ECMA

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

SUGGESTIONS FOR A DISK LABELLING SYSTEM

June 1972

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FOREWORD

The aim of this document is to facilitate the interchange of files recorded on interchangeable disk packs. This is accomplished by means of magnetically recorded labels to identify files and describe their basic logical and physical structure, together with associated rules for these structures.

The disk packs intended to be used in conjunction with this document are described in Standards ECMA-32 and ECMA-33. However, the same system, with minor variations, should be suitable for other interchangeable disk packs which may be standardized in future, or as the basis of a non-interchange system for removable or fixed direct access media.

The particular characteristics of disk packs, e.g. the possibility of random addressing, require that some rules be laid down about the placement of labels.

This document lays down the structure for a group of contiguous locations called a "Label Pool", containing the labels relating to Volume administration, File identification, File space and free space description. The additional information describing the logical and physical structure of the files could be "pooled" in the same Label Pool or partly "separated" and related to the relevant files; both approaches are described in this document.

This document is based on a survey examining the following labelling systems for sequential file organization on disks:

Honeywell	(200 series)
IBM	(360 series)
ICL	(1900 series)
Philips	(P1000 series)
Siemens	(4004 series)

Moreover, the ECMA Standard for Magnetic Tape Labelling (ECMA-13) has been taken into account.

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1. SCOPE

To define a labelling system for use with direct access media recorded according to a track format similar to that described in ECMA-33.

It provides a complete labelling system for sequential files and a framework within which additional information to deal with the special requirements of other types of file organization can be accomodated.

2. RELATIONSHIP TO TRACK FORMAT

This section gives general rules and assumptions regarding the use of a track format as described in ECMA-33. A diagram of this track format, showing those areas whose contents are the concern of this document, is given in Appendix B.

2.1 Defective and Alternative Tracks

ECMA-33 provides for the flagging of defective tracks (3.1.2.2) and the recording of the address of an alternative track in the Count of Sector 0 (3.1.4.3). This labelling system requires that the computer system should be capable, by hardware and/or software, of recognizing a defective track by means of the flags and switching to the alternative track for recording or reading data.

2.2 Sector 0

Data for interchange should not be recorded in the Key or Data Block of Sector 0 (defined in 3.1.6 and 3.1.8 of ECMA-33). These are reserved for operating system use and their lengths are given as part of the file label information (see 6.2). Only the use of the Count of Sector 0 on defective and alternative tracks (as defined in 3.1.4.3 of ECMA-33) is required by this labelling system.

2.3 File Mark

The configuration permitted by 3.1.8 of ECMA-33 of a rudimentary Data Block of one byte $(00)_{16}$, preceded by a Count with DL equal to ZERO, is termed as 'File Mark'. The File Mark is used in certain circumstances as a terminating block at the end of a sequential file and at the end of a set of labels recorded at the Start of File (see 5.1.3 and 5.1.4).

2.4 Sector Overflow

Section 3.2.1.2 of ECMA-33 provides a feature called an "overflowing sector". This feature is used to link the

Data Blocks of two or more consecutive sectors, including the last (or only) sector of one track with the first (or only) sector on the next highest addressed track. Any number of sectors may be linked in such a chain, called a "sector overflow chain", provided that the chain does not extend past a cylinder boundary.

2.5 Device Type and Media Characteristics

Provision is made in the Volume Header Label (see 4.1) to record a device type code indicating the type of device on which the disk was recorded. This code would enable an operating system to deduce information about the characteristics of the medium (number of cylinders, track capacity, etc.). Alternatively, this information may be given explicitly in fields of the Volume Header Label and Volume Administration Label (see 4.3).

The variables referred to in character positions 36-51 of the Volume Administration Label are derived from the track capacity formula. For the 6 disk packs, the following figures are derived from Appendix B of ECMA-33:

a) 61 sector overhead no key
b) 81 sector overhead with key
c) 537 numerator of tolerance fraction
d) 512 denominator of tolerance fraction

2.6 Address Representation

Addresses held within the labels take the form:

6 characters	Cylinder and Track address
2 characters	Sector number within track

The sector number is omitted when not relevant.

The Cylinder and Track address takes the form of either a relative track within volume (displacement of this track from cylinder 0, track 0, counting all intervening cylinders) or a cylinder number followed by a track number. The latter format may require either a 4/2 split or a 3/3 split. The choice of format and the split is specified by parameters in the Volume Header Label.

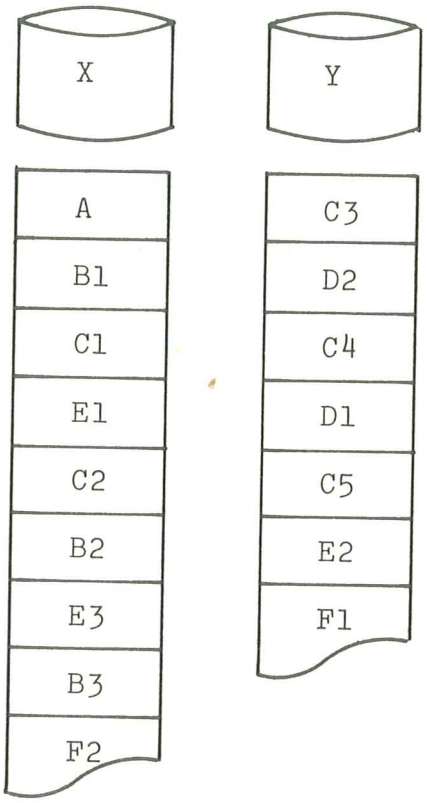
3. ORGANIZATION OF A VOLUME

3.1 Volume Structure

A direct access volume is divided into extents. An extent is a set of tracks whose cylinder and head addresses form a continuous ascending monotonic sequence, henceforth known as 'contiguous'.

