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character set for optical character recognition (OCR-B)

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**American National Standard
Character Set for
Optical Character Recognition (OCR-B)**

Secretariat

Computer and Business Equipment Manufacturers Association

Approved January 16, 1975

American National Standards Institute, Inc

American National Standard

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Foreword

(This Foreword is not a part of American National Standard Character Set for Optical Character Recognition (OCR-B), X3.49-1975.)

This standard presents an alphanumeric character set for use in optical character recognition (OCR) systems. There are two standard character sets for machine printing: OCR-A (American National Standard X3.17-1974), and OCR-B (American National Standard X3.49-1975). Both sets include numerals, uppercase and lowercase characters, and special symbols. In the design of character shapes for OCR it is possible to exchange conventional appearance for OCR reading performance (for example, insensitivity to degradation of printing; simplicity of required OCR device design). For the numeric and uppercase character sets of OCR-A the emphasis is on OCR reading performance, while for OCR-B the emphasis is on conventional appearance. The objective is to provide a choice for the user — optimized reading performance or conventional appearance.

The design of OCR-B is an outgrowth of European Computer Manufacturers Association Standard ECMA-11 for the Alphanumeric Character Set OCR-B for Optical Recognition, November 1965, which was also published as character set OCR-B in ISO (International Organization for Standardization) Recommendation R 1073-1969, Alphanumeric Character Sets for Optical Recognition. In 1970 a joint ECMA/ANSI experts group undertook a revision of OCR-B for the purpose of improving OCR readability without affecting its conventional appearance.

The revised version of OCR-B that resulted differs from the November 1965 ECMA-11 and from the May 1969 ISO versions in several respects: (1) a large number of changes have been made to the character shapes; (2) some characters have been added and others removed; (3) Size II has been dropped; and (4) a new Size IV, having the same centerline height to width aspect ratio as Size I, has been added.

The revised OCR-B design described above is the basis for both American National Standard X3.49-1975 and the revised ECMA-11-1975. For the most part the character shapes defined in both of these standards are identical. There are the following exceptions:

- (1) ECMA-11-1975 includes both a constant stroke-width and a letterpress version; American National Standard X3.49-1975 includes only the constant stroke-width version.
- (2) ECMA-11-1975 has a *Vertical Line* and a *Preprinted Long Vertical Mark*; American National Standard X3.49-1975 has only a *Long Vertical Mark*.

At the time of preparation of this standard, ISO Technical Committee 97, Subcommittee 3 (ISO/TC 97/SC 3) on Character and Mark Recognition was in the process of revising ISO R 1073 so that the ISO version of OCR-B, ECMA-11-1975, and American National Standard X3.49-1975 will all be in agreement.

Suggestions for improvement of this standard will be welcome. They should be sent to the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

This standard was processed and approved for submittal to ANSI by American National Standards Committee on Computers and Information Processing, X3. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the X3 Committee had the following members:

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	W. B. Rinehuls (Alt)
	W. B. Robertson (Alt)
Xerox Corporation	J. L. Wheeler

Subcommittee X3A1 on Optical Character Recognition, which developed this standard, had the following members:

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M. A. Butterfield, Vice-Chairman
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J. E. Faldus	S. Lanzatella	B. J. Vincent
D. Fehnel	W. B. Lingo	M. Wilmer
H. S. Fitch	A. Lohan	F. W. Wirdzek
J. J. Forsythe	R. Maihofer	R. Worrall
H. Freeman		J. Yacyk

Other persons who contributed to the development of this standard were:

C. S. Adell
J. P. Ancona
P. E. Baetz
T. C. Bagg
K. Bol
J. L. Crawford
W. A. Dickerson, Sr

D. C. Friedman
M. D. Hogan
C. Jones
A. M. Kader
R. Krolak
N. Lee
J. L. Maddox

D. Mandelson
P. A. Mantek
T. Pealler
H. W. Silsby
O. C. Stokes
B. Tafoya
J. A. Warme

Technical responsibility for the development of this standard was assigned to X3A1 Working Group A on Character Sets and Shapes. During the development period the chairmen of this group were K. Bol and A. Hamburgen. The technical work was carried out by a subcommittee of Working Group A that had the following members:

