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Alphanumeric character sets for optical recognition — Part II : Character set OCR-B — Shapes and dimensions of the printed image

MODIFICATION TO THE FOREWORD *(Inside front cover)*

The ISO member body for U.S.S.R. has now approved this International Standard. U.S.S.R. should therefore be included in the list of countries whose member bodies have approved the document.

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INTERNATIONAL STANDARD ISO 1073/II

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Alphanumeric character sets for optical recognition — Part II : Character set OCR-B — Shapes and dimensions of the printed image

Jeux alphanumériques de caractères pour la reconnaissance optique — Partie II : Jeu de caractères ROC-B — Formes et cotes de l'image imprimée

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Price based on 42 pages

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (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 set up 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 1073/II was drawn up by Technical Committee ISO/TC 97, *Computers and information processing*, and was circulated to the Member Bodies in May 1975.

It has been approved by the Member Bodies of the following countries :

Australia	Hungary	Sweden
Belgium	Italy	Switzerland
Brazil	Japan	Turkey
Czechoslovakia	Netherlands	United Kingdom
Denmark	New Zealand	Yugoslavia
France	Romania	
Germany	South Africa, Rep. of	

The Member Body of the following country expressed disapproval of the document on technical grounds :

U.S.A.

This International Standard, together with ISO 1073/I, cancels and replaces ISO Recommendation R 1073-1969.

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Alphanumeric character sets for optical recognition — Part II : Character set OCR-B — Shapes and dimensions of the printed image

1 GENERAL

1.1 Scope

This International Standard for character shapes and sizes is intended to facilitate and foster the use of Optical Character Recognition (OCR) in data processing, by defining character shapes suitable for both human and machine reading.

It establishes a common basis for printing equipment and optical scanning equipment for OCR interchange applications.

Additional International Standards will cover the print quality and the relevant characteristics of the formats needed to satisfy interchange requirements.

1.2 Field of application

This International Standard specifies the printed image shapes and sizes of alphanumeric characters, graphics and symbols designed for use in Optical Character Recognition. They are also suitable for general purposes.

In order to satisfy present requirements and encourage the wide extension of OCR applications, two sets of characters are specified. These are named OCR-A and OCR-B.

Character set OCR-A includes the numeric sub-set which was recommended in draft ISO Recommendation No. 890 (now part of this International Standard). The shapes of the characters have been designed to be suitable for use in many applications of OCR. Dimensions of OCR-A are given in three sizes. (See part I.)

The shapes of the OCR-B characters have been designed for use in OCR systems without undue sacrifice of their suitability for general purposes in a wide range of applications. Dimensions of OCR-B are given in three sizes.

1.3 Definitions

For the purpose of this International Standard the following definitions apply :

1.3.1 OCR-A : A repertoire of 69 characters of which 56 are graphics included in the ISO 7-bit coded character set (ISO 646-1973). It comprises digits, capital letters, capital national letters and other graphics. (See part I.)

1.3.2 OCR-B : A repertoire of 121 characters comprising digits, capital and small letters, all the graphics specified in the ISO 7-bit coded character set (ISO 646-1973), national letters, diacritical signs and further graphics.

NOTES

1 For applications which involve circulation of documents across boundaries between areas in which different national characters are in use, agreement between the sender and the recipient of the documents is required.

2 The metric and inch dimensions in this International Standard are rounded and therefore consistent but not exactly equal. Either system may be used but the two should not be intermixed.

3 It is recognized that some type-making and printing processes will not be able to produce sharp corners. Corners not specified as having a specific radius should be as sharp as practicable. However, it is not necessary for OCR purposes that the radii of the corners of the nominal printed image be less than 0,08 mm (0.003 5 in).

2 STYLES

The OCR-B font (see clause 13) comprises 121 characters, but, in general, only a subset will be used for a specific application.

The character shapes and dimensions are specified by reference drawings on a reference grid. The nominal strokewidth is constant for each character of the standard set entitled "constant-strokewidth font"; the centreline of each character is indicated on the reference grid.

A second style of characters entitled "letterpress font" may be used with printing equipment which can reproduce fine details with sufficient accuracy. For many classes of printers, however, the strokewidth is less controllable and therefore for these printers the constant-strokewidth font shall be used.

For aesthetic reasons, the strokewidth of the letterpress font characters is varied deliberately and the stroke endings are specially designed. But the centrelines are the same for both fonts and these centrelines, as defined for the constant-strokewidth font, are the definitive part of this standard.

3 OCR-B SIZES

3.1 Three sizes are specified for OCR-B characters in order to provide for use with a wide range of printing equipment processing differing print quality characteristics. Devices such as typewriters, cash registers, numbering machines, high-speed printers, and credit card imprinters, besides printing processes such as letterpress and offset lithography, are all suitable.

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3.2 The letterpress font is specified in size I (the smallest) only. It provides the option of a variable pitch between characters as is usual with letterpress.

3.3 The constant-strokewidth font is specified in three sizes, I, III and IV. Mechanisms using the constant-strokewidth font will usually maintain a fixed pitch.

3.4 Size II which was in ISO/R 1073-1969 has been deleted. (See annex B.)

3.5 The centrelines for the three sizes are simply related by appropriate horizontal and vertical scale factors. The factors for size III and size IV referred to size I are :

for size III

Vertical : 1,333 Horizontal : 1,086

for size IV

Vertical : 1,500 Horizontal : 1,500

This scale relationship does not apply to the outline shapes, since nominal strokewidth is not strictly proportional to centreline dimensions. The strokewidths for each size are shown in the reference drawings.

3.6 The character with the greatest height in each size is digit EIGHT. It is the character which extends farthest above the base line for capital letters. The longest character is small letter j, because of its descender.

The centreline heights of the character EIGHT are :

for size I : 2,40 mm (0.094 in)
for size III : 3,20 mm (0.126 in)
for size IV : 3,60 mm (0.142 in)

3.7 The widest character in each size (except for the alternative small letter m) is digit ZERO. Its centreline widths are :

for size I : 1,40 mm (0.055 in)
for size III : 1,52 mm (0.060 in)
for size IV : 2,10 mm (0.083 in)

3.8 Constant-pitch printing

In constant-pitch printing for OCR applications, the following minimum nominal pitches are appropriate :

size I : 2,54 mm (0.100 in) min.
size III : 2,54 mm (0.100 in) min.
size IV : 3,63 mm (0.143 in) min.

4 TYPICAL DIMENSIONS OF THE NOMINAL PRINTED IMAGE

4.1 Constant-strokewidth font

Typical dimensions for the nominal printed image of the constant-strokewidth font in size I are given below. These dimensions are the heights above and below the horizontal base line of digits, capital and small letters, ascenders and descenders (see figure 1). These dimensions are for general information only. The values for individual characters are obtainable from the reference drawings.

4.2 Letterpress font

The shapes of the letterpress characters are similar except that the stroke ends are not rounded.

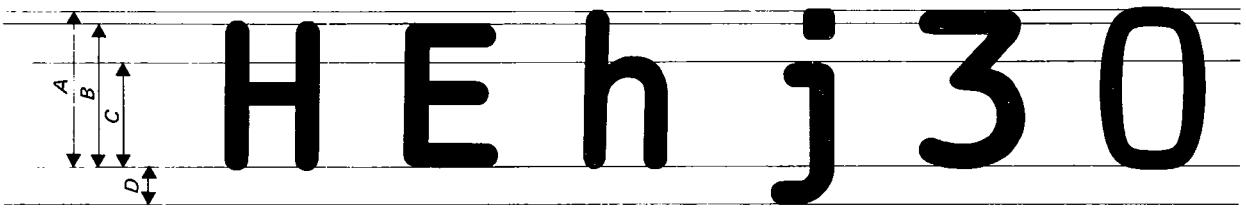

FIGURE 1 — **Heights above and below base line**

TABLE 1 — **Typical dimensions *A*, *B*, *C* and *D***

Size	millimetres				inches			
	A	*B*	*C*	*D*	*A*	*B*	*C*	*D*
I	2,66	2,46	1,83	0,60	0.105	0.097	0.072	0.024

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5 OCR-B CHARACTER SET

The full character set comprises 121 characters.

The following sub-sets can be distinguished.

5.1 Sub-set 1 : Numeric sub-set

This sub-set comprises 22 characters :

0 1 2 3 4 5 6 7 8 9

< + >

C E N S T X Z

| SPACE

NOTES

1 The character ZERO is the only digit which had to be modified in this revision of ISO/R 1073-1969. The use of the original design is tolerated in numeric applications implemented before 1976. OCR reading of both old and revised design is subject to special agreement between OCR equipment supplier and user. For any application implemented after 1976, only the new design is standard.

2 The characters C E N S T X Z should preferably not be used in document reading applications.

5.2 Sub-set 2 : Initial alphanumeric sub-set

This sub-set comprises 47 characters :

0 1 2 3 4 5 6 7 8 9

A B C D E F G H I J K L M

N O P Q R S T U V W X Y Z

< + > * − = / . ,

| SPACE

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5.3 Sub-set 3 : Extended alphanumeric sub-set

This sub-set comprises 98 characters, in particular those of the ISO 7-bit coded character set (ISO 646-1973) :

```
!"#£¤$%&'()*+,-./
0123456789:;<=>?
@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_
`abcdefghijklmno
pqrstuvwxyz{|}~
```

¦ SPACE

5.4 Sub-set 4 : Options sub-set

This sub-set comprises 8 capital national letters, 5 small national letters, 4 diacritical signs and 4 further characters :

```
ÄÅÆIJÑÖØÜ
åæijøß§¥
¨´ ^
,
m_
```

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5.5 Sub-set 5 : Erase characters

This sub-set comprises 2 characters :

CHARACTER ERASE 

GROUP ERASE 

The dimensions of these two characters are as shown below :

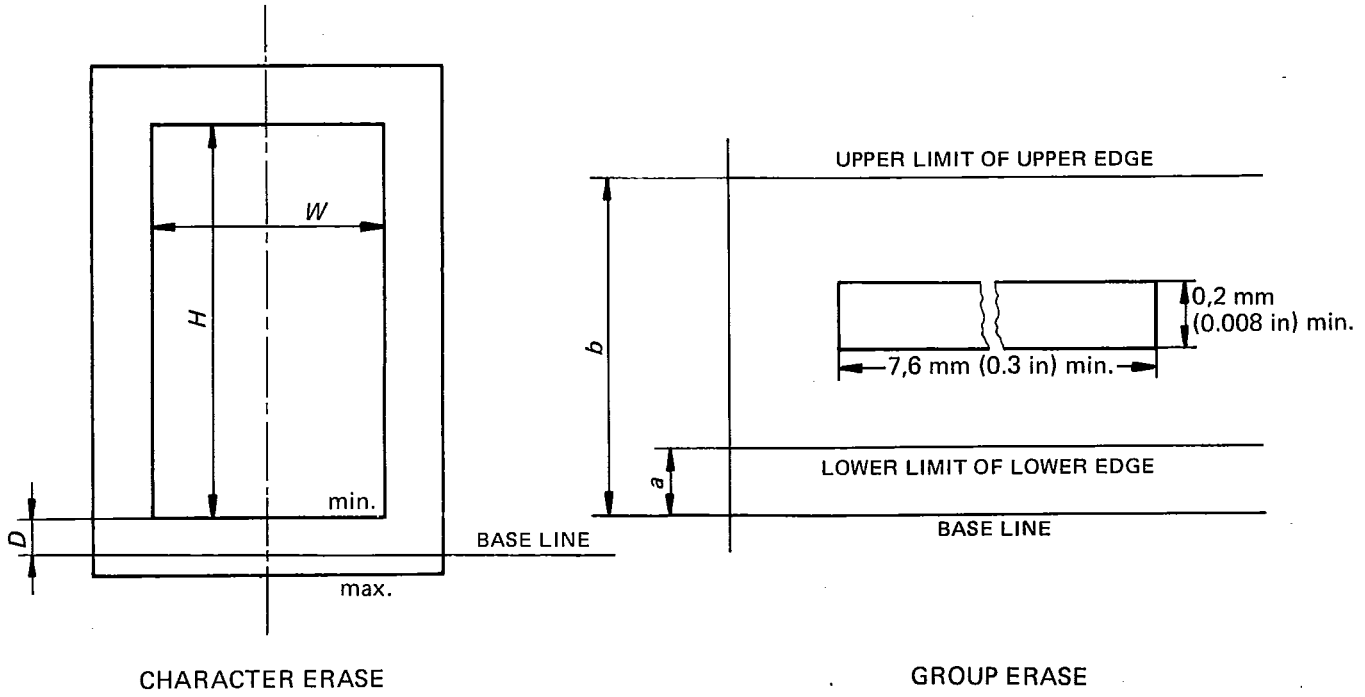

FIGURE 2 — **Erase characters**

TABLE 2 — **Dimensions of erase characters**

	millimetres			inches		
	Size I	**Size III**	**Size IV**	**Size I**	**Size III**	**Size IV**
CHARACTER ERASE :						
min. *H*	2,4		3,8	0.094		0.149
max. *H*	2,9		4,6	0.115		0.181
min. *W*	1,4		2,0	0.055		0.079
max. *W*	1,9		2,8	0.075		0.110
D	0,13		0,20	0.005		0.008
GROUP ERASE :						
minimum length	7,6	7,6	10,9	0.300	0.300	0.430
minimum width	0,2	0,2	0,2	0.008	0.008	0.008
a	0,4	0,5	0,6	0.016	0.020	0.024
b	2,0	2,7	3,0	0.077	0.106	0.118

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6 INDEX TABLE

6.1 All characters are available in size I as constant-strokewidth font and as letterpress font.

Only the characters of the numeric sub-set (sub-set 1) and the character GROUP ERASE are available in size III as constant-strokewidth font.