Extents are allocated to files in such a way that a volume may contain more than one file and each file may

be recorded on more than one extent. Files may also appear on more than one volume. To the concepts of multi-file volume and multi-volume file of the tape labelling standard (ECMA-13) are added the concepts of multi-extent file and multi-extent volume. The following picture illustrates these concepts and shows a number of possibilities, not all of which are recommended (see 5.1).



X and Y are multi-file, multi-extent volumes.

A is a single extent file.

B is a multi-extent single volume file with extents B1, B2, B3

D is a multi-extent single volume file with extents D1, D2

C is a multi-extent multi-volume file with extents C1, C2, C3, C4, C5

E is a multi-extent multi-volume file with extents E1, E2, E3

F is a multi-extent multi-volume file with extents F1, F2.

3.2 Alternative Track Pool

Alternative tracks should be allocated from a pool which consists of the last n tracks of the volume, where n is determined by the owner. Alternative tracks should be allocated for all known defective tracks at the time a volume is first initialized, beginning with the highest numbered track and working towards the lower numbered tracks. If one of these tracks is itself defective, it should be flagged 'defective, no alternative' (ECMA-33, 3.1.2.2) and the next alternative track should be used instead.

3.3 Volume Entry Point

3.3.1 A direct access medium is not like a tape, where it is normal to start reading at the beginning and continue serially in a forward direction. With direct access media one may start anywhere and continue in a completely random manner. Therefore, rules are required for where to start and how to continue. These rules may be implemented in two ways: by searching for a specific key and by going to a specific address given by a pointer.

3.3.2 It is recommended that a volume is entered at some sector in Cylinder 0. This sector is identified by the fact that the first four characters of the Data Block contain 'VOL1' and it will be located by searching from the start of Track 0. Optionally, the characters 'VOL1' may be recorded in the Key of this sector.
Part of the Data Block of this sector is a pointer to the start of a Label Pool.

NB: It is guaranteed that Cylinder 0 of a volume presented for interchange will contain no defective tracks (see ECMA-32).

3.4 Label Pool

3.4.1 The primary use of the Label Pool is as a table of contents for the volume. It lists those files, part or all of which are recorded in extents of the volume, and for each file the addresses of each of its extents. Thus a file can be retrieved rapidly by searching the table of contents for its identifier.

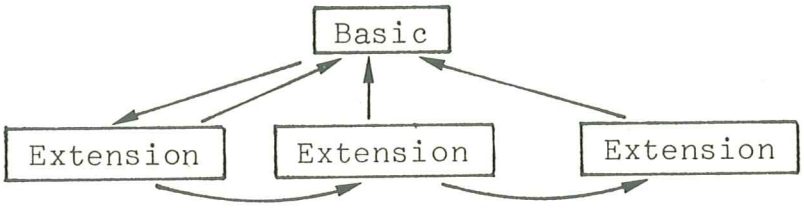
The Label Pool may be accessed either by a linear search of its contents or by direct addressing to a given label, from a centralized system catalogue,

for example. The choice of method is not recommended here. Also, the identifier of the file can be recorded in a Key to make searching easier and more efficient. Again, no recommendation is made on this point.

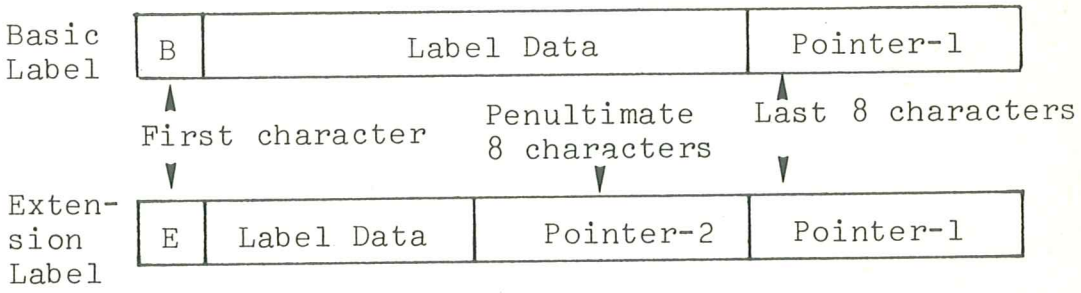
3.4.2 Label Pool Structure

The Label Pool is an area of the volume consisting of a number of contiguous tracks contained within one cylinder. This area is preformatted with fixed length data blocks known as Label Blocks. Each Label Block contains one Label Record.

There are two types of Label Record: Basic and Extension. Label Records are chained together in the following manner :



The formats of the two types of label are as follows:



The length of the labels is determined by the approach taken (see sections 8 and 9).

Pointer-1 is a pointer to the next extension label in the chain.
Pointer-2 is a pointer to the basic label for the chain.

3.4.3 Special Labels in the Label Pool

3.4.3.1 The first label in the Label Pool is used as the Volume Administration Label (see 4.3).

3.4.3.2 Optionally, all free labels in the Label Pool may be chained to the Volume Administration Label using the pointer system described in 3.4.2. In

this case, a count of the number of free labels is included in the Volume Administration Label (character positions 67-70).

