ECMA

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

STANDARD ECMA-11

FOR

THE ALPHANUMERIC CHARACTER SET OCR-B

FOR

OPTICAL RECOGNITION

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European Computer Manufacturers Association
114 Rue du Rhône – 1204 Geneva (Switzerland)

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BRIEF HISTORY

ECMA TC4 started their standardization work in the field of Optical Character Recognition in June 1961. In the course of the work, several character sets already in existence, were evaluated. As a result of this evaluation and under consideration of the widely varying European OCR requirements, it was decided to develop two fonts, a stylized (Class A) numeric character set and a conventional one (Class B).

The work of ECMA on a stylized set is laid down in Standard ECMA-8. In parallel a considerable amount of work was done and a full proposal, entirely developed by ECMA, for an OCR-B alphanumeric character set for optical recognition was submitted in February 1965 to the Expert Group of ISO/TC97/SC3/WG-1. It was recognized that this font fulfills the requirements for a Class B font as outlined in ISO document 97/3/1/N29. The ECMA proposal was eventually accepted by TC97/SC3 and by TC97 at their meetings in October 1965 in Tokyo as the ISO font for OCR-B (ISO Recommendation 1073). The Standard ECMA-11 corresponds to this ISO font. It was adopted by the General Assembly of ECMA in November 1965.

Work on a revision of this Standard was started in September 1969. It was felt that a number of shape modifications would make the font more widely accepted. In addition, some new characters were added to increase the general applicability of OCR-B. The 2nd edition also contained a small number of minor changes to improve the aesthetics of the font. Five character shapes were deleted. Size II was also deleted from the revised Standard because of lack of interest. Instead, size IV was introduced, which has the same aspect ratio as size I.

This 3rd edition of the Standard is technically identical to the 2nd edition but for the following points: the character set has been completed by adjunction of the characters PARAGRAPH, YEN and of two erase characters; the minimum length of the PRE-PRINTED LONG VERTICAL MARK has been modified to make it identical to that chosen in ISO 1073.

THIS 3rd EDITION SUPERSEDES THE VERSION DATED OCTOBER 1971.

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APPENDIX A

RECOMMENDATION FOR THE IMPLEMENTATION OF OCR-B ON TYPEWRITERS

1. SCOPE

This Standard ECMA-11 defines the nominal shapes of the printed images of the individual characters of the OCR-B font. It does not define characteristics of the print quality or tolerances in character positioning, which are covered elsewhere (see Standards ECMA-15, ECMA-18, ECMA-21, ECMA-30).

The OCR-B font whilst primarily intended for use in Optical Character Recognition, is also highly suitable for general purposes.

2. GENERAL CONSIDERATIONS

Two styles of characters are provided, one entitled 'letterpress font' for use on printing equipment with accurate control of the printed image, and the other 'constant-strokewidth
font' for printing equipment without such accurate control.
The letterpress font is intended for use with any printing
mechanism which can reproduce fine detail with sufficient
accuracy. The strokewidths of its characters are varied deliberately for aesthetic reasons. For many classes of printers, however, the strokewidths are less controllable and for
these the constant-strokewidth font is more appropriate. The
definitive part of the Standard is the set of centreline
shapes, since the dimensions have been specified to make
these shapes the same for both letterpress and constant-strokewidth fonts.

3. OCR-B SIZES

- 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, credit card imprinters besides printing processes such as letterpress and offset lithography are all suitable.
- 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 the first edition of the Standard has been deleted in 1971 when the 2nd edition was issued.
- 3.5 The centreline shapes 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 digit EIGHT are:

for Size I: 2,40 mm for Size III: 3,20 mm for Size IV: 3,60 mm

3.7 The widest character in each size (except for the alternative SMALL LETTER m in the letterpress font) is digitated. Its centreline widths are:

for Size I: 1,40 mm for Size III: 1,52 mm for Size IV: 2,10 mm

3.8 Constant-pitch printing

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

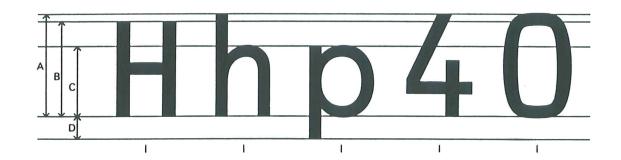
Size I : 2,54 mm minimum Size III : 2,54 mm minimum Size IV : 3,63 mm minimum

4. TYPICAL DIMENSIONS OF THE NOMINAL PRINTED IMAGE

4.1 Letterpress font

Typical dimensions for the nominal printed image of the letterpress 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. These dimensions are for general information only. The exact values for all individual characters are obtainable from the original drawings only (see 11.1).

Size	mm					
5120	A	В	С	D		
I	2,60	2,46	1,83	0,60		



4.2 Constant-strokewidth font

The shapes of the constant-strokewidth characters are similar except that they have rounded stroke ends.

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.

0123456789 <+> CENSTXZ

5.2 <u>Sub-set 2 - Initial Alphanumeric Sub-set</u>
This sub-set comprises 47 characters.

0123456789
ABCDEFGHIJKLM
NOPQRSTUVWXYZ
<+>*-=/.,

SPACE

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 (ECMA-6).

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

5.4 Sub-set 4 - Options Sub-set

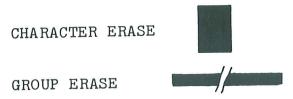
This sub-set comprises 8 capital national letters, 5 small national letters, 4 accents and 4 further characters.

AAÆIJÑÖØÜ aæijøß§¥

m

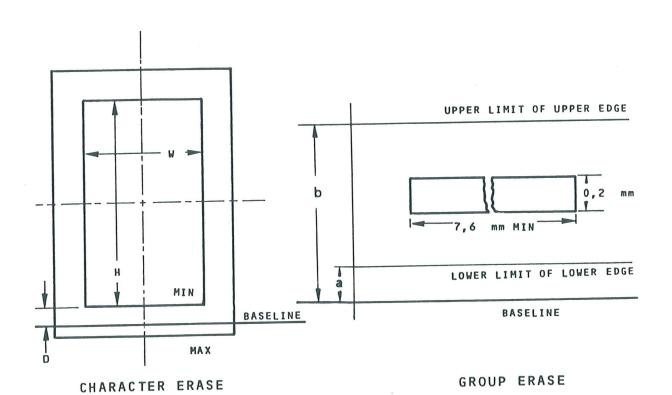
5.5 Sub-set 5 - Erase Characters

This sub-set comprises 2 characters.