All characters are available in size IV as constant-strokewidth font, with the exception of VERTICAL LINE.

6.2 In the following index table each character is given with the indication of the reference drawing or drawings and the sub-set or sub-sets in which it is comprised.

The drawings are identified as follows :

L : for letterpress font, size I

C : for the constant-strokewidth font, size I

III : for the constant-strokewidth font, size III.

6.3 As stated in 11.6, the character shapes for size IV are derived from those of size I for the constant-strokewidth font (designated by C).

6.4 Application advice is given in the column "Remarks", where it is indicated, *inter alia*, which characters are included for general-purpose use only and should not be used for OCR purposes.

It is recommended that prospective users of this standard consult manufacturers before deciding on a particular character set.

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INDEX TABLE

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
1	1	1 L, C, III	DIGIT ONE	1 2 3	
2	2	2 L, C III	DIGIT TWO	1 2 3	
3	3	3 L, C, III	DIGIT THREE	1 2 3	
4	4	4 L, C, III	DIGIT FOUR	1 2 3	
5	5	5 L, C, III	DIGIT FIVE	1 2 3	
6	6	6 L, C, III	DIGIT SIX	1 2 3	
7	7	7 L, C, III	DIGIT SEVEN	1 2 3	
8	8	8 L, C, III	DIGIT EIGHT	1 2 3	
9	9	9 L, C, III	DIGIT NINE	1 2 3	
10	0	10 L, C, III	DIGIT ZERO	1 2 3	The character ZERO is the only digit which had to be modified in this revision of ISO/R 1073-1969. The use of the original design is tolerated in numeric applications implemented before 1976. OCR reading of both old and revised design is subject to special agreement between OCR equipment supplier and user. For any application implemented after 1976, only the new design is standard.
11	A	11 L, C	CAPITAL LETTER A	2 3	

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INDEX TABLE *(continued)*

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
12	B	12 L, C	CAPITAL LETTER B	2 3	
13	C	13 L, C, III	CAPITAL LETTER C	1 2 3	
14	D	14 L, C	CAPITAL LETTER D	2 3	
15	E	15 L, C, III	CAPITAL LETTER E	1 2 3	
16	F	16 L, C	CAPITAL LETTER F	2 3	
17	G	17 L, C	CAPITAL LETTER G	2 3	
18	H	18 L, C	CAPITAL LETTER H	2 3	
19	I	19 L, C	CAPITAL LETTER I	2 3	
20	J	20 L, C	CAPITAL LETTER J	2 3	
21	K	21 L, C	CAPITAL LETTER K	2 3	
22	L	22 L, C	CAPITAL LETTER L	2 3	

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INDEX TABLE *(continued)*

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
23	M	23 L, C	CAPITAL LETTER M	2 3	
24	N	24 L, C, III	CAPITAL LETTER N	1 2 3	
25	O	25 L, C	CAPITAL LETTER O	2 3	
26	P	26 L, C	CAPITAL LETTER P	2 3	
27	Q	27 L, C	CAPITAL LETTER Q	2 3	
28	R	28 L, C	CAPITAL LETTER R	2 3	
29	S	29 L, C, III	CAPITAL LETTER S	1 2 3	
30	T	30 L, C, III	CAPITAL LETTER T	1 2 3	
31	U	31 L, C	CAPITAL LETTER U	2 3	
32	V	32 L, C	CAPITAL LETTER V	2 3	
33	W	33 L, C	CAPITAL LETTER W	2 3	

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INDEX TABLE *(continued)*

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
34	X	34 L, C, III	CAPITAL LETTER X	1 2 3	
35	Y	35 L, C	CAPITAL LETTER Y	2 3	
36	Z	36 L, C, III	CAPITAL LETTER Z	1 2 3	
37	a	37 L, C	SMALL LETTER a	3	Smaller strokewidth, see clause 11.
38	b	38 L, C	SMALL LETTER b	3	Smaller strokewidth, see clause 11.
39	c	39 L, C	SMALL LETTER c	3	Smaller strokewidth, see clause 11.
40	d	40 L, C	SMALL LETTER d	3	Smaller strokewidth, see clause 11.
41	e	41 L, C	SMALL LETTER e	3	Smaller strokewidth, see clause 11.
42	f	42 L, C	SMALL LETTER f	3	Smaller strokewidth, see clause 11.
43	g	43 L, C	SMALL LETTER g	3	Smaller strokewidth, see clause 11.
44	h	44 L, C	SMALL LETTER h	3	Smaller strokewidth, see clause 11.

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INDEX TABLE *(continued)*

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
45	i	45 L, C	SMALL LETTER i	3	Smaller strokewidth, see clause 11.
46	j	46 L, C	SMALL LETTER j	3	Smaller strokewidth, see clause 11.
47	k	47 L, C	SMALL LETTER k	3	Smaller strokewidth, see clause 11.
48	l	48 L, C	SMALL LETTER l	3	Smaller strokewidth, see clause 11.
49	m	49 L, C	SMALL LETTER m	3	Smaller strokewidth, see clause 11.
50	n	50 L, C	SMALL LETTER n	3	Smaller strokewidth, see clause 11.
51	o	51 L, C	SMALL LETTER o	3	Smaller strokewidth, see clause 11.
52	p	52 L, C	SMALL LETTER p	3	Smaller strokewidth, see clause 11.
53	q	53 L, C	SMALL LETTER q	3	Smaller strokewidth, see clause 11.
54	r	54 L, C	SMALL LETTER r	3	Smaller strokewidth, see clause 11.
55	s	55 L, C	SMALL LETTER s	3	Smaller strokewidth, see clause 11.

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INDEX TABLE *(continued)*

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
56	t	56 L, C	SMALL LETTER t	3	Smaller strokewidth, see clause 11.
57	u	57 L, C	SMALL LETTER u	3	Smaller strokewidth, see clause 11.
58	v	58 L, C	SMALL LETTER v	3	Smaller strokewidth, see clause 11.
59	w	59 L, C	SMALL LETTER w	3	Smaller strokewidth, see clause 11.
60	x	60 L, C	SMALL LETTER x	3	Smaller strokewidth, see clause 11.
61	y	61 L, C	SMALL LETTER y	3	Smaller strokewidth, see clause 11.
62	z	62 L, C	SMALL LETTER z	3	Smaller strokewidth, see clause 11.
63	*	63 L, C	ASTERISK	2 3	
64	+	64 L, C, III	PLUS SIGN	1 2 3	
65	−	65 L, C	HYPHEN (MINUS SIGN)	2 3	
66	=	66 L, C	EQUALS SIGN	2 3	

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INDEX TABLE *(continued)*

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
67	/	67 L, C	SOLIDUS	2 3	
68	■	68 L, C	FULL STOP (PERIOD)	2 3	
69	◢	69 L, C	COMMA	2 3	Two vertical locations are specified, one of which projects below the base line for capital letters (see 11.4 and 11.7).
70	■ ■	70 L, C	COLON	3	
71	■ ◢	71 L, C	SEMI-COLON	3	Two vertical locations are specified, one of which projects below the base line for capital letters (see 11.4 and 11.7).
72	"	72 L, C	QUOTATION MARK	3	Can be replaced by DIAERESIS (Ref. 107) in non-OCR applications, if it is required to print QUOTATION MARK and DIAERESIS with the same type-face (see 7.2).
73	'	73 L, C	APOSTROPHE	3	Can be replaced by ACUTE ACCENT (Ref. 108) in non-OCR applications, if it is required to print APOSTROPHE and ACUTE ACCENT with the same type-face (see 7.2).
74	▬	74 L, C	DISCONTINUOUS UNDERLINE	3	For OCR this character shall be used as stand alone character only, and shall not be printed under another character (see clause 8).
75	? ■	75 L, C	QUESTION MARK	3	
76	! ■	76 L, C	EXCLAMATION MARK	3	
77	(	77 L, C	LEFT PARENTHESIS	3	

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INDEX TABLE *(continued)*

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
78	)	78 L, C	RIGHT PARENTHESIS	3	
79	<	79 L, C, III	LESS THAN SIGN	1 2 3	
80	>	80 L, C, III	GREATER THAN SIGN	1 2 3	
81	[	81 L, C	LEFT SQUARE BRACKET	3	
82	]	82 L, C	RIGHT SQUARE BRACKET	3	
83	%	83 L, C	PERCENT SIGN	3	Smaller strokewidth, see clause 11.
84	#	84 L, C	NUMBER SIGN	3	Smaller strokewidth, see clause 11.
85	&	85 L, C	AMPERSAND	3	
86	@	86 L, C	COMMERCIAL AT	3	Smaller strokewidth, see clause 11.
87	^	87 L, C	UPWARD ARROW HEAD	3	Can be replaced by CIRCUMFLEX ACCENT (Ref. 110) in non-OCR applications, if it is required to print UPWARD ARROW HEAD and CIRCUMFLEX ACCENT with the same type-face (see 7.2).
88	¤	88 L, C	CURRENCY SIGN	3	

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INDEX TABLE *(continued)*

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
89	£	89 L, C	POUND SIGN	3	
90	$	90 L, C	DOLLAR SIGN	3	
91	|	91 L, C	VERTICAL LINE	3	See clause 10.
92	¦	92 L, C, III	LONG VERTICAL MARK	1 2 3	See clause 10.
93	\	93 L, C	REVERSE SOLIDUS	3	
94	Ä	94 L, C	CAPITAL LETTER Ä	4	Where possible, substitution by the two capital letters A (Ref. 11) and E (Ref. 15) is recommended for OCR.
95	Å	95 L, C	CAPITAL LETTER Å	4	
96	Æ	96 L, C	CAPITAL LETTER Æ	4	
97	Ö	97 L, C	CAPITAL LETTER Ö	4	Where possible, substitution by the two capital letters O (Ref. 25) and E (Ref. 15) is recommended for OCR.
98	Ø	98 L, C	CAPITAL LETTER Ø	4	
99	Ü	99 L, C	CAPITAL LETTER Ü	4	Where possible, substitution by the two capital letters U (Ref. 31) and E (Ref. 15) is recommended for OCR.

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INDEX TABLE *(continued)*

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
100	IJ	100 L, C	CAPITAL LETTER DUTCH IJ	4	For OCR purpose, separate capital letters I (Ref. 19) and J (Ref. 20) should be used.
101	Ñ	101 L, C	CAPITAL LETTER Ñ	4	
102	å	102 L, C	SMALL LETTER å	4	Smaller strokewidth, see clause 11.
103	æ	103 L, C	SMALL LETTER æ	4	Smaller strokewidth, see clause 11.
104	ø	104 L, C	SMALL LETTER ϕ	4	Smaller strokewidth, see clause 11.
105	ij	105 L, C	SMALL LETTER DUTCH ij	4	Smaller strokewidth, see clause 11.
106	ß	106 L, C	SMALL LETTER GERMAN DOUBLE s	4	Smaller strokewidth, see clause 11.
107	¨	107 L, C	DIAERESIS	4	For use see clause 7.
108	´	108 L, C	ACUTE ACCENT	4	For use see clause 7.
109	`	109 L, C	GRAVE ACCENT	3	For use see clause 7.
110	^	110 L, C	CIRCUMFLEX ACCENT	4	For use see clause 7.

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INDEX TABLE (*concluded*)

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
111	~	111 L, C	TILDE	4	For use see clause 7.
112	¸	112 L, C	CEDILLA	4	For use see clause 7.
113	{	113 L, C	LEFT CURLY BRACKET	3	Use is not recommended for OCR.
114	}	114 L, C	RIGHT CURLY BRACKET	3	Use is not recommended for OCR.
115	m	115 L, C	ALTERNATIVE SMALL LETTER m	4	May be used in variable-pitch printing as a substitute for Ref. 49.
116	_	116 L, C	CONTINUOUS UNDERLINE	4	CONTINUOUS UNDERLINE is not intended for use. Its width must be such that adjacent CONTINUOUS OCR UNDERLINES have no gap between them. See clause 8.
117		No drawing	SPACE	1 2 3	SPACE is a non-printing character. For definition, see clause 9. Not all readers will necessarily recognize SPACE.
118	§	118 L, C	PARAGRAPH	4	
119	¥	119 L, C	YEN SIGN	4	
120	■	No drawing L, C	CHARACTER ERASE	5	
121	▬/▬	No drawing L, C, III	GROUP ERASE	5	

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7 USE OF DIACRITICAL SIGNS

7.1 Besides the specially designed national letters (subset 4) a number of diacritical marks are provided which have been designed and positioned in such a way that they can be combined with small letters in order to modify or stress their meaning. These are :

CIRCUMFLEX ACCENT	(ref. 110)	^
GRAVE ACCENT	(ref. 109)	`
ACUTE ACCENT	(ref. 108)	´
DIAERESIS	(ref. 107)	¨
TILDE	(ref. 111)	~
CEDILLA	(ref. 112)	¸

The relative position of the accent and of the letter is obtained by superimposing the horizontal and vertical axes of the two graphics concerned. Accented letters can be obtained as shown in figure 3. For OCR purposes, the superposition of an accent on a character shape must be done very accurately. Composite characters may be printed in a single operation or in two operations. Prospective users should consult manufacturers before planning inclusion of accented letters in OCR character sets.