3.4.3.3 If option 3.4.3.2 is not taken, all free labels are identified by having the first character with the value 'space'. The count in the Volume Administration Label is also spaces, as is 'Pointer-1'.

3.4.3.4 Optionally, any one basic label may have the reserved identifier of a file of free extents : 'ΔFREEΔSPACEΔFILEΔ'. The extent descriptions of this file are then used to record the free file extents for the volume.

3.5 Start of File

By 'Start of File' is meant the beginning of the first extent in which the file is recorded on this volume, regardless of whether this is the first or a subsequent volume on which the file is recorded. Label information may be located at this place or in the Label Pool, or both. Two approaches, and some criteria for a choice between them, are given later in this document.

4. VOLUME LABEL INFORMATION

4.1 Volume Header Label

The Volume Header Label appears at the Volume Entry Point and occupies all of that Data Block (see 3.3.2).

CP	Field Name	L	Content
1-3	Label Identifier	3	VOL
4	Label Number	1	1
5-10	Volume Serial Number	6	6 'a' characters permanently assigned by the owner to identify this volume
11	Accessibility	1	One 'a' character indicating restrictions on access to this volume. Space mean no restrictions.
12-21	Reserved for future standardization	10	Spaces
22	Device Type	1	One 'a' character indicating the type of storage medium. If a space, the characteristics are given by the following field and in the Volume Administration Label.

Volume Header Label (cont'd)

CP	Field Name	L	Content
23-30	Cylinder/Track configuration (optional)	8	2 'n' characters representing the cylinder/track (c/t) split of a six character field followed by c 'n' and t 'n' characters denoting the number of cylinders and tracks into which the medium is divided.
31	Address Format	1	One 'a' character. 'C' means the address representation used is cylinder/track, using the split indicated by either of the preceding fields. 'T' means that track addressing relative to the start of the volume is used.
32-37	Label Pool Pointer	6	Address of track in which Label Pool starts, in format determined by preceding field.
38-51	Owner Identification	14	14 'a' characters.
52-79	Reserved for future standardization	28	Spaces
80	Label Standard	1	One 'n' character indicating the revision level of the eventual labelling standard, applicable to label and data formats prescribed by that standard.

4.2 User Volume Labels (optional)

User Volume Labels follow the Volume Header Label, and are unblocked. The last User Volume Label is followed by a File Mark.

User Volume Labels have the following format.

CP	Field Name	L	Content
1-3	Label Identifier	3	UVL
4	Label Number	1	One 'n' character
5-80	User Option	76	Any 'a' character

4.3 Volume Administration Label

The Volume Administration Label is the first label in the Label Pool in both approaches to labelling. It contains the following fields.

CP	Field Name	L	Content
1	Label Identifier	1	B
2-24	Identification	23	VOLUME Δ ADMINISTRATIONΔΔ
Medium Description			
25-27	Number of defective tracks	3	3 'n' characters
28-30	Size of alternative track pool	3	3 'n' characters specifying the number of tracks.
31-35	Track Length *	5	5 'n' characters specifying the total length of the recordable track in bytes.
36-50	Track Variables *	16	4 groups of 4 'n' characters representing the variables in the track capacity formula for this medium.
51-60	Reserved for future standardization	10	Spaces
* Optional unless CP 22 of the Volume Header Label contains a space.			
Label Pool Description			
61-62	Blocks per track	2	2 'n' characters specifying number of Label Blocks per track.
63-66	Label Pool Size	4	4 'n' characters specifying number of Label Blocks in the Label Pool.

Volume Administration Label (cont'd)

CP	Field Name	L	Content
67-70	Number of free labels **	4	4 'n' characters indicating the number of free Label Blocks in the Label Pool.
71 onwards	Reserved for future standardization		Spaces. (Length depends on length of Label Block)
** Optional, see 3.4.3.2 and 3.4.3.3.			

4.4 Free Extent Administration (optional)

If free extent administration is included in the labelling system, a 'free space file' is identified in the Label Pool. The following fields of the basic label are common to both labelling approaches.

CP	Field Name	L	Content
1	Label Identifier	1	B
2-24	Identification	23	VOLUMEΔFREEΔ SPACEΔFILEΔ
25-34	-	10	Spaces
35	Data Status	1	Zero (see section 6.1, field F8)

The remaining file description fields contain spaces but the extent descriptions and pointers in the basic label and extension labels are used in the same way as for data files.

5. STRUCTURE OF FILES

5.1 Sequential File Structure

5.1.1 Allocation of Extents

Extents are allocated to files in units of tracks or cylinders, as indicated by field F24 (see 6.2).

5.1.2 Order of Extents

The sequence of extents in any section of a sequential file need not reflect the sequence of the physical addresses of the start of the extents. However, the sequence of file sections must reflect the sequence of the file data, and only one section of any given file may appear on any one volume, i.e. of the examples given in 3.1, only file E is NOT a valid sequential file.

5.1.3 Start of File

If labels are recorded at the start of file, the file data may begin on the same track as the labels, or on the following track, as indicated by field F43 (see 6.4). In the former case, the labels must be followed by a File Mark. In the latter case, this is optional.

5.1.4 End of File Data

The end of recorded (valid) data in any file section is given by field F23 (see 6.2). If this does not coincide with the end of a track, a File Mark may optionally be recorded following the last data block.

5.2 Mapping Blocks on to Sectors

The term 'block' as used in the remainder of this document, applies to the contents of a single Data Block of a sector, or to the contents of the Data Blocks of all sectors in a chain as defined in 2.4.

