and shall not be changed unless authorized by the owner of the file, and then only as prescribed by the owner.

During initialization, all sectors intended to contain file labels shall be deleted according to 9.2.

8.4 Error Map Label (ERMAP)

The ERMAP Label, once created, shall be reserved for system use.

The ERMAP Label shall be created during initialization, after formatting. The ERMAP Label shall be initialized with the Label Identifier (CP 1-5) set to ERMAP, followed by 123 SPACES.

9. PHYSICAL RECORDS

9.1 Structure of Data Blocks

The Data Block of a sector, as defined in ECMA-66 and ECMA-70, comprises three fields:

- Data Mark
- Physical Record
- EDC (Error Detection Characters)

NOTE 2:

In Standards ECMA-66 and ECMA-70 the field "Physical Record" is called "Data Field".

9.1.1 Data Mark

The layout of the Data Mark depends on the recording method. For all tracks on flexible disk cartridges according to ECMA-66, and for track 00 on side 0 on flexible disk cartridges according to ECMA-70, this field shall comprise:

6 (00)-bytes

1 byte which shall be either (FB)* or a flag byte of (F8)*.

For all tracks on disks according to ECMA-70, except track 00 on side 0, this field shall comprise:

12 (00)-bytes

3 (A1)*-bytes

1 byte which shall be either (FB) or a flag byte of (F8).

(FB) or (FB)* shall indicate that the data is valid and that the whole Physical Record can be read. The flag byte shall indicate that the first byte of the Physical Record shall be interpreted according to 9.2 and 9.3.

NOTE 3:

(00) is the hexadecimal notation for the 8-bit combination 00000000.

(A1) is the hexadecimal notation for the 8-bit combination 10100001 (high order bit B8 left) where the boundary transition between B3 and B4 is missing.*

(FB) is the hexadecimal notation for the 8-bit combination 11111011 (high-order bit B8 left).

(F8) is the hexadecimal notation for the 8-bit combination 11111000 (high-order bit B8 left).

(FB) is the hexadecimal notation for the 8-bit combination 11111011 (high-order bit B8 left), where the clock transitions of B6, B5 and B4 are missing.*

(F8) is the hexadecimal notation for the 8-bit combination 11111000 (high-order bit B8 left), where the clock transitions of B6, B5 and B4 are missing.*

9.1.2 Physical Record

This field shall comprise 256 bytes. If a block comprises less than 256 data bytes, the remaining positions of the Physical Record shall be filled with NULs.

9.1.3 EDC

These two bytes shall be generated by hardware using the bytes of the Data Block starting with the last byte of the Data Mark and ending with the last byte of the Physical Record.

9.2 Deleted Data

The data of a Physical Record shall be considered deleted if the last byte of the Data Mark is a flag byte and the first byte of the Physical Record contains the character D; the remaining bytes in that Physical Record shall be ignored in interchange, the EDC of such a Data Block shall be valid.

This method of deletion shall be applied only to a Physical Record which is within cylinder 0 or within an extent of a Basic Interchange file.

9.3 Defective Physical Records

A Physical Record shall be considered defective if the last byte of the Data Mark is a flag byte and if its first byte contains the character F; the remaining bytes in that Physical Record shall be ignored in interchange.

The EDC of a Data Block containing a defective Physical Record may or may not be valid.

9.4 Handling of Defective Physical Records

Distinction shall be made between defective Physical Records found when formatting a flexible disk cartridge, and Physical Records found defective during processing of data (writing or reading of a file), after the flexible disk was initialized. This Standard specifies options for use while processing data; formatting of a flexible disk cartridge is defined in Standards ECMA-66 and ECMA-70.

If a defective Physical Record is encountered on cylinder 00, then further processing shall be suspended.

When a defective Physical Record is encountered within a file the following actions can be taken:

- to suspend further processing of the offending file on this flexible disk cartridge,
- to continue processing using Sequential Relocation.

9.4.1 Sequential Relocation

If a defective Physical Record is encountered when creating a file, a flag byte shall be entered as last byte of the Data Mark and the character F shall be entered as first byte of the Physical Record. The data intended for this Physical Record shall then be written in the next non-defective Physical Record instead. If it is impossible to write a flag byte and F, the system shall suspend further processing of this file on this flexible disk cartridge.

If a flag byte and F are encountered when reading a flexible disk cartridge, the desired data will be found in the next sequential Physical Record. No further processing of the defective Physical Record is required.

9.4.2 Suspension of processing of a file

If processing of a file is suspended during its creation because a defective Physical Record has been encountered, the file shall be terminated on this flexible disk cartridge with the last Physical Record of the block preceding the block in which the defective Physical Record occurred. The file may then be continued on another volume.