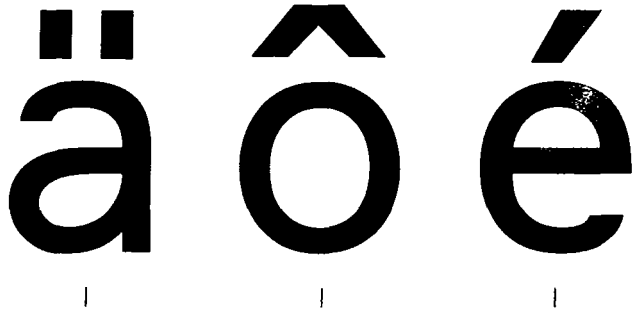

FIGURE 3 — **Examples of accented letters**

7.2 In non-OCR applications the DIARESIS, ACUTE ACCENT and CIRCUMFLEX ACCENT may be used as free-standing characters, to mean QUOTATION MARKS, APOSTROPHE and UPWARD ARROW HEAD respectively, thereby reducing the total number of characters required. For OCR, however, this practice is not recommended and the proper designs must be used (ref. 72, 73 and 87) for these three characters.

8 USE OF THE TWO UNDERLINE CHARACTERS

Two characters are provided for underlining :

DISCONTINUOUS UNDERLINE	(ref. 74) _
CONTINUOUS UNDERLINE	(ref. 116) ___

The latter, CONTINUOUS UNDERLINE, is not intended for use in OCR applications. The character DISCONTINUOUS UNDERLINE shall be used in OCR applications as a free-standing character only, and shall not be printed under another character.

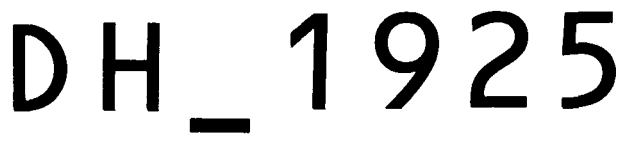

FIGURE 4 — **Example of use of DISCONTINUOUS UNDERLINE**

9 SPACE (no reference drawing)

The character SPACE is an intentionally blank position in a line of printing. With constant-pitch printing, its nominal width is equal to the printing pitch (for example, 2,54 mm if the characters are printed 10 per 25,4 mm). With variable-pitch printing, its nominal width is equal to the largest character pitch available.

10 VERTICAL LINE AND LONG VERTICAL MARK

Both the VERTICAL LINE (ref. 91) and the LONG VERTICAL MARK (ref. 92) are vertical lines but they differ in minimum height, as given in table 3.

TABLE 3 — **Dimensions of VERTICAL LINE and LONG VERTICAL MARK**

	millimetres			inches		
	Size I	**Size III**	**Size IV**	**Size I**	**Size III**	**Size IV**
Height of VERTICAL LINE	3,2			0.126		
Minimum height of LONG VERTICAL MARK	3,7	5,0	5,6	0.146	0.196	0.220
Nominal strokewidth of VERTICAL LINE and LONG VERTICAL MARK	0,35	0,38	0,50	0.014	0.015	0.019

NOTE — The character VERTICAL LINE is available in size I only.

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The character VERTICAL LINE has been introduced specifically for high-speed or other printers, to allow them to print the character allocated to the position 7/12 of the ISO 7-bit coded character set (ISO 646-1973).

When required by a reading application, the LONG VERTICAL MARK can be allocated the same code combination (7/12) as VERTICAL LINE. For the purpose of character spacing, both characters shall be considered as a full-width character.

11 CHARACTER SHAPE DEFINITION

11.1 Reference drawings

The shapes and dimensions of the OCR-B characters for both the letterpress and the constant-strokewidth fonts are specified by original drawings for size I and III.

The characters are drawn at scale 100 : 1 on a 2 mm square grid. The total grid measures 280 mm x 380 mm. For the purpose of illustration in this standard, some of these original drawings have been reduced to approximately 70 x full size. Gride readings should be made only from drawings on stable material. Photographic reproductions of drawings printed on paper are not satisfactory for this purpose — the dimensional stability of paper is not sufficient.

Points on the reference drawing can certainly be determined with an accuracy of half a square (10 μm at full size), and if desired one-quarter of a square (5 μm at full size) should be possible. The number of readings taken on a character further determines the accuracy of the work drawing.

11.2 Availability of duplicates

Duplicates of the original drawings on a stable base at exact 100 : 1 scale with the 280 mm x 380 mm grid can be obtained upon request. Reproduction and mailing costs only will be charged.

Requests with precise indication of the set(s) desired should be addressed to :

The Secretary General
ECMA
114, rue du Rhône
CH-1204 GENEVA
Switzerland

or

Office of Standard Reference Materials
Room B311, Chemistry Building
National Bureau of Standards
Washington (D.C. 20234)
U.S.A.

The following sets of drawings are available :

OD 1. Letterpress font, size I. (Only from ECMA.)

OD 2. Letterpress font, size I with the grid removed over approximately 2 mm around the character outline. This set is particularly suitable for photographic reduction. (Only from ECMA.)

OD 3. Constant-strokewidth font, size I.

OD 4. Constant-strokewidth font, size III.

11.3 Type dimensions

Attention is called to the fact that since this standard specifies the nominal printed images, the type should not necessarily be cut to these dimensions. Type dimensions should be deduced from the nominal printed images after due correction for the systematic effects occurring in the printing process.

11.4 Constant-strokewidth font, size I

11.4.1 The nominal printed image of each character is defined by its centreline and by its nominal strokewidth. The nominal strokewidth is :

0,35 mm (0.014 in) for most of the characters,

0,31 mm (0.012 in) for all small letters and the three characters #, % and @.

The centreline and preferred line endings and corners are given in drawings marked "C". Pointers establish the vertical position (base line) and the orientation. Another pointer establishes the horizontal position for fixed-pitch printing. Reference drawings 69 C and 71 C contain also pointers, to indicate alternative positions.

11.4.2 A special effort should be made in type design and manufacturing to arrive at actual print that conforms as closely as possible to the given line endings and corners. This is especially important for the square corners of capital letters B and D.

11.4.3 A pointer is provided to produce the most aesthetic spacing of characters in a line of printing. However, on printers having a significant horizontal spacing tolerance it is recommended to use the geometric character centreline instead of the line defined by the pointer where necessary to achieve an acceptable character separation.

11.5 Constant-strokewidth font, size III

The nominal printed image of each character is given by its centreline and by its nominal strokewidth. The nominal strokewidth is 0,38 mm (0.015 in). The 22 reference drawings for 0 1 2 3 4 5 6 7 8 9 < + > LONG VERTICAL MARK C E N S T X Z and GROUP ERASE are marked "III" and include pointers. Sub-clauses 11.4.2 and 11.4.3 also apply.

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11.6 Constant-strokewidth font, size IV

The nominal printed image of each character is given by its centreline and by its nominal strokewidth. The size IV centreline is derived from the corresponding size I centreline (see 11.4 and reference drawings marked "C") by a linear magnification of exactly 1,5. For example, a character centreline width of 2,40 mm becomes $1,5 \times 2,40 \text{ mm} = 3,60 \text{ mm}$ in size IV, and so on. The nominal strokewidth is :

0,50 mm (0.020 in) for most of the characters

0,44 mm (0.017 in) for all small letters and the three characters #, % and @.

Preferred line endings and corners cannot be accurately arrived at by a 1,5 magnification since the ratio of nominal strokewidths for size IV and I is not exactly 1,5. However, given a 1,5 magnification of the size I drawing, the nominal size IV constant-strokewidth image can easily be constructed.

11.7 Letterpress font, size I

The nominal printed image of each character is drawn on a reference grid (see 11.1) to allow readings with any desired accuracy from drawings marked "L". Pointers establish the vertical position (base line), the orientation and for letterpress type the body width. A pointer establishes the horizontal position for fixed-pitch printing. Reference drawings 69 L and 71 L contain also pointers, to indicate alternative positions.

The characters of the letterpress font are designed with minor strokewidth variations. However, strokewidths are always close to the nominal value of 0,35 mm (0.014 in) for digits and capital letters, and of 0,31 mm (0.012 in) for small letters and the three characters #, % and @.

12 PRINTING THE LETTERPRESS AND CONSTANT-STROKEWIDTH FONTS

In order to print the letterpress font and to achieve the most satisfactory appearance, the printing device should be able to print sharp corners and to keep the strokewidth variations under close control. These features are not required for printing the constant-strokewidth fonts, although a special effort should be made to produce sharp corners in the capital letters B and D. There may well be printing equipment in which the accuracy of strokewidth control is intermediate between that required in letterpress quality and that provided by, for example, high-speed printers. It is at the discretion of the manufacturers of such printing equipment to design their type so that the printed images incorporate as many as practicable of the strokewidth variations which contribute to the aesthetically satisfactory appearance of the letterpress character shapes.

Care should be taken that the printed image strokes are symmetrically distributed around the centrelines as specified in this document.

13 ILLUSTRATION OF OCR-B

The following drawings show :

— the complete character set in size I at scales 4 : 1 and 1 : 1;

— digit ONE, capital letter E, PARAGRAPH and YEN in size I as letterpress font and as constant-strokewidth font;

— digit ONE and capital letter E in size III as constant-strokewidth font.

These reproductions of the original drawings are approximately at scale 70 : 1.

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ILLUSTRATION OF SIZE I

SCALE 4 : 1



SCALE 1 : 1

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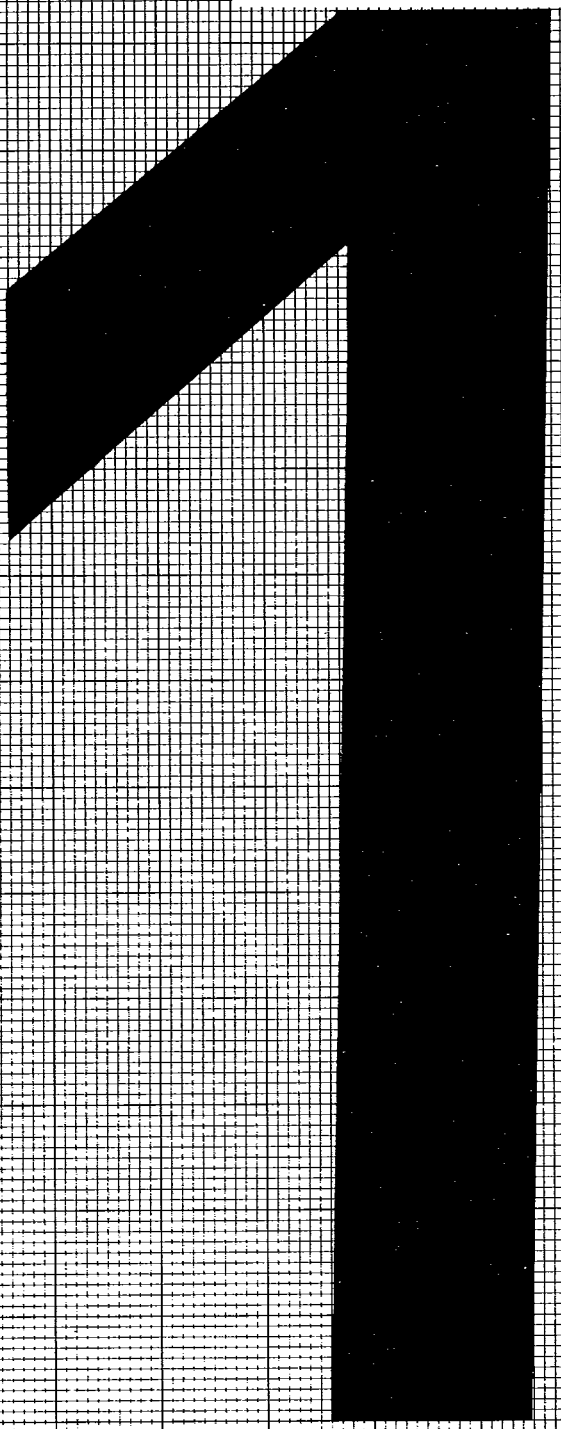