CHARACTER ERASE is normally printed by printing devices controlled by means of a keyboard. It can be printed over or after an erroneous character. GROUP ERASE is also normally printed by printing devices controlled by means of a keyboard, however, it can also be drawn by hand. It is mandatory that the precise use of these characters be agreed upon by user and manufacturer of the reading equipment.

The dimensions of these two characters are as follows:



SIZE	I	III	IV
CHARACTER ERASE: min H max H	2,4 2,9		3,8· 4,6
min W	1,4		2,0
max W	1,9		2,8
D	0,13		0,20
GROUP ERASE: minimum length minimum width a b	7,6	7,6	10,9
	0,2	0,2	0,2
	0,4	0,5	0,6
	2,0	2,7	3,0

6. INDEX TABLE

6.1 All characters are available in Size I as letterpress font and as constant-strokewidth font, with the exception of VL which is not in the 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 constantstrokewidth font, with the exception of VL.

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 Section 11.7 the character shapes for Size IV are derived from those of Size I for the constant-stroke-width font (designated by C).
- 6.4 Application advice is given in column "Remarks", where it is indicated amongst others 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.

INDEX TABLE

ef. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
1	1	l L,C,III	DIGIT	1 2 3	
2	2	L,C,III	DIGIT	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	
11	A	11 L,C	CAPITAL LETTER	2 3	
12	В	12 L,C	CAPITAL LETTER B	2	

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
13	C	13 L,C,III	CAPITAL LETTER	1 2 3	Character in numeric sub-set. See ECMA-30
14	D	14 L,C	CAPITAL LETTER	2 3	
15	Ε	15 L,C,III	CAPITAL LETTER E	1 2 3	Character in numeric sub-set. See ECMA-30
16	F	16 L,C	CAPITAL LETTER	2	
17	G	17 L,C	CAPITAL LETTER G	2	
18	Н	18 L,C	CAPITAL LETTER H	2	
19	Ι	19 L,C	CAPITAL LETTER	2	
20	J	20 L,C	CAPITAL LETTER	2 3	
21	K	21 L,C	CAPITAL LETTER K	2	
22	L	22 L,C	CAPITAL LETTER	2	
23	M	23 L,C	CAPITAL LETTER	2	
24	N	24 L,C,III	CAPITAL LETTER	1 2 3	Character in numeric sub-set. See ECMA-30

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
25	0	25 L,C	CAPITAL LETTER O	2	
26	Р	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	2	
29	S	29 L,C,III	CAPITAL LETTER S	1 2 3	Character in numeric sub-set. See ECMA-30
30	T	30 L,C,III	CAPITAL LETTER	1 2 3	Character in numeric sub-set. See ECMA-30
31	U	31 L,C	CAPITAL LETTER U	· 2	
32	V	32 L,C	CAPITAL LETTER V	1 2 3	
33	W	33 L,C	CAPITAL LETTER W	2	
34	X	34 L,C,III	CAPITAL LETTER	1 2 3	Character in numeric sub-set. See ECMA-30
35	Y	35 L,C	CAPITAL LETTER Y	2	
36	Z	36 L,C,III	CAPITAL LETTER Z	2	Character in numeric sub-set. See ECMA-30

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
37	a	37	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.
		L,C	a		
38	h	38	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.
		L,C	b		
39	С	39	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.
		L,C	С		
40	d	40	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.
		· L,C	đ		
41	е	41	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.
		L,C	e		
42	f	42	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.
		L,C	f		
43	a	43	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.
	3	L,C	g		
44	h	44	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.
	• •	L,C	h		
45	i	45	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.
	•	L,C	i		
46	i	46	SMALL LETTER	3	Smaller strokewidth, see Sec. il.
10	J	L,C	j		
47	k	47	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.
		L,C	k		
48		48	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.
40		L,C	1		

Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
49	m	49 L , C	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.
50	n	50 L,C	SMALL LETTER	3	Smaller strokewidth, see Sec. il.
51	0	51 L,C	SMALL LETTER	3	Smaller strokewidtn, see Sec. 11.
· 52	р	52 L,C	SMALL LETTER	3	Smaller strokewidth, see Sec. i
53	q	53 L,C	SMALL LETTER	3	Smaller strokewidth, see Sec. li.
54	r	54 L,C	SMALL LETTER	3	Smaller strokewidth, see Jec. 1).
55	S	55 L,C	SMALL LETTER	3	imailer strokewidth, see 'ec. II.
56	t	56 L,C	SMALL LETTER t	3	Smaller strokewidth, see Jec. 11.
57	u	57 L,C	SMALL LETTER	3	Smailer strokewidth, ≾ee Sec. 17.
58	V	58 L,C	SMALL LETTER V	3	Smaller strokewidt:, see Sec. 11.
59	W	59 L,C	SMALL LETTER w	3	Smaller strokewidth, see Sec. 11.
60	X	60 L,C	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.

			THE LATER		
Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
61	У	61 L,C	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.
62	Z	62 L,C	SMALL LETTER	3	Smaller strokewidth, see Sec. 11.
63	*	63 L,C	ASTERISK	2	
64	+	64 L,C,III	PLUS SIGN	1 2 3	Character in numeric sub-set. See ECMA-JO
65		65 L,C	HYPHEN (MINUS SIGN)	2	
66	=	66 L,C	EQUALS SIGN	2	
67	/	67 L,C :	SOLIDUS	2	
68	-	68 L,C	FULL STOP	2	
69	/	69 L,C	COMMA	2	Two vertical locations are specified, one of which projects below the base line for capital letters (see Sec. 11.).
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 Sec. 11.).
72	11	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 Sec. 7.2).

