INTERNATIONAL STANDARD

ISO/IEC 7811-2

Third edition
2001-02-01

Identification cards — Recording technique —

Part 2: Magnetic stripe — Low coercivity

Cartes d'identification — Technique d'enregistrement —

Partie 2: Raie magnétique — Faible coercitivité

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO/IEC 7811 may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 7811-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Identification cards and related devices*.

This third edition of ISO/IEC 7811-2 cancels and replaces ISO/IEC 7811-2:1995, ISO/IEC 7811-4:1995 and ISO/IEC 7811-5:1995. The user is encouraged to review the entire standard for revisions and updates. The major changes made during this revision are listed below.

1. The requirements given in ISO/IEC 7811-4:1995 and ISO/IEC 7811-5:1995 are included in this edition of ISO/IEC 7811-2.

2. Wherever possible the same definitions, criteria and test methods have been used for both Part 2 and Part 6.

3. Revised the bandpass filter requirements for the test method.

ISO/IEC 7811 consists of the following parts, under the general title *Identification cards — Recording technique*:

— *Part 1: Embossing*

— *Part 2: Magnetic stripe — Low coercivity*

— *Part 6: Magnetic stripe — High coercivity*

Annex B forms a normative part of this part of ISO/IEC 7811. Annexes A and C are for information only.

Identification cards — Recording technique —

Part 2:
Magnetic stripe — Low coercivity

1 Scope

This part of ISO/IEC 7811 is one of a series of standards describing the characteristics for identification cards as defined in the definitions clause and the use of such cards for international interchange.

This part of ISO/IEC 7811 specifies requirements for a low coercivity magnetic stripe (including any protective overlay) on an identification card, the encoding technique and coded character sets. It takes into consideration both human and machine aspects and states minimum requirements.

Coercivity influences many of the quantities specified in this part of ISO/IEC 7811 but is not itself specified. Exposure of the card to a magnetic field is likely to destroy the recorded data.

It is the purpose of this series of standards to provide criteria to which cards shall perform. No consideration is given within these standards to the amount of use, if any, experienced by the card prior to test. Failure to conform to specified criteria should be negotiated between the involved parties.

ISO/IEC 10373-2 specifies the test procedures used to check cards against the parameters specified in this part of ISO/IEC 7811.

NOTE Numeric values in the SI and/or Imperial measurement system in this part of ISO/IEC 7811 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 not be intermixed or reconverted. The original design was made using the Imperial measurement system.

2 Conformance

A prerequisite for conformance with this part of ISO/IEC 7811 is conformance with ISO/IEC 7810. An identification card is in conformance with this part of ISO/IEC 7811 if it meets all mandatory requirements specified herein. Default values apply if no others are specified.

3 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 7811. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO/IEC 7811 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 4287, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*.

ISO/IEC 7810, *Identification cards — Physical characteristics*.

ISO/IEC 10373-1, *Identification cards — Test methods — Part 1: General characteristics tests*.

ISO/IEC 10373-2, *Identification cards — Test methods — Part 2: Cards with magnetic stripes*.

4 Terms and definitions

For the purposes of this part of ISO/IEC 7811, the terms and definitions given in ISO/IEC 7810 and the following apply.

4.1
primary standard
set of reference cards established and maintained by Physikalisch-Technische Bundesanstalt (PTB) that represent the values of U_R and I_R designated RM7811-2

4.2
secondary standard
reference card designated RM7811-2 that is related to the primary standard as stated in the calibration certificate supplied with each card

NOTE Secondary standards can be ordered from Physikalisch-Technische Bundesanstalt (PTB), FLab. 2.24 - Bundesallee 100, D-38116 Braunschweig, Germany. The source of secondary standards will be maintained at least until 2005.

4.3
unused un-encoded card
card possessing all the components required for its intended purpose, which has not been subjected to any personalization or testing operation, and which has been stored in a clean environment with no more than 48 hour exposure to daylight at temperatures between 5 °C to 30 °C and humidity between 10% to 90% without experiencing thermal shock

4.4
unused encoded card
card according to 4.3 that has only been encoded with all the data required for its intended purpose (e.g. magnetic encoding, embossing, electronic encoding)

4.5
returned card
card according to 4.4 after it has been issued to the card holder and returned for the purpose of testing

4.6
flux transition
location of the greatest rate of change with distance of the magnetisation

4.7
reference current
I_R
minimum recorded current amplitude under the given test conditions that causes, on the reference card, a readback signal amplitude equal to 80% of the reference signal amplitude U_R, at a density of 8 flux transitions per millimetre (200 flux transitions per inch) as shown in Figure 6

4.8
reference flux level
F_R
flux level in the test head that corresponds to the reference current I_R

4.9
test recording currents
two recording currents defined by:

I_{min} = Recording current corresponding to 3,5 F_R
I_{max} = Recording current corresponding to 5,0 F_R

4.10
individual signal amplitude
U_i
base-to-peak amplitude of a single readback voltage signal

4.11
average signal amplitude
U_A
sum of the absolute value of the amplitude of each signal peak (U_i) divided by the number of signal peaks (n) for a given track over the length of the magnetic stripe area

4.12
reference signal amplitude
U_R
maximum value of the average signal amplitude of a reference card corrected to the primary standard

4.13
physical recording density
number of flux transitions per unit length recorded on a track

4.14
bit density
number of data bits stored per unit of length (bits/mm or bpi)

4.15
bit cell
distance between two clocking flux transitions. See Figure 10

4.16
sub interval
distance that is nominally half of the distance between two clocking flux transitions. See Figure 10

5 Physical characteristics of the identification card

The identification card shall conform to the specification given in ISO/IEC 7810.

WARNING --The attention of card issuers is drawn to the fact that information held on the magnetic stripe may be rendered ineffective through contamination by contact with dirt and certain commonly used chemicals including plasticizers. It should also be noted that any printing or screening placed on top of the magnetic stripe must not impair the function of the magnetic stripe.