A. J. Atrubin, Chairman
R. E. Schubert, Former Chairman
K. Bol, Former Chairman

L. M. Andrews
T. C. Bagg
G. Brown
M. A. Butterfield

B. T. Daniels
M. Dorochin
D. C. Friedman

W. E. Holmes
S. Homa
S. Lanzatella
J. L. Rosenblum

The following members of ECMA (European Computer Manufacturers Association) Technical Committee 4 on Optical Character Recognition participated with members of X3A1 in the ECMA/ANSI Experts Work Group on OCR-B meeting held in Paris on November 17-20, 1970:

C. L. Cooreman
J. Dubos
F. Demonte

A. Frutiger
M. Nadler

P. Schröer
H. van Steenis
W. R. Throssel

The original illustration plates for the OCR-B character shapes used in this standard were prepared by the European Computer Manufacturers Association and were made available through the courtesy and assistance of Secretary General Dara Hekimi.

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American National Standard Character Set for Optical Character Recognition (OCR-B)

1. General

1.1 Scope. This standard describes nominal shapes, sizes, and printing positions of OCR-B alphanumeric characters and symbols for optical character recognition (OCR) systems.

1.2 Purpose. The purpose of this standard is to establish a standard character set and character specifications for use in optical character recognition systems. It is the further purpose of this standard to provide a character set in which the conventional appearance of the characters has not been compromised for purposes of increasing OCR distinguishability. In order to accommodate a wide variety of OCR applications, the character repertoire includes numerals, uppercase and lowercase characters, and special symbols in three different sizes.

1.3 Application. This standard specifies the OCR-B nominal printed character images. This standard does not specify how to make type that will print the nominal characters. The design of type (or other printing apparatus) must be inferred from the required printed character shape and from the systematic printing effects and distortions inherent in the equipment of concern.

This standard may also be used as the design basis for OCR devices for reading OCR-B.

Typically, OCR applications will not require all of the characters defined in this standard and it is understood that equipment said to be in conformance with this standard will not necessarily accommodate the complete OCR-B repertoire. Forthcoming standards will define standard subsets of the OCR-B character set.¹ Meanwhile, the user is advised to consult with equipment manufacturers to determine the character repertoire that is available on each particular piece of equipment.

¹ Work on such additional standards is presently being undertaken by Subcommittee X3A1 on Optical Character Recognition, of American National Standards Committee X3.

In order to accommodate a variety of applications, OCR printing or reading equipment may offer a large number of the OCR-B characters. In any particular application the indiscriminate use of an unnecessarily large subset may result in additional costs and poorer performance. It is recommended that users consult with equipment manufacturers in order to make a judicious selection of an appropriately small subset of characters for each application.

The implementation of a successful OCR system may involve considerations that are beyond the scope of this standard; for example, the characteristics of the paper on which the printing appears or the accuracy with which the actual printed characters approach the nominal character shape (print quality). These considerations will be discussed in future standards.¹

2. Standard Characters

2.1 Character Shapes. The character shapes are defined by precise master drawings on stable material. The master drawings are kept by the National Bureau of Standards (NBS); the procedure for obtaining accurate, stable copies is given in Section 3. Paper reproductions of the drawings are also available from NBS for use when precision of scale is unimportant.

The drawings show the centerlines of the character strokes. The full character comprises the area covered by a circle of diameter equal to the stroke width which is placed with its center on the character centerline and made to traverse the entire extent of the centerline. In the vicinity of stroke endings or intersections there may be exceptions to the general rule. All stroke edges in the vicinity of stroke endings and intersections are shown on the master drawings.

Size I characters are drawn at 100X full size and are superimposed on an accurate rectangular grid of 2-mm (0.0787-inch) resolution. The purpose of the grid is to enable the character shape to be determined approximately by counting of grid squares. This is possible even from inaccurately reproduced copies.

The drawings show external square corners on characters such as "B," "D," "E," "F," "G," and the like. It is important for reliable OCR performance, especially on "B" and "D," that these corners be made as square as is practical. It is advised that special attention be given to this in the design of type.

