ECMA

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

STANDARD ECMA-58

FLEXIBLE DISK CARTRIDGE LABELLING AND FILE STRUCTURE FOR INFORMATION INTERCHANGE

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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
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 ele-
ments 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 Inter-
change, it was agreed to limit the 1st edition of the standard to
one level only: namely Basic Interchange.

Therefore this 1st edition contains:

- A general description of flexible disk cartridge labelling and
  file structure.

- A specific limitation of this edition of the standard to Basic
  Interchange.

- Clear indications of this limitation in the text and in notes.

- Advanced information on future standardization and reservation
  of characters for label fields, so as to indicate to the users
  (without committment) the trend of future standardization and
  at the same time make provisions for having the best chance of
  compatibility of future, augmented editions of the standard with
  already existing implementations.

This Standard ECMA-58 has been adopted by the General Assembly
of ECMA on June 21, 1979.

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1. SCOPE AND FIELD OF APPLICATION

The aim of this Standard ECMA-58 is to facilitate the inter-change of information recorded on each of the types of flexible disk cartridges defined in Standards ECMA-54 and ECMA-59 between users of different systems.

This is accomplished by specifying recorded labels to identify files, file sections, and volumes of flexible disk cartridges, and by defining the basic characteristics of the blocks containing the records which constitute the file, as well as the file structure.

This Standard provides specifications for file and labelling facilities. It defines a minimum set of facilities which each implementation shall include and which is called Basic Interchange. This Standard also describes some facilities beyond Basic Interchange which may be the subject of future standardization (see Appendices C and D). They are referred to so as to reserve some characters for specific use in future versions of this Standard and also to facilitate the description of the handling of defective physical records. Conformance to the present version of this Standard requires implementation of Basic Interchange only.

The labelling support provided by a product or programming system to which this Standard is applicable must include the procedures for producing and processing labelled flexible disk cartridge volumes and files. Failure to conform to this Standard may result in loss of the ability to interchange data effectively.

Within this Standard the specifications for file and labelling facilities applicable to each of the types of flexible disk cartridge possess a high level of similarity. This fact makes it both desirable and practical to include them within a single standards document. It also simplifies any implementation which is intended within the same equipment or system to support Basic Interchange on both types of flexible disk cartridge.

The requirements of this Standard need not to apply to data which are not intended for interchange.

2. 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-54   Data Interchange on 200 mm Flexible Disk Cartridges using Double Frequency Recording at 13262 ftprad on One Side

ECMA-59   Data Interchange on 200 mm Flexible Disk Cartridges using Two-Frequency Recording at 13262 ftprad on Both Sides

3. DEFINITIONS

For the purposes of this Standard the following definitions apply.

3.1 Block: A group of characters written or read as a unit.

- A block may contain one or more complete records or segments of spanned records.

- A block may be recorded in all or part of a physical record or in more than one physical record.

- A block shall begin at the first byte of a physical record.

- For a given file, the length of a block is fixed.

NOTE 1:

For Basic Interchange, the number of records per block is restricted to one; also, the length of a block is restricted to a maximum of 128 characters.

3.2 Blocked Record: A record contained in a file in which each block may contain more than one record or record segment.

NOTE 2:

For Basic Interchange, records may not be blocked.

3.3 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 according to Standard ECMA-54, which are recorded only on one side, cylinders comprise one track only.

3.4 Extent: A set of physical records the addresses of which form a continuous ascending sequence and which, on a flexible disk cartridge, contains the one and only section of a file on the volume.

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

- The delineation of a file may be arbitrary.

- A file may be recorded in all or part of a volume, or in more than one volume.

3.6 File Section: For a file recorded in more than one volume, that part of the file that is recorded in any one volume.

3.7 Fixed-Length Record: A record contained in a file in which all the records shall have the same length.

NOTE 3:

For Basic Interchange, all records shall have the same length.

3.8 Formatting: Writing the proper control information establishing the 77 physical cylinders and designating addresses of

physical records on the flexible disk's surface.

3.9 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.

3.10 Label: A record that identifies, characterizes and/or delimits that volume or a file on that volume.

   - A label is not part of a file.

3.11 Label Handling Routines: A set of routines which process labels and that are an integral part of a system's software.

3.12 Operating System: Software which controls the execution of computer programs and may provide scheduling, debugging, input/output control, accounting, compilation, storage assignment, data management, and related services.

   - An operating system may be used in a single installation, or it may be used in many installations, as is frequently the case when it is provided by a supplier.

3.13 Physical Record: A fixed-length field containing the data of a sector. In Standards ECMA-54 and ECMA-59 this field is named "Data Field".

3.14 Record: Related data treated as a unit of information.

   - The delineation of a record may be arbitrary and determined by a designer of the information format.
   - A record may be recorded in all or part of a block or over more than one block.

   NOTE 4:

   For Basic Interchange, records are restricted to a maximum length of 128 characters, and shall be of fixed length.

3.15 Record Segment: That part of a spanned record that is contained in any one block.

   - The segments of a record shall not have segments of another record interspersed.

3.16 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.

3.17 Spanned Record: A record contained in a file in which each record may begin in one block and end in another.

   - Each record consists of one or more segments.
   - Records are contained in one or more consecutive blocks, such that only one segment of each record can appear in any one block.

   NOTE 5:

   For Basic Interchange, records may not be spanned.

3.18 <u>Track:</u> That part of a flexible disk which can be accessed by a single magnetic head while the disk makes a complete re-volution.

3.19 <u>Unblocked Record:</u> A record contained in a file in which each block shall contain only one record or record segment.

3.20 <u>Unspanned Record:</u> A record contained in a file in which each record shall end in the block in which it begins.

3.21 <u>User:</u> Invoker of the labelling functions described.