	TIVELY INDEE (cont.)						
Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks		
73	ı	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 Sec. 7.2).		
74	_	74 L,C	DISCONTINUOUS UNDERLINE	3			
75	?	75 L,C	QUESTION MARK	3			
76	!	76 L,C	EXCLAMATION MARK	3			
77 .	(77 L,C	LEFT PARENTHESIS	3			
78)	78 L,C	RIGHT PARENTHESIS	3	,		
79	<	79 L,C,III	LESS THAN SIGN	1 2 3	Character in numeric sub-set. See ECMA-!0		
80	>	80 L,C,III	GREATER THAN SIGN	1 2 3	Character in numeric sub-set. See ECMA-30		
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 fee. 11.		
84	#	84 L,C	NUMBER SIGN	3	Smaller strokewidth, see Jec. 11.		

Ref.	Shape	Drawing(s) No.	Name	Sets	Remarks
85	&	85 L,C	AMPERSAND	3	
86	a	86 L,C	COMMERCIAL AT	3	Smaller strokewidth, see Sec. 11.
87	^	87 L,C	UPWARD ARROW HEAD	3	can be replaced by CIRCUMPLEX ACCENT (Ref. 110) in non-OCR applications, if it is required to print UPWARD ARROW HEAD and CIRCUMPLEX ACCENT with the same type-face (see Sec. 7.2).
88	¤	88 L,C	CURRENCY SIGN	3	(
89	£	89 L,C	POUND SIGN	3	
90	\$	90 L,C	DOLLAR SIGN	3.	
91	I	91 C	VERTICAL LINE	3	Not to be confused with PLVM (Ref. 92). See Sec. 10.
92		92 L,C,IIÍ	PRE-PRINTED LONG VERTICAL MARK	1 2 3	Is intended to be pre-printed only. See Sec. 10. Character in numeric sub-set. See ECMA-30
93	\	93 L,C	REVERSE SOLIDUS	3	
94	Ά	94 L,C	CAPITAL LETTER	4	where possible, substitution by the two capital letters A (Ref. 11) and E (Ref. 15) is recommended for OCR.
95	A	95 L,C	CAPITAL LETTER	4	
96	Æ	96 L,C	CAPITAL LETTER	4	

Ref.	Shape	Drawing(s) No.	Name	Sets	Remarks
97	Ö	97 L,C	CAPITAL LETTER	4	where possible, substitution by the two carital letters O (Ref. 25) and E (Ref. 15) is recommended for OCR.
98	Ø	98 L,C	CAPITAL LETTER	4	
99	Ü	99 L,C	CAPITAL LETTER Ü	4	where possible, substitution by the two carital letters U (Ref. 31) and E (Ref. 15) is recommended for OCE.
100	IJ	100 L,C	CAPITAL LETTER DUTCH LJ	4	For OCR purpose separate capital letters : (Ref. 19) and J (Ref. 20) should be used.
101	Ñ	101 L,C	CAPITAL LETTER Ñ	4	
102	a	102 L,C	SMALL LETTER	4	Smaller strokewidth, see Sec. 11.
103	æ	103 L,C	SMALL LETTER	4	Smaller strokewidth, see Sec. 11.
104	Ø	104 L,C	SMALL LETTER	Ţţ	Smaller strokewidth, see Sec. 11.
105	ij	105 L,C	SMALL LETTER DUTCH ij	4	Smaller strokewidth, see Sec. 11.
106	ß	106 L,C	SMALL LETTER GERMAN DOUBLE s	4	Smaller strokewidth, see Sec. 1:.
107		107 L,C	DIAERESIS	4	For use see Sec. 7.
108	"	108 L,C	ACUTE ACCENT	4	Por use see Sec. 7.

Ref.	Shape	Drawing(s)	Name	Sets	Remarks
109	•	109 L,C	GRAVE ACCENT	4	Por use see Sec. 7.
110	^	110 L,C	CIRCUMFLEX ACCENT	4	For use see Sec. 7.
111	~	111 L,C	TILDE	4	Por use see Sec. 7.
112		112 L,C	CEDILLA	4	For use see Sec. 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 OCR use. Its width must be such that adjacent CONTINUOUS UNDERLINES have no gap between them. See Sec. 8.
117		No Drawing	SPACE	1 2 3	SPACE is a non-printing character. For definition, see Sec. 9. Not all readers will necessarily recogn SPACE. Character in numeric sub-set, see ECMA-30.
118	S	118 L,C	PARAGRAPH	4	
119	¥	119 L,C	YEN	4	
120		No Drawing	CHARACTER ERASE	5	See Sec. 5.5

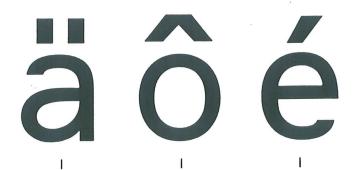
Ref. No.	Shape	Drawing(s) No.	Name	Sets	Remarks
121		No Drawing	GROUP ERASE	5	See Sec. 5.5

7. USE OF DIACRITICAL SIGNS

7.1 Besides the specially designed National Letters (Sub-set 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 super-imposing the horizontal and vertical axes of the two graphics concerned. Accented letters can be obtained as shown below. For OCR purposes, the super-position of an accent on a character shape must be done very accurately. The composed character must meet the centreline tolerance specified in ECMA-15. If this tolerance cannot be met in a given printing device by printing in two operations, the composite character must be printed in a single operation. Prospective users should consult with manufacturers before planning inclusion of accented letters in OCR character sets.



7.2 In non-OCR applications the DIAERESIS, ACUTE ACCENT and CIRCUMFLEX ACCENT may be used standing alone, 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.

DH_1925

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 used (i.e. the nominal distance between the vertical centrelines of two successive SMALL LETTERS m).

The vertical centrelines (for definition see ECMA-15, par. 5.11.2) of bounding characters and the intended character pitch shall be used for the purpose of determining the number of SPACE characters between printed characters.

NOTE: The possibility of counting either a single SPACE character or the number of SPACE characters in a given blank area is dependent on the OCR reader, the print location tolerances and other factors requiring prior agreement between user and manufacturers involved.