2.2 Character Sizes. The characters are specified in three different sizes in order to provide for their use with a wide range of printing equipment. These sizes are denoted I, III, and IV. The sizes are related to one another by separate vertical and horizontal scale factors. These factors relate to the centerline heights and widths. Since the nominal stroke widths are not proportional to the centerline dimensions, these factors do not apply to the overall printed dimensions. Relative to Size I the other centerline sizes are larger by the following factors:

<i>Size</i>	<i>Vertical</i>	<i>Horizontal</i>
III	1.333	1.086
IV	1.500	1.500

Of the 10 digits and 26 capital letters, the characters "8" and "0" (Zero) are of maximum height and width. These centerline heights are nominally:

<i>Size</i>	<i>Nominal Centerline Height of Characters "8" and "0"</i>
I	0.094 inch (2.39 mm)
III	0.126 inch (3.20 mm)
IV	0.141 inch (3.58 mm)

These centerline widths are nominally:

<i>Size</i>	<i>Nominal Centerline Width of Characters "8" and "0"</i>
I	0.055 inch (1.40 mm)
III	0.060 inch (1.52 mm)
IV	0.083 inch (2.10 mm)

The nominal stroke widths for most characters of each size are:

<i>Size</i>	<i>Nominal Stroke Width</i>
I	0.014 inch (0.35 mm)
III	0.015 inch (0.38 mm)
IV	0.020 inch (0.50 mm)

Exceptions to these nominal stroke widths are as follows: All small letters and the symbols "#," "%," and "@" have nominal stroke widths of 0.012 inch (0.31 mm) for Size I and 0.017 inch (0.44 mm) for Size IV. (None of these characters are used in Size III — see 2.3.)

A description of the Size-I master drawings is given

in 2.1. (Reduced size reproductions of the Size-I drawings are shown in Fig. 1 through 96 and Fig. 117 through 140.)

Size-IV character centerlines can be derived from the same set of master drawings by a magnification factor of 1.5 (except for Fig. 91, 93, 95, 96, and 138). (Note that the stroke edges shown are properly located for Size I but not for Size IV.)

Separate master drawings are available for Size III at 100:1 scale. (Reduced size reproductions of the Size-III drawings are shown in Fig. 91, 93, and 97 through 116.)

2.3 Character Repertoire. The OCR-B repertoire *for OCR usage* is comprised of the characters listed in Table 1. The characters are keyed to the master drawings by the "Reference Drawing Number" (RDN). An "X" is included in the columns labeled Size I, III, or IV when the character of that row is included in the standard at that size. For OCR usage each character is used in a stand-alone manner. For example, the character "Continuous Underline" stands as an individual character and is not combined with other characters to form composites.

Additionally, OCR-B includes characters or symbols that increase the usefulness of the font in non-OCR applications. These extended repertoire characters are listed in Table 2.

Composite characters may be formed by combining accents or underlines with other characters. This is accomplished by superimposing their horizontal baselines and their print position centerlines (see 2.5). Neither the characters listed in Table 2 nor the composite characters that may be formed were especially designed for OCR. This, however, does not preclude the possibility that some of them can be so used. The OCR use of these characters should be undertaken only in consultation with the manufacturers of the printing and OCR equipment.

The OCR-B characters for OCR usage, and for the extended repertoire, are illustrated in Fig. 1 through 116 and Fig. 117 through 140, respectively. They are reduced from the 100X-size master drawings to a size suitable for use in this standard. The original reference grid is 2 mm by 2 mm and dimensional relationships may be inferred by counting grid squares, if desired. The user is referred to the stable-base master drawings (see Section 3) for any situation requiring precision of detail. The complete set of characters for OCR usage is illustrated in Fig. 141; the extended repertoire character set is shown in Fig. 142. (Fig. 95, 96, and 138 are Size I only; Fig. 97 through 116 are Size III only; Fig. 91 and 93 are Sizes I, III, and IV; all other figures are Sizes I and IV.)