3.22 <u>Variable-Length Record:</u> A record contained in a file in which the records may have different lengths.

NOTE 6:

For Basic Interchange, all records shall have the same length.

3.23 <u>Volume:</u> A dismountable physical unit of storage media, viz. a flexible disk cartridge.

- A volume may contain a file section, a complete file, or more than one file.

- A volume may contain sections of several files but not multiple sections of the same file.

NOTE 7:
The systems software may be an operating system provided by a supplier or it may be provided by an installation or a user.

NOTE 8:
This Standard has been written as if the label handling routines were not contained in the user program.

NOTE 9:
The term system is used to include programming support, hardware pro-ducts, or combinations of these, for support of the flexible disk cartridge.

4. ARRANGEMENT OF LABELS AND DATA

4.1 Notation

The following notation is used hereafter:

CP	:	Character position within the label
L	:	Length of the field in number of characters
a-character	:	Any of the allowed characters (see 5.1)
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.

4.2 Justification of Characters

In the label fields, characters shall be justified as fol-lows.

i) in numeric 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.

4.3 Applicability to Flexible Disk Cartridge according to ECMA-54

Where this Standard ECMA-58 states requirements for labels and data on Side 0, such requirements shall apply. Where this Standard states requirements for data on Side 1 such requirements shall not apply.

4.4 Applicability to Flexible Disk Cartridge according to ECMA-59

Where this Standard ECMA-58 states requirements for labels and data on Side 0 and on Side 1, such requirements shall apply.

4.5 Organization of space on a Flexible Disk Cartridge

Available space on a flexible disk cartridge shall be organized so that 75 cylinders can be used at a time, 74 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 75 and 76 shall be reserved as alternative cylinders, intended to be used when logically replacing defective cylinders.

- The remaining cylinders (01 to 74) shall be available for data.

4.6 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. The allocation of sectors on the Index Cylinder shall be as follows:

SIDE	SECTOR	USE
0	01	Reserved for system use
0	02	Reserved for system use
0	03	Reserved for system use
0	04	Reserved for system use
0	05	Reserved for the Error Map (ERMAP)
0	06	Reserved for future standardization
0	07	Reserved for the Volume Label (VOL1)
0	08-26	Reserved for the File Labels (HDR1)
1	01-26	Reserved for future standardization

4.6.1 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 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.

4.6.2 Sector reserved for the Error Map

Sector 05 of side 0 shall be reserved for the Error Map (see 5.5).

4.6.3 Sector reserved for future standardization

Sector 06 of side 0 and sectors 01 to 26 of side 1 shall be reserved for future standardization and shall be ignored in interchange.

4.6.4 Sectors reserved for labels

Labels on the Index Cylinder shall be recorded on side 0 only. They shall be fixed-length records. Sector 07 of side 0 is reserved for the Volume Label (VOL1).

Sectors 08-26 of side 0 shall be reserved for File Labels (HDR1), one per physical record to describe the data files recorded on cylinders with addresses 01 to 74.

If fewer sectors are required for File Labels than the total number of sectors reserved, then the unused sectors may appear in any of the sector positions that are re-served for File Labels, The content of an unused sector is not specified in this Standard, except that it shall not contain a valid Label Identifier field (see 5.4.2). File Labels may be deleted according to 8.2.

4.7 Contents of Cylinders with Addresses 01 to 74

Cylinders with addresses 01 to 74 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.

5. FORMAT AND CONTENTS OF THE LABELS

5.1 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.

b7	0	0	0	0	1	1	1	1
b6	0	0	1	1	0	0	1	1
b5	0	1	0	1	0	1	0	1
b4 b3 b2 b1	0	1	2	3	4	5	6	7
0 0 0 0 0	NUL	TC₁ (DLE)	SP	0	@	P	`	p
0 0 0 1 1	TC₁ (SOH)	DC₁	!	1	A	Q	a	q
0 0 1 0 2	TC₂ (STX)	DC₂	"	2	B	R	b	r
0 0 1 1 3	TC₃ (ETX)	DC₃	#	3	C	S	c	s
0 1 0 0 4	TC₄ (EOT)	DC₄	¤	4	D	T	d	t
0 1 0 1 5	TC₅ (ENQ)	TC₈ (NAK)	%	5	E	U	e	u
0 1 1 0 6	TC₆ (ACK)	TC₉ (SYN)	&	6	F	V	f	v
0 1 1 1 7	BEL	TC₁₀ (ETB)	'	7	G	W	g	w
1 0 0 0 8	FE₀ (BS)	CAN	(	8	H	X	h	x
1 0 0 1 9	FE₁ (HT)	EM	)	9	I	Y	i	y
1 0 1 0 10	FE₂ (LF)	SUB	*	:	J	Z	j	z
1 0 1 1 11	FE₃ (VT)	ESC	+	;	K	[	k	{
1 1 0 0 12	FE₄ (FF)	IS₄ (FS)	,	<	L	\	l		
1 1 0 1 13	FE₅ (CR)	IS₃ (GS)	-	=	M	]	m	}
1 1 1 0 14	SO	IS₂ (RS)	.	>	N	^	n	‾
1 1 1 1 15	SI	IS₁ (US)	/	?	O	_	o	DEL

TABLE 1

5.2   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, side 0 as a record with a record/block length of
128 characters.

5.3   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.

The Volume Label shall be for the exclusive use of the sys-
tem; the fields in the label may be used for information in-
terchange between systems.