5.3 Grouping Records into Blocks

5.3.1 No explicit indication of the boundaries between records is required. There must be an integral number of records in a block for formats F and D. There must be an integral number of segments in a block for format S. Variable length blocks are permitted. Padding is permitted (see 5.5).

5.3.2 Fixed-Length Records (F format). When all the records in a file are of the same length, no indication of that uniform length is required within a file.

5.3.3 Variable-Length Records (D format). When the records in a file are not all of the same length, the length of each record (i.e. the number of characters it contains) shall be recorded as the first field in each record. That field shall be counted as part of the record length. The record length shall be expressed as a decimal number, occupying the first four character positions of each record.

5.3.4 Spanned Records (S format). When the records in a file are spanned, a segment control word (SCW) precedes each segment in S format. The SCW consists of 5 decimal characters. The first character of the SCW is called the Spanning Indicator. This indicator may have the values 0, 1, 2 or 3 as follows:

0 means that the record is complete in this segment
1 means that the record begins in this segment
2 means that the record continues through this segment
3 means that the record ends in this segment.

Any other value in this position is invalid. The next four characters of the SCW are the segment length which include the SCW. Further information on spanned records is given in 5.4.

5.3.5 Undefined Records (U format). When records do not meet the above definitions, they are undefined in format. The interchange of information in the undefined format will require the prior agreement of the interchange parties.

5.3.6 By-pass or check-point records. Only relevant data blocks should be written on a disk pack used for interchange. Since by-pass information or check-point records are considered to be extraneous to the interchange, no standard means of identification is provided.

5.4 Spanned Records

5.4.1 No explicit logical record control words exist.

5.4.2 Logical record length is unbounded, in that there is no limit to the number of segments in one logical record. This does not prohibit an implementation from limiting the size of a work area available to reconstruct a logical record, thus limiting the size of a logical record acceptable to it. Therefore, agreement between the interchange parties is necessary on the maximum size of the logical record.

5.4.3 There shall be only one segment of the same record in a block.

5.4.4 The segments of a record shall not have segments of other records interspersed.

5.4.5 Examples of the use of spanned records are given in Appendix B.

5.5 Padding

5.5.1 Whenever it becomes necessary or advisable to extend the recorded length of a block beyond the end of the last (or only) record in it, the block shall be padded out to the desired length by the use of characters of position 5/14 of the ECMA 7-bit code table.

5.5.2 Whenever a disk pack is recorded by, or is expected to be read by a word-oriented computer, all data blocks and labels shall be padded out to a multiple of the word length of the computer.

5.5.3 Padding may also be required where sector lengths are fixed either per volume or per file.

5.6 User File Labels (optional)

User File Labels appear at the Start of File. In the case of Approach B, they immediately follow the File Header Labels. Each label record has the format described below. Label records are blocked, three to a block in Approach A, two to a block in Approach B.

CP	Field Name	L	Content
1-3	Label Identifier	3	UHL
4	Label Number	1	Any 'a' character
5-80	User Option	76	Any 'a' character

6. FILE LABEL INFORMATION

6.1 File Identification and Control (Medium Independent)

Field	Field Name	L	Content
F1	File Set Identification	6	6 'a' characters. The identification must be the same for all files of a set of files to be interchanged.
F2	File Identifier	17	17 'a' characters identifying the file.
F3	File Section Number	4	4 'n' characters. The number of the first section of a file is 0001. This number is increased by 1 for each successive volume of the file.
F4	Generation Number	4	4 'n' characters. The first Generation Number written for a file is 0001. If subsequent generations of a file are noted, this number is increased by 1 for each successive generation of the file.
F5	Generation Version Number	2	2 'n' characters.
F6	Creation Date	6	One space followed by two 'n' characters for the year followed by three 'n' characters for the day (001 to 366).
F7	Expiration Date	6	Date on or after which the space occupied by the file may be released in the same format as field F6.
F8	Data Status	1	One 'n' character indicating the status of the file and what mode of access is permitted. '0' means space has been reserved but no data has been written to the file.

File Identification and Control (cont'd)

Field	Field Name	L	Content
F8	Data Status (cont'd)		'1' means data may be added to the end of the file (appended). '2' means data may only be read from the file. '3' means '1' plus '2'. '4' means the data in the file may be updated. '5' means '1' plus '4'. Any other value is invalid.
F9	Accessibility	1	One 'a' character indicating restrictions on who may access the file. 'space' means no restrictions.
F10	System Code	13	Optional, 13 'a' characters. Not intended for use in an interchange environment.

6.2 Physical Environment (File Organization Dependent)

Field	Field Name	L	Content
F21	Block Count	6	6 'n' characters denoting the number of blocks written in the file in this volume.
F22	Accumulated Block Count	8	8 'n' characters denoting the number of blocks written in all sections of the file up to but not including this section. '00000000' for the first section of a file.
F23	End of Recorded Data	8	8 'n' characters denoting the address of the sector in which the last valid block of this file section begins.

Physical Environment (cont'd)

Field	Field Name	L	Content
F24	Allocation Type	1	One 'a' character indicating the type of storage allocation. 'C' means cylinders, 'T' means tracks.
F25	Allocation Quantity	6	6 'n' characters denoting the number of units of type (field F24) to be allocated at each request.
F26	Last Volume Indicator	1	One 'a' character. 'L' indicates that this is the last volume of the file. Space otherwise.
F27	Key Position	5	5 'n' characters specifying the displacement of the first character of the key field within the record from the start of the record.
F28	Key Length	3	3 'n' characters specifying the length of either (a) the key field described by field F27 or (b) the key which precedes each block of the file.
NOTE: fields F27 and F28 are considered relevant to file organizations other than Sequential.			