Table 1
Repertoire for OCR Usage

Fig.	RDN	Shape	Name	Sizes		
				I	III	IV
1, 97	1	1	Digit One	X	X	X
2, 98	2	2	Digit Two	X	X	X
3, 99	3	3	Digit Three	X	X	X
4, 100	4	4	Digit Four	X	X	X
5, 101	5	5	Digit Five	X	X	X
6, 102	6	6	Digit Six	X	X	X
7, 103	7	7	Digit Seven	X	X	X
8, 104	8	8	Digit Eight	X	X	X
9, 105	9	9	Digit Nine	X	X	X
10, 106	10	0	Digit Zero	X	X	X
11	11	A	Capital Letter A	X		X
12	12	B	Capital Letter B	X		X
13, 107	13	C	Capital Letter C	X	X	X
14	14	D	Capital Letter D	X		X
15, 108	15	E	Capital Letter E	X	X	X
16	16	F	Capital Letter F	X		X
17	17	G	Capital Letter G	X		X
18	18	H	Capital Letter H	X		X
19	19	I	Capital Letter I	X		X
20	20	J	Capital Letter J	X		X
21	21	K	Capital Letter K	X		X
22	22	L	Capital Letter L	X		X
23	23	M	Capital Letter M	X		X
24, 109	24	N	Capital Letter N	X	X	X
25	25	O	Capital Letter O	X		X
26	26	P	Capital Letter P	X		X
27	27	Q	Capital Letter Q	X		X
28	28	R	Capital Letter R	X		X
29, 110	29	S	Capital Letter S	X	X	X
30, 111	30	T	Capital Letter T	X	X	X
31	31	U	Capital Letter U	X		X
32	32	V	Capital Letter V	X		X

(Continued on next page)

Table 1 — *Continued*

Fig.	RDN	Shape	Name	Sizes		
				I	III	IV
33	33	W	Capital Letter W	X		X
34, 112	34	X	Capital Letter X	X	X	X
35	35	Y	Capital Letter Y	X		X
36, 113	36	Z	Capital Letter Z	X	X	X
37	37	a	Small Letter A	X		X
38	38	b	Small Letter B	X		X
39	39	c	Small Letter C	X		X
40	40	d	Small Letter D	X		X
41	41	e	Small Letter E	X		X
42	42	f	Small Letter F	X		X
43	43	g	Small Letter G	X		X
44	44	h	Small Letter H	X		X
45	45	i	Small Letter I	X		X
46	46	j	Small Letter J	X		X
47	47	k	Small Letter K	X		X
48	48	l	Small Letter L	X		X
49	49	m	Small Letter M	X		X
50	50	n	Small Letter N	X		X
51	51	o	Small Letter O	X		X
52	52	p	Small Letter P	X		X
53	53	q	Small Letter Q	X		X
54	54	r	Small Letter R	X		X
55	55	s	Small Letter S	X		X
56	56	t	Small Letter T	X		X
57	57	u	Small Letter U	X		X
58	58	v	Small Letter V	X		X
59	59	w	Small Letter W	X		X
60	60	x	Small Letter X	X		X
61	61	y	Small Letter Y	X		X
62	62	z	Small Letter Z	X		X
63	63	*	Asterisk	X		X
64, 114	64	+	Plus Sign	X	X	X
65	65	—	Hyphen (Minus Sign)	X		X

(Continued on next page)

Table 1 — Continued

Fig.	RDN	Shape	Name	Sizes		
				I	III	IV
66	66	=	Equals Sign	X		X
67	67	/	Slant	X		X
68	68	.	Period (Decimal Point)	X		X
69	69	,	Comma	X		X
70	70	:	Colon	X		X
71	71	;	Semicolon	X		X
72	72	"	Quotation Mark	X		X
73	73	'	Apostrophe (Opening or Closing Single Quotation Mark)	X		X
74	74	_	Discontinuous Underline	X		X
75	75	?	Question Mark	X		X
76	76	!	Exclamation Point	X		X
77	77	(	Opening Parenthesis	X		X
78	78	)	Closing Parenthesis	X		X
79, 115	79	<	Less Than Sign	X	X	X
80, 116	80	>	Greater Than Sign	X	X	X
81	81	[	Opening Bracket	X		X
82	82	]	Closing Bracket	X		X
83	83	%	Percent Sign	X		X
84	84	#	Number Sign	X		X
85	85	&	Ampersand	X		X
86	86	@	Commercial At	X		X
87	87	^	Upward Arrowhead	X		X
88	88	¤	Currency Sign	X		X
89	89	£	Pound Sign	X		X
90	90	\$	Dollar Sign	X		X
91	92	|	Long Vertical Mark*	X	X	X
92	93	\	Reverse Slant	X		X
93	117		Character Space†	X	X	X
94	119	¥	Yen Sign	X		X
95	120	■	Character Erase‡	X		
96	121	—	Group Erase§	X		