10. VERTICAL LINE and PRE-PRINTED VERTICAL MARK

Both the VERTICAL LINE (ref. 91) and the PRE-PRINTED LONG VERTICAL MARK (ref. 92) are vertical lines but they differ in minimum height, as indicated below.

	millimetre			
	Size I	Size III	Size IV	
Height VL	3,20	*	*	
Minimum height of PLVM	3,7	5,0	5,6	
Nominal strokewidth (both VL and PLVM)	0,35	0,38	0,50	

^{*} The character VL is available in Size I only.

As its name indicates, the PRE-PRINTED LONG VERTICAL MARK is normally to be pre-printed. However, it can also be generated by other means. It should not be confused with VERTICAL LINE, which is a standard graphic character of the International Reference Version of the 7-bit coded character set (Table 2 in Standard ECMA-6). The precise use of both characters should be agreed upon by user and manufacturer of the reading equipment.

For purpose of Character Spacing (see ECMA-15) both characters are to be considered as a full width character.

11. CHARACTER SHAPE DEFINITION

11.1 The shapes and dimensions of the OCR-B character for both the letterpress and the constant-strokewidth font 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 62 x full size.

Grid readings should be made for the establishment of work 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 micrometres at full size) and if desired one quarter of a square (5 micrometres at full size) should be possible. The number of readings taken on a character further determines the accuracy of the work drawing.

11.2 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.

Following sets of drawings are available:

- OD 1. Letterpress font, Size I.
- OD 2. Letterpress font, Size I with the grid removed over approximately 2mm around the character outline. This set is particularly suitable for photographic reduction.
- OD 3. Constant-strokewidth font, Size I.
- OD 4. Constant-strokewidth font, Size III.

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

11.3 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 occuring in the printing process.

11.4 Letterpress font, Size I

The nominal printed image of each character is drawn on a reference grid 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 for numerals and capital letters, and of 0,31 mm for small letters, #, % and 3.

11.5 Constant-Strokewidth font, Size I

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

- 0,35 mm for most of the characters,
- 0,31 mm for all small letters, #, % and a.

The centreline and preferred line endings and corners are given in drawings marked "C". Pointers are as in paragraph 11.4.

- 11.5.2 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 CAPITAL LETTER B and CAPITAL LETTER D.
- 11.5.3 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 (see ECMA-15, par. 5.13).

11.6 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. The 21 reference drawings for 0 1 2 3 4 5 6 7 8 9 < + > PLVM C E N S T X and Z are marked "III" and include pointers. Paragraphs 11.5.2 and 11.5.3 also apply.

11.7 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 par. 11.5, 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 x 2,40 = 3,60 mm in size IV, and so on. The nominal strokewidth is:

- 0,50 mm for most of the characters,
- 0,44 mm for all small letters, #, % and a.

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.

2. 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 enclosed 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 as letterpress font and as constant-strokewidth font,
- digit ONE and CAPITAL LETTER E in Size III as constantstrokewidth font.

These reproductions of the original drawings are approximately at scale 62:1.

