International Standard ISO 5654/2

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Information processing — Data interchange on 200 mm (8 in) flexible disk cartridges using two-frequency recording at 13 262 ftprad on one side — Part 2 : Track format

Traitement de l'information — Échange d'information sur cartouches à disquette de 200 mm (8 in) utilisant un enregistrement à double fréquence à 13 262 ftprad sur une face — Partie 2 : Schéma de piste

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 5654/2 was developed by Technical Committee ISO/TC 97, *Computers and information processing*, and was circulated to the member bodies in January 1980.

It has been approved by the member bodies of the following countries :

Belgium	Germany, F. R.	South Africa, Rep. of
Canada	Italy	Spain
Cuba	Japan	Sweden
Czechoslovakia	Mexico	Switzerland
Egypt, Arab Rep. of	Netherlands	United Kingdom
Finland	Poland	USSR
France	Romania	

No member body expressed disapproval of the document.

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Information processing — Data interchange on 200 mm (8 in) flexible disk cartridges using two-frequency recording at 13 262 ftprad on one side — Part 2 : Track format

0 Introduction

ISO 5654 specifies the characteristics of 200 mm (8 in) flexible disk cartridges recorded at 13 262 ftprad on one side using two-frequency recording.

ISO 5654/1 specifies the dimensional, physical and magnetic characteristics of the cartridge, so as to provide physical interchangeability between data processing systems.

Together with the labelling scheme specified in ISO 7665, ISO 5654/1 and ISO 5654/2 provide for full data interchange between data processing systems.

1 Scope and field of application

This part of ISO 5654 specifies the quality of recorded signals, track layout and the track format to be used on the above-mentioned flexible disk cartridge which is intended for data interchange between data processing systems.

NOTE — Numeric values in the SI and/or Imperial measurement system in this International Standard may have been rounded off and therefore are consistent with, but not exactly equal to, each other. Either system may be used, but the two should be neither intermixed nor re-converted.

The original design was made using the Imperial measurement system.

2 References

ISO 646, *Information processing — 7-bit coded character set for information interchange.*[1]

ISO 2022, *Information processing — ISO 7-bit and 8-bit coded character sets — Code extension techniques.*[2]

ISO 4873, *Information processing — 8-bit coded character set for information interchange.*

ISO 7665, *Information processing — File structure and labelling of flexible disk cartridges for information interchange.*[3]

3 General recording requirements

3.1 Mode of recording

The mode of recording shall be two-frequency where the start of every bit cell is a clock flux transition. A ONE is represented by a data flux transition between two clock flux transitions.

3.2 Track location tolerance of the recorded flexible disk cartridge

The centrelines of the recorded tracks shall be within ± 0,085 mm (0.003 3 in) of the nominal positions, when measured in the testing environment. This tolerance corresponds to twice the standard deviation.

1) At present at the stage of draft. (Revision of ISO 646-1973.)

2) At present at the stage of draft. (Revision of ISO 2022-1973.)

3) At present at the stage of draft.

3.3 Recording offset angle

At the instant of writing or reading a magnetic transition, the transition may have an angle of 0° ± 18′ with the radius. This tolerance corresponds to twice the standard deviation.

3.4 Density of recording

3.4.1 The nominal density of recording shall be 13 262 flux transitions per radian. The resulting nominal spacing between two clock flux transitions, the nominal bit cell length, is 151 microradians.

3.4.2 The long term average bit cell length shall be the average bit cell length measured over a sector. It shall be within ± 3 % of the nominal bit cell length.

NOTE — It is recognized that at extremes of supply frequency encountered on computer sites the deviation may be ± 5 % in exceptional circumstances. Successful data interchange may still then be possible provided that formatting of the cartridge and subsequent writing of data are not carried out at the opposite limits of this range.

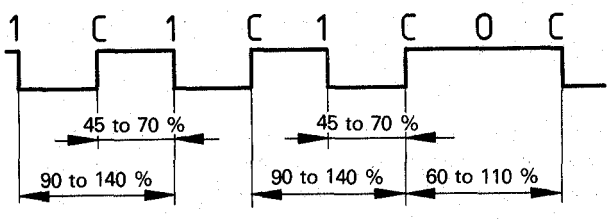
3.4.3 The short term average bit cell length, referred to a particular bit cell, shall be the average of the lengths of the preceding eight bit cells. It shall be within ± 8 % of the long term average bit cell length.