*See 2.4.3.

‡See 2.4.4.

†See 2.4.2.

§See 2.4.5.

Table 2
Extended Repertoire

Fig.	RDN	Shape	Name	Sizes	
				I	IV
117	94	Ä	Capital Letter Ä (A Umlaut)	X	X
118	95	Å	Capital Letter Å (A Angstrom)	X	X
119	96	Æ	Capital Letter AE	X	X
120	97	Ö	Capital Letter Ö (O Umlaut)	X	X
121	98	Ø	Capital Letter Ø (O Oersted)	X	X
122	99	Ü	Capital Letter Ü (U Umlaut)	X	X
123	100	IJ	Capital Letter Dutch IJ	X	X
124	101	Ñ	Capital Letter Ñ (N Tilde)	X	X
125	102	ä	Small Letter Ä (Small Letter A Angstrom)	X	X
126	103	æ	Small Letter AE	X	X
127	104	ø	Small Letter Ø (Small Letter O Oersted)	X	X
128	105	ij	Small Letter Dutch IJ	X	X
129	106	ß	Small Letter German Double S (S Sharp)	X	X
130	107	¨	Diaeresis	X	X
131	108	´	Acute Accent	X	X
132	109	`	Grave Accent (Opening Single Quotation Mark)	X	X
133	110	^	Circumflex Accent	X	X
134	111	~	Tilde	X	X
135	112	,	Cedilla	X	X
136	113	{	Opening Brace	X	X
137	114	}	Closing Brace	X	X
138	115	ₘ	Alternative Small Letter M (Variable Pitch Only)	X	
139	116	—	Continuous Underline	X	X
140	118	§	Section Sign	X	X

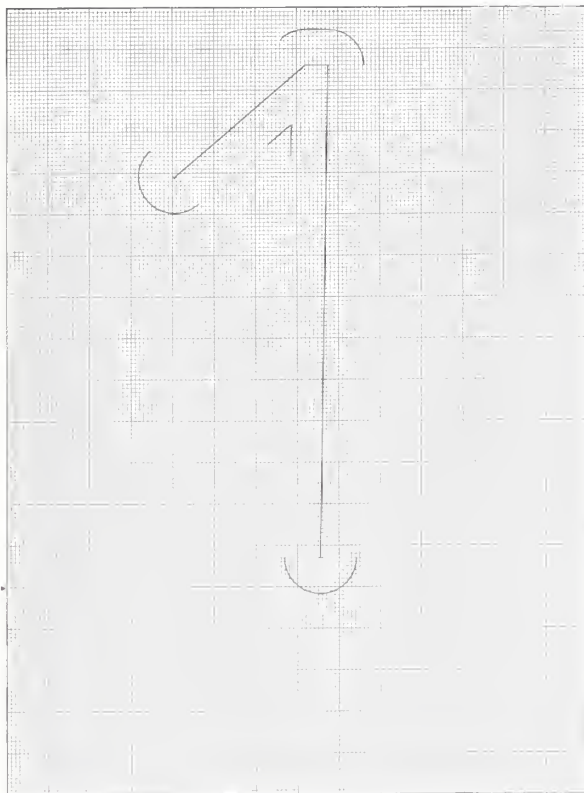


Fig. 1
Digit One (RDN 1)