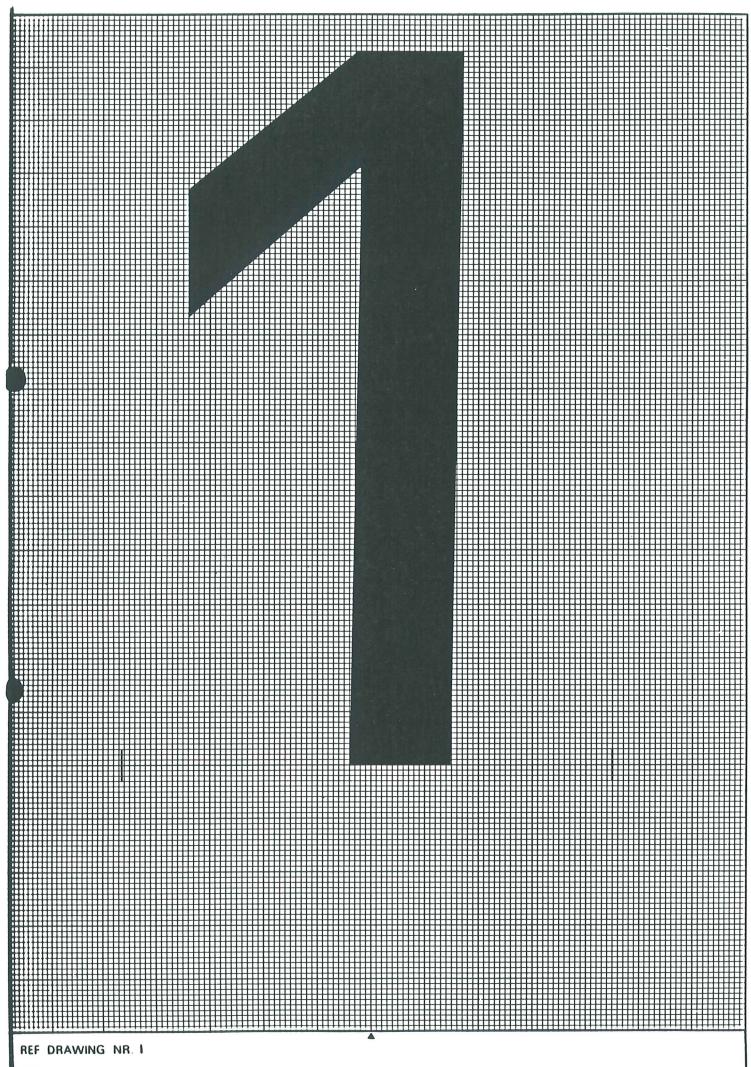
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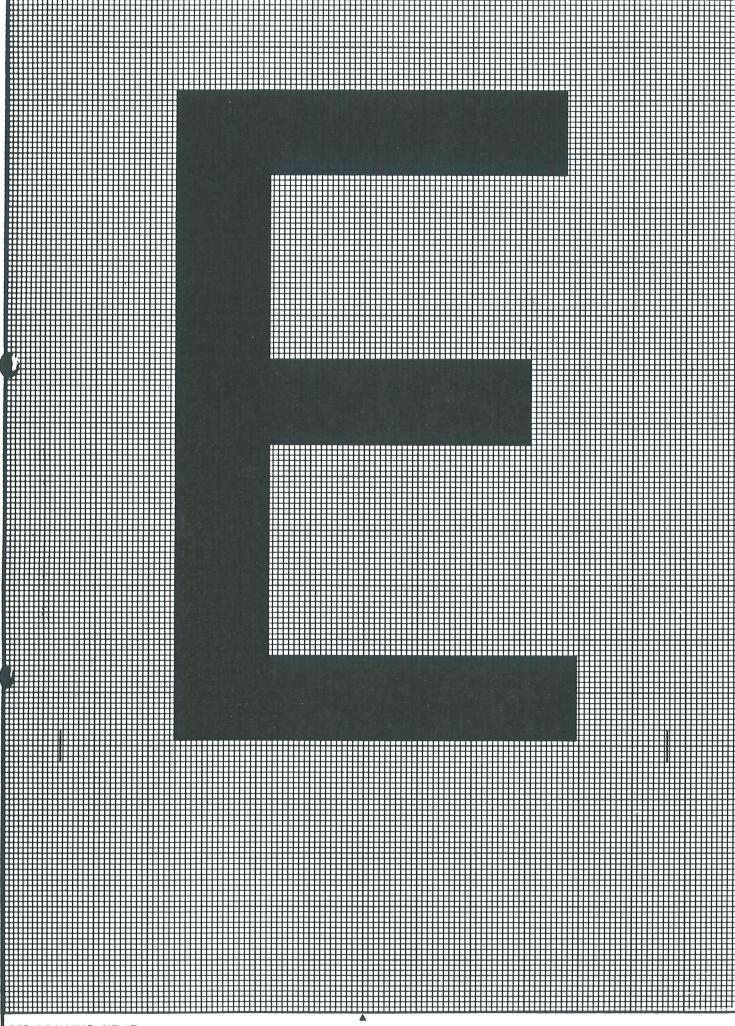
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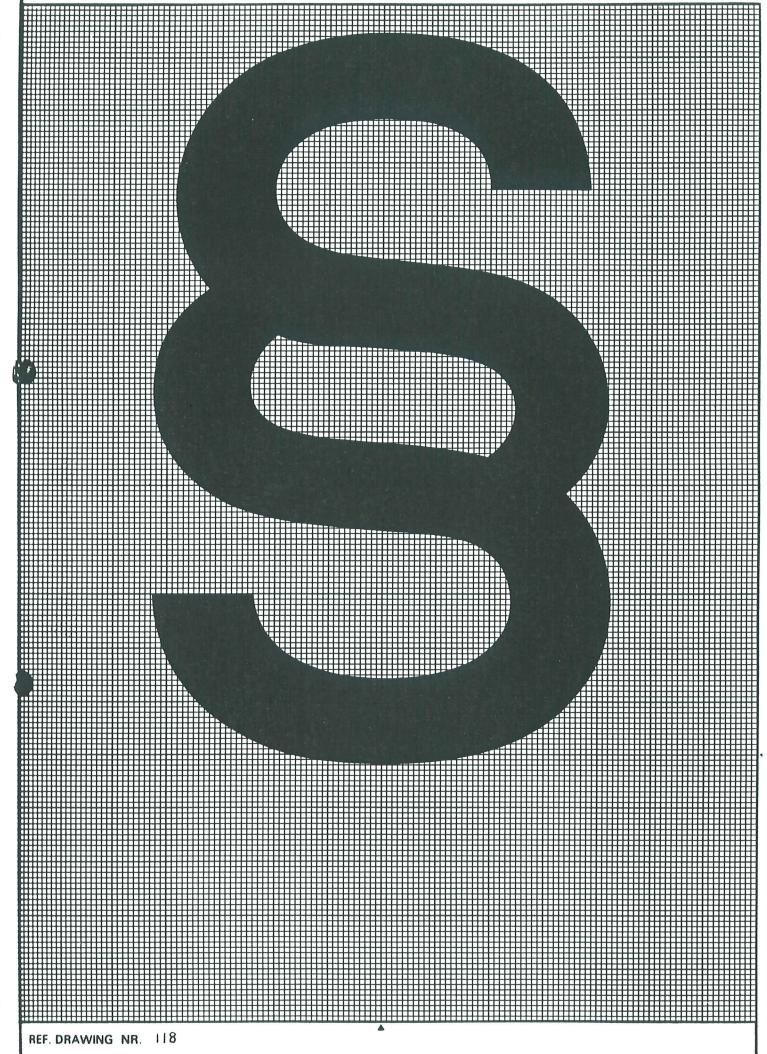