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-characters
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

CP	Field Name	L	Content
76	Physical Record Length Indicator	1	SPACE or digits
77-78	Sector Sequence Indicator	2	SPACEs or digits
79	(Reserved for future standardization)	1	SPACE
80	Label Standard Version	1	Digits
81-128	(Reserved for future standardization)	48	SPACEs

5.3.1 Fields reserved for future standardization (CP 12-37, 52-71, 73-75, 79 and 81-128)

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

5.3.2 Label Identifier (CP 1-3)

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

5.3.3 Label Number (CP 4)

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

5.3.4 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.

5.3.5 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 re
                          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.

5.3.6 Owner Identifier (CP 38-51)

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

5.3.7 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-54.
TWO	shall mean that both sides are formatted in this volume according to ECMA-59.

NOTE 10:

Further characters will be specified for other types of formats, if they are standardized in future versions of this Standard.

5.3.8 Physical Record Length Identifier (CP 76)

This field shall specify the length of the physical re-
cords on all cylinders other than cylinder 00.
The character allowed in this field shall be a SPACE or
a digit.

SPACE	shall mean that the length of all physical records is 128 characters.

NOTE 11:

Physical record lengths of more than 128 characters may be allowed either in future versions of Standard ECMA-54 or ECMA-59 or in future standards for flexible disk cartridges with different recording char- acteristics. A meaning will then be allocated to digits, e.g. digit ONE meaning that the length is 256 characters and digit TWO meaning that it is 512 characters.

5.3.9 Sector Sequence Indicator (CP 77-78)

This field shall specify the sequence of the sectors on
the tracks.
The characters allowed in this field shall be SPACE and
digits.

SPACEs	shall mean that the sectors are in the natural order.
01	shall also mean that the sectors are in the natural order.
02 to 13	shall mean that the sectors are in one of the other 12 orders specified by clause 6.3.3.2.2.3 of Standard ECMA-54 and by clause 6.3.4.2.2.2 of Standard ECMA-59.

NOTE 12:

For Basic Interchange, only the natural order of sectors is allowed.

5.3.10 Label Standard Version (CP 80)

This field shall specify the version of this Standard to which labels and interchange files on the volume conform. The character allowed in this field shall be a digit.

ONE   shall indicate the present version of this Standard ECMA-58, dated August 1979.

Other characters will be allocated to future versions.

5.4 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. The File Label shall be for the exclusive use of the label handling routines.

NOTE 13:

The user may supply, or obtain, the content of some fields of the File Label (e.g. File Identifier, Creation Date, Expiration Date, Block Length, Record Length, Record Format) at the discretion of the label handling routines.

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 Extent	5	Digits
34	(Reserved for future standardization)	1	SPACE
35-39	End Extent	5	Digits
40	Record Format	1	SPACE or F
41	Bypass Indicator	1	SPACE or B

CP	Field Name	L	Content
42	File Accessibility Indicator	1	a-character
43	Write Protect	1	SPACE or P
44	Interchange Type	1	a-character
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	a-character
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

5.4.1 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.

5.4.2 Label Identifier (CP 1-3)

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

5.4.3 Label Number (CP 4)

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

5.4.4 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 dup-
licate file identifiers on the same volume.

NOTE 14:

*For Basic Interchange, this field shall contain a file name of 8
characters maximum.*

5.4.5 Block Length (CP 23-27)

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

NOTE 15:

For Basic Interchange this maximum is restricted to 128 characters.

5.4.6 Begin 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 74).
The third digit	shall specify the side number.
The last two digits	shall specify the sector number (01 to 26).

5.4.7 End 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 74).
The third digit	shall specify the side number.
The last two digits	shall specify the sector number (01 to 26).

5.4.8 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 and F.

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

5.4.9 Bypass Indicator (CP 41)

This field shall specify whether or not a file may be trans-
ferred during copy operations, when transmitting or trans-

ferring the file on the volume or during interchange.
The characters allowed in this field shall be SPACE and B.

SPACE   shall mean that the file may be trans-
ferred.

B   shall mean that the file may not be trans-
ferred and shall be skipped.

5.4.10   File Accessibility Indicator (CP 42)

This field shall specify whether or not there are parti-
cular 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 restrict-
ion.

Any other
character   shall mean that there are particular qua-
lifications for access to the file, which
are subject to agreement between the sen-
der and the recipient of the data. In this
case the Volume Accessibility Indicator
(CP 11) shall also not be SPACE.

5.4.11   Write Protect (CP 43)

This field shall specify whether or not there is a pro-
tection 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.

5.4.12   Interchange Type (CP 44)

This field shall specify the set of attributes that the
file possesses.
The character allowed in this field shall be an a-character.

SPACE   shall mean Basic Interchange File.

Any other
character   shall mean that the file is not a Basic
Interchange file

NOTE 16:

*If other sets of facilities are standardized in future versions of
this Standard, capital letters will be assigned to this field for
specifying such sets.*

5.4.13   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 con-
                         tained in the volume.

C   shall mean that the file continues on an-
                         other volume.

L   shall mean that the file ends, but does not
                         begin in the volume.

5.4.14 File Section Number (CP 46-47)

This field shall specify the ordinal number of the file
sections (starting with 01) in a multi-volume file if it is
significant.
The characters allowed in this field shall be SPACE and
digits.

SPACEs   shall mean that this number is not signi-
                         ficant.

Digits   shall form this number (01 to 99).

5.4.15 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).

5.4.16 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 record length is
                         equal to the block length.

Digits   shall specify the maximum number of char-
                         acters 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).

5.4.17 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.

NOTE 17:
For Basic Interchange, where unblocked records only are allowed, this field shall always contain SPACEs or ZEROs.

5.4.18 Record Attribute (CP 63)

This field shall specify if 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 un-blocked.

B   shall mean that the records are blocked.

NOTE 18:
For Basic Interchange, only unblocked records are allowed.