NOTE 4:

The terminating Physical Record specified in this clause is the Physical Record preceding the defective Physical Record if the block length is less than or equal to the Physical Record length.

10. LEVELS OF INTERCHANGE

10.1 General

This Standard specifies three levels of interchange called Basic Interchange (BI), Extended Interchange Level 1 (E1) and Extended Interchange Level 2 (E2).

A single volume may contain Basic Interchange files along with files of other levels of interchange or files not conforming to any interchange level specified in this Standard. Therefore a volume may conform to more than one interchange level simultaneously.

A data-processing system which supports an identified interchange level shall be capable of processing on a volume those files which conform to that interchange level or to a lower interchange level, but is not required to process any file, or associated file label, that does not conform to one of those levels.

On a given flexible disk cartridge, all data shall be recorded according to Standard ECMA-66 or ECMA-70.

10.2 Basic Interchange

A volume shall contain one or more Basic Interchange files. The file label for a Basic Interchange file shall not be recorded on side 1.

A Basic Interchange file shall be specified by SPACE in the Interchange Type field (HDR1, CP 44) and shall have the following attributes:

- i) The file name shall be of 8 characters maximum.
- ii) The block length shall not exceed the Physical Record length (256 characters).
- iii) All records shall be in fixed-length format.
- iv) All records shall have a length equal to the block length.
- v) All records shall be unblocked.

The following fields, having assumed values in Basic Interchange, need not to be checked:

Field Name	Assumed Values		
	Label	CP	Characters
Record Format	HDR1	40	SPACE or F
Record Length	HDR1	54-57	SPACE

Field Name	Assumed Values		
	Label	CP	Characters
Offset to Next Record Space	HDR1	58-62	SPACE
Record Attribute	HDR1	63	SPACE

Defective Physical Records within Basic Interchange files shall be handled either by using the Sequential Relocation method or by terminating the file on this flexible disk cartridge.

10.3 Extended Interchange Level 1

A volume shall contain one or more Extended Interchange Level 1 files.

The file label for an Extended Interchange Level 1 file shall not be recorded on side 1.

An Extended Interchange Level 1 file shall be specified by digit ONE in the Interchange Type field (HDR1, CP 44) and shall have the following attributes:

- i) The file name shall be of 8 characters maximum.
- ii) The block length shall not exceed the data capacity of a track, i.e. 2304 characters (ECMA-66) or 4096 characters (ECMA-70).
- iii) All records shall be in fixed-length format.
- iv) Records can be blocked or unblocked.

The following field having an assumed value in Extended Interchange Level 1 need not be checked:

Field Name	Assumed Value		
	Label	CP	Characters
Record Format	HDR1	40	SPACE or F

Defective Physical Records within Extended Interchange Level 1 files shall be handled either by using the Sequential Relocation method or by terminating the file on this flexible disk cartridge.

10.4 Extended Interchange Level 2

A volume shall contain one or more Extended Interchange Level 2 files.

The file label for an Extended Interchange Level 2 file may be recorded on side 1.

An Extended Interchange Level 2 file shall be specified by digit TWO in the Interchange Type field (HDR1, CP 44) and shall have the following attributes:

- i) The file name can be of 17 characters maximum.
- ii) The block length shall not exceed the data capacity of a track, i.e. 2304 characters (ECMA-66) or 4096 characters (ECMA-70).
- iii) Records can be in fixed-length or in variable-length format.
- iv) Records can be blocked or unblocked.

Defective Physical Records within Extended Interchange Level 2 files shall be handled either by using the Sequential Relocation method or by terminating the file on this flexible disk cartridge.

10.5 Files not Conforming to Specified Interchange Levels

If a volume includes a file that does not conform to any of the interchange levels specified in this Standard, the identifying label of the file shall have contents that conform to the requirements of clause 7.4 in the following fields:

Field Name	Prescribed Values		
	Label	CP	Characters
Label Identifier	HDR1	1-3	HDR
Label Number	HDR1	4	1
Begin of Extent	HDR1	29-33	Digits
End of Extent	HDR1	35-39	Digits
Interchange Type	HDR1	44	Capital Letters

The contents of all other fields are not specified.

APPENDIX

EXAMPLES

This Appendix describes examples of structuring data records and blocks on flexible disk cartridges and the fields of the HDR1 Label defined for that purpose.

1. Relevant Fields for Data Format

The following fields in HDR1 are relevant for describing the data formats:

- CP 23-27 : Block Length
- CP 40 : Record Format
- CP 54-57 : Record Length
- CP 58-62 : Offset to Next Record Space
- CP 63 : Record Attribute

A2. Specific Formats

A2.1 Unblocked Records

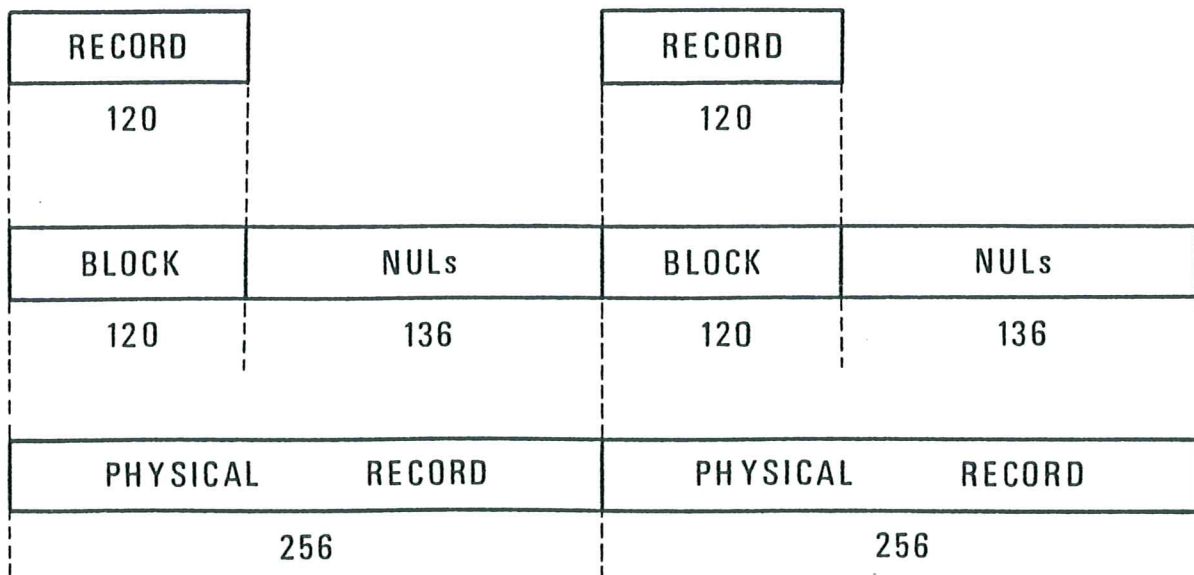
These records are recorded as one and only one record per block, irrespective of the record length.

Example 1

A file containing fixed-length records of 120 characters is considered.

The label fields of interest will contain:

- Block Length : 120
- Record Format : F or SPACE
- Record Length : 120 or SPACES



Offset to Next
Record Space : SPACES
Record Attribute : SPACE

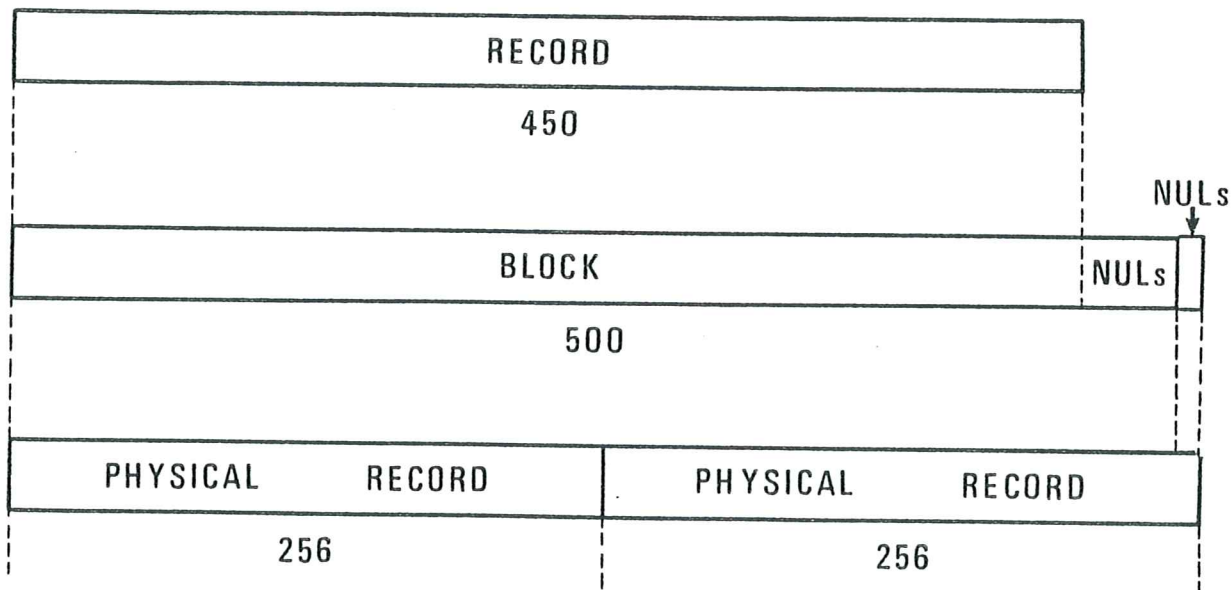
In this file, each Physical Record then would contain 120 data characters, followed by 136 padding characters (NULs).

Example 2

In a file containing variable-length records with a maximum length of 500 characters is considered. The label fields of interest will contain:

Block Length : 500
Record Format : V
Record Length : 500 or SPACES
Offset to Next
Record Space : SPACES
Record Attribute : SPACE

The record considered in the following example has a length of 450 characters.



In this file every pair of Physical Records would contain a variable-length record, followed by padding characters (NULs) within the block and between the end of the block and the end of the second Physical Record.

A2.2 Blocked Records

These records are recorded as one or more record per block, depending on the record lengths.

Example 3

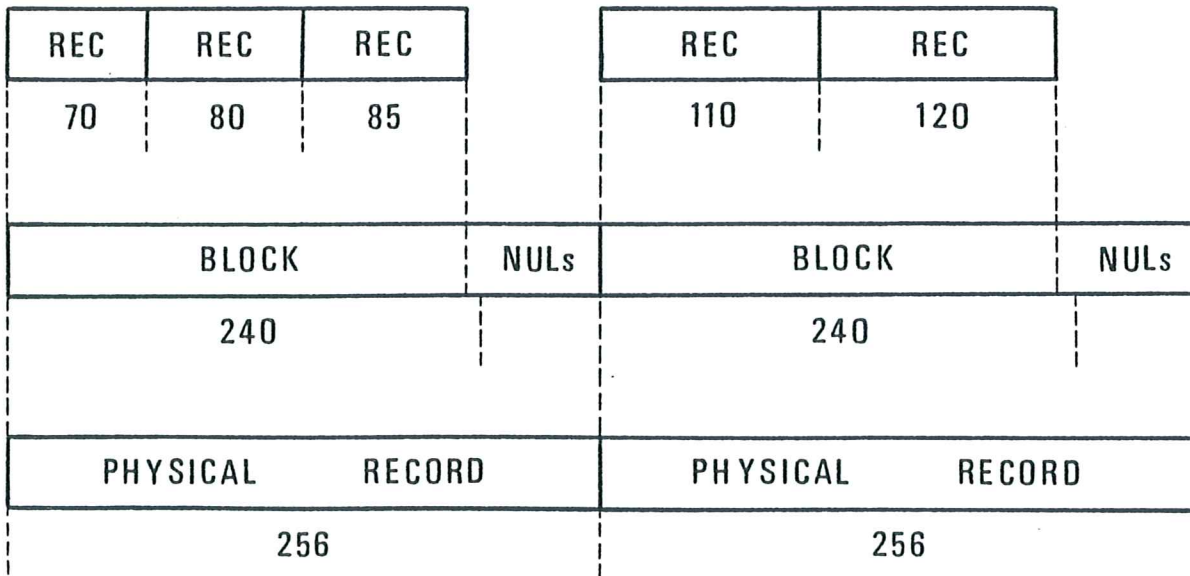
A file containing fixed-length records of 60 characters that are blocked into blocks with a length of 240 characters is considered. The label fields of interest will contain:

Block Length : 240
Record Format : F or SPACE
Record Length : 60
Offset to Next Record Space : ZEROs or SPACEs or 60 or 120 or 180
Record Attribute : B

The contents of the Offset to Next Record Space field depend on the number of records written in the last block:

- ZERO means a completely filled block of four records;
- 60 means a partly filled block with three records;
- 120 means a partly filled block with two records;
- 180 means a partly filled block with one record.

In this file, each Physical Record (except possibly the last one used) contains 240 characters and 16 padding characters (NULs).



Example 4

A file containing variable-length records with a maximum length of 120 characters that are blocked into blocks with a length of 240 characters is considered. The last two blocks of the file are shown in the diagram below. The label fields of interest will contain:

Block Length : 240
 Record Format : V
 Record Length : 120
 Offset to Next Record Space : 10
 Record Attribute : B

The contents of the Offset to Next Record Space field specify the number of unused character positions in the last block written; these positions shall be filled with NULs.

In this file, each Physical Record contains variable-length records within blocks followed by padding characters (NULs) within the block and between the end of the block and the end of the Physical Records.

REC	REC	REC	REC		REC	REC	REC	REC	
60	60	60	60		60	60	60	60	
BLOCK				NULs	BLOCK				NULs
240				16	240				16
PHYSICAL RECORD					PHYSICAL RECORD				
256					256				