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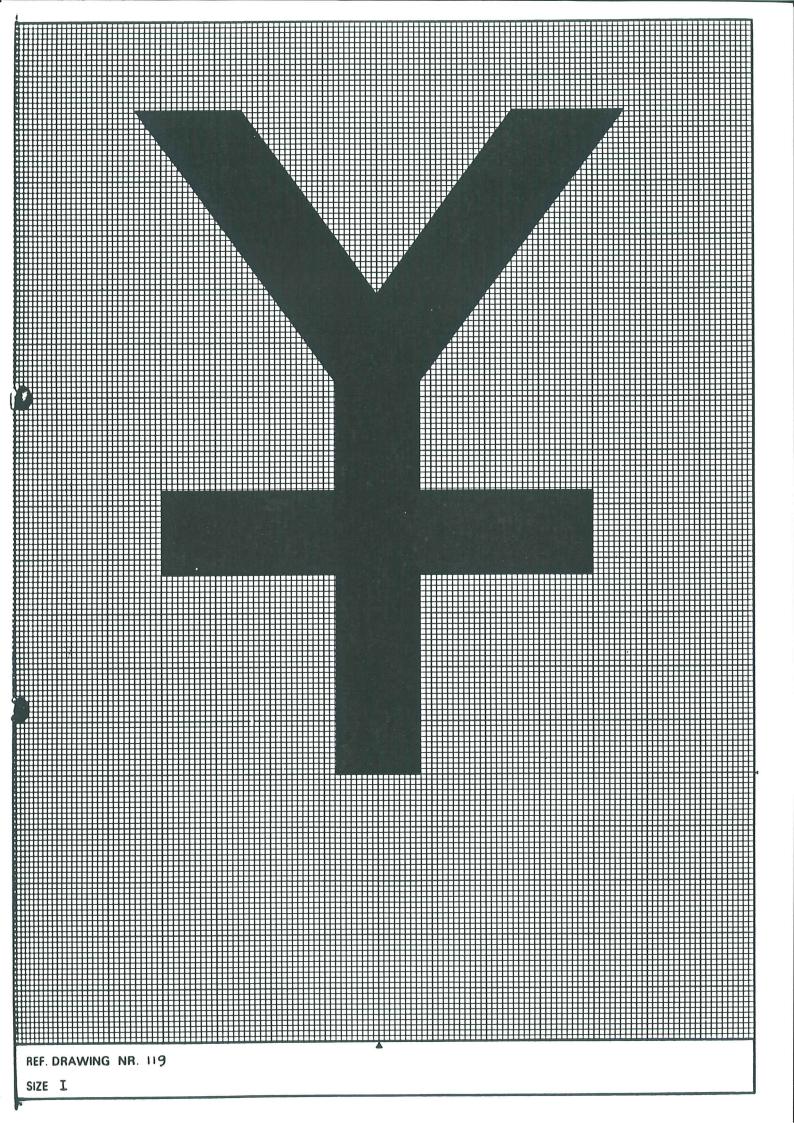
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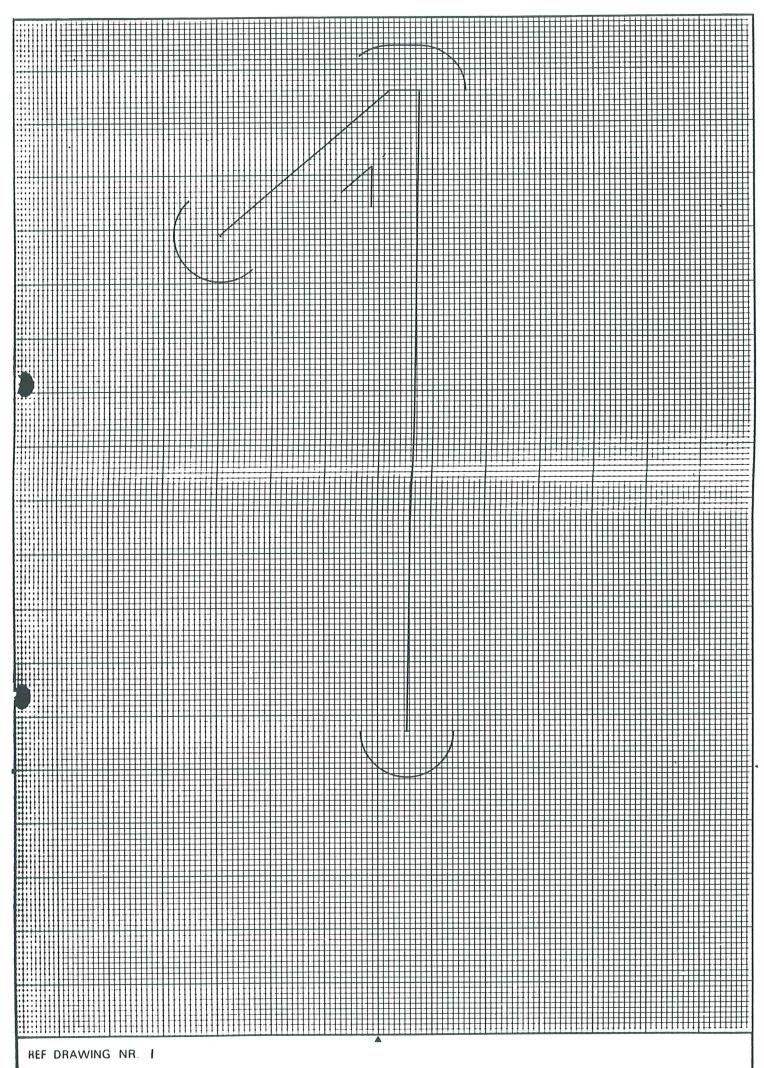