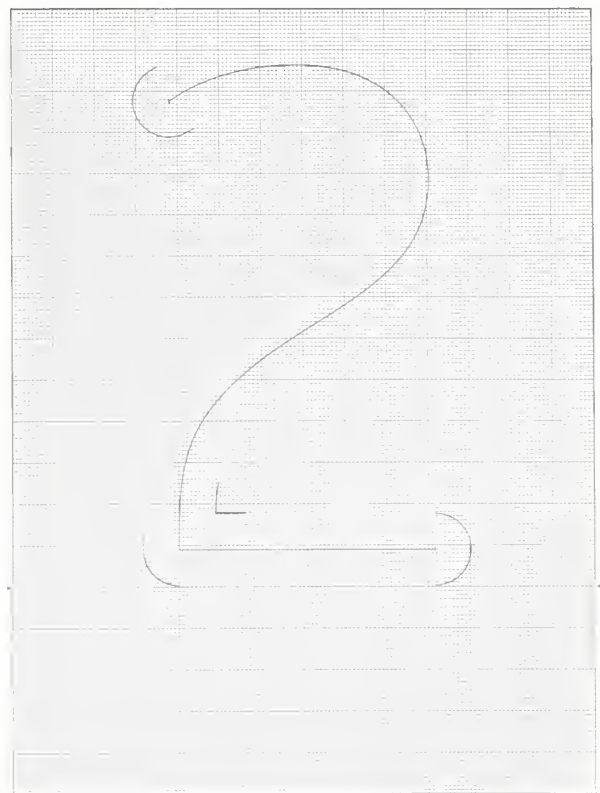


Fig. 2
Digit Two (RDN 2)

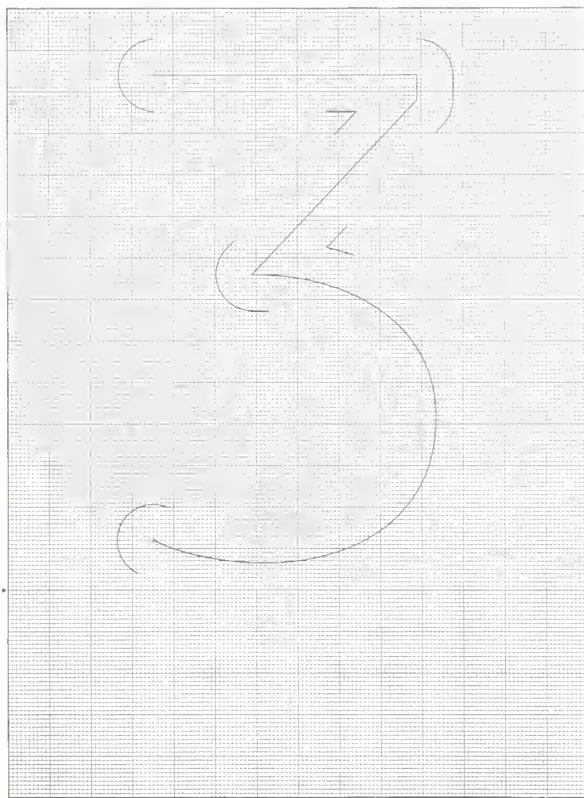


Fig. 3
Digit Three (RDN 3)