6.3 Data Structure (Medium and File Organization Independent)

Field	Field Name	L	Content
F31	Record Format	1	F = Fixed Length D = Variable S = Spanned U = Undefined
F32	Block Length	5	5 'n' characters specifying the maximum number of characters per block.
F33	Buffer Offset	2	2 'n' characters specifying length in characters of any additional field inserted before the logical records in a block. This length is included in field F32. '00' if no field is inserted.

Data Structure (cont'd)

Field	Field Name	L	Content
F34	Record Length	5	5 'n' characters specifying: - record length, if Record Format (F31) is F, - maximum record length including any count fields, if Record Format (F31) is D or S, - if the Record Format (F31) is 'S' then 00000 indicates that maximum may be greater than 99999, - if Record Format (F31) is U, the content of this field is undefined.
F35	File Organization	1	One 'a' character indicating type of file organization. 'S' means sequential organization.

6.4 Mapping (Medium Dependent)

Field	Field Name	L	Content
F41	Key Indicator	1	One 'a' character. 'K' if a Key precedes each block of the file, else space.
F42	Sector Overflow	1	One 'a' character. 'S' indicates sector overflow was used in writing the file. Space otherwise.
F43	Start of Data	1	One 'a' character. 'T' indicates that data starts on the track after that containing the label information at Start of File. 'Space' indicates that data follows the concluding File Mark on the track containing labels.
F44	Length of Sector 0 Key	3	3 'n' characters indicating the length of the Key of Sector 0 (if used), for each track of the file.

Mapping (cont'd)

Field	Field Name	L	Content
F45	Length of Sector 0 Data	4	4 'n' characters indicating the length of the Data Block of Sector 0 (if used) for each track of the file.

6.5 Extent Information

Field	Field Name	L	Content
F50	Number of Extents	2	2 'n' characters specifying the number of extents of the file on this volume.
F51	Extent Description	15	15 characters subdivided as follows.
F51a	Extent Sequence	2	2 'n' characters specifying the number of this extent in the sequence of extents for the file on this volume commencing at '01'.
F51b	Extent Type	1	One 'a' character indicating type of extent. Always space for sequential files.
F51c	Extent Start	6	Address of start of extent.
F51d	Extent Size	6	Number of tracks in extent.
F52	As field F51	15	As field F51 or spaces if further extent not yet allocated.

7. DISCUSSION OF TWO APPROACHES

7.1 Introduction

7.1.1 In the survey of existing disk labelling systems it was found that, while all systems employed a label pool where the identity of files, their extents, and in some cases free space lists were maintained, a minority separated out the information describing files more closely and recorded this at the head of the file, while the majority kept this information in the Label Pool. Some reasons why either choice could be valid are given below. It was not felt appropriate in this document to recommend a choice and so the labelling fields introduced earlier in the

document have been structured according to the two approaches and the resulting formats are described in sections 8 and 9.

7.1.2 The choice of a block size for labels is influenced by:

(a) the amount of labelling information to be contained;
(b) the buffer space required in the system processing the labels;
(c) the utilisation of the space on the tracks of the disk pack.

The sizes chosen have attempted to take these factors into account, and in the case of the 'separated' approach, the existing label size of ECMA-13 (80 characters) was also a factor.

7.2 Reasons for Separation

7.2.1 Standard ECMA-13 provides a framework for labelling files which happen to be recorded on magnetic tape. Most of the fields described in ECMA-13 are in fact medium-independent. Further, additional labels are provided, currently reserved for operating system use, which could be used for medium-dependent and file organization-dependent information.
Thus a case emerges for building a system based on ECMA-13 labels HDR1 to HDR9 held at the Start of File. Trailer labels (EOF and EOV) are not necessary for disk as the labelling information is available at any time through random access.

7.2.2 In installations where the number of files is fluctuating or unknown, it is better to place the main overhead of file description with the file rather than in a central pool whose size is fixed beforehand.

7.3 Reasons against Separation

7.3.1 The file identification information is partly duplicated between the Label Pool and the Start of File because of the basic need to identify the file.

7.3.2 If all the information is held together, it can be obtained with one access, whereas in the separated approach a head movement is required to access the file label blocks.

7.3.3 The problem of mapping a file into the available space can be made more difficult when either a number of blocks or a whole track at Start of File has to be set aside for labels.

7.4 Brief Description of Approach A, 'Pooled'

In this approach, all file label information is recorded in a Basic Label in the Label Pool except for User File Labels, if present, which are recorded at Start of File, and any additional extent descriptions, which are recorded in Extension Labels in the Label Pool.

All label blocks are 256 characters in length. The Basic Label holds four extent descriptions and the Extension Label fourteen. The User File Labels are blocked three to a block, with padding, at Start of File.
Alternatively, the User File Labels could be blocked according to the block size of the user's file.

7.5 Brief Description of Approach B, 'Separated'

In this approach, all file label information is recorded at the Start of File in labels HDR1 to HDR3, except for a duplicatedfile identification and extent descriptions which are held in a Basic Label in the Label Pool and in Extension Labels if necessary.

All label blocks are 160 characters in length. The Basic Label holds six extent descriptions and the Extension Label eight.

The first Start of File label block holds the first and second file labels, HDR1 and HDR2. The second label block holds the third file label, HDR3. User file labels, if present, follow the second label block and are blocked two to a block.