5.1 Magnetic stripe area warpage

Application of a 2,2 N (0.5 lbf) load evenly distributed on the front face opposite the magnetic stripe shall bring the entire stripe within 0,08 mm (0.003 in) of the rigid plate.

5.2 Surface distortions

There shall be no surface distortions, irregularities or raised areas on both the front and the back of the card in the area shown in Figure 1 that might interfere with the contact between the magnetic head and magnetic stripe.

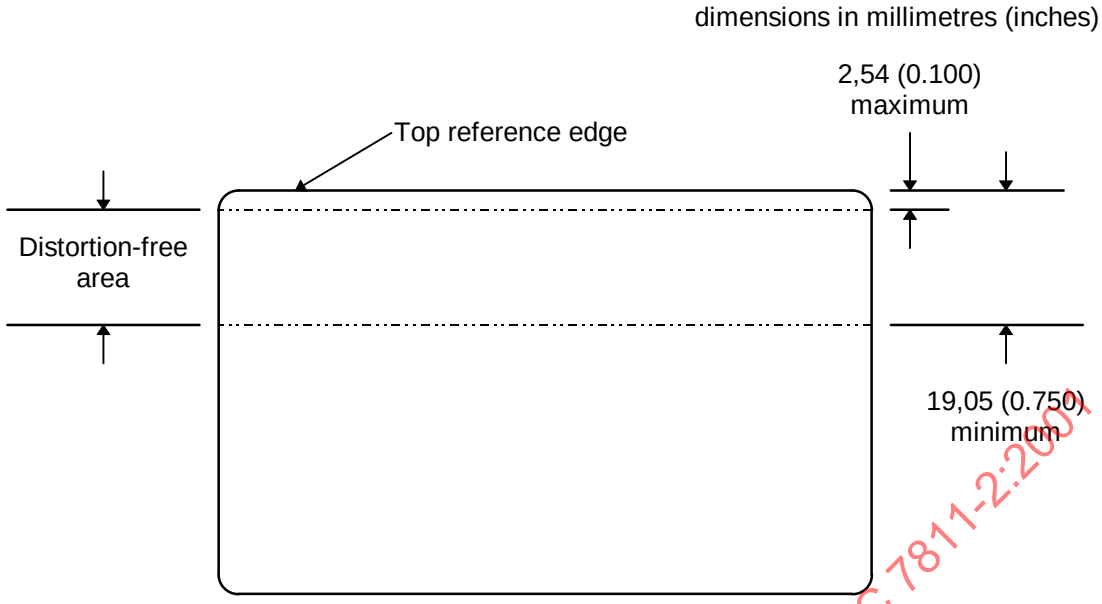


Figure 1 — Distortion-free area on card with magnetic stripe

If a raised signature panel area is located on the front or back of the card, then it shall be no closer to the top edge of the card than 19,05 mm (0.750 in).

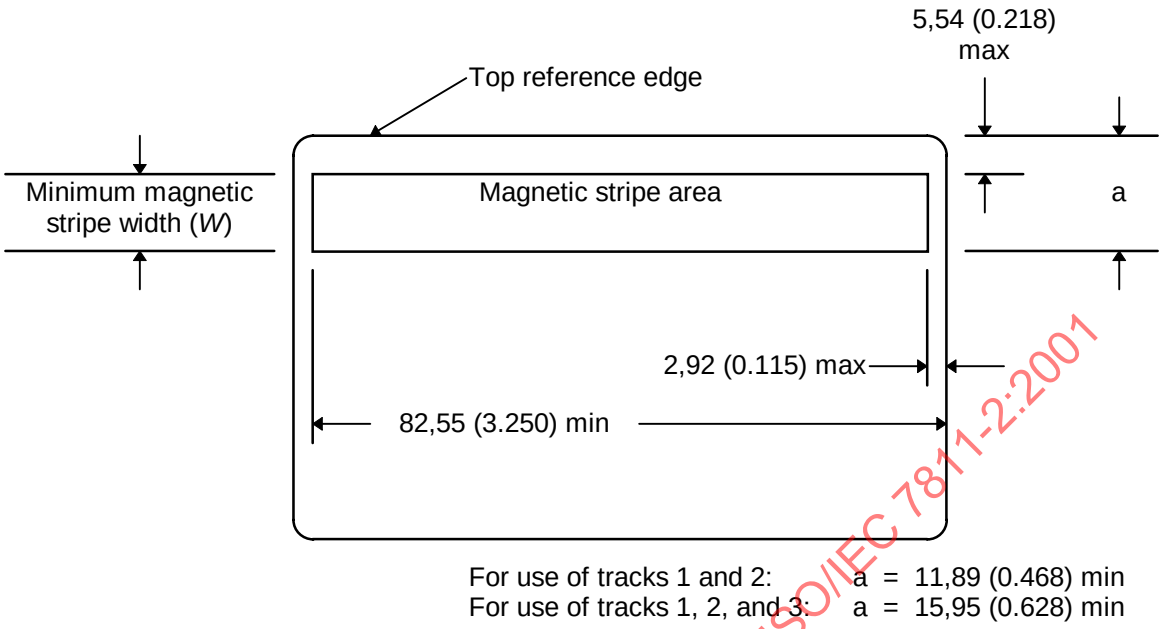
NOTE Raised areas and distortions on other areas of the card may cause card transport problems with magnetic stripe processing equipment resulting in reading or writing errors.

6 Physical characteristics of the magnetic stripe

6.1 Height and surface profile of the magnetic stripe area

The magnetic stripe area is located on the back of the card as shown in Figure 2.

dimensions in millimetres (inches)



NOTE In the case of the magnetic stripe area used for track 1 and 2, the dimension a as shown in Figure 2 of the magnetic media could be less than the maximum dimension b as shown in Figure 11 for the location of track 2 data on the card. It is desirable that the magnetic stripe area extend beyond the limits of the encoded track.