5.4.19 File Organization (CP 64)

This field shall specify the organization of the data.
The character allowed in this field shall be an a-character.

SPACE or S   shall mean sequential organization.

NOTE 19:
Further characters will be specified for other types of organization, if they are standardized in future versions of this Standard.

5.4.20 Expiration Date (CP 67-72)

This field shall specify the date at which the file may be deleted.
The characters allowed in this field shall be SPACE and digits.

SPACE   shall mean that the file may be de-leted.

999999   shall mean that the file shall not be deleted.

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

The first two digits   shall specify the two low-order di-gits 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).

5.4.21 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 alterna-
                             tively, that this information is not
                             relevant in interchange.

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

5.4.22 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 for 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 75).

The third digit   shall specify the side number.

The last two digits   shall specify the sector number (01
                        to 26).

If this address is equal to that in the Begin Extent
field (CP 29-33), this shall mean that no data is recorded
in the extent.

If this address is higher than that in the End Extent field
(CP 35-39), it means that the entire extent has been used.
In this situation only, cylinder address 75 may occur.

5.5 ERMAP Label

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

CP	Field Name	L	Content
1-5	Label Identifier	5	ERMAP
6	(Reserved for future standardization)	1	SPACE
7-9	Defective Cylinder Iden-tification 1	3	SPACEs or digits
10	(Reserved for future standardization)	1	SPACE

CP	Field Name	L	Content
11-13	Defective Cylinder Identification 2	3	SPACEs or digits
14-128	(Reserved for future standardization)	115	SPACEs

5.5.1 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.

5.5.2 Label Identifier (CP 1-5)

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

5.5.3 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 74) of the first defective cylinder.
The third digit	shall be always ZERO.

5.5.4 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 75) of the second defective cylinder.
The third digit	shall always be ZERO.

NOTE 20:

Examination of fields CP 7-9 and CP 11-13 allows for rapid determination of the physical condition of the flexible disk cartridge (e.g. whether at least one defective cylinder exists).

6. PROCESSING OF LABEL FIELDS

6.1 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.

6.2 Volume Label (VOL1)

The Volume Label, once created, shall be preserved, and may be changed only if 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 Indicator (CP 76)
- Sector Sequence Indicator (CP 77-78)
- Label Standard Version (CP 80)

Entry of other fields shall be permitted with either the same initialization process or with a 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)

6.3 File Label (HDR1)

A file label, once created, shall be preserved, and may only be changed if authorized by the owner of the file, and then only as prescribed by that owner. Although it is not a requirement of this Standard, it is recommended that a file label (HDR1) be created before the file itself is recorded.

6.4 ERMAP Label

The ERMAP label, once created, shall be reserved for system use and shall be changed only as specified below.

The ERMAP label shall be initialized with the Label Identifier (CP 1-5) set to ERMAP, followed by 123 SPACEs. The cylinder numbers of any defective cylinders (up to two) detected during formatting shall be recorded in CP 7-9 and CP 11-13.

7. RECORD AND BLOCK STRUCTURES

7.1 General

This clause describes the method of structuring data records/ blocks on the flexible disk and the fields of HDR1 defined for that purpose.

7.2 Relevant Fields for Data Format

The following fields are relevant for describing the data formats:

- Field in VOL1:

  CP 76   :   Physical Record Length Indicator

- Fields in HDR1:

  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

7.3 Specific Format for Basic Interchange : Unblocked Records

Records shall be recorded as one (and only one) record per block, irrespective of the record length.

←—Block—→		←—Block—→		←—Block—→
←Record—→		←Record—→		←Record—→
←Phys Rec—→		←Phys Rec—→		←Phys Rec—→

NOTE 21:

The physical record length is 128 characters and the block length is less than or equal to that length.

NOTE 22:

The space left between the end of a block and the end of a physical record is not used.

8. PHYSICAL RECORDS

8.1 Structure of Data Blocks

The Data Block of a sector comprises three fields:

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

NOTE 23:

In Standards ECMA-54 and ECMA-59 the field "Physical Record" is called "Data Field."

8.1.1 Data Mark

This field shall comprise:

- 6 (00)-bytes
- 1 byte which shall be either:

(FB)*   indicating that the data is valid and that the whole Physical Record can be read, or

(F8)*   indicating that the first byte of the Physical Record shall be interpreted according to 8.2 and 8.3.

NOTE 24:

(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.

8.1.2 Physical Record

This field shall comprise 128 bytes. If a block comprises less than 128 data bytes, the remaining positions of the physical record shall be filled with NULs.

8.1.3 EDC

These two bytes shall be generated by hardware using the bytes of the Data Block starting with the 7th byte of the Data Mark and ending with the last byte of the Physical Record.

8.2 Deleted Data

The data of a Physical Record shall be considered deleted if the 7th byte of the Data Mark is (F8)* 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.

8.3 Defective Physical Records

A Physical Record shall be considered defective if the 7th byte of the Data Mark is (F8)* 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.

8.4 Handling of Defective Physical Record

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-54 and ECMA-59.

When defective Physical Records are encountered 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,

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

8.4.1 Sequential Relocation

If a defective Physical Record is encountered when creating a file, a (F8)*-byte shall be entered as 7th 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 (F8)*-byte and F, the system shall suspend further processing of this file on this flexible disk cartridge.

If a (F8)*-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.

When writing sequentially, recording of the file on this volume may be terminated with the data preceding the defective Physical Record and continued on another volume.

9. LEVELS OF INTERCHANGE

9.1 General

This Standard specifies a first level of interchange called Basic Interchange. Further levels will be defined in future versions of this Standard.

A single volume may contain Basic Interchange files along with files of other types of interchange or files not intended for interchange.

On a given flexible disk cartridge, all data shall be recorded according to Standard ECMA-54 or ECMA-59.