7.6 Reserved Fields and Additional Labels

Certain fields in both approaches have been left available for possible future use. No additional labels similar to the HDR4 to HDR9 of ECMA-13 have been defined.

8. APPROACH A : POOLED

8.1 Labels in Label Pool

8.1.1 Volume Administration Label

CP	Field	Field Name	Remarks
1-70			As defined in section 4.3
71-248			Reserved for future standardization
249-256			Pointer-1 (optional)

8.1.2 Basic File Label

CP	Field	Field Name	Remarks
1	-	Label Identifier	B
2-7	F1	File Set Identifier	
8-24	F2	File Identifier	
25-28	F3	File Section Number	
29-32	F4	Generation Number	
33-34	F5	Generation Version Number	
35	F8	Data Status	
36-41	F6	Creation Date	
42-47	F7	Expiration Date	
48	F9	Accessibility	
49-58	-	-	(10) Reserved for system Software use.
59-71	F10	System Code	
72-77	F21	Block Count	
78-85	F22	Accumulated Block Count	
86-93	F23	End of Recorded Data	
94	F24	Allocation Type	
95-100	F25	Allocation Quantity	
101	F26	Last Volume Indicator	
102-127	-	-	(26) Reserved for future standardization. (Expected to include fields F27, F28).
128	F31	Record Format	
129-133	F32	Block Length	
134-135	F33	Buffer Offset	
136-140	F34	Record Length	

Basic File Label (cont'd)

CP	Field	Field Name	Remarks
141	F35	File Organization	
142-176	-	-	(35) Reserved for system software use.
177	F41	Key Indicator	
178	F42	Sector Overflow	
179	F43	Start of Data	
180-182	F44	Sector 0 Key Length	
183-186	F45	Sector 0 Data Length	
187-188	F50	Number of Extents	
189-203	F51	Extent Description	Four Extents in all
204-218	F52	Extent Description	
219-248	(F52)	Extent Description	
249-256	-	Pointer-1	

8.1.3 Extension File Label

CP	Field	Field Name	Remarks
1	-	Label Identifier	E
2-16	F52	Extent Description	14 extents in all
17-211	(F52)	Extent Description	
212-240	-	-	(29) Reserved for system software use.
241-248	-	Pointer-2	
249-256	-	Pointer-1	

8.1.4 Free Extent Administration (optional)

8.1.4.1 Basic Label

CP	Field	Field Name	Remarks
1-35	-	-	As defined in section 4.4.
36-186	-	-	Spaces
187-256	-	-	As for Basic File Label (8.1.2).

8.1.4.2 Extension Label

CP	Field	Field Name	Remarks
1-256	-	-	As for Extension File Label (8.1.3).

8.2 Labels at Start of File (optional)

8.2.1 Label Block Format

CP	Content
1-80	User File Label
81-160	User File Label
161-240	User File Label
241-256	Padding (see section 5.5)

8.2.2 User File Label

CP	Field Name	L	Content
1-3	Label Identifier	3	UHL
4	Label Number	1	Any 'a' character
5-80	User Option	76	Any 'a' character

8.2.3 Alternatively the User File Labels may be blocked according to the block size of the user's file.

8.2.4 Up to 36 User File Labels may be recorded in Start of File Label Blocks. A File Mark may follow the last Label Block (see section 5.1.3).

9. APPROACH B: SEPARATED

All label blocks are 160 characters in length.

9.1 Labels in Label Pool

9.1.1 Volume Administration Label

CP	Field	Field Name	Remarks
1-70	-	-	As defined in section 4.3.
71-152	-	-	Reserved for future standardization.
153-160	-	-	Pointer-1 (optional)

9.1.2 Basic Label

CP	Field	Field Name	Remarks
1	-	Label Identifier	B
2-7	F1	File Set Identifier	Repeated in first file label
8-24	F2	File Identifier	
25-28	F3	File Section Number	
29-32	F4	Generation Number	
33-34	F5	Generation Version Number	
35	F8	Data Status	
36	F9	Accessibility	Repeated in first file label
37-46	-	-	(10) Reserved for system software use
47-60	-	-	(14) Reserved for future standardization
61-62	F50	Number of Extents	
63-77	F51	Extent Description	Six Extents in all.
78-92	F52	Extent Description	
93-152	(F52)	Extent Description	
153-160	-	Pointer-1	

9.1.3 Extension Label

CP	Field	Field Name	Remarks
1	-	Label Identifier	E
2-16	F52	Extent Description	8 Extents in all
17-121	(F52)	Extent Description	
122-144	-	-	(23) Reserved for system software use.
145-152	-	Pointer-2	
153-160	-	Pointer-1	

9.1.4 Free Extent Administration (optional)

9.1.4.1 Basic Label

CP	Field	Field Name	Remarks
1-35	-	-	As defined in section 4.4.
36-60	-	-	Spaces
61-160	-	-	As for Basic Labels

9.1.4.2 Extension Label

CP	Field	Field Name	Remarks
1-160	-	-	As for Extension Label (9.1.3).

9.2 Labels at Start of File

9.2.1 Label Block 1

This block contains the first and second file labels.