SIZE I

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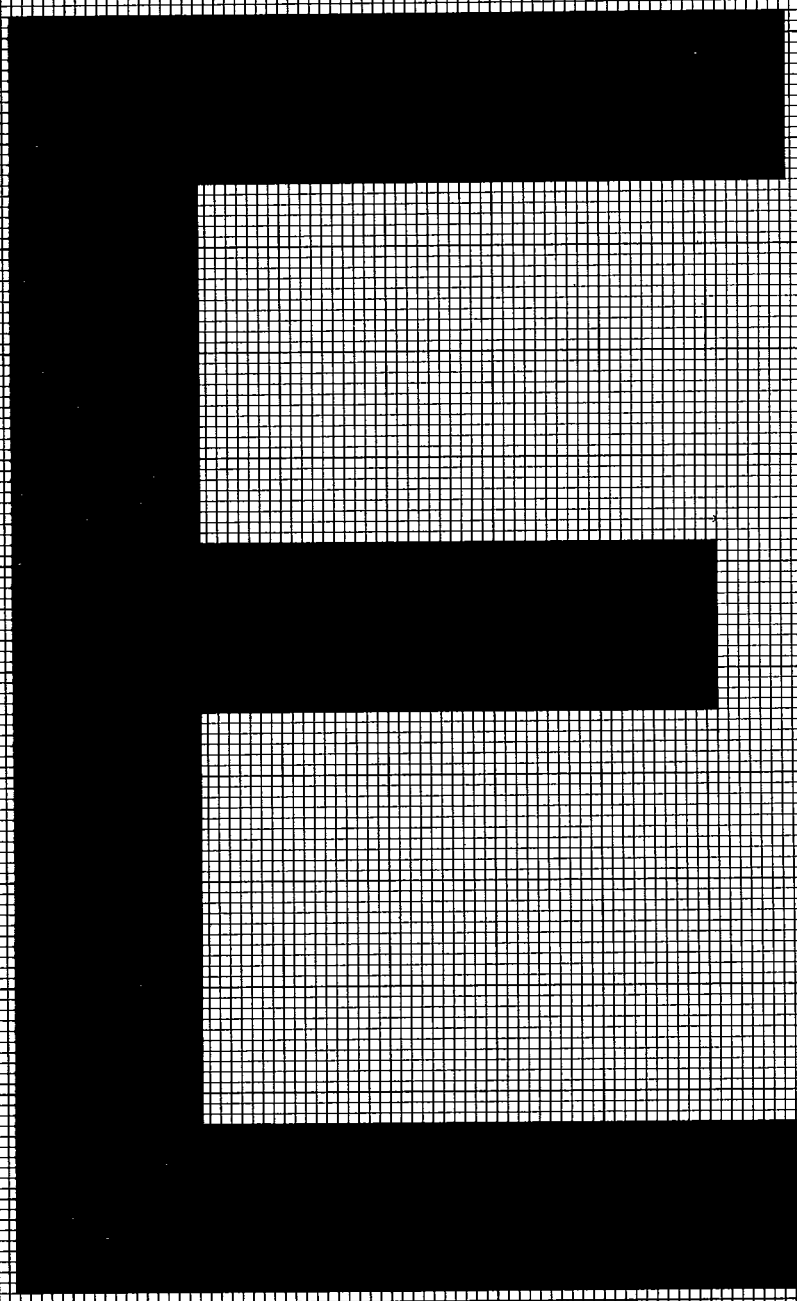

SIZE I

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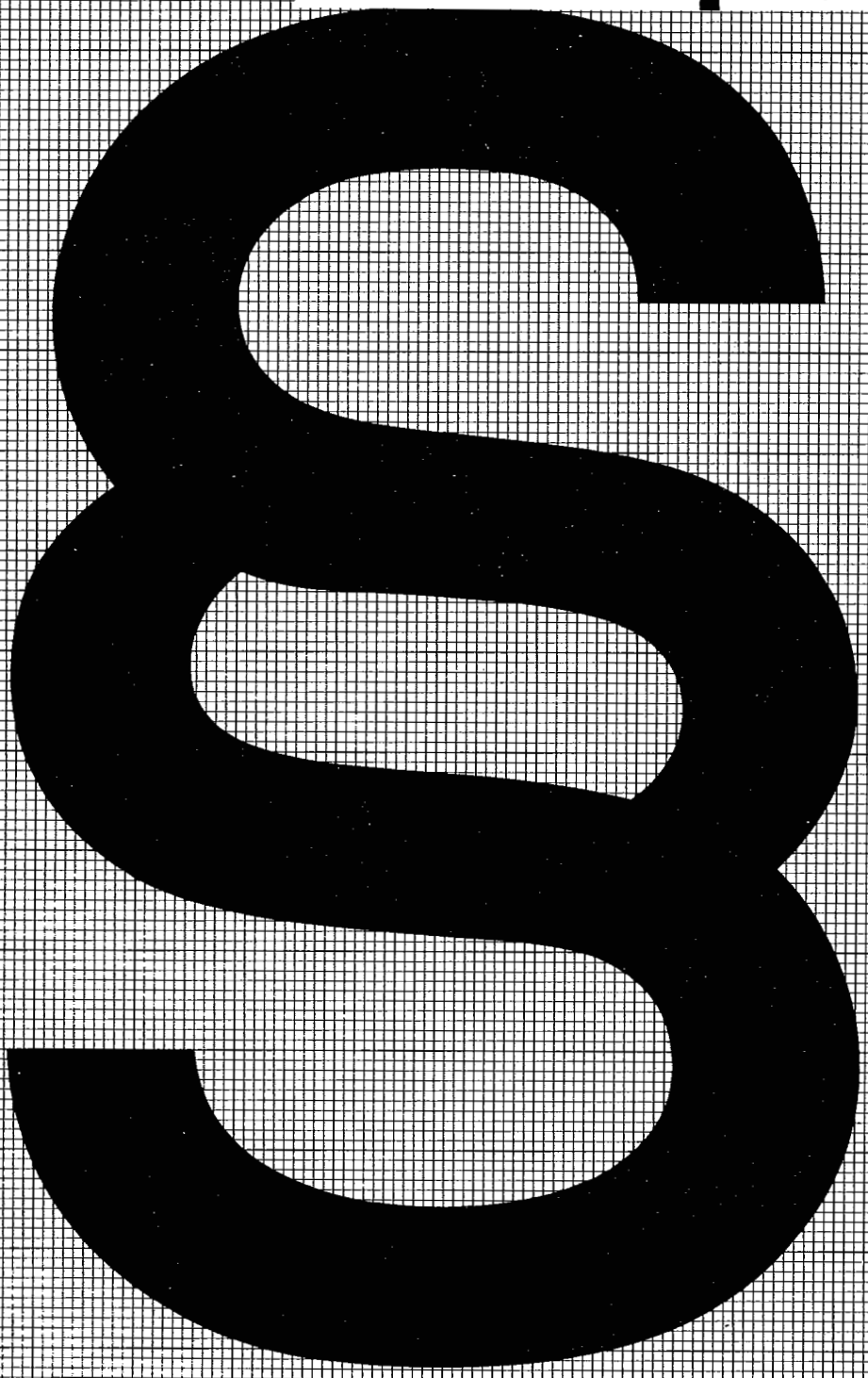

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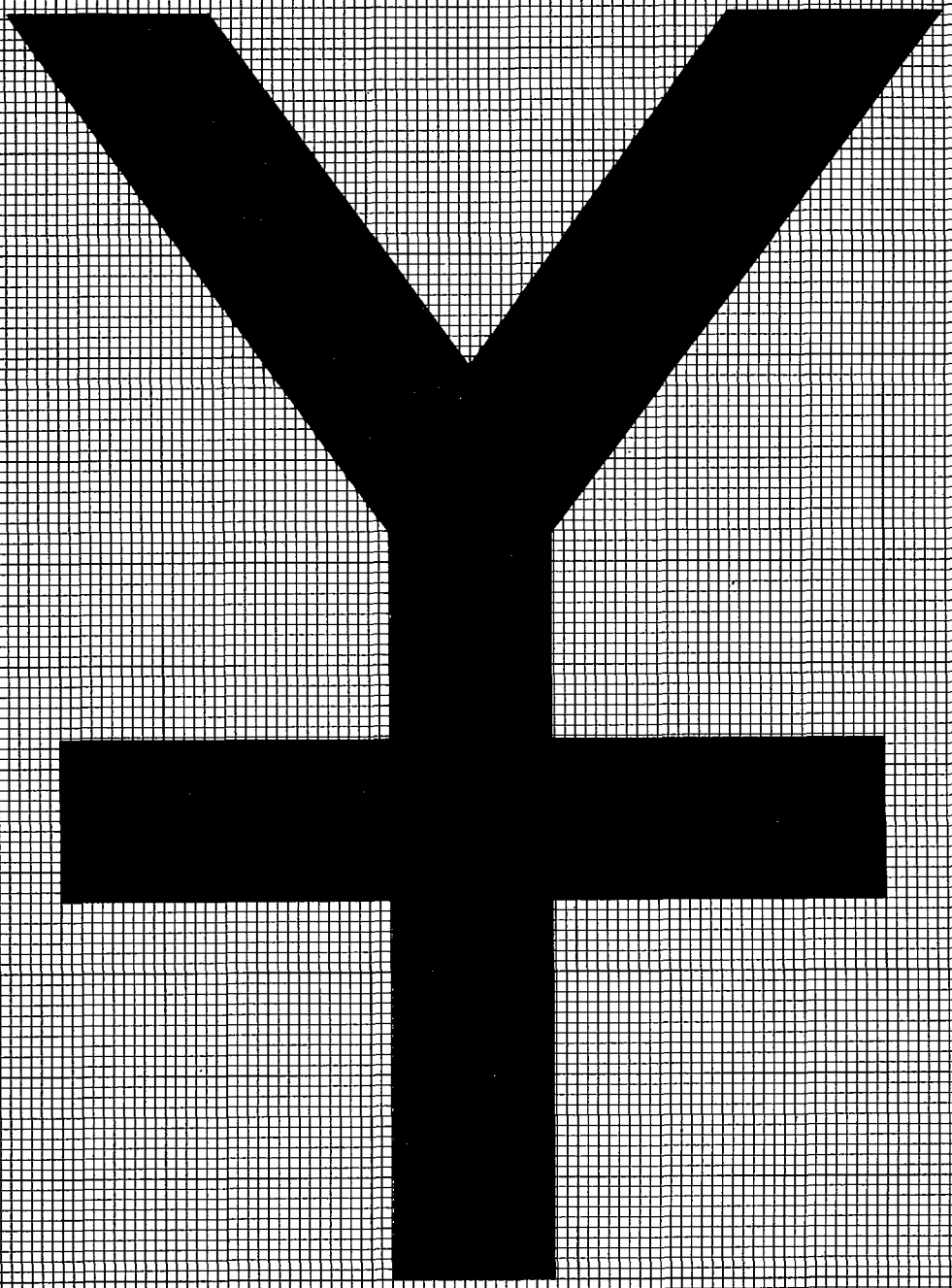
SIZE T

1073 PT II-76 4851903 0000691 0



SIZE I

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REF. DRAWING NR. 119

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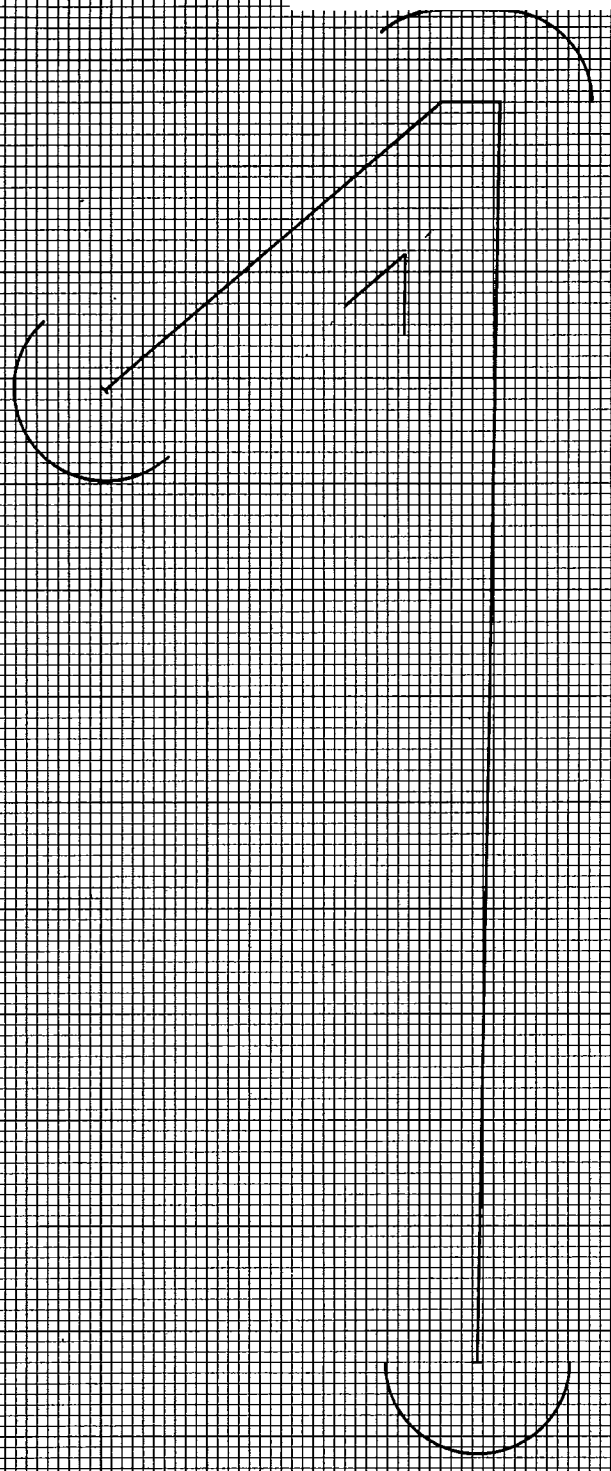