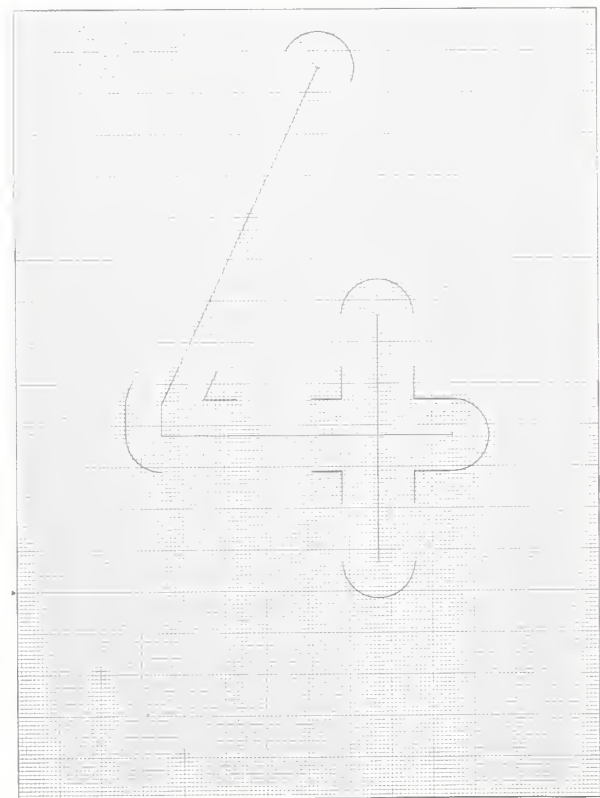


Fig. 4
Digit Four (RDN 4)

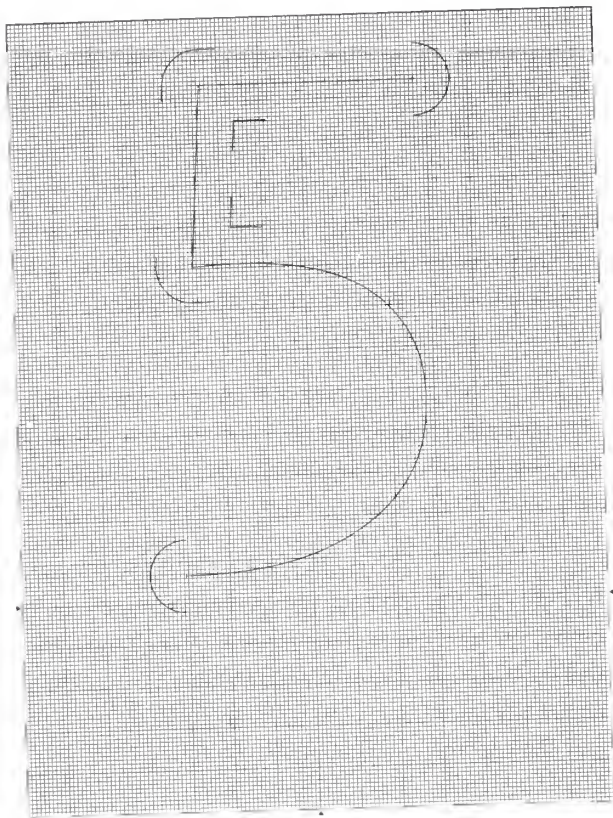


Fig. 5
Digit Five (RDN 5)

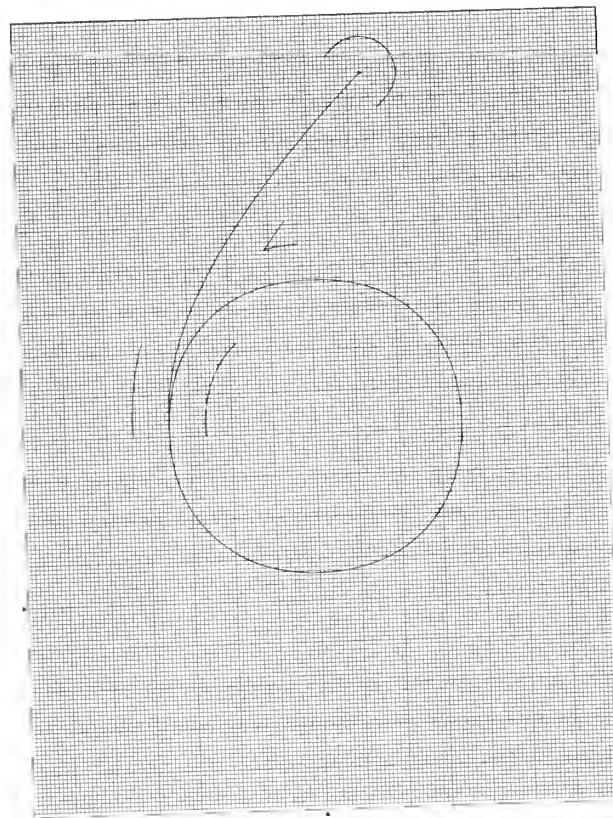


Fig. 6
Digit Six (RDN 6)