CP	Content
1-80	HDR1 Label
81-160	HDR2 Label

9.2.1.1 First File Label (HDR1)

CP	Field	Field Name	Remarks
1-3	-	Label Identifier	HDR
4	-	Label Number	1
5-21	F2	File Identifier	*
22-27	F1	File Set Identifier	*
28-31	F3	File Section Number	*
32-35	-	-	Reserved for Magnetic Tape Labelling
36-39	F4	Generation Number	*
40-41	F5	Generation Version Number	*
42-47	F6	Creation Date	*
48-53	F7	Expiration Date	*
54	F9	Accessibility	*
55-60	F21	Block Count	*

First File Label (HDR1) (cont'd)

CP	Field	Field Name	Remarks
61-73	F10	System Code	*
74-80	-	-	(7) Reserved for future standardization.

Note: Fields identified by an asterisk (*) are defined in Standard ECMA-13.

9.2.1.2 Second File Label

CP	Field	Field Name	Remarks
1-3	-	Label Identifier	HDR
4	-	Label Number	2
5	-	Record Format	*
6-10	F32	Block Length	*
11-15	F34	Record Length	*
16-50	-	-	(35) Reserved for system software use.
51-52	F33	Buffer Offset	*
53	F35	File Organisation	
54-70	-	-	(17) Reserved for future standardization
71	F41	Key Indicator	
72	F42	Sector Overflow	
73	F43	Start of Data	
74-76	F44	Sector 0 Key Length	
77-80	F45	Sector 0 Data Length	

Note: Fields identified by an asterisk (*) are defined in Standard ECMA-13.

9.2.2 Label Block 2

This block contains the third file label.

CP	Content
1-80	HDR3 Label
81-160	Spaces

9.2.2.1 Third File Label

CP	Field	Field Name	Remarks
1-3	-	Label Identifier	HDR
4	-	Label Number	3
5-12	F22	Accumulated Block Count	
13-20	F23	End of Recorded Data	
21	F24	Allocation Type	
22-27	F25	Allocation Quantity	
28	F26	Last Volumes Identifier	
29-80	-	-	(57) Reserved for future standardization. (Expected to include fields F27, F28.)

9.2.3 Label Blocks 3 onwards (optional)

These blocks contain User File Labels, if present.

CP	Content
1-80	User File Label
81-160	User File Label

9.2.3.1 User File Label

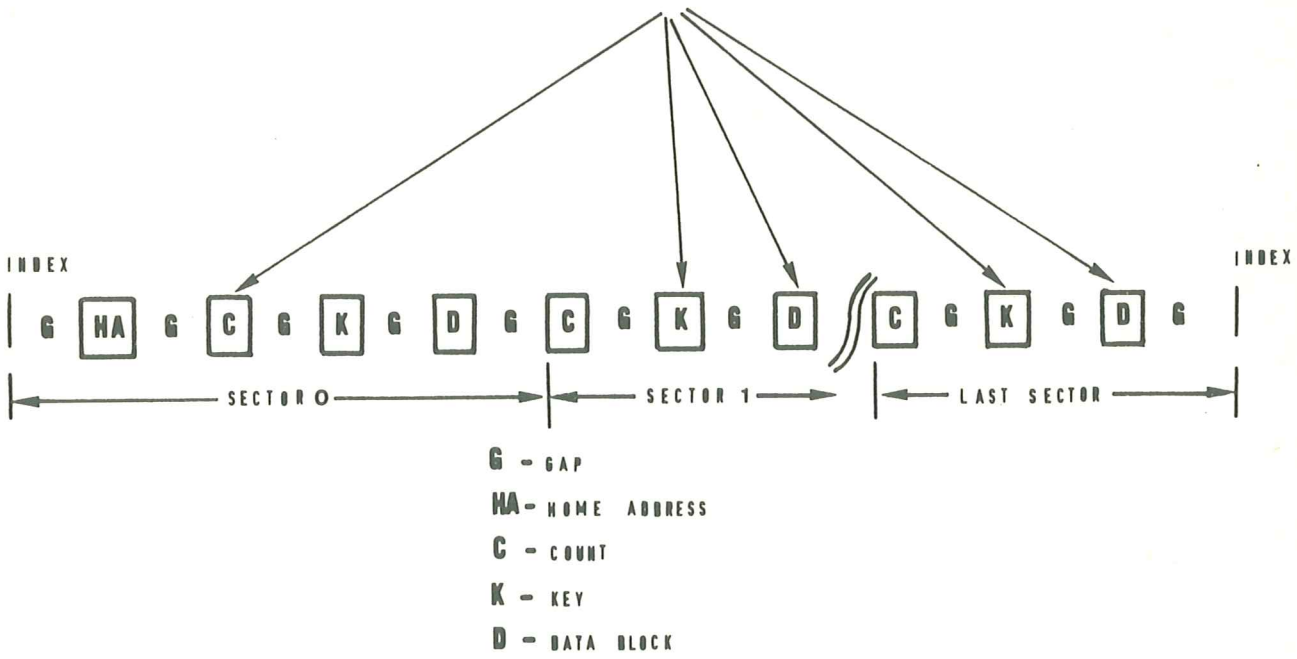
CP	Field Name	L	Content
1-3	Label Identifier	3	UHL
4	Label Number	1	Any 'a' character
5-80	User Option	76	Any 'a' characters

9.2.3.2 Up to 36 User File Labels may be recorded in Label Blocks 3 onwards. A File Mark may follow the last Label Block (see section 5.1.3).

APPENDIX A

TRACK FORMAT

The following figure is extracted from ECMA-33. This document is concerned with the marked areas of the track.



G - GAP
HA - HOME ADDRESS
C - COUNT
K - KEY
D - DATA BLOCK

APPENDIX B

RECORD SPANNING

The following figures are extracted from the second Edition of Standard ECMA-13 (Annex A, Fig. A5 to A8).