9.2 Basic Interchange

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 shall be considered as organized sequentially.

ii) Blocks shall have a maximum length of 128 characters.

iii) Records shall be in fixed-length unspanned format and unblocked.

iv) The File Identifier field (HDR1, CP 6-22) shall contain a file name of 8 characters maximum, left justified.

v)   Labels written such that HDR1, CP 80-128 contain SPACEs; on reading these positions shall be assumed to contain SPACEs, and shall be ignored.

A flexible disk cartridge used to contain Basic Interchange Files shall be formatted with sectors in the natural order (VOL1 CP 77-78 = SPACEs or 01) as specified in standards ECMA-54 and ECMA-59.

The following HDR1 fields, having prescribed values in Basic Interchange, need not be checked:

- Record Attribute (CP 63),
- File Organization (CP 64),
- Record Format (CP 40),
- Record Length field (CP 54-57),
- Offset to Next Record Space (CP 58-62).

Defective Physical Records shall be handled either by using the Sequential Relocation method or by terminating the file on this flexible disk cartridge with the Physical Record preceding the defective Physical Record and continuing the file on another volume.

APPENDIX A

EXPLANATORY INFORMATION ON RECORD AND BLOCK FORMATS

A.1 GENERAL

This Appendix describes additional methods of structuring data records/blocks on the flexible disk cartridge and the manner in which they are to be described using the fields of HDR1 defined for that purpose.

The information provided in this Appendix is meant also to give guidance to implementors of this Standard on facilities that they wish to implement in addition to those defined by this Standard. When used, these facilities fall outside Basic Interchange.

Since the support for facilities that go beyond those defined for Basic Interchange is not required by this Standard, prior agreement between exchanging parties to use such facilities is needed.

A.2 RELEVANT FIELDS

The following fields are relevant for describing various data formats:

i)   Fields in VOL1

CP 76 : Physical Record Length Identifier

ii)   Fields in HDR1

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

A.3 SPECIFIC FORMATS
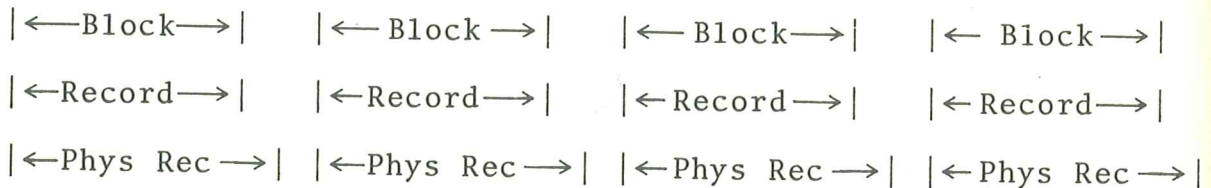
A.3.1 Unblocked Records

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

Example 1

A flexible disk cartridge formatted for Physical Records with a length of 256 characters, containing records/blocks with a length of 200 characters is considered. The label fields of interest will contain:

```
Block Length                                  : 200
Physical Record Length Identifier (VOL1)      : 1
Record Format                                 : F or SPACE
Record Length                                 : 200
Offset to Next Record Space                   : SPACE
Record Attribute                              : SPACE
```
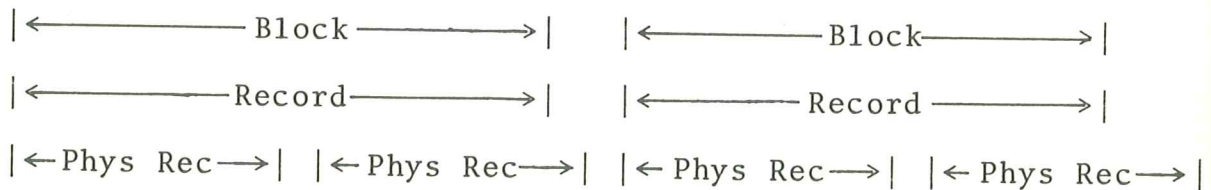
On this flexible disk cartridge, each Physical Record then would contain 200 data characters, followed by 56 padding characters from the end of the block to the end of the Physical Record.

```
|←—Block—→|     |←— Block —→|     |←— Block—→|     |← Block—→|

|←Record—→|     |←Record—→|      |←Record—→|       |←Record—→|

|←Phys Rec —→|  |←Phys Rec —→|   |←Phys Rec —→|    |←Phys Rec —→|
```

Example 2

A flexible disk cartridge formatted for Physical Record with a length of 128 characters, containing the same type of data as in Example 1 is considered. Then, all HDR1 fields would be as in Example 1, except the field Physical Record Length Indicator, which will contain SPACE to indicate a length of 128 characters. On this flexible disk cartridge, the first Physical Record would contain 128 data characters; the second would contain 72 data characters, followed by 56 padding characters.

In both Examples 1 and 2, the next block, by definition, would then begin at the beginning of the next Physical Record.

```
|←————————— Block —————————→|    |←————————— Block—————————→|

|←————————Record————————→|       |←———————— Record ————————→|

|←Phys Rec—→|  |← Phys Rec—→|    |← Phys Rec—→|    |← Phys Rec—→|
```

NOTE A.1

When the Physical Record Lneght is 128 characters and the Block Length is (or may be interpreted as) less than or equal to that length, the Basic Interchange format requirements are satisfied.