3.5 Flux transition spacing

3.5.1 The spacing between two clock flux transitions surrounding a data flux transition or between two data flux transitions surrounding a clock flux transition shall be between 90 % and 140 % of the nominal bit cell length.

3.5.2 The spacing between two clock flux transitions not surrounding a data flux transition or between two data flux transitions surrounding a missing clock flux transition shall be between 60 % and 110 % of the nominal bit cell length.

3.5.3 The spacing between a data flux transition and the preceding clock flux transition (when not missing) or between a clock flux transition and the preceding data flux transition (when not missing) shall be between 45 % and 70 % of the nominal bit cell length.



3.6 Average signal amplitude

The average signal amplitude on any non-defective track of the interchanged flexible disk shall be not more than 160 % of the standard reference amplitude for track 00 and not less than 40 % of the standard reference amplitude for track 76.

4 General format requirements

4.1 Byte

A byte is a group of eight bit-positions, identified B1 to B8, with B8 most significant and recorded first.

The bit in each position shall be a ZERO or a ONE.

4.2 Sector

Each track shall be divided into 26 sectors.

4.3 Data capacity of a track

The data capacity of a track shall be 3 328 bytes.

4.4 Hexadecimal notation

Hexadecimal notation shall be used to denote the following bytes :

(00) for (B8 to B1) = 00000000

(FF) for (B8 to B1) = 11111111

(FC)* for (B8 to B1) = 11111100

where the clock transitions of B6 and B4 are missing

(FE)* for (B8 to B1) = 11111110

where the clock transitions of B6, B5 and B4 are missing

(FB)* for (B8 to B1) = 11111011

where the clock transitions of B6, B5 and B4 are missing

(F8)* for (B8 to B1) = 11111000

where the clock transitions of B6, B5 and B4 are missing

4.5 Error detection characters (EDC)

The two EDC-bytes are hardware-generated by shifting serially the relevant bits, specified later for each part of the track, through a 16-bit shift register described by the generator polynomial :

$$X^{16} + X^{12} + X^5 + 1$$

(See also the annex.)

4.6 Representation of characters

Characters shall be represented by means of the 7-bit coded character set (ISO 646) and, where required, by its 7-bit or 8-bit extensions (ISO 2022) or by means of the 8-bit coded character set (ISO 4873).

Each 7-bit coded character shall be recorded in bit-positions B7 to B1 of a byte; bit-position B8 shall be recorded with bit ZERO.

The relationship shall be as follows :

Bits of the 7-bit combination	0	b7	b6	b5	b4	b3	b2	b1
Bit-positions in the byte	B8	B7	B6	B5	B4	B3	B2	B1

Each 8-bit coded character shall be recorded in bit-positions B8 to B1 of a byte.

The relationship shall be as follows :

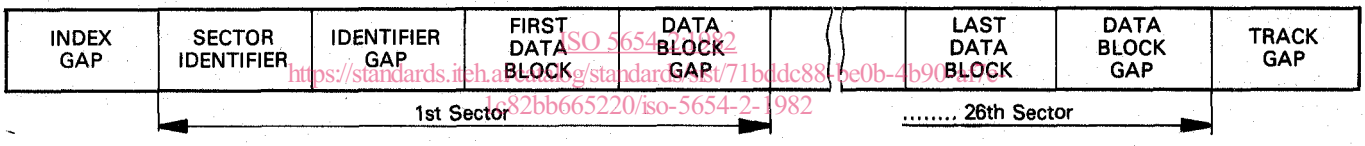
Bits of the 8-bit combination	b8	b7	b6	b5	b4	b3	b2	b1
Bit-positions in the byte	B8	B7	B6	B5	B4	B3	B2	B1

4.7 Track assignment

Track 00 shall be used for labels only. Of the remaining 76 tracks, only 74 may be used for the recording of data, leaving the possibility of one or two defective tracks.