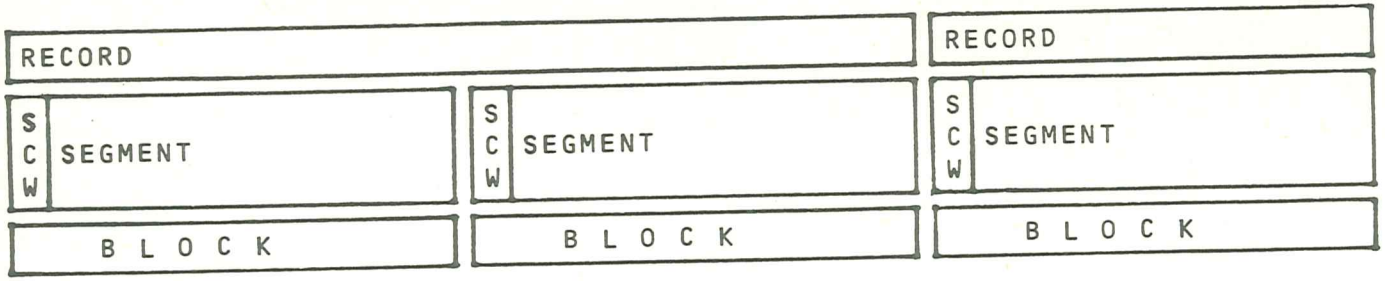


Fig. 1 Spanned records,unblocked

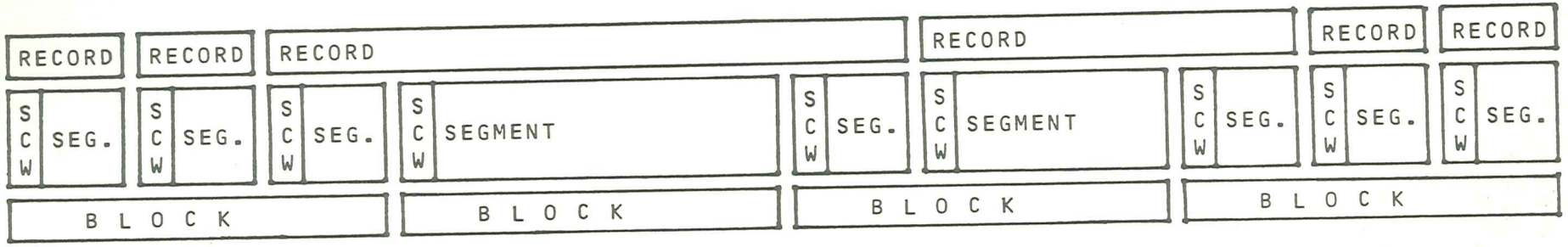


Fig. 2 Spanned records,blocked

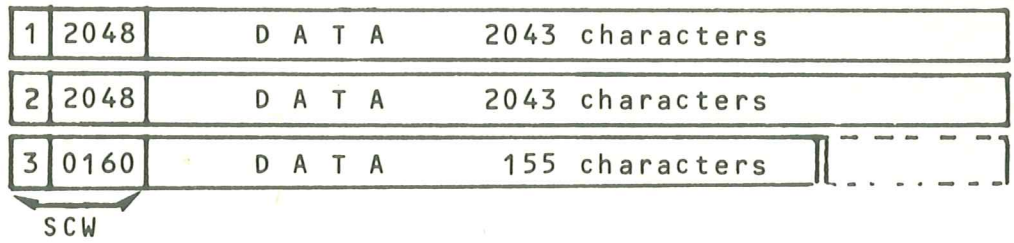


Fig. 3 One spanned record,unblocked.
Total length 4241 characters.
(each line represents a block)

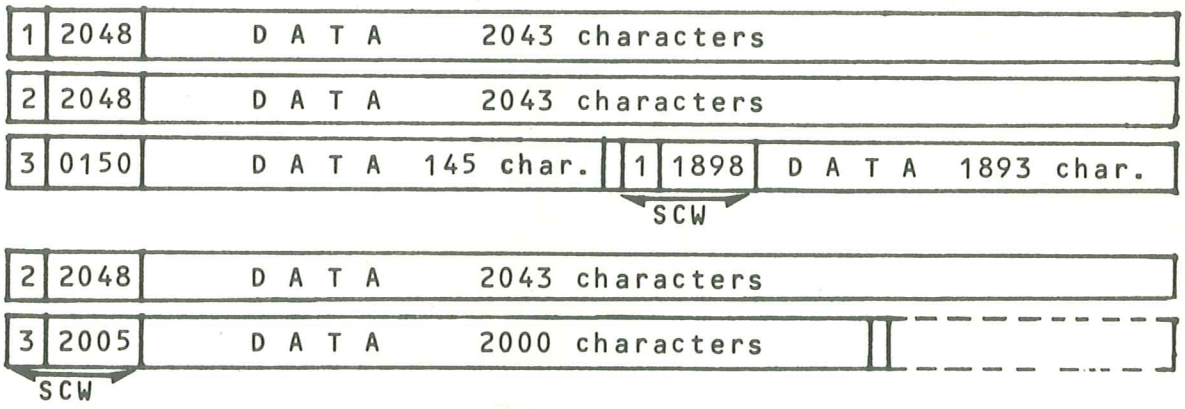


Fig. 4 Two spanned records,blocked.
Record # 1 : 4931 characters
Record # 2 : 5936 characters
(each line represents a block)