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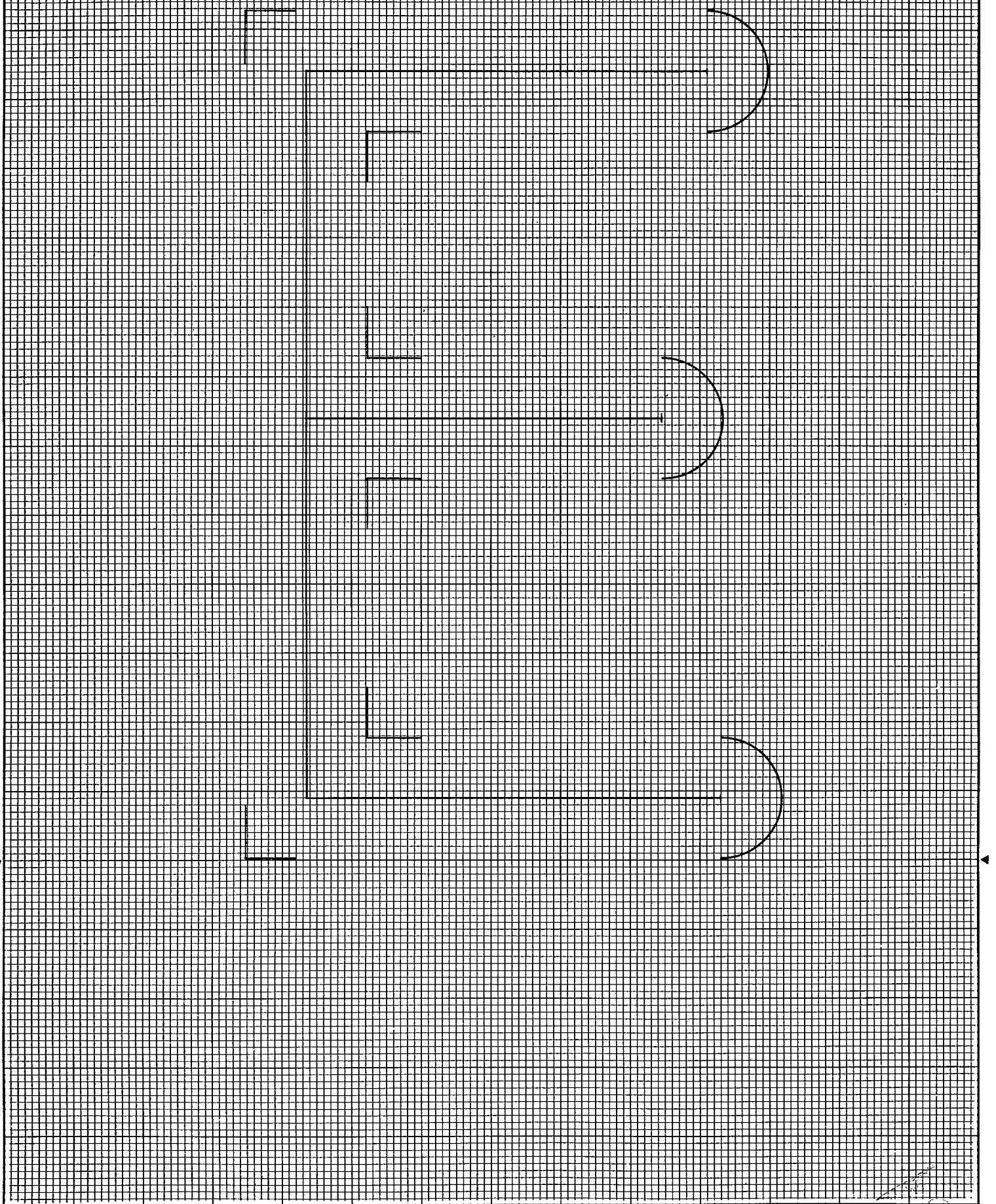
SIZE I



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RING NR. 15

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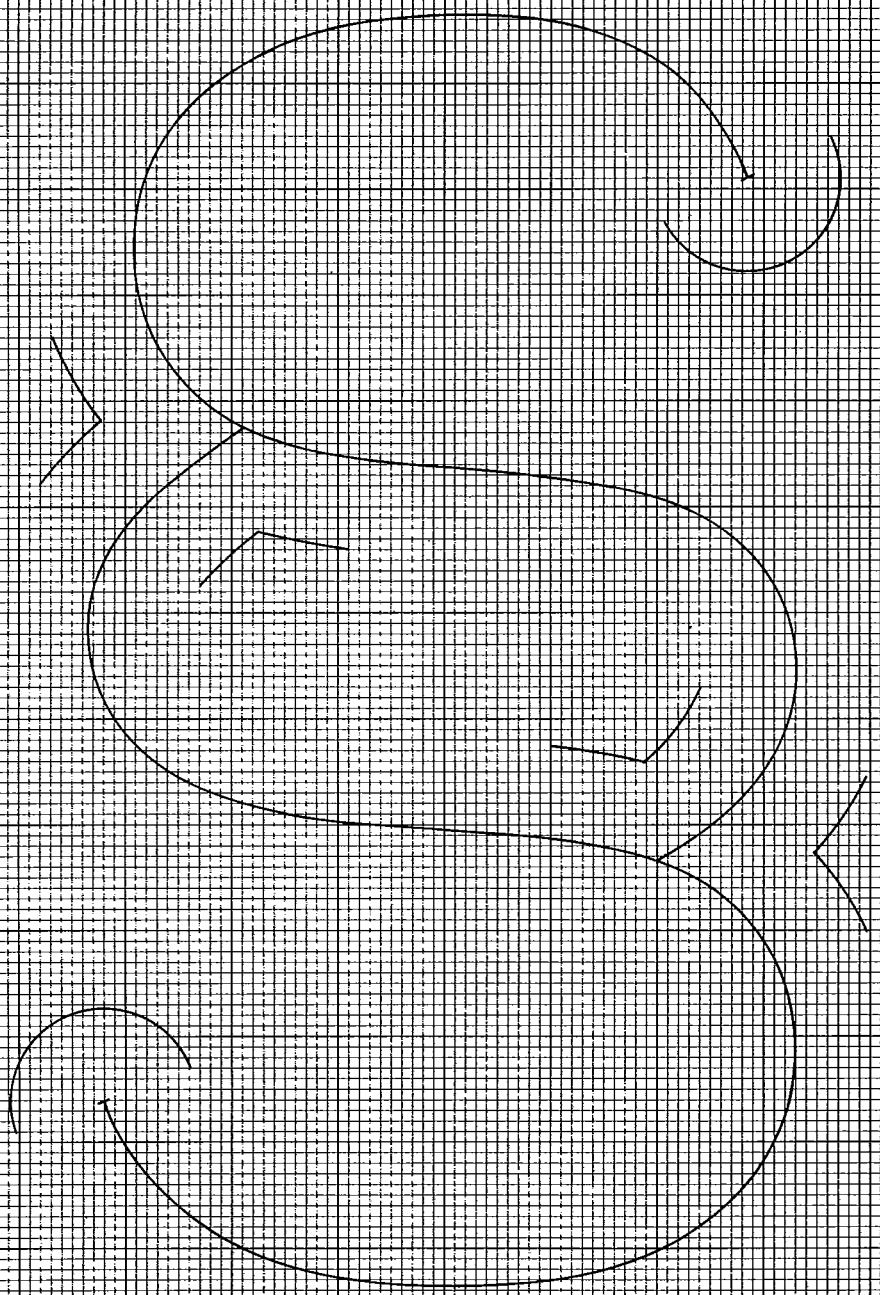
SIZE I



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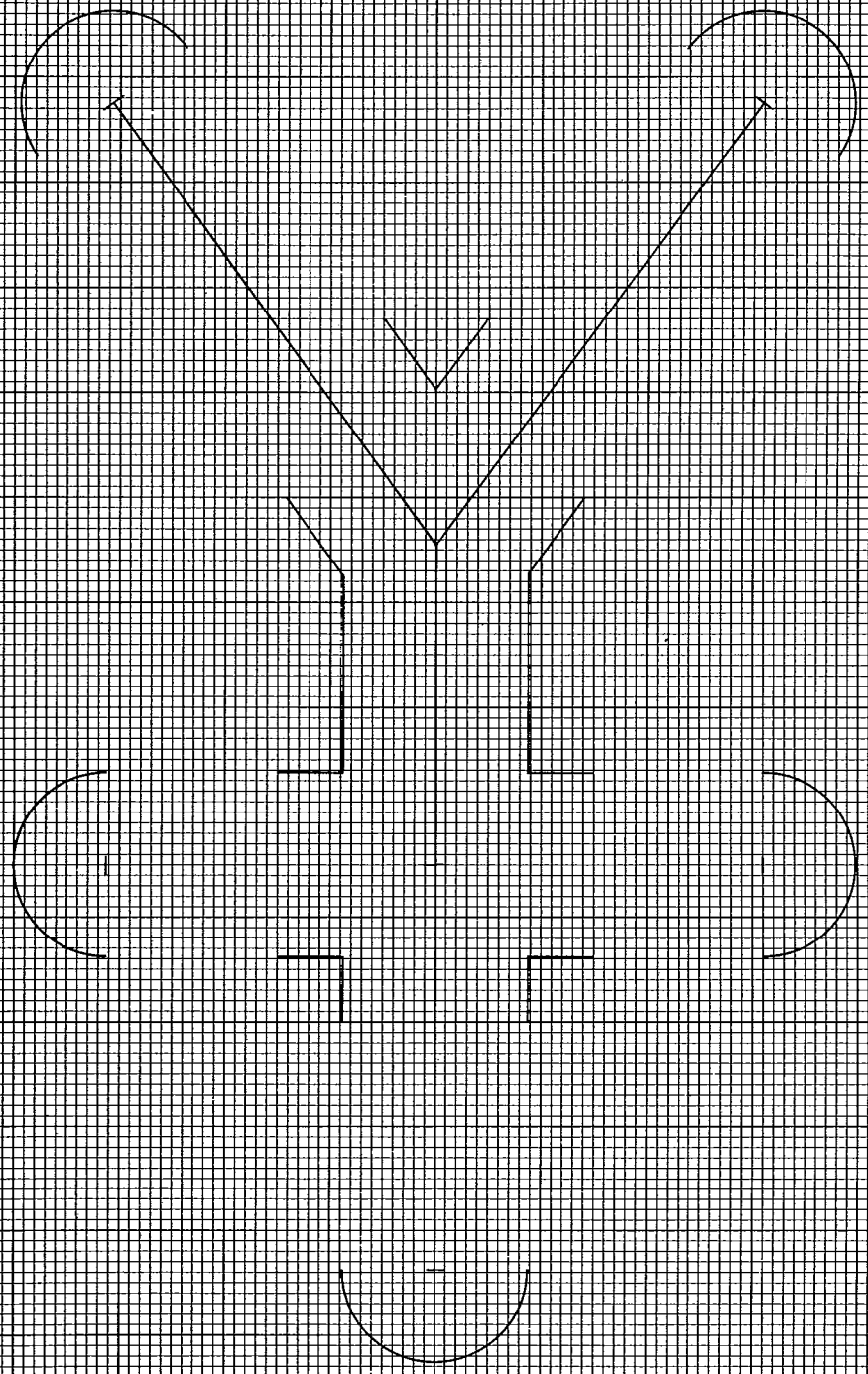