A.3.2   Blocked Records

This type of format is similar to the unblocked format, except that each block may contain more than one record.
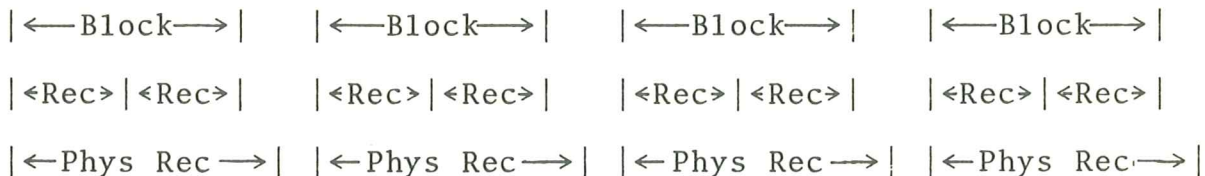
Example 3

A flexible disk cartridge which is formatted to contain Physical Records with a length of 128 characters, is to

contain records with a length of 60 characters that are
blocked into blocks with a length of 120 characters.
The label fields of interest would then contain:

Block Length   : 120
Physical Record Length Identifier (VOL1)   : SPACE
Record Format   : F or SPACE
Record Length   : 60
Offset to Next Record Space   : ZERO or SPACE or
                                                  60
Record Attribute   : B

The contents of the Offset to Next Record Space field de-
pends on the number of records written in the last block:
ZERO means a completely filled block of two records; 60
means a partly filled block with one record. Each Physic-
al Record (except possibly the last one) contains 120
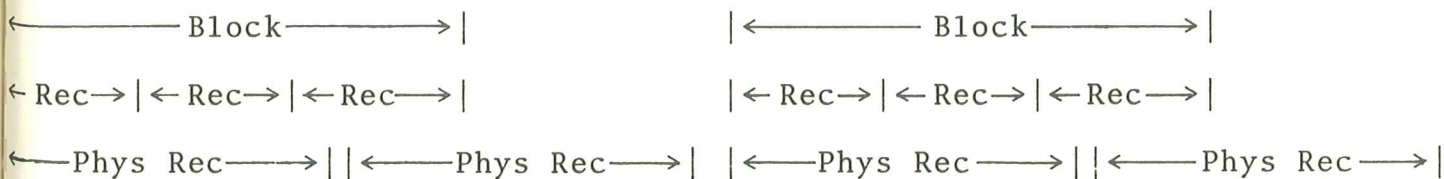characters and 8 padding characters.

|←——Block——→| |←——Block——→| |←——Block——→| |←——Block——→|

|<Rec>|<Rec>| |<Rec>|<Rec>| |<Rec>|<Rec>| |<Rec>|<Rec>|

|←Phys Rec →| |←Phys Rec →| |← Phys Rec →| |←Phys Rec →|

The last block in a file may be truncated at the end of
the last record.

Example 4

If the block length is 180 characters instead of 120,
three 60-character records can be recorded per block, even
with a Physical Record length of 128 characters. The HDR1
fields are then the same as in Example 3, except that the
Block Length field contains 180, and the Offset to Next
Record Space field contains any of the values 0, 60 or
120. With Physical Records having a length of 128 charac-
ters and the Offset to Next Record Sapce field containing
the values 60 or 120, a whole Physical Record exists bet-
ween the start of the next record and the EOD addressed
block.

As before, this format may be used with any of the physic-
al record sizes permitted.

|←——————— Block————→| |←——————— Block————→|

|← Rec→|← Rec→|← Rec—→| |← Rec→|← Rec→|← Rec—→|

|←——Phys Rec——→||←——Phys Rec——→| |←——Phys Rec——→||←——Phys Rec——→|

A.3.3 Spanned and Blocked Records

For better utilization of flexible disk cartridge ca-
pacity, logical records may be recorded contiguously,

independent of the Physical Record length and of how lo-
gical records may start or end with respect to Physical
Record boundaries.

A Block Length (HDR1 CP 24-27) that is equal to the Phy-
sical Record length may be used for blocked and spanned
records.

Even though a block could be considered equivalent to a
single stored record - or to the entire file - the practic-
al value of doing either of these is much less than equat-
ing a block to a single Physical Record, in the HDR1 label.
(Indeed, a block is a logical entity and its length is
not determined by the length of the Physical Records in
the flexible disk cartridge, but rather by the logical
processes of the system.) The records will usually be of
such length that they span these blocks. Also, since the
records are contiguous, they are blocked. It is necessary
to utilize the Offset to Next Record Space field (HDR1
CP 58-62) with this format.

Example 5

A flexible disk cartridge with 128-character Physical
Records containing contiguous 80-character records is con-
sidered. The label fields of interest should contain:

Block Length	: 128
Physical Record Length Indicator (VOL1)	: SPACE
Record Format	: F or SPACE
Record Length	: 80
Offset to Next Record Space	: See below
Record Attribute	: (to be defined)

The value in Offset to Next Record Space specifies the
number of unused record positions from the end of the last
record to the end of the block. Also, on recording, the
Offset to Next Record Space field may be used to determine
the actual end of data within the last block containing
data.

If the file described previously began in record 1 of cy-
linder 10 (BOE = 10001) and five records were recorded,
then the HDR1 label, at the completion of the output oper-
ation, should contain EOD = 10005 and Offset to Next Re-
cord Space = 112.

If the last recorded record ends at the last position of
a block, the EOD, which is the beginning of the next
available block, will also be the place for the next re-
cord to be recorded. This means that the Offset to Next
Record Sapce field will contain ZERO in that case (no
unused record positions remaining in the block preceding
the EOD block).

```
|←——Block——→||←——Block——→||←——Block——→||←— Block —→|

|←Rec→|←Rec→|←Rec→|←Rec→|←Rec→|←Rec→|

|←Phys Rec›||←Phys Rec›||←Phys Rec›||←Phys Rec→|
```

The last block in a file may be truncated.