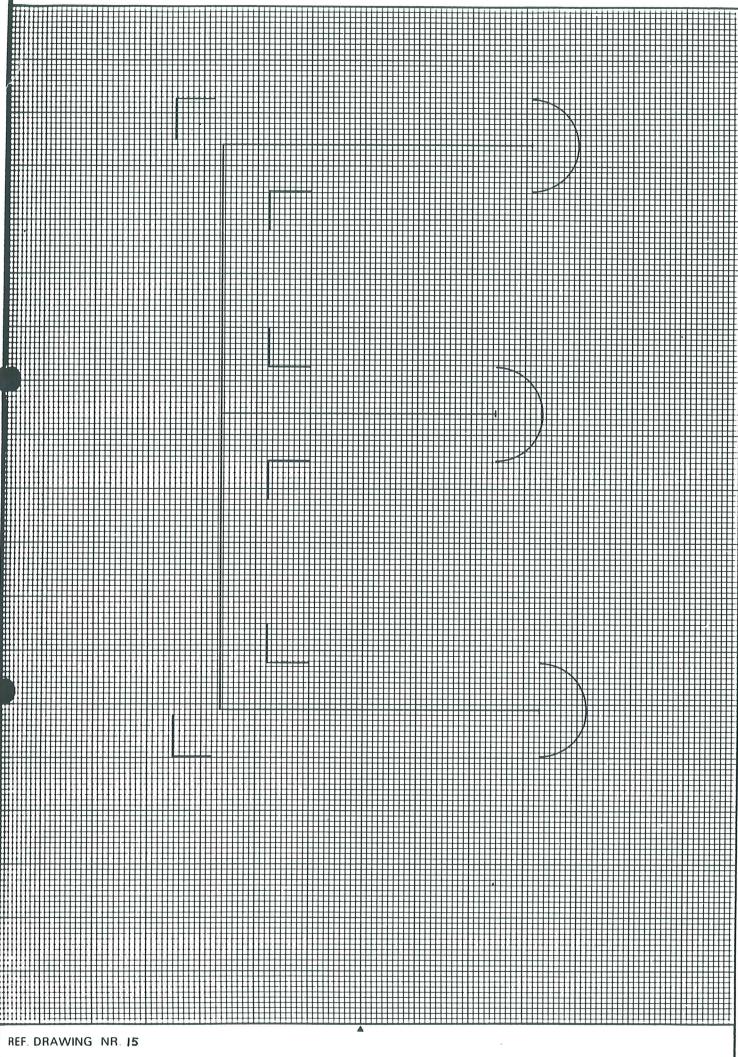


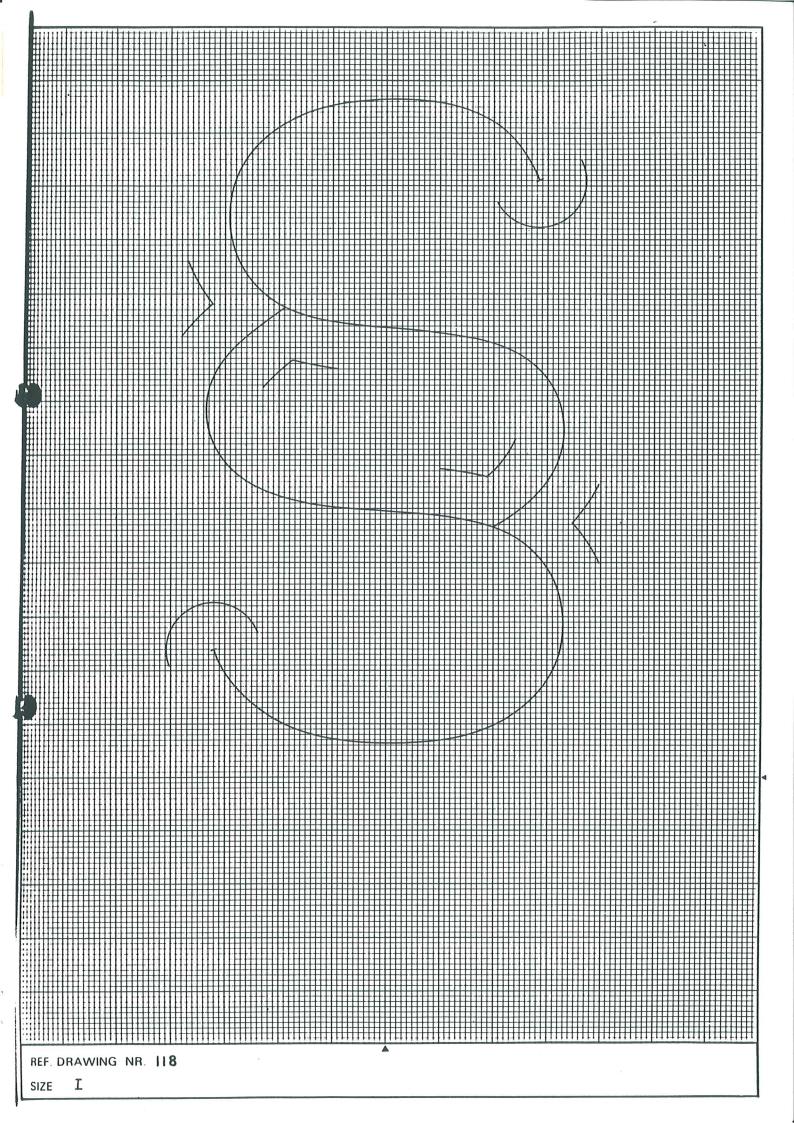


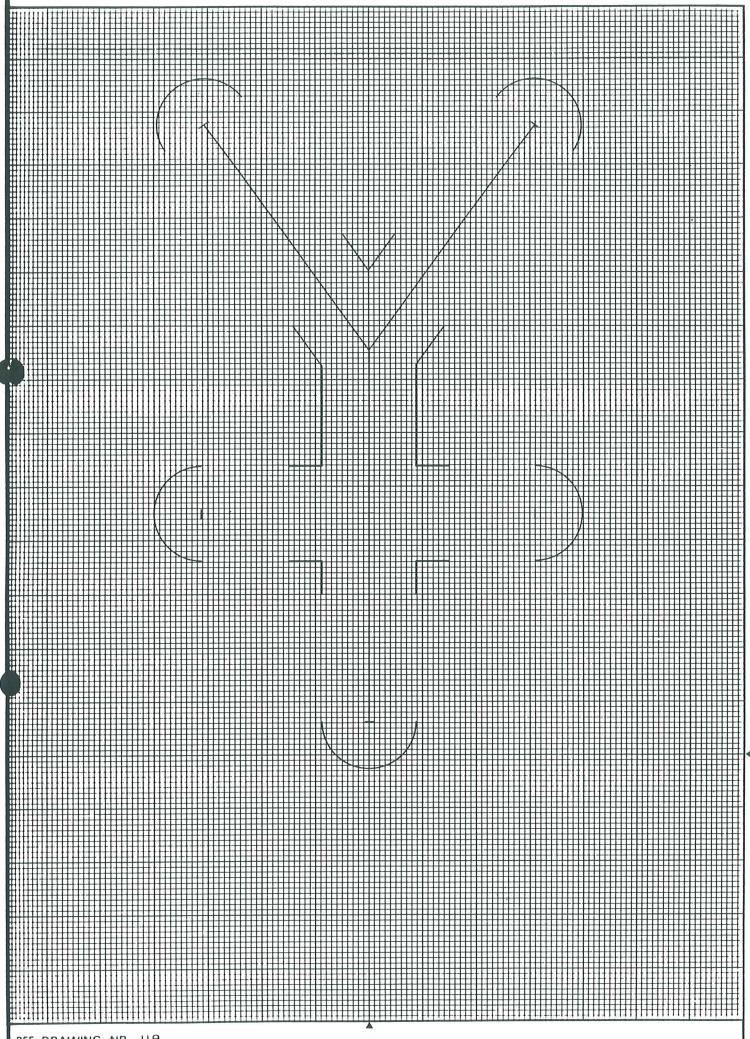
SIZE I

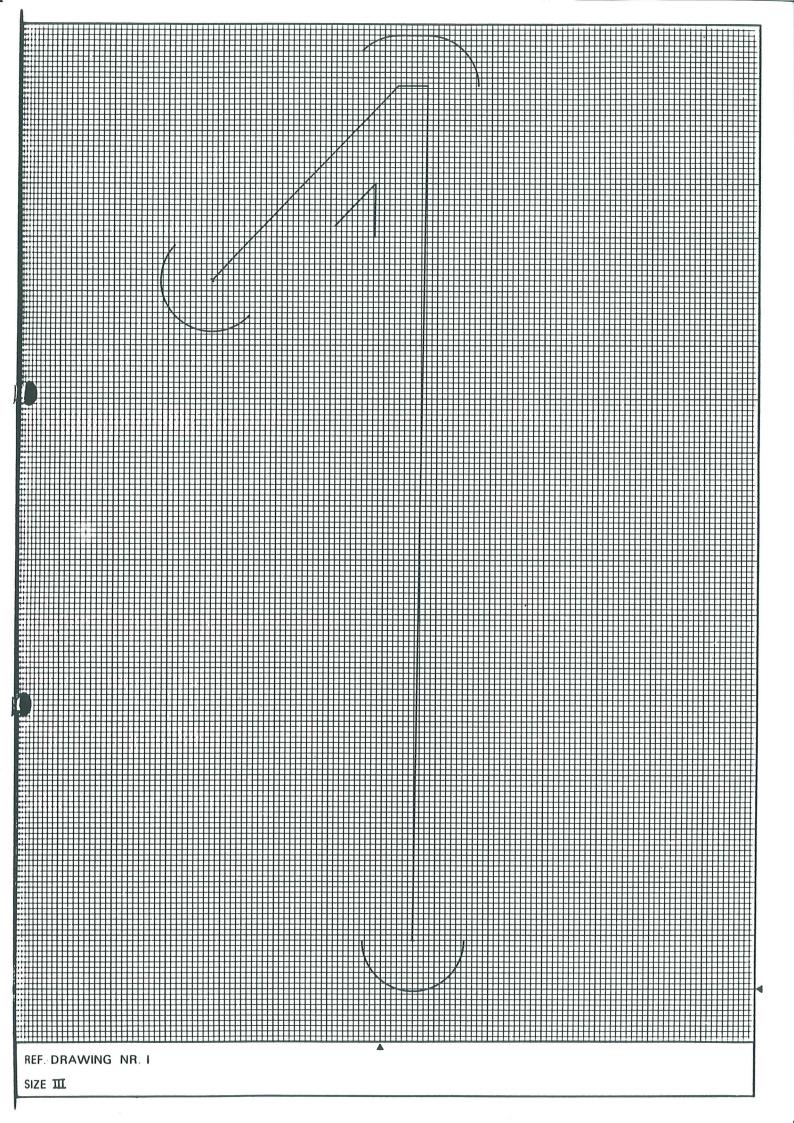


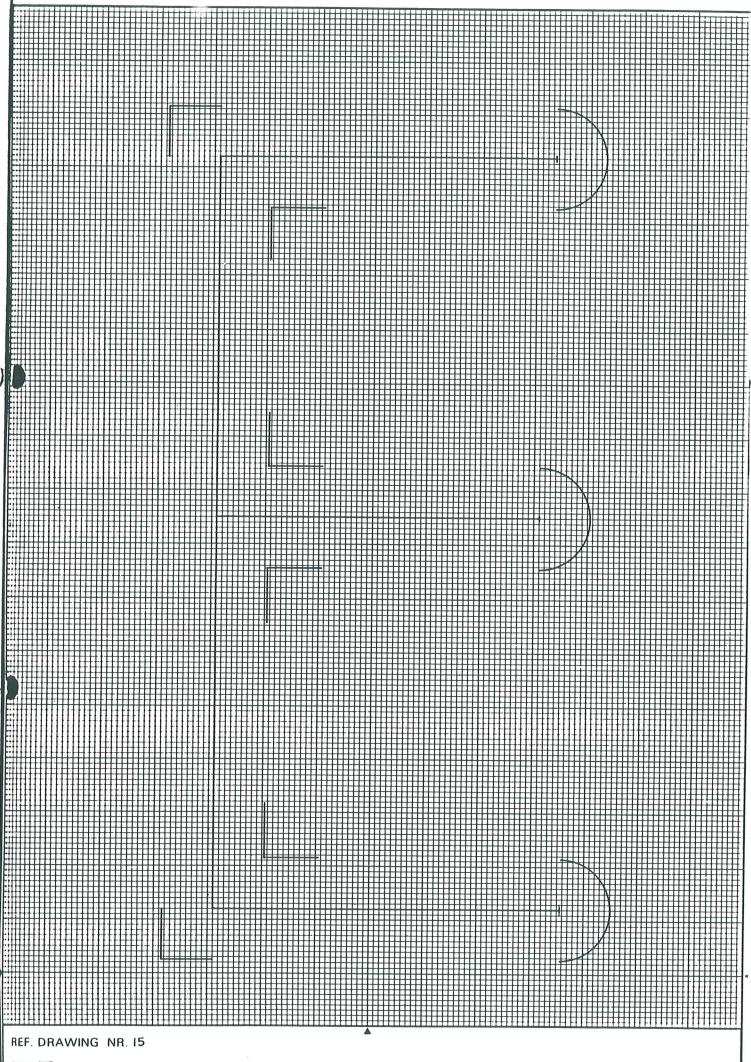












APPENDIX A

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 have 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 ressemblance to the typographic forms to which the human eye is 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 disposal and on his desire to achieve a more typographic appearance of the characters.