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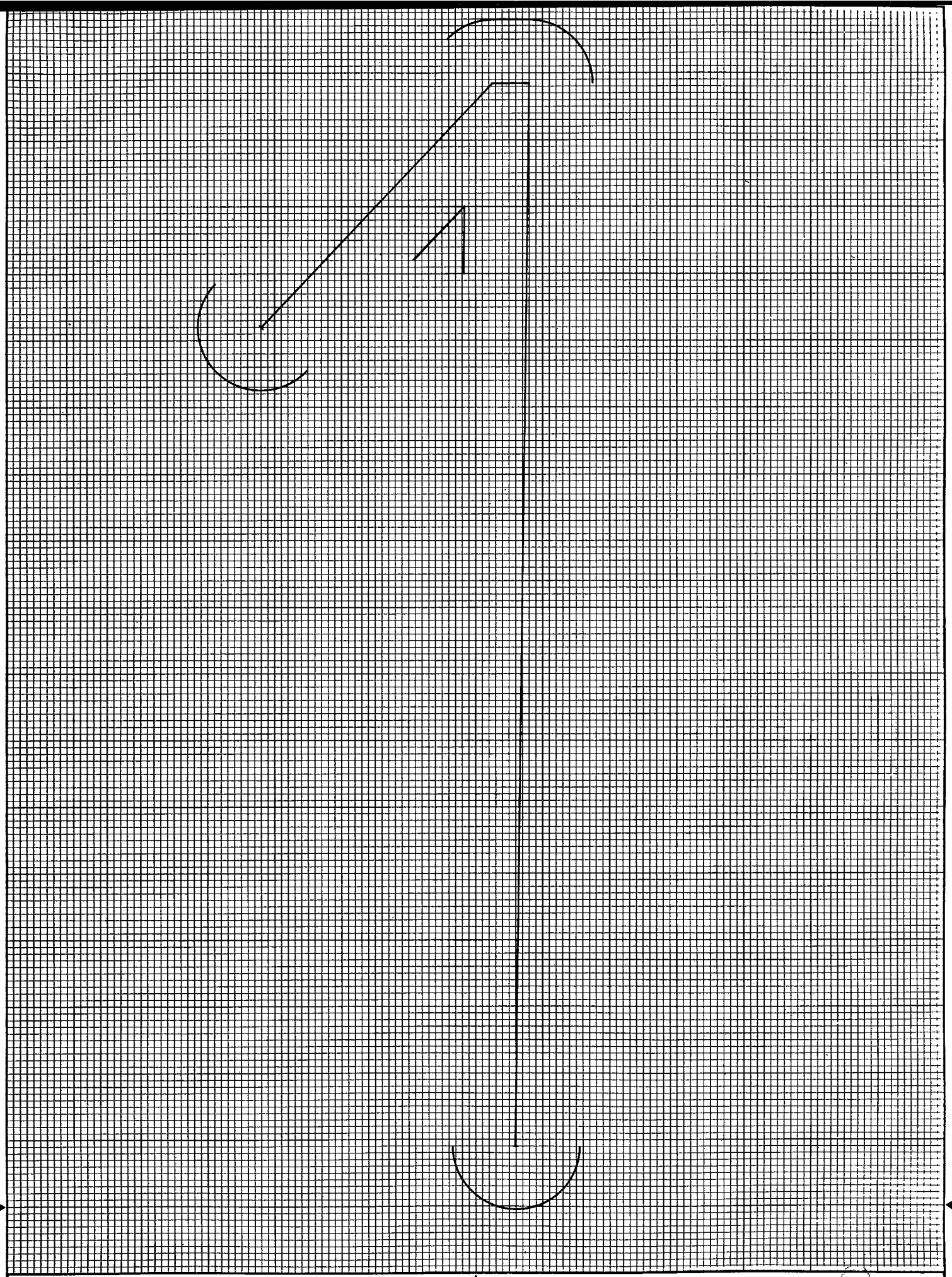

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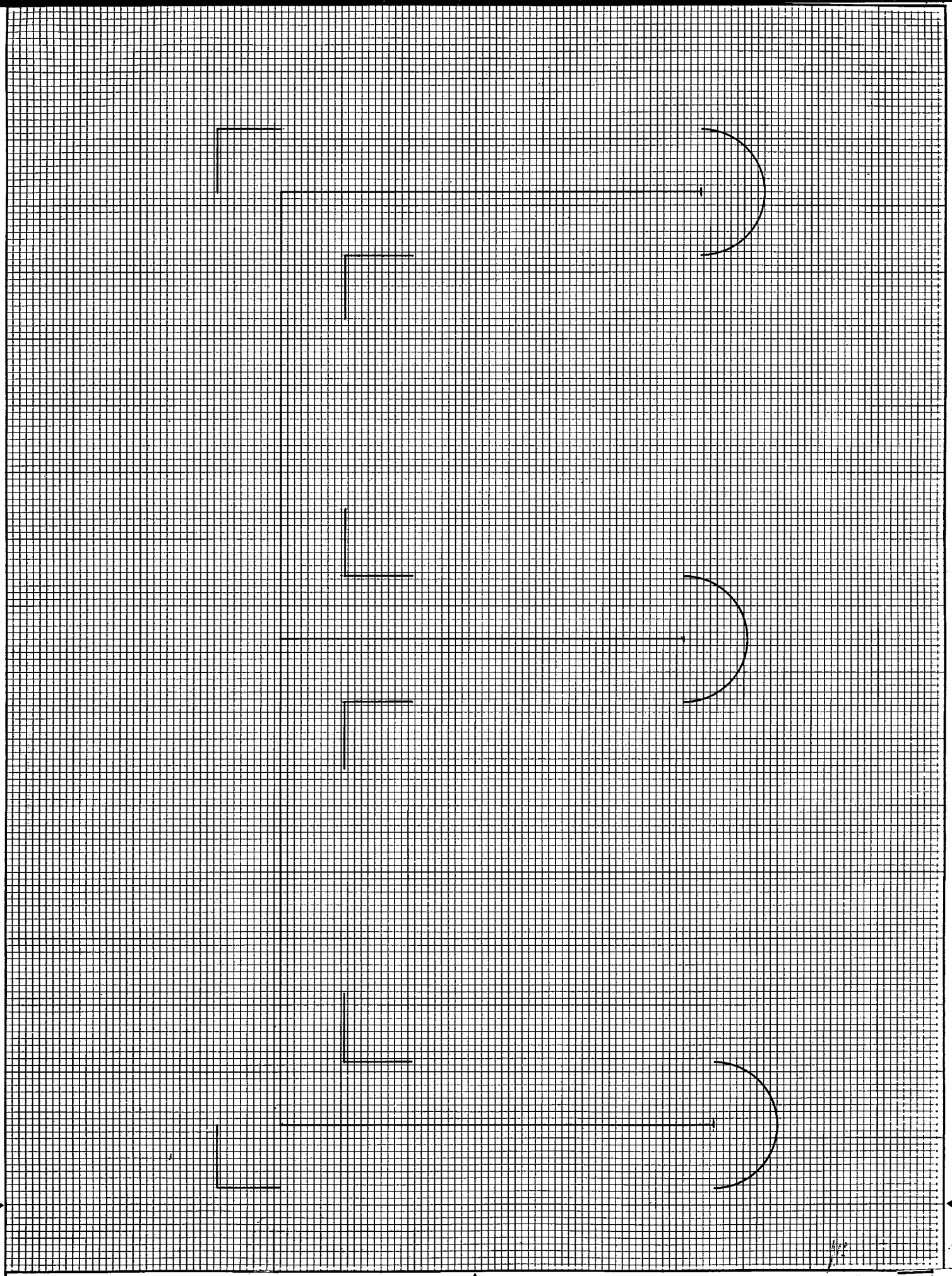

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ANNEX A

(not part of the standard)

OLD DESIGN OF DIGIT ZERO

The character ZERO is the only numeral which had to be modified in this revision of ISO/R 1073-1969. The use of the original design is tolerated in numeric applications implemented before October 1976. OCR reading of both old and revised design is subject to special agreement between OCR equipment supplier and user. For any application implemented after 1976, only the new design is standard.

The following illustration shows the letterpress font and the constant-strokewidth font of digit ZERO in size I at scale 30 : 1 and the centreline of the constant-strokewidth font in size III also at scale 30 : 1.

Letterpress font

The nominal printed image of the character is described by a series of points on the character outline, numbered from 101 onwards. Two additional reference points numbered 1 and 3 are provided together with a vertical reference line 2. Reference points 1 and 3 establish the vertical position, the orientation and the width. Reference line 2 establishes the horizontal position for printing pitch. All the points are described in a rectangular co-ordinate system. To avoid negative co-ordinates, the points 1 and 3 are given the positive vertical ordinate $y = 2\,000\ \mu m$ and the reference line 2 is given the positive abscissa $x = 2\,000\ \mu m$. The size I character outline is defined by x_{12} and y_1.

Constant-strokewidth font

The nominal printed image of the character is defined by its centreline and by its nominal strokewidth 0,35 mm for size I and 0,38 mm for size III.

The character centreline is described by a series of points numbered from 11 onwards.

The size I character centreline is defined by x_{12} and y_1.

The size III character centreline is defined by x_3 and y_3.

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N	Y1	X12
1	2000.	840
2	1363.2000	
3	2000.3143	
11	3357.1363	
12	3663.1387	
13	3923.1440	
14	4167.1523	
15	4380.1657	
16	4507.1827	
17	4533.2017	
18	4473.2217	
19	4340.2367	
20	4123.2490	
21	3897.2560	
22	3653.2607	
23	3357.2617	
24	3053.2603	
25	2770.2557	
26	2533.2480	
27	2310.2350	
28	2173.2180	
29	2130.1990	
30	2173.1800	
31	2310.1643	
32	2543.1507	
33	2793.1430	
34	3080.1377	

N	Y1	X12
101	3360.1173	
102	3687.1197	
103	3957.1250	
104	4227.1353	
105	4487.1523	
106	4653.1763	
107	4693.2017	
108	4617.2300	
109	4433.2510	
110	4180.2653	
111	3927.2747	
112	3663.2790	
113	3357.2810	
114	3043.2797	
110	2733.2740	
116	2470.2643	
117	2217.2490	
118	2030.2260	
119	1973.1990	
120	2027.1743	
121	2193.1517	
122	2460.1350	
123	2743.1247	
124	3050.1187	

4851903 0000699 5

N	Y1	X12
125	3357.1557	
126	3647.1573	
127	3893.1620	
128	4103.1693	
129	4270.1790	
130	4353.1893	
131	4373.2013	
132	4330.2130	
133	4243.2220	
134	4070.2317	
135	3870.2373	
136	3647.2410	
137	3363.2427	
138	3063.2420	
139	2803.2377	
140	2593.2317	
141	2403.2210	
142	2310.2097	
143	2290.1993	
144	2330.1863	
145	2423.1767	
146	2627.1667	
147	2843.1607	
148	3103.1567	

N	X3	Y3
1	741.2000	
2	2000.1151	
3	3241.2000	
11	1309.3809	
12	1334.4218	
13	1392.4564	
14	1482.4889	
15	1627.5173	
16	1812.5342	
17	2018.5378	
18	2235.5298	
19	2398.5120	
20	2532.4831	
21	2608.4529	
22	2659.4204	
23	2670.3809	
24	2655.3404	
25	2604.3027	
26	2521.2711	
27	2380.2413	
28	2195.2231	
29	1989.2173	
30	1783.2231	
31	1613.2413	
32	1464.2724	
33	1381.3058	
34	1323.3440	

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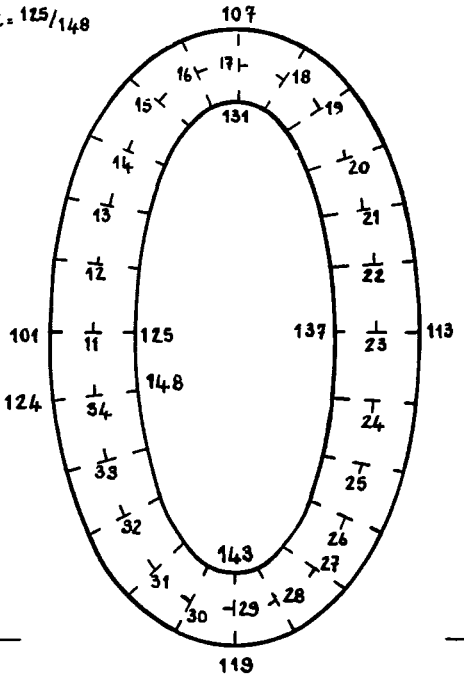
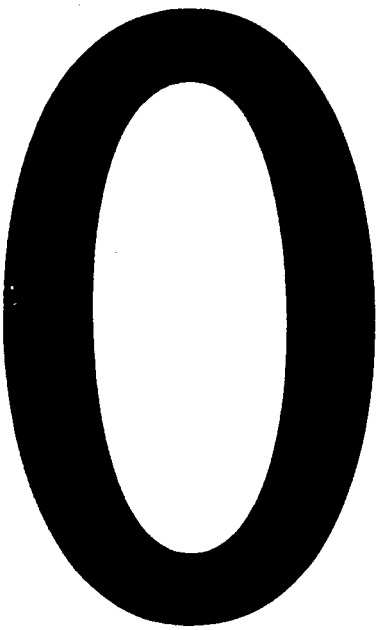
1073 PT II-76 4851903 0000700 8

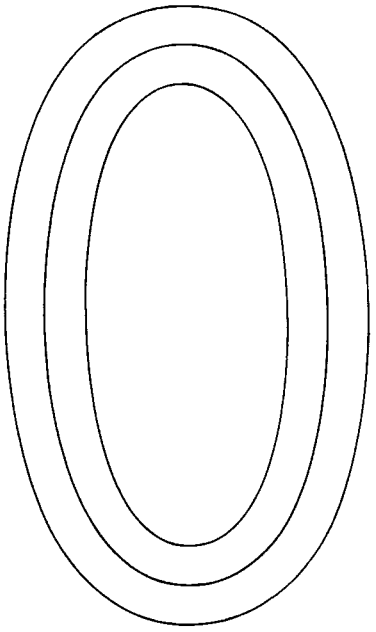
Lc = 11/34

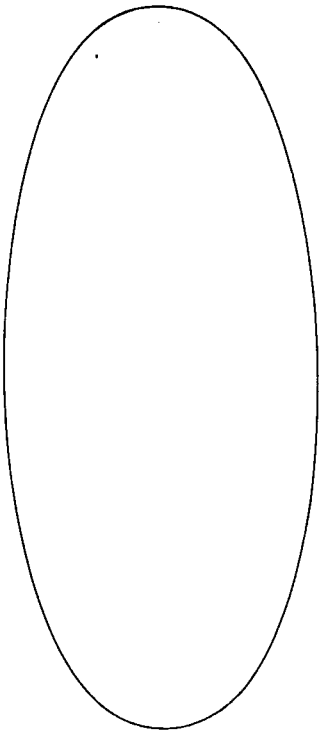
Lext = 101/124

Lint = 125/148









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ANNEX B

(not part of the standard)

EXISTING APPLICATIONS USING FORMER SIZE II WITH FORMER FONT DESIGN OF THE TEN DIGITS

This annex is not part of the standard; it is presented for information only.