5 Track layout after the first formatting

After the first formatting, the track layout shall be as follows :



5.1 Index gap

The field shall comprise 73 bytes as follows :

40 (FF)-bytes, 6 (00)-bytes, 1 (FC)*-byte, 26 (FF)-bytes

Writing the Index Gap is started when the Index hole is detected. Any of the first 20 bytes may be ill-defined due to subsequent overwriting.

5.2 Sector identifier

This field shall be as follows :

Identifier mark		Address identifier				
		T	2nd byte	S	4th byte	EDC
6 bytes (00)	1 byte (FE)*	1 byte	1 byte (00)	1 byte	1 byte (00)	2 bytes

5.2.1 Identifier mark

This field shall comprise 7 bytes :

6 (00)-bytes

1 (FE)*-byte

5.2.2 Address identifier

This field shall comprise 6 bytes.

5.2.2.1 Track address (T)

The track address is the first byte of the address identifier. It shall represent in binary notation the track address from 00 for the outermost track to 76 for the innermost track.

5.2.2.2 2nd byte of the address identifier

The 2nd byte shall be always a (00)-byte.

5.2.2.3 Sector number (S)

The 3rd byte shall represent in binary notation the sector number from 01 for the 1st sector to 26 for the last sector.

The 26 sectors shall be recorded in the natural sequence :

1, 2, 3, ..., 25, 26.

5.2.2.4 4th byte of the address identifier

The 4th byte shall be always a (00)-byte.

5.2.2.5 EDC

These two bytes shall be generated as defined in 4.5 using the bytes of the sector identifier starting with the (FE)*-byte (see 5.2.1) of the identifier mark and ending with the 4th byte (see 5.2.2.4) of the address identifier.

5.3 Identifier gap

This field shall comprise 11 initially recorded (FF)-bytes.

5.4 Data block

This field shall be as follows :

Data mark		Data field	EDC
6 bytes (00)	1 byte (FB)*	128 bytes	2 bytes

5.4.1 Data mark

This field shall comprise

— 6 (00)-bytes

— 1 (FB)*-byte

5.4.2 Data field

This field shall comprise 128 bytes. No requirements are implied beyond the correct EDC for the content of this field (see also 6.4.2).

5.4.3 EDC

These two bytes shall be generated as defined in 4.5 using the bytes of the data block starting with the 7th byte of the data mark (see 5.4.1) and ending with the last byte of the data field (see 5.4.2).

5.5 Data block gap

This field shall comprise 27 initially recorded (FF)-bytes. It is recorded after each data block and it precedes the following sector identifier. After the last data block it precedes the track gap.

5.6 Track gap

This field shall follow the data block gap of the 26th sector. At nominal density it should comprise 247 (FF)-bytes. Writing of the track gap takes place until the index hole is detected, unless it has been detected during writing of the last data block gap, in which case there shall be no track gap.

6 Interchange flexible disk cartridges — Track layout of good tracks

6.1 Index gap

Description : see 5.1.

6.2 Sector identifier

6.2.1 Identifier mark

Description : see 5.2.1.

6.2.2 Address identifier

This field shall comprise 6 bytes.

6.2.2.1 Track address (T)

The track address is the first byte of the address identifier. It shall represent in binary notation the track address from 00 for the outermost track to 76 for the innermost track.

— If there is no bad track, the track address is identical to the track number.

— If there are one or two bad tracks, the track address(es) of the bad track(s) is skipped and the track address numbering continues sequentially with the next good track. In this case the track address differs by 1 (or 2) from the track number.

6.2.2.2 2nd byte of the address identifier

Description : see 5.2.2.2.

6.2.2.3 Sector number (S)

The 3rd byte shall represent in binary notation the sector number from 01 for the 1st sector to 26 for the last sector.

NOTES

1 Each column of the table below is identified by a two digit number from 01 to 13. ISO 7665 specifies a field called Sector Sequence Indicator in character positions 77-78 of the Vol. 1 Label, in which this two-digit number identifying the order in which the sectors are recorded is to be entered.

2 The table lists vertically the sector numbers of the sectors as they appear sequentially on the track. For example, for order 08, the first sector of the track bears sector number 01, the following one bears sector number 09, the third one bears sector number 17, and so on until the twenty-sixth sector which bears sector number 24.