This format may be used with any of the physical record sizes permitted, so long as Block Length and Physical Record Length agree. That is, a flexible disk cartridge formatted for 256-character Physical Records shall have a Physical Record Length Indicator of 1 and Block Length equal to 256.

A.3.4   Spanned and Unblocked Records

This format is similar to the unblocked format (see Example 2), except that the record spans blocks as well as Physical Records.

Example 6

```
|←——Block——→|   |←——Block——→|   |←——Block——→|   |←——Block——→|

|←————————Record————————→|          |←————————Record————————→|

|← Phys Rec —→|   |← Phys Rec —→|   |←Phys Rec —→|   |← Phys Rec—→|
```

APPENDIX B

RECOMMENDATIONS FOR USER LABELS

B.1 General

User Header Labels (UHL) and User Trailer Labels (UTL) are not within the scope of this Standard, and therefore support for them is not required. However, UHL labels and/or UTL labels that are associated with a data file may be recorded on the same flexible disk cartridge that contains the file if the interchange parties agree. The position, structure and content of the sets of UHL and UTL labels are also subject to the agreement of the interchange parties. User Labels are not considered to be part of the file.

B.2 Position

The following alternative recommendations are made concerning the position of the UHL and UTL sets.

B.2.1 UHL and UTL sets may be recorded within the file extent that contains the data file with which they are associated. The interchange parties must agree upon the method for distinguishing between the User Labels and the data records.

B.2.2 UHL and UTL sets may be recorded as a separate file. The interchange parties must agree on the method of reference between the file containing the User Labels and the file containing the data with which the User Labels are associated.

Whichever position is chosen for the User Labels, the UHL set should precede the UTL set, and within each set the User Labels should appear in ascending sequence of Label Number.

B.3 Content

It is recommended that the content of user labels should be as shown below.

CP	Field Name	L	Content
1-3	Label Identifier	3	UHL or UTL
4	Label Number	1	a-character
5-80	(Reserved for User Application)	76	a-characters

B.3.1   Label Identifier (CP 1-3)

This field should specify the type of the label.
The characters allowed in this field should be UHL and UTL.

UHL   should mean User Header Label.
UTL   should mean User Trailer Label.

B.3.2   Label Number (CP 4)

This field should specify a particular user file label
within a user file label set.
The characters allowed in this field should be a-characters.

B.3.3   Reserved for User Application (CP 5-80)

This field shall be reserved for user application.
The characters allowed in this field should be a-characters.

APPENDIX C

FACILITIES NOT PART OF BASIC INTERCHANGE

C.1 Studies on more comprehensive sets of facilities are being carried out and are expected to lead to one or more additional interchange types being standardized.
In anticipation of the results of these studies and to facilitate maintenance of compatibility with the Basic Interchange set, provision has been made in this Standard for some of the additional facilities, even though their use has not yet been standardized.

This preview of future areas of standardization is provided in the hope that implementors will thereby be able to plan compatibility between their parochial interchange of non-Basic Interchange files and future versions of this Standard.

C.2 The facilities mentioned in this document and which are not within Basic Interchange are:

i) The use of Physical Records with a length of more than 128 character positions: characters other than SPACE for the Physical Record Length Identifier (VOL1, CP 76).

ii) The arrangement of sectors in orders different from the natural order: characters 02 to 13 for the Sector Sequence Indicator (VOL1, CP 77-78).

iii) File Identifier of more than 8 characters.

iv) The use of blocked records: digits for the Offset to Next Record Space field (HDR1, CP 58-62) and character B for the Record Attribute field (HDR1, CP 63).

v) The use of spanned records.

vi) Organization of files other than sequential: characters other than SPACE and S for the File Organization field (HDR1, CP 64).

vii) The use of other types of relocation than sequential Relocation: other characters than SPACE for the Relocation Type Indicator (ERMAP, CP 23), recording other characters than F as first byte of a defective Physical Record.

It is expected that one or more sets of such facilities will be standardized in future. Each set will be identified by a specific character other than SPACE for the Interchange Type field (HDR1, CP 44).

C.3 Another facility mentioned in this document and which is not within Basic Interchange is User Labels (Appendix B).

APPENDIX D

ALTERNATIVE RELOCATION

D.1 General

Alternative Relocation is a relocation method for records intended for Physical Records found defective, according to which these records are relocated to non-defective Physical Records which are not sequentially following the defective Physical Records encountered. This relocation method requires the use of CP 23-72 of the ERMAP Label, as described below.

If Alternative Relocation is included in future versions of this Standard, it will be part of another set of facilities than Basic Interchange. This set of facilities will then be defined by a character different from SPACE for HDR1, CP 44. However, there is no intention to include Alternative Relocation in Basic Interchange.

A possible implementation of Alternative Relocation is described hereafter by defining the necessary fields of the ERMAP Label, the handling of defective Physical Records, the ERRORSET file and the ERLOC List.

D.2 Fields of the ERMAP Label

The following fields of the ERMAP Label shall be used as specified.

D.2.1 Alternative Relocation Indicator (CP 23)

This field shall specify whether or not the volume contains at least one record handled by Alternative Relocation.

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

SPACE   shall mean that the volume contains no record handled by Alternative Relocation.

D   shall mean that the volume contains at least one record handled by Alternative Relocation.

If the Error Directory Indicator field (CP 24) contains SPACE, then this field must also contain SPACE.

D.2.2 Error Directory Indicator (CP 24)

This field shall indicate whether or not Alternative Relocation has been specified and if so it shall specify the location of the addresses of defective Physical Records, the contents of which have been relocated to the ERRORSET File (D.4).

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

SPACE   shall mean that the method of Alternative Relocation has not been specified.