The previous version of this International Standard (ISO/R 1073-1969) included a size which has been removed from the present edition.

However, some long-term numeric applications have in the meantime implemented the ten digits in size II and their existence must be recognized for a long period after the issue of this edition of the standard.

Those applications, initiated before 1976, may be considered as standard, as far as they conform to the specification, charts and drawings given in the following pages. An application such as the printing of transferable securities (shares, bonds) implemented prior to 1976 is entitled to continue even for new bonds issued after 1976.

For any application implemented after 1976, only sizes I, III and IV with the new font design are standard.

Use of co-ordinate tables and reference point drawings

The nominal printed image of each character is defined by its centreline and by its nominal strokewidth.

The character centreline is described by a series of points numbered from 11 onwards. Two additional reference points numbered 1 and 3 are provided together with a vertical reference line 2.

Reference points 1 and 3 establish the vertical position, the orientation and the set-width. Reference line 2 establishes the horizontal position for printing pitch. All the points are described in a rectangular co-ordinate system. To avoid negative co-ordinates, the points 1 and 3 are given the positive ordinate $y = 2\,000\ \mu m$ and the reference line 2 is given the positive abscissa $x = 2\,000\ \mu m$. Character centrelines are established for size II by x_{12} and y_2. The nominal strokewidth is 0,35 mm.

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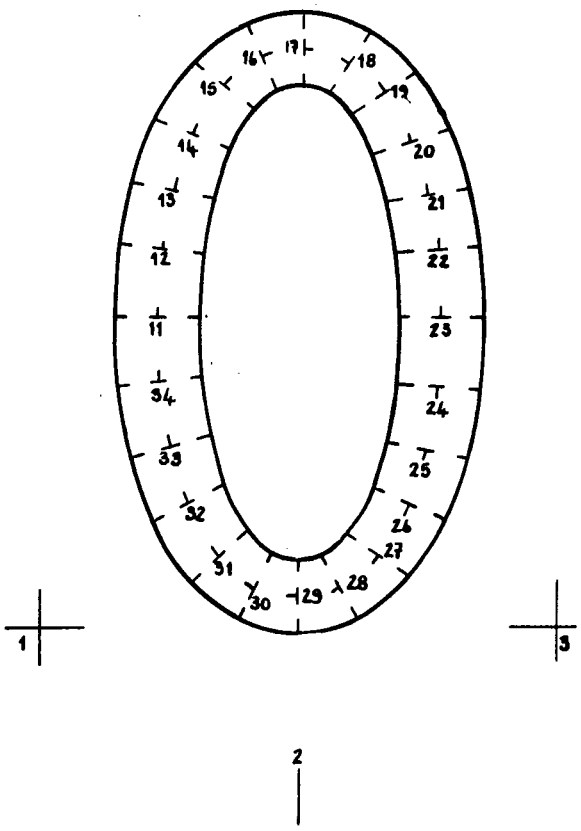
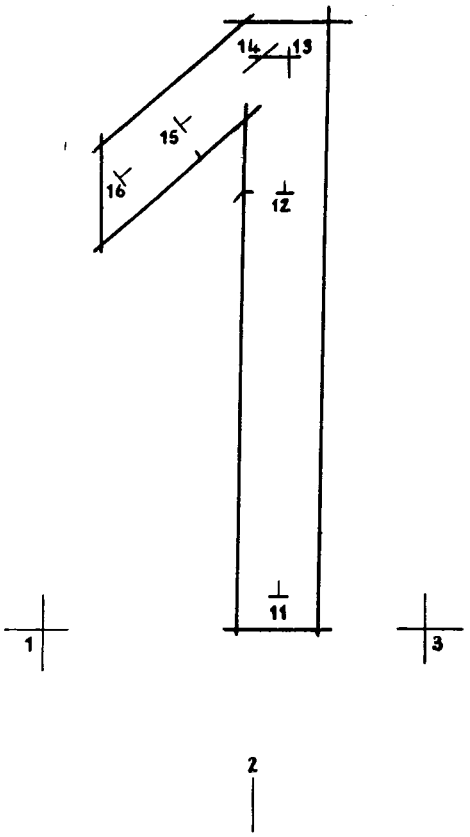
Lc = 11/34



Lc=11/16



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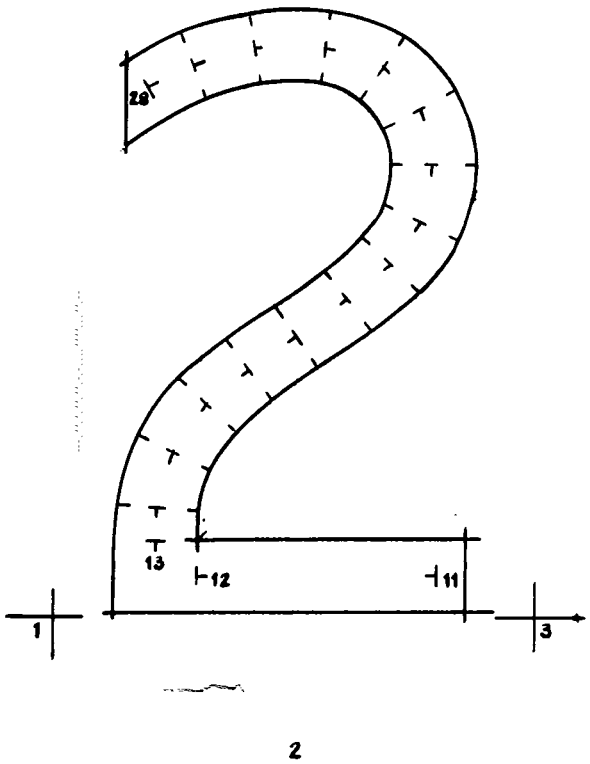

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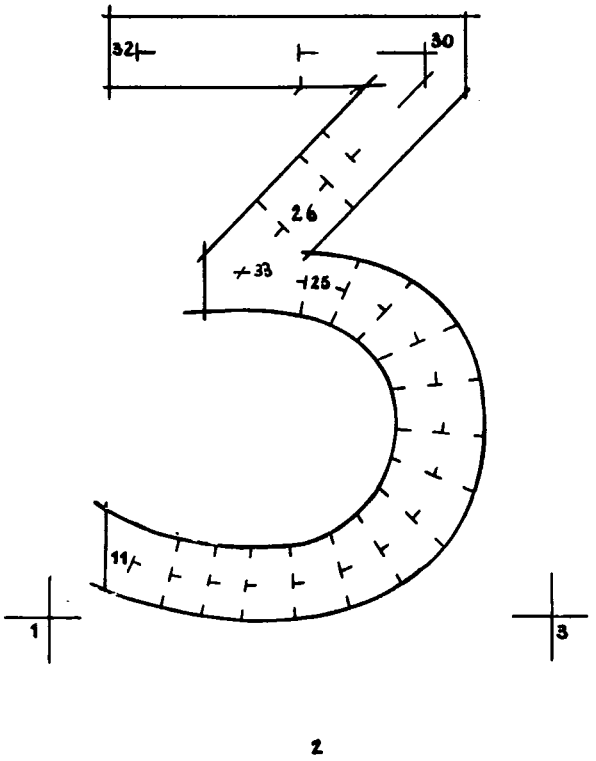

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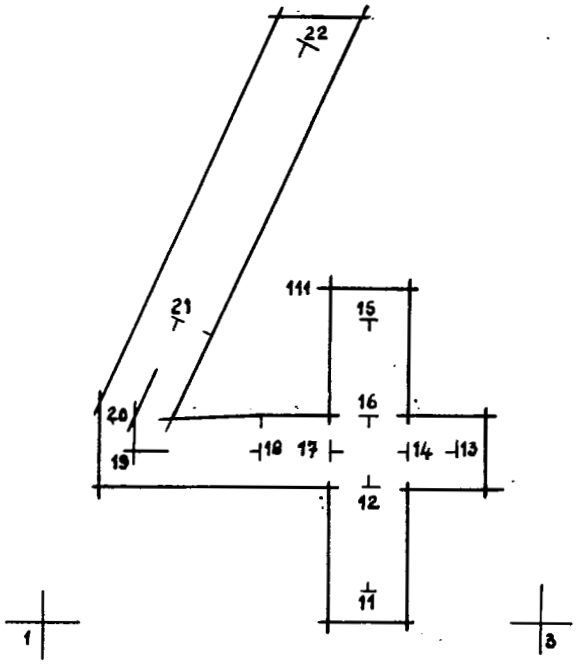
L.c.= 11/22



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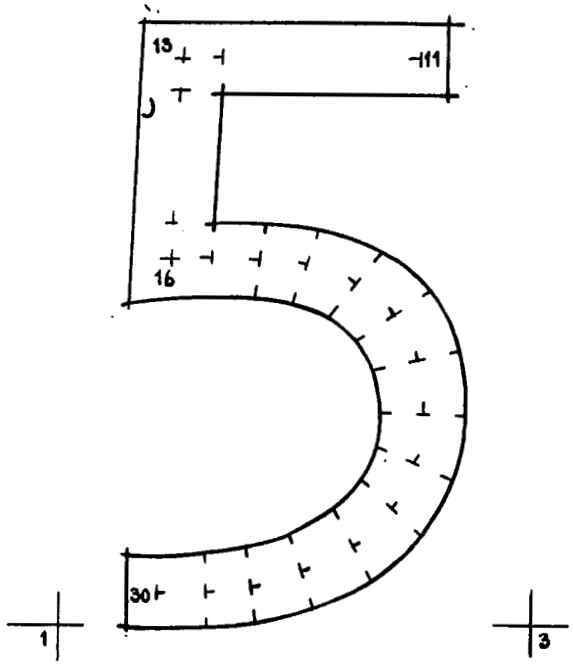
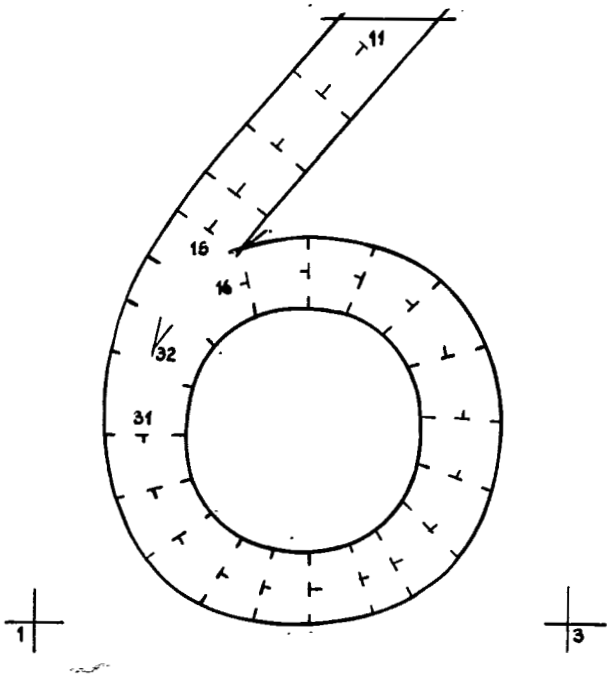
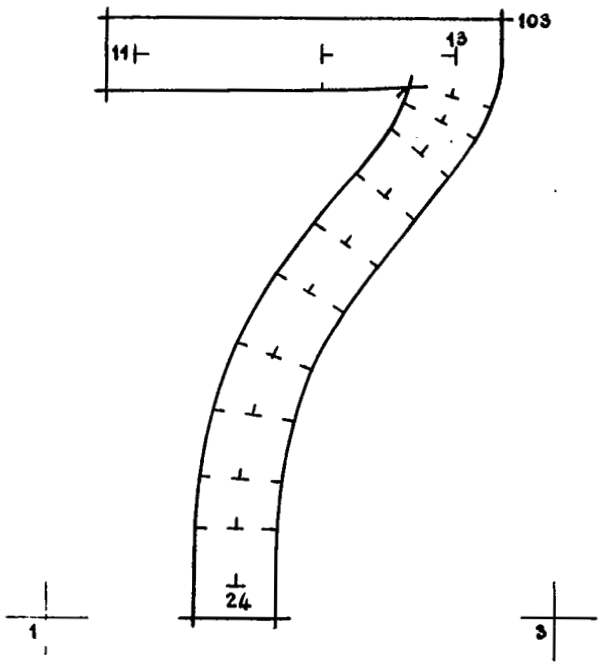