Figure 2 — Location of magnetic material for ID-1 type card

6.1.1 Surface profile of the magnetic stripe area

The maximum vertical deviation (*a*) of the transverse surface profile of the magnetic stripe area is shown below. See Figures 3, 4, and 5. The slope of the surface profile curve shall be limited to: -4a/W < slope < 4a/W

When the bending stiffness value (see ISO/IEC 7810) for the card is 20 mm or more then the surface profile limits are:

Minimum stripe width	**As shown in Figure 3A**	**As shown in Figure 3B**
W = 6,35 mm (0.25 in)	a ≤ 9,5 µm (375 µin)	a ≤ 5,8 µm (225 µin)
W = 10,28 mm (0.405 in)	a ≤ 15,4 µm (607 µin)	a ≤ 9,3 µm (365 µin)

When the bending stiffness value (see ISO/IEC 7810) for the card is less than 20 mm then the surface profile limits are:

Minimum stripe width	**As shown in Figure 3A**	**As shown in Figure 3B**
W = 6,35 mm (0.25 in)	a ≤ 7,3 µm (288 µin)	a ≤ 4,5 µm (175 µin)
W = 10,28 mm (0.405 in)	a ≤ 11,7 µm (466 µin)	a ≤ 7,3 µm (284 µin)

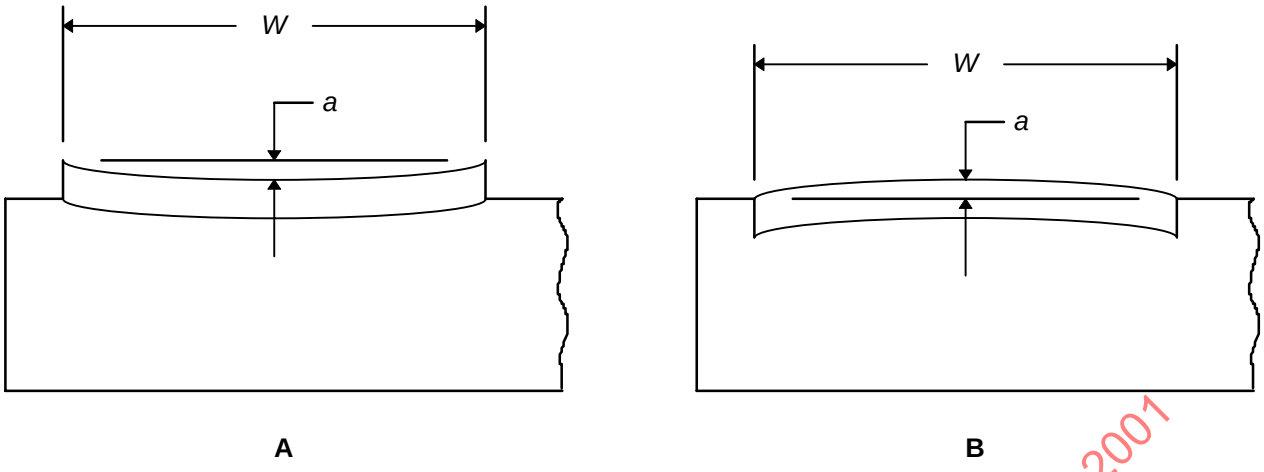


Figure 3 — Surface profile

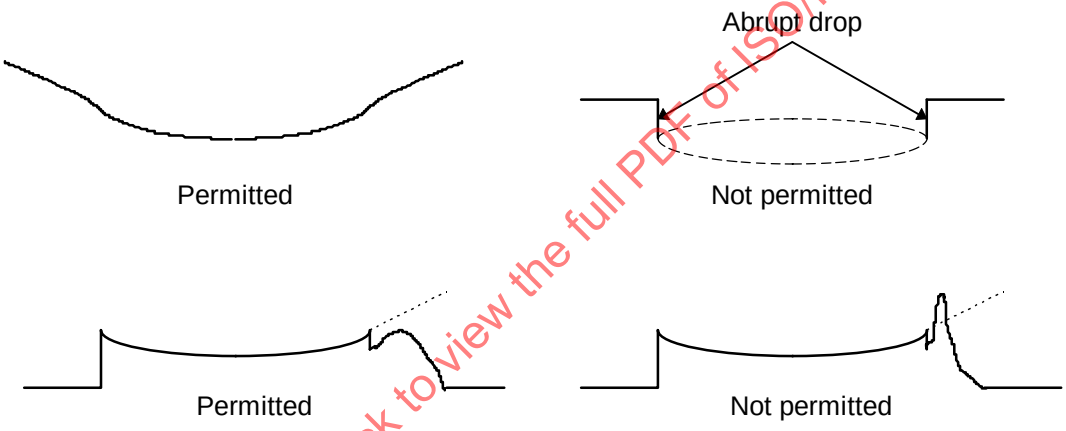
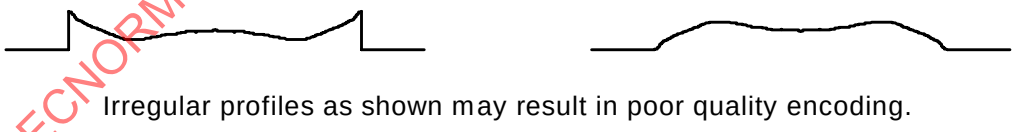


Figure 4 — Surface profile examples



Irregular profiles as shown may result in poor quality encoding.

Figure 5 — Irregular surface profile examples

6.1.2 Height of the magnetic stripe area

The vertical deviation (*h*) of the magnetic stripe area relative to the adjacent surface of the card shall be:

-0,005 mm (- 200 µin) ≤ *h* ≤ 0,038 mm (1500 µin)

Spiking in the profile caused by the material "squirt out" in hot stamping is not part of the stripe. It shall not extend above the magnetic stripe area height (*h*) as defined above.

6.2 Surface roughness

The average surface roughness (R_a) of the magnetic stripe area shall not exceed 0,40 µm (15.9 µin) in both the longitudinal and transverse directions. Refer to ISO 4287.

6.3 Adhesion of stripe to card

The stripe shall not separate from the card under normal use.

6.4 Wear of magnetic stripe from read/write head

Average signal amplitude (U_A) and individual signal amplitude (U_i) are measured before and after 2 000 wear cycles and shall result in:

$$U_{A\ after} \geq 0{,}60\ U_{A\ before} \qquad \text{and} \qquad U_{i\ after} \geq 0{,}80\ U_{A\ after}$$

6.5 Resistance to chemicals

Average signal amplitude (U_A) and individual signal amplitude (U_i) are measured before and after short-term exposure (as defined in the referenced Test Method document) shall result in:

$$U_{A\ after} \geq 0{,}90\ U_{A\ before} \qquad \text{and} \qquad U_{i\ after} \geq 0{,}90\ U_{A\ after}$$

Average signal amplitude (U_A) and individual signal amplitude (U_i) are measured before and after long-term exposure (24 hours) to acid and alkaline artificial perspiration, as defined in the referenced Test Method document.

$$U_{A\ after} \geq 0{,}90\ U_{A\ before} \qquad \text{and} \qquad U_{i\ after} \geq 0{,}90\ U_{A\ after}$$

7 Performance characteristics for the magnetic material

The purpose of this section is to enable magnetic interchangeability between card and processing systems. Media coercivity is not specified. The media's performance criteria, regardless of coercivity, is specified in 7.3.

7.1 General

This method uses a reference card whose material is traceable to the primary standard (see clause 4). All signal amplitude results from the use of the secondary reference card must be corrected by the factor supplied with the secondary reference card.

7.2 Testing and operating environment

The testing environment for signal amplitude measurements is 23 °C ± 3 °C (73 °F ± 5 °F) and 40% to 60% relative humidity. When tested under otherwise identical conditions, the average signal amplitude measured at 8 ft/mm (200 ftpi) shall not deviate from its value in the above test environment by more than 15% after 5 minute exposure over the following operating environment range:

temperature	-35 °C to 50 °C (-31 °F to 122 °F)
relative humidity	5% to 95%

7.3 Signal amplitude requirements for magnetic media

The requirements for recording characteristics of the card are shown in Table 1, and Figures 6 and 7.

Table 1 — Signal amplitude requirements for unused unencoded cards

Description	Density ft/mm (ftpi)	Test recording current	Signal amplitude result	Requirement
Signal amplitude	8 (200)	I_{min}	U_{A1}	$0{,}8\ U_R \le U_{A1} \le 1{,}3\ U_R$
Signal amplitude	8 (200)	I_{min}	U_{i1}	$U_{i1} \le 1{,}36\ U_R$
Signal amplitude	8 (200)	I_{max}	U_{A2}	$U_{A1} \ge U_{A2} \ge 0{,}8\ U_R$
Signal amplitude	20 (500)	I_{max}	U_{i2}	$U_{i2} \ge 0{,}65\ U_R$
Resolution	20 (500)	I_{max}	U_{A3}	$U_{A3} \ge 0{,}7\ U_{A2}$
Erasure	0	I_{min}, DC	U_{A4}	$U_{A4} \le 0{,}03\ U_R$
Extra pulse	0	I_{min}, DC	U_{i4}	$U_{i4} \le 0{,}05\ U_R$
The slope of the saturation curve shall never be positive between I_{min} and I_{max}				

NOTE It is not permissible to combine the above requirements mathematically.

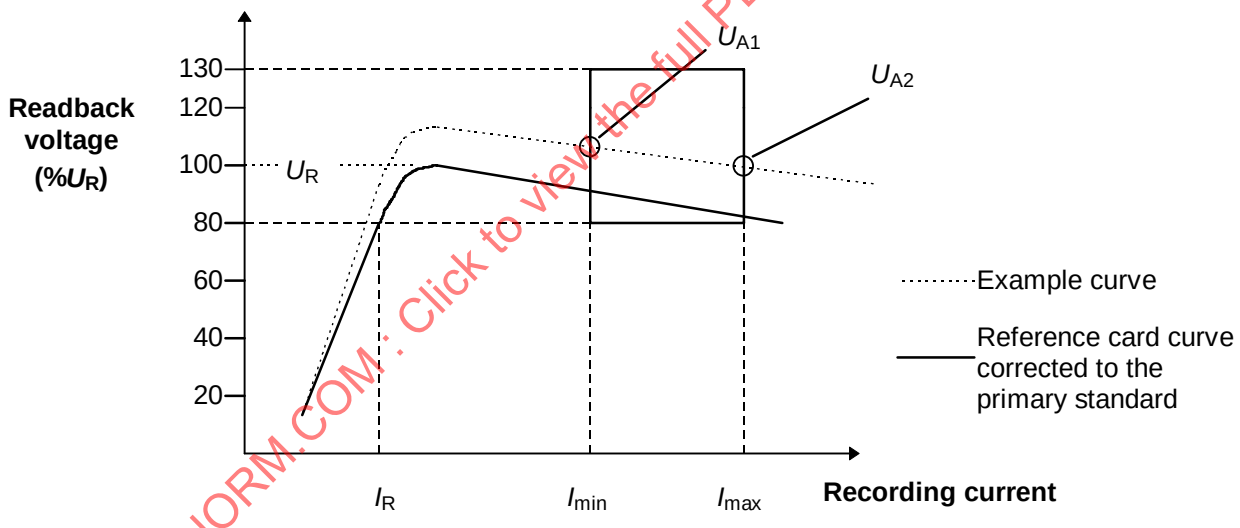


Figure 6 — Saturation curve example showing tolerance area at 8 ft/mm (200 ftpi)

NOTE The curve defines the primary standard response (on a card). The window parameters define a card that will be functional in the machine readable environment. The corrected reference curve depicted above may not meet the specifications defined in clause 7.

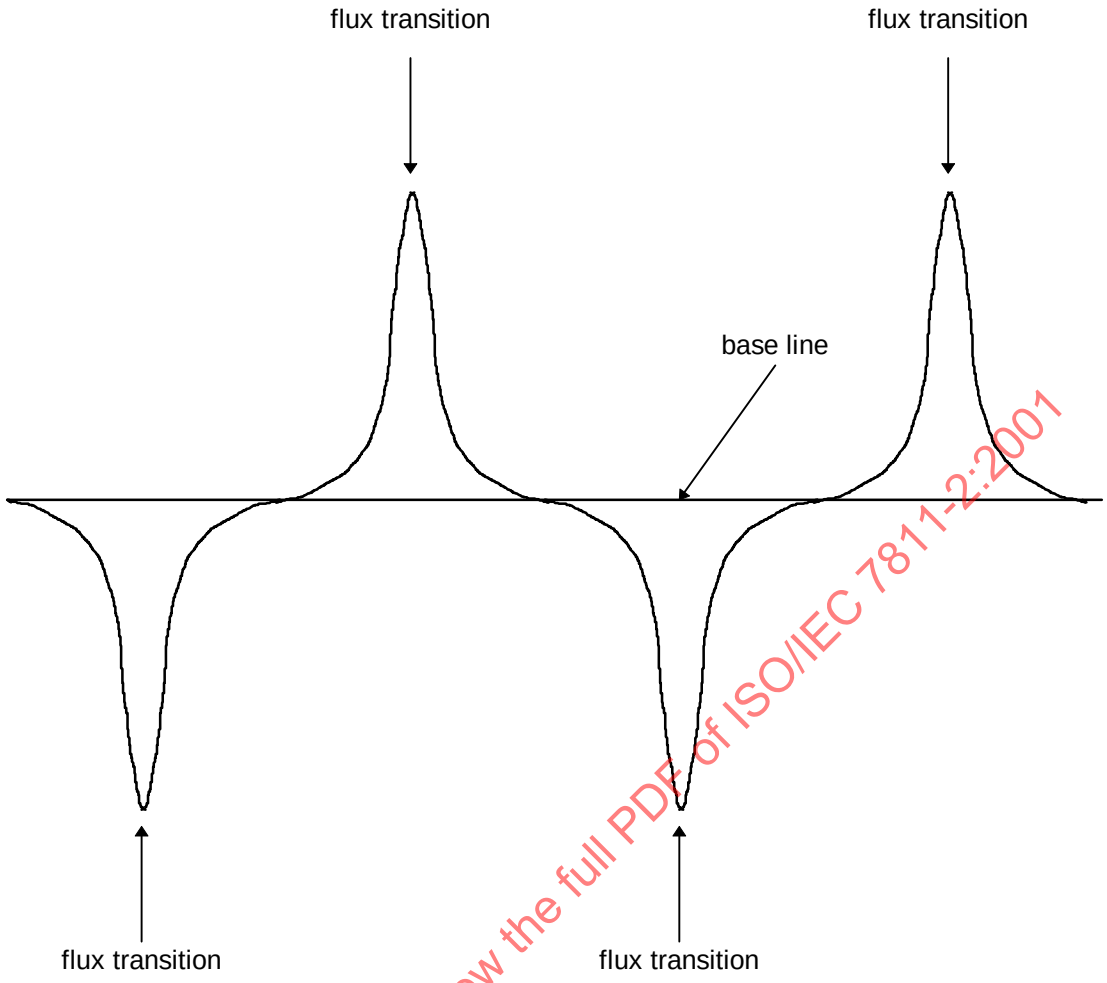
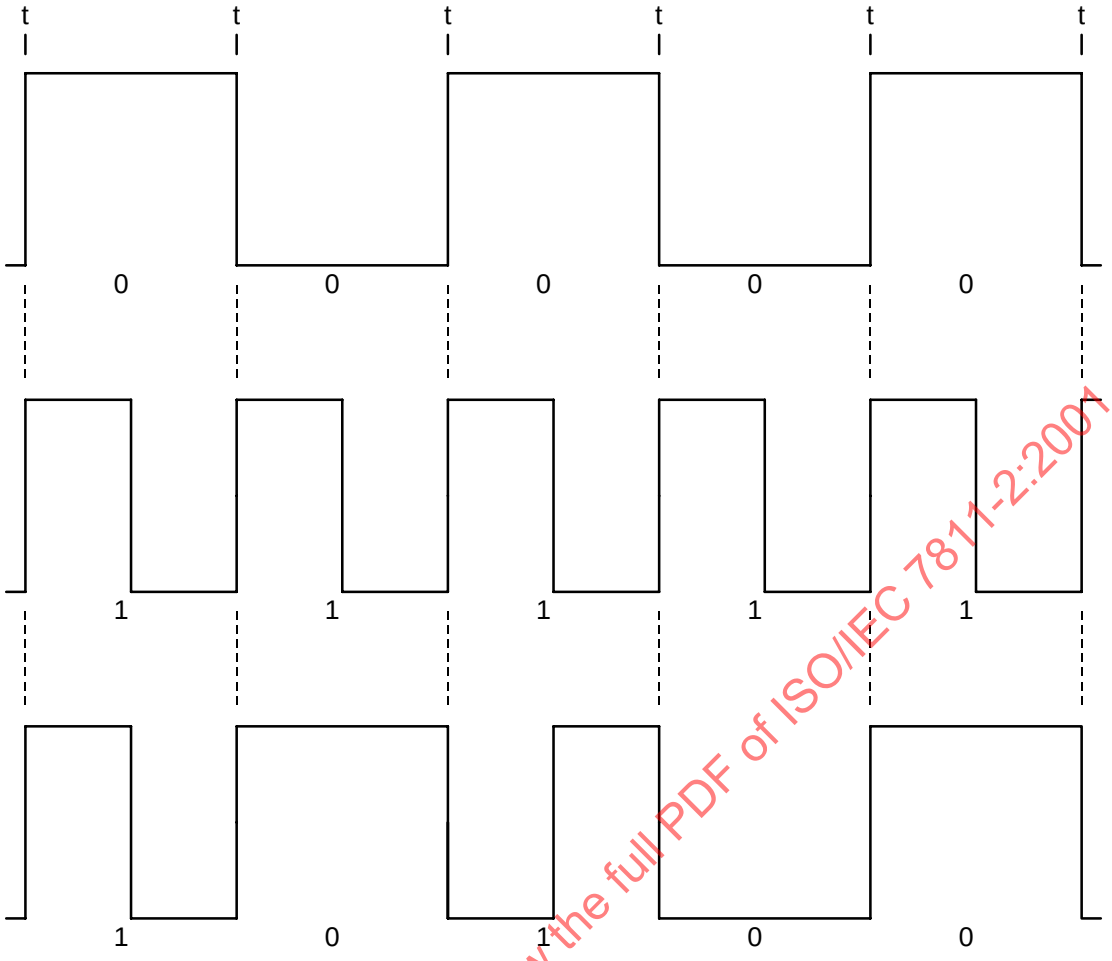


Figure 7 — Waveform example

8 Encoding technique

The encoding technique for each track is known as two-frequency recording. This method allows for serial recording of self-clocking data. The encoding comprises data and clocking transitions together. A flux transition occurring between clocks signifies that the bit is a "one" and the absence of a flux transition between clocking transitions signifies that the bit is a "zero" (see Figure 8).



t, indicates self-clocking (timing) intervals

Figure 8 – Examples of two-frequency encoding

The data shall be recorded as a synchronous sequence of characters without intervening gaps.

NOTE Recording with a write current which is less than I_{min} may result in poor quality encoding.

9 Encoding specification, general

9.1 Angle of recording

The angle of recording shall be normal to the nearest edge of the card parallel to the magnetic stripe with a tolerance of ± 20 minutes. The angle of recording (α) is determined by measuring the angle of the head gap when the reading amplitude is maximum (see Figure 9).

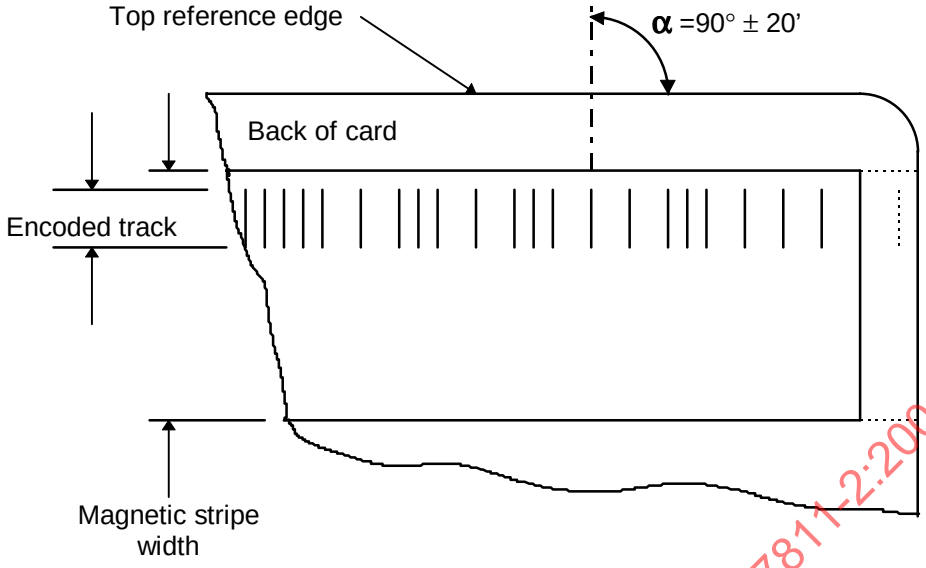


Figure 9 — Angle of recording

9.2 Nominal bit density

The nominal bit density for each of the tracks shall be:

for track 1 8,27 bits/mm (210 bpi),
for track 2 2,95 bits/mm (75 bpi),
for track 3 8,27 bits/mm (210 bpi).

9.3 Signal amplitude requirements for tracks 1, 2 and 3

The requirements for signal amplitude on tracks 1, 2 and 3 shall be as follows:

Unused encoded cards: $0{,}64\ U_R \le U_i \le 1{,}36\ U_R$
Returned cards: $0{,}52\ U_R \le U_i \le 1{,}36\ U_R$

NOTE The requirements above specify the interchange signal amplitude limits for each of the encoded track locations at the specified bit densities. Signal amplitude requirements specified in Table 1 reflect the magnetic media limits at the specified recording frequency and recording test currents.

9.4 Bit configuration

In the bit configuration for each character on the magnetic area, the least significant bit (2^0) shall be encoded first and the parity bit last.

9.5 Direction of recording

The encoding shall begin from the right-hand side viewed from the side with the magnetic stripe and with the stripe at the top.

9.6 Leading and trailing zeroes

The lead-in up to the first data bit shall be recorded with zeroes and the space after the last bit shall also be recorded with zeroes. Zeroes prior to 3,30 mm (0.130 in) or after 82,17 mm (3.235 in) from the right edge of the card when viewed from the back are not required to meet the specifications given herein.

10 Encoding specifications

10.1 Alphanumeric track, track 1

10.1.1 Average bit density

The average bit density (B_a) shall be 8,27 bits/mm (210 bpi) ± 8% measured in a longitudinal direction parallel to the top reference edge.

10.1.2 Flux transition spacing variation

Flux transition spacing variations are shown in Table 2 for unused encoded cards and in Table 3 for returned cards. See also Figure 10.

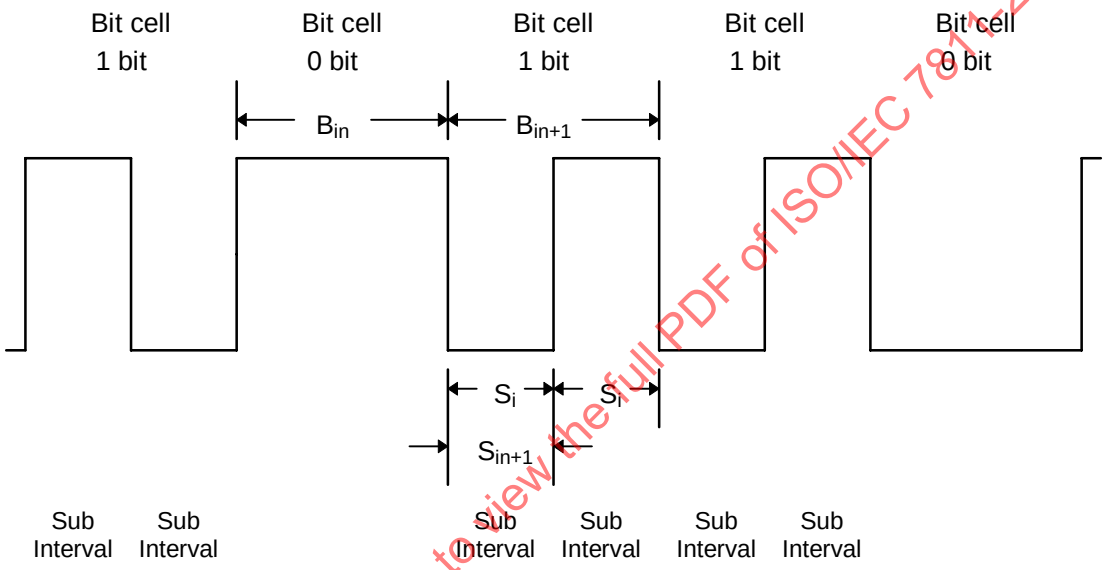


Figure 10 — Flux transition spacing variation

Table 2 — Flux transition spacing variation for unused encoded cards-Track 1 and 3

Term	Description	Requirement	Variation
B_a	Average length between clocking flux transitions	111 µm (4381 µin) ≤ B_a ≤ 131 µm (5143 µin)	± 8%
B_{in}	Individual length between clocking flux transitions	109 µm (4286 µin) ≤ B_{in} ≤ 133 µm (5238 µin)	± 10%
B_{in+1}	Adjacent bit-to-bit variation	0,90 B_{in} ≤ B_{in+1} ≤ 1,10 B_{in}	± 10%
S_{in}	Subinterval length	53 µm (2095 µin) ≤ S_{in} ≤ 68 µm (2667 µin)	± 12%
S_{in+1}	Adjacent subinterval length	0,88 $B_{in}/2$ ≤ S_{in+1} ≤ 1,12 $B_{in}/2$	± 12%
B_{in+1} or S_{in+1} is the length between flux transitions immediately following and adjacent to B_{in}.			

Table 3 — Flux transition spacing variation for returned cards-Track 1 and 3

Term	Description	Requirement	Variation
B_a	Average length between clocking flux transitions	111 µm (4381 µin) ≤ B_a ≤ 131 µm (5143 µin)	± 8%
B_{in}	Individual length between clocking flux transitions	103 µm (4048 µin) ≤ B_{in} ≤ 139 µm (5476 µin)	± 15%
B_{in+1}	Adjacent bit-to-bit variation	0,85 B_{in} ≤ B_{in+1} ≤ 1,15 B_{in}	± 15%
S_{in}	Subinterval length	48,4 µm (1905 µin) ≤ S_{in} ≤ 72,6 µm (2857 µin)	± 20%
S_{in+1}	Adjacent subinterval length	0,70 $B_{in}/2$ ≤ S_{in+1} ≤ 1,30 $B_{in}/2$	± 30%
B_{in+1} or S_{in+1} is the length between flux transitions immediately following and adjacent to B_{in}.			
NOTE This table shows only the limits within which cards will function normally and does not imply any guarantee of flux transition spacing during valid term for issued card.			

10.1.3 Coded character set

The coded character set for track 1 shall be 7 bit alphanumeric as shown in Table 4.

The 14 characters **! " & ' * + , : ; < = > @ _** are available for hardware control purposes and may not be used for information (data content).

The 3 characters **[\ ]** are reserved for additional national characters when required. They must not be used internationally.

The character **#** is reserved for optional additional graphic symbols.

The 3 characters **% ^ ?** shall have the following meaning:

% start sentinel
^ field separator
? end sentinel

Table 4 — Coded character set for 7 bit alphanumeric

	Char.	Binary								Char	Binary						
		P	2^5	2^4	2^3	2^2	2^1	2^0			P	2^5	2^4	2^3	2^2	2^1	2^0
	space	1	0	0	0	0	0	0		@	0	1	0	0	0	0	0
	!	0	0	0	0	0	0	1		**A**	1	1	0	0	0	0	1
	“	0	0	0	0	0	1	0		**B**	1	1	0	0	0	1	0
	#	1	0	0	0	0	1	1		**C**	0	1	0	0	0	1	1
	$	0	0	0	0	1	0	0		**D**	1	1	0	0	1	0	0
	%	1	0	0	0	1	0	1		**E**	0	1	0	0	1	0	1
	&	1	0	0	0	1	1	0		**F**	0	1	0	0	1	1	0
	‘	0	0	0	0	1	1	1		**G**	1	1	0	0	1	1	1
	(	0	0	0	1	0	0	0		**H**	1	1	0	1	0	0	0
	)	1	0	0	1	0	0	1		**I**	0	1	0	1	0	0	1
	*****	1	0	0	1	0	1	0		**J**	0	1	0	1	0	1	0
	+	0	0	0	1	0	1	1		**K**	1	1	0	1	0	1	1
	,	1	0	0	1	1	0	0		**L**	0	1	0	1	1	0	0
	-	0	0	0	1	1	0	1		**M**	1	1	0	1	1	0	1
	.	0	0	0	1	1	1	0		**N**	1	1	0	1	1	1	0
	/	1	0	0	1	1	1	1		**O**	0	1	0	1	1	1	1
	0	0	0	1	0	0	0	0		**P**	1	1	1	0	0	0	0
	1	1	0	1	0	0	0	1		**Q**	0	1	1	0	0	0	1
	2	1	0	1	0	0	1	0		**R**	0	1	1	0	0	1	0
	3	0	0	1	0	0	1	1		**S**	1	1	1	0	0	1	1
	4	1	0	1	0	1	0	0		**T**	0	1	1	0	1	0	0
	5	0	0	1	0	1	0	1		**U**	1	1	1	0	1	0	1
	6	0	0	1	0	1	1	0		**V**	1	1	1	0	1	1	0
	7	1	0	1	0	1	1	1		**W**	0	1	1	0	1	1	1
	8	1	0	1	1	0	0	0		**X**	0	1	1	1	0	0	0
	9	0	0	1	1	0	0	1		**Y**	1	1	1	1	0	0	1
	:	0	0	1	1	0	1	0		**Z**	1	1	1	1	0	1	0
	;	1	0	1	1	0	1	1		**[**	0	1	1	1	0	1	1
	<	0	0	1	1	1	0	0		****	1	1	1	1	1	0	0
	=	1	0	1	1	1	0	1		**]**	0	1	1	1	1	0	1
	>	1	0	1	1	1	1	0		**^**	0	1	1	1	1	1	0
	?	0	0	1	1	1	1	1		**_**	1	1	1	1	1	1	1

NOTE This coded character set is identical to the coded character set in ISO/IEC 7811-6 (derived from ASCII.)

10.1.4 Maximum number of characters for ID-1 type card

The data characters, control characters, start and end sentinels, and longitudinal redundancy check character shall together not exceed 79 characters.

10.2 Numeric track, Track 2

10.2.1 Average bit density

The average bit density (B_a) shall be 2,95 bits/mm (75 bpi) ± 5% measured in a longitudinal direction parallel to the top reference edge.

10.2.2 Flux transition spacing variation

Flux transition spacing variations are shown in Table 5 for unused encoded cards and in Table 6 for returned cards. See also Figure 10.

Table 5 — Flux transition spacing variation for unused encoded cards-Track 2

Term	Description	Requirement	Variation
B_a	Average length between clocking flux transitions	322 µm (12667 µin) ≤ B_a ≤ 356 µm (14000 µin)	± 5%
B_{in}	Individual length between clocking flux transitions	315 µm (12400 µin) ≤ B_{in} ≤ 363 µm (14267 µin)	± 7%
B_{in+1}	Adjacent bit-to-bit variation	0,90 B_{in} ≤ B_{in+1} ≤ 1,10 B_{in}	± 10%
S_{in}	Subinterval length	153 µm (6000 µin) ≤ S_{in} ≤ 186 µm (7333 µin)	± 10%
S_{in+1}	Adjacent subinterval length	0,88 $B_{in}/2$ ≤ S_{in+1} ≤ 1,12 $B_{in}/2$	± 12%
B_{in+1} or S_{in+1} is the length between flux transitions immediately following and adjacent to B_{in}.			

Table 6 — Flux transition spacing variation for returned cards-Track 2

Term	Description	Requirement	Variation
B_a	Average length between clocking flux transitions	322 µm (12667 µin) ≤ B_a ≤ 356 µm (14000 µin)	± 5%
B_{in}	Individual length between clocking flux transitions	288 µm (11333 µin) ≤ B_{in} ≤ 390 µm (15333 µin)	± 15%
B_{in+1}	Adjacent bit-to-bit variation	0,85 B_{in} ≤ B_{in+1} ≤ 1,15 B_{in}	± 15%
S_{in}	Subinterval length	136 µm (5333 µin) ≤ S_{in} ≤ 203 µm (8000 µin)	± 20%
S_{in+1}	Adjacent subinterval length	0,70 $B_{in}/2$ ≤ S_{in+1} ≤ 1,30 $B_{in}/2$	± 30%
B_{in+1} or S_{in+1} is the length between flux transitions immediately following and adjacent to B_{in}.			
NOTE This table shows only the limits within which cards will function normally and does not imply any guarantee of flux transition spacing during valid term for issued card.			

10.2.3 Coded character set

The coded character set for track 2 shall be 5 bit numeric as shown in Table 7

The 3 characters **: < >** are available for hardware control purposes and may not be used for information (data content).

The 3 characters **; = ?** shall have the following meaning:

; start sentinel
= field separator
? end sentinel

Table 7 — Coded character set for 5 bit numeric

	Char.	Binary						Char.	Binary				
		P	2^3	2^2	2^1	2^0			P	2^3	2^2	2^1	2^0
	0	1	0	0	0	0		**8**	0	1	0	0	0
	1	0	0	0	0	1		**9**	1	1	0	0	1
	2	0	0	0	1	0		**:**	1	1	0	1	0
	3	1	0	0	1	1		**;**	0	1	0	1	1
	4	0	0	1	0	0		**<**	1	1	1	0	0
	5	1	0	1	0	1		**=**	0	1	1	0	1
	6	1	0	1	1	0		**>**	0	1	1	1	0
	7	0	0	1	1	1		**?**	1	1	1	1	1

NOTE This coded character set is identical to the coded character set in ISO/IEC 7811-6 (derived from ASCII.)

10.2.4 Maximum number of characters for ID-1 type card

The data characters, control characters, start and end sentinels, and longitudinal redundancy check character shall together not exceed 40 characters.

10.3 Numeric track, Track 3

10.3.1 Average bit density

The average bit density (B_a) shall be 8,27 bits/mm (210 bpi) ± 8% measured in a longitudinal direction parallel to the top reference edge.

10.3.2 Flux transition spacing variation

Flux transition spacing variations are shown in Table 2 for unused encoded cards and in Table 3 for returned cards. See also Figure 10.

10.3.3 Coded character set

The coded character set for track 3 shall be 5 bit numeric as shown in Table 7

The 3 characters **: < >** are available for hardware control purposes and may not be used for information (data content).

The 3 characters **; = ?** shall have the following meaning:

; start sentinel
= field separator
? end sentinel