Table — Sequence of the sector numbers on the track

Position of the sectors on the track	Sector sequence indicator												
	01	02	03	04	05	06	07	08	09	10	11	12	13
	Sequence of the sector numbers												
1st	01	01	01	01	01	01	01	01	01	01	01	01	01
2nd	02	03	04	05	06	07	08	09	10	11	12	13	14
3rd	03	05	07	09	11	13	15	17	19	21	23	25	02
4th	04	07	10	13	16	19	22	25	02	02	02	02	15
5th	05	09	13	17	21	25	02	02	11	12	13	14	03
6th	06	11	16	21	26	02	09	10	20	22	24	26	16
7th	07	13	19	25	02	08	16	18	03	03	03	03	04
8th	08	15	22	02	07	14	23	26	12	13	14	15	17
9th	09	17	25	06	12	20	03	03	21	23	25	04	05
10th	10	19	02	10	17	26	10	11	04	04	04	16	18
11th	11	21	05	14	22	03	17	19	13	14	15	05	06
12th	12	23	08	18	03	09	24	04	22	24	26	17	19
13th	13	25	11	22	08	15	04	12	05	05	05	06	07
14th	14	02	14	26	13	21	11	20	14	15	16	18	20
15th	15	04	17	03	18	04	18	05	23	25	06	07	08
16th	16	06	20	07	23	10	25	13	06	06	17	19	21
17th	17	08	23	11	04	16	05	21	15	16	07	08	09
18th	18	10	26	15	09	22	12	06	24	26	18	20	22
19th	19	12	03	19	14	05	19	14	07	07	08	09	10
20th	20	14	06	23	19	11	26	22	16	17	19	21	23
21st	21	16	09	04	24	17	06	07	25	08	09	10	11
22nd	22	18	12	08	05	23	13	15	08	18	20	22	24
23rd	23	20	15	12	10	06	20	23	17	09	10	11	12
24th	24	22	18	16	15	12	07	08	26	19	21	23	25
25th	25	24	21	20	20	18	14	16	09	10	11	12	13
26th	26	26	24	24	25	24	21	24	18	20	22	24	26

NOTE — As after first formatting the sectors are recorded in the natural sequence, the use of the other 12 possible sequences requires reformatting.

6.2.2.4 4th byte of the address identifier

Description : see 5.2.2.4.

6.2.2.5 EDC

Description : see 5.2.2.5.

6.3 Identifier gap

This field shall comprise initially 11 (FF)-bytes. These bytes may subsequently become ill-defined due to the overwriting process.

6.4 Data block

6.4.1 Data mark

This field shall comprise :

— 6 (00)-bytes

— 1 byte

The 7th byte shall be :

(FB)* indicating that the data is valid and that the whole data field can be read;

(F8)* indicating that only the first byte of the data field shall be read and interpreted according to ISO 7665.

6.4.2 Data field

This field shall comprise 128 bytes. If it comprises less than 128 data bytes, the remaining positions shall be filled with (00)-bytes.

Data fields in track 00 are reserved for operating system use, including labelling.

6.4.3 EDC

Description : see 5.4.3.

If the 7th byte of the data mark is (F8)* and the 1st character of the data field is either CAPITAL LETTER F or FULL STOP, the EDC may or may not be correct, as the sector contains a defective area. If the 1st character is CAPITAL LETTER D, then the EDC shall be correct.

On track 00 only CAPITAL LETTER D shall be allowed.

6.5 Data block gap

This field is recorded after each data block and it precedes the following sector identifier. After the last data block it precedes the track gap.

It comprises initially 27 (FF)-bytes. These bytes may subsequently become ill-defined due to the overwriting process.

6.6 Track gap

Description : see 5.6.

7 Re-writing of a bad track

The fields of a bad track should have the following contents :

7.1 Index gap

This field should comprise 73 (FF)-bytes.

7.2 Sector identifier

This field should comprise an identifier mark and an address identifier.

7.2.1 Identifier mark

This field should comprise 7 bytes :

— 6 (00)-bytes

— 1 (FE)*-byte