L.c = 11/32



L.c = 11/24



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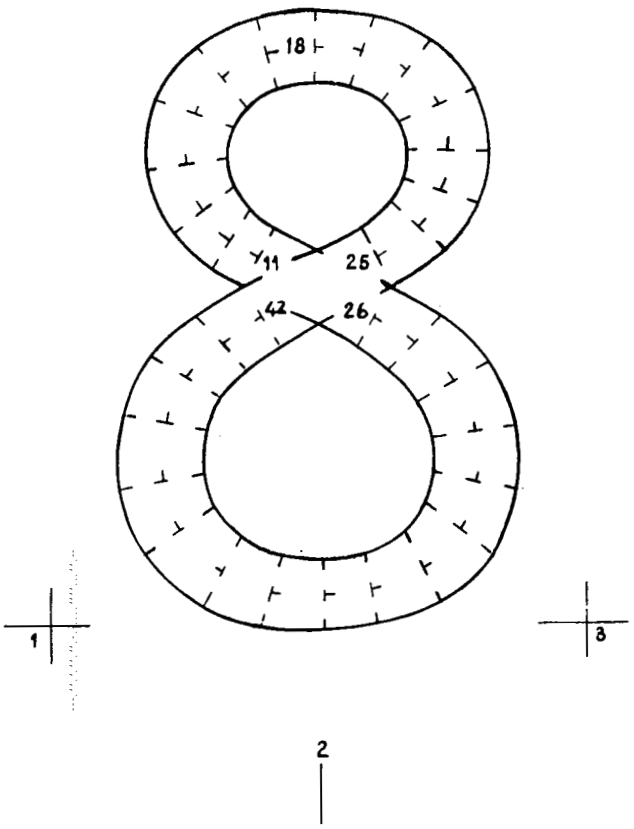
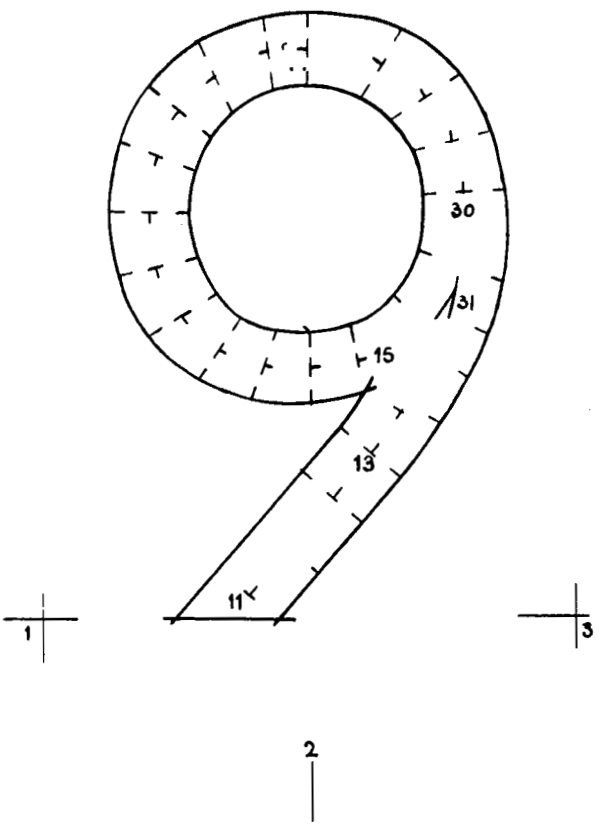
L.C = 11/42



L.C = 11/31



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CHARACTER -- 0

N	Y1	X12	Y2
1	2000.	840.	2000.
2	1363.	2000.	1257.
3	2000.	3143.	2000.
11	3357.	1363.	3556.
12	3663.	1387.	3914.
13	3923.	1440.	4217.
14	4167.	1523.	4501.
15	4380.	1657.	4750.
16	4507.	1827.	4898.
17	4533.	2017.	4929.
18	4473.	2217.	4859.
19	4340.	2367.	4703.
20	4123.	2490.	4451.
21	3897.	2560.	4186.
22	3653.	2607.	3902.
23	3357.	2617.	3556.
24	3053.	2603.	3202.
25	2770.	2557.	2872.
26	2533.	2480.	2596.
27	2310.	2350.	2335.
28	2173.	2180.	2176.
29	2130.	1990.	2125.
30	2173.	1800.	2176.
31	2310.	1643.	2335.
32	2543.	1507.	2607.
33	2793.	1430.	2899.
34	3080.	1377.	3233.

CHARACTER -- 1

N	Y1	X12	Y2
1	2000.	1078.	2000.
2	1348.	2000.	1240.
3	2000.	2758.	2000.
11	2138.	2112.	2134.
12	3911.	2138.	4203.
13	4511.	2150.	4903.
14	4512.	2033.	4904.
15	4206.	1676.	4547.
16	3983.	1412.	4287.

CHARACTER -- 2

N	Y1	X12	Y2
1	2000.	930.	2000.
2	1343.	2000.	1234.
3	2000.	3067.	2000.
11	2187.	2623.	2191.
12	2183.	1567.	2187.
13	2337.	1387.	2366.
14	2480.	1390.	2533.
15	2733.	1460.	2829.
16	2943.	1613.	3074.
17	3097.	1793.	3253.
18	3240.	2003.	3420.
19	3407.	2230.	3614.
20	3557.	2420.	3789.
21	3747.	2550.	4011.
22	4003.	2603.	4311.
23	4247.	2547.	4594.
24	4427.	2380.	4804.
25	4513.	2123.	4906.
26	4517.	1810.	4909.
27	4440.	1537.	4820.
28	4343.	1340.	4707.

CHARACTER -- 3

N	Y1	X12	Y2
1	2000.	809.	2000.
2	1338.	2000.	1228.
3	2000.	3029.	2000.
11	2234.	1179.	2246.
12	2181.	1342.	2184.
13	2148.	1519.	2146.
14	2128.	1679.	2122.
15	2142.	1892.	2138.
16	2192.	2095.	2197.
17	2289.	2259.	2310.
18	2429.	2415.	2474.
19	2619.	2508.	2696.
20	2812.	2541.	2921.
21	3026.	2517.	3170.
22	3212.	2437.	3388.
23	3345.	2290.	3543.
24	3432.	2110.	3644.
25	3482.	1933.	3702.
26	3715.	1836.	3974.
27	3912.	2026.	4204.
28	4022.	2129.	4332.
29	4372.	2462.	4741.
30	4486.	2459.	4873.
31	4485.	1905.	4872.
32	4487.	1189.	4875.
33	3524.	1653.	3752.

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CHARACTER — 4

N	Y1	X12	Y2
1	2000.	899.	2000.
2	1375.	2000.	1271.
3	2000.	3099.	2000.
11	2139.	2342.	2135.
12	2586.	2341.	2656.
13	2749.	2728.	2848.
14	2749.	2515.	2847.
15	3326.	2337.	3520.
16	2906.	2341.	3030.
17	2749.	2168.	2847.
18	2751.	1861.	2850.
19	2751.	1301.	2849.
20	2901.	1304.	3024.
21	3321.	1497.	3514.
22	4538.	2059.	4935.

CHARACTER — 5

N	Y1	X12	Y2
1	2000.	957.	2000.
2	1343.	2000.	1234.
3	2000.	3043.	2000.
11	4487.	2537.	4874.
12	4493.	1667.	4882.
13	4487.	1493.	4874.
14	4343.	1483.	4707.
15	3767.	1453.	4034.
16	3603.	1443.	3844.
17	3613.	1623.	3856.
18	3597.	1833.	3836.
19	3583.	2043.	3821.
20	3500.	2253.	3723.
21	3360.	2423.	3560.
22	3160.	2527.	3327.
23	2923.	2553.	3051.
24	2710.	2520.	2802.
25	2510.	2417.	2568.
26	2343.	2243.	2374.
27	2233.	2013.	2246.
28	2170.	1793.	2172.
29	2150.	1593.	2148.
30	2143.	1383.	2141.

CHARACTER — 6

N	Y1	X12	Y2
1	2000.	830.	2000.
2	[illegible]	2000.	1238.
3	[illegible]	3103.	2000.
11	4543.	2270.	4941.
12	4327.	2080.	4688.
13	4100.	1883.	4423.
14	3890.	1710.	4178.
15	3727.	1587.	3988.
16	3493.	1767.	3716.
17	3550.	2030.	3782.
18	3517.	2263.	3743.
19	3397.	2493.	3603.
20	3177.	2647.	3346.
21	2900.	2717.	3023.
22	2637.	2683.	2716.
23	2403.	2573.	2444.
24	2253.	2410.	2269.
25	2190.	2270.	2195.
26	2147.	2040.	2144.
27	2157.	1833.	2156.
28	2217.	1653.	2226.
29	2377.	1457.	2413.
30	2583.	1350.	2654.
31	2827.	1307.	2938.
32	3227.	1353.	3404.

CHARACTER — 7

N	Y1	X12	Y2
1	2000.	886.	2000.
2	1348.	2000.	1240.
3	2000.	3126.	2000.
11	4487.	1259.	4875.
12	4482.	2082.	4869.
13	4479.	2665.	4866.
14	4299.	2649.	4655.
15	4189.	2609.	4527.
16	4046.	2516.	4360.
17	3859.	2360.	4142.
18	3645.	2180.	3893.
19	3432.	2027.	3644.
20	3158.	1874.	3325.
21	2895.	1781.	3017.
22	2611.	1728.	2686.
23	2391.	1708.	2430.
24	2138.	1705.	2134.

CHARACTER — 8

N	Y1	X12	Y2
1	2000.	802.	2000.
2	1352.	2000.	1244.
3	2000.	3182.	2000.

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11 3615.1733.3857.
12 3694.1607.3950.
13 3831.1490.4109.
14 4028.1416.4339.
15 4248.1449.4595.

16 4408.1572.4782.
17 4515.1772.4907.
18 4535.1989.4931.
19 4515.2192.4908.
20 4432.2392.4811.

21 4279.2526.4632.
22 4089.2569.4411.
23 3909.2536.4201.
24 3749.2443.4014.
25 3615.2250.3858.

26 3349.2241.3547.
27 3242.2424.3423.
28 3069.2591.3221.
29 2849.2688.2964.
30 2626.2688.2704.

31 2416.2615.2459.
32 2252.2455.2268.
33 2155.2229.2155.
34 2135.2016.2131.
35 2145.1782.2142.

36 2234.1565.2247.
37 2421.1375.2464.
38 2634.1302.2713.
39 2894.1318.3016.
40 3091.1408.3246.

41 3238.1564.3417.
42 3355.1741.3554.
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21 3787.1307.4058.
22 4033.1340.4346.
23 4230.1437.4575.
24 4383.1600.4754.
25 4480.1830.4867.

26 4497.2000.4886.
27 4430.2337.4808.
28 4290.2527.4645.
29 4097.2647.4419.
30 3867.2693.4151.

31 3423.2650.3634.
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CHARACTER — 9

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 N    Y1    X12   Y2

  1 2000.  833.2000.
  2 1343.2000.1234.
  3 2000.3187.2000.

 11 2097.1737.2086.
 12 2523.2110.2584.
 13 2717.2280.2809.
 14 2907.2407.3031.
 15 3133.2220.3296.

 16 3097.2013.3253.
 17 3107.1803.3264.
 18 3187.1613.3358.
 19 3330.1443.3525.
 20 3547.1330.3778.
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ANNEX C

(not part of the standard)

RECOMMENDATION FOR THE IMPLEMENTATION OF OCR-B ON TYPEWRITERS

The design of OCR-B is based on fundamental aesthetic laws which, as far as feasible, correspond to the criteria emerging from the long development of our classic typography. One of the essential principles prescribes that in a letter design all vertical parts must be heavier than the horizontal parts. This is also true for so-called sans serif characters, that is for a design which at first sight has a thread-like appearance. This is precisely the case for OCR-B.

The OCR-B character set can be implemented in two clearly different forms. It can be used as a font with constant-strokewidth as well as a letterpress font. Type engraving can be based on either implementation.

For printing devices like high-speed printers and similar machines, the centreline is the skeleton along which a stroke of prescribed width is placed. It is recommended to use a tool the diameter of which is equal to the strokewidth. The resulting engraving is completely thread-like, all strokes having an equal width. The aesthetic appearance as well as readability are partly diminished by this process.

In spite of strong technical limitations and difficulties, there is a tendency to design type fonts for typewriters which, as close as possible, look like letterpress fonts. For this type of application it is therefore strongly recommended to use a finer tool and to base the design on the OCR-B letterpress font used as basic pattern. Using a tool with a diameter equal to half the strokewidth, it should be possible to engrave types presenting most of the intended variations of the strokewidth. Furthermore, the ends of the strokes, instead of being rounded, would then have a more rectangular appearance. Also, the internal angles would remain more open. The whole character set then looks less mechanical and bears more resemblance to the typographic forms to which the human eye has been accustomed for centuries.

Each manufacturer is, of course, free to take advantage of the aesthetic features of the letterpress font, depending on the technical means at his disposal and on his desire to achieve a more typographic appearance of the characters.

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