C   shall mean that the addresses of the defective Physical Records are recorded in the Error Directory (ERMAP CP 25-72) and that the data intended for the defective Physical Records are relocated to the ERRORSET File (D.4). A maximum of 8 addresses can be recorded in this Error Directory.

E   shall mean that the addresses of the defective Physical Records are recorded in the Error Directory (D.4.1.4) of the first record (ERLOC List, D.4.1) of the ERRORSET File (D.4) and that the data intended for the defective Physical Records are relocated in the following records of the ERRORSET File (D.4). A maximum of 20 addresses can be recorded in this Error Directory.

D.2.3   Error Directory (CP 25-72)

This field shall specify the addresses of defective Physical Records when the Error Directory Indicator (CP 24) contains C.
The characters allowed in this field shall be SPACE and digits.

When initializing the flexible disk cartridge, this field shall be recorded with SPACEs.

The addresses of the defective Physical Records shall be recorded in this field as follows:

1st character position: SPACE

2nd, 3rd character positions   : digits specifying the cylinder address (01 to 74)

4th character position: digits specifying the side number.

5th, 6th character positions   : digits specifying the sector number (01 to 26).

The data intended for the defective Physical Records are relocated to the ERRORSET File (D.4).

D.3 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-54 and ECMA-59.

When defective Physical Records are encountered 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,

- to continue processing using Alternative Relocation.

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

NOTE D.1:

For Basic Interchange, Alternative Relocation is not applicable.

D.3.1 Sequential Relocation

See 8.4.1 of the Standard.

D.3.2 Alternative Relocation

If a defective Physical Record is encountered when creating a file, a (F8)*-byte shall be entered as 7th byte of the Data Mark and FULL STOP shall be entered as first byte of the Physical Record. If it is impossible to write a (F8)*-byte and FULL STOP the system shall suspend further processing of this file on this flexible disk cartridge.

The addresses of the defective Physical Records shall be recorded in the Error Directory of the ERMAP Label, if ERMAP CP 24 contains C or in the Error Directory of the ERLOC List (D.4.1) of the ERRORSET File (D.4) if ERMAP CP 24 contains E.

The data intended for the defective Physical Record shall be always recorded in the ERRORSET File within a volume. The first such data relocated to the ERRORSET File is relative to the first address in the Error Directory (D.2.2 or D.4.1.4), the second such relocated data to the second address, and so on.

When reading a flexible disk cartridge, if a (F8)*-byte and FULL STOP are encountered, the Error Directory Indicator (ERMAP CP 24) is examined. If it contains C, the Error Directory (CP 25-72) of the ERMAP Label contains the address of the corresponding defective Physical Record, if it contains E, this address is contained in the Error Directory (CP 7-126) of the ERLOC List of the ERRORSET File. In both

cases the position of the address in either Error Directory shall determine the position in the ERRORSET File of the data intended for the defective Physical Record.

When writing sequentially, recording of the file on this volume may be terminated with the record preceding the defective Physical Record and continue on another volume.

D.4 ERRORSET File

The ERRORSET File shall be a file, to which the data intended for defective Physical Records are relocated if Alternative Relocation is used. The size of the file shall be as large as is necessary to contain the number of Physical Records that can be identified in either the ERMAP Label or the ERLOC List as appropriate. One Physical Record is needed for the ERLOC List, if it is used.

If the Error Directory Indicator (ERMAP CP 24) contains C, the first record of the ERRORSET File shall contain the data intended for the defective Physical Record the address of which is recorded first in the Error Directory (CP 25-72) of the ERMAP Label.

The second record of the ERRORSET File shall contain the data intended for the defective Physical Record the address of which is the second one in the Error Directory (CP 25-72) of the ERMAP Label, and so on.

If the Error Directory Indicator (ERMAP CP 24) contains E, the first record of the ERRORSET File shall be the ERLOC List (D.4.1). The second record of the ERRORSET File shall contain the data intended for the defective Physical Record the address of which is recorded first in the Error Directory (CP 7-126) of the ERLOC List. The third record of the ERRORSET File shall contain the data intended for the defective Physical Record the address of which is the second one in the Error Directory (CP 7-126) of the ERLOC List, and so on.

D.4.1 ERLOC List

If the Error Directory Indicator (CP 24) of the ERMAP Label contains E, the ERLOC List shall be the first record of the ERRORSET File.

CP	Field Name	L	Content
1-5	Identifier	5	ERLOC
6	(Reserved for future standardization	1	SPACE
7-126	Error Directory	120	SPACEs and digits
127-128	(Reserved for future standardization)	2	SPACEs

D.4.1.1 Field reserved for future standardization (CP 6 and 127-128)

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

D.4.1.2 Identifier (CP 1-5)

This field shall specify the identification of the ERLOC List. The characters allowed in this field shall be ERLOC.

D.4.1.3 Error Directory (CP 7-126)

This field shall specify the addresses of defective Physical Records when the Error Directory Indicator (CP 24) of the ERMAP Label contains E.

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

When initializing the flexible disk cartridge, this field shall be recorded with SPACEs.

The addresses of the defective Physical Records are recorded in this field as follows:

1st character position	: SPACE
2nd, 3rd character positions	: digits specifying the cylinder address.
4th character position	: digits specifying the side number.
5th, 6th character positions	: digits specifying the sector number

The data intended for these defective Physical Records are relocated to the ERRORSET File (D.4).

D.5 Requirements for the Use of Alternative Relocation

Before using the Alternative Relocation method, it is necessary to set the Error Directory Indicator (ERMAP Label, CP 24) to C or E, and to create the HDR1 label of the ERRORSET File. In this label the Interchange Type field (CP 44) shall contain E.

Records within the ERRORSET File may never be relocated. If a defective Physical Record is encountered within this file, further processing of this flexible disk cartridge shall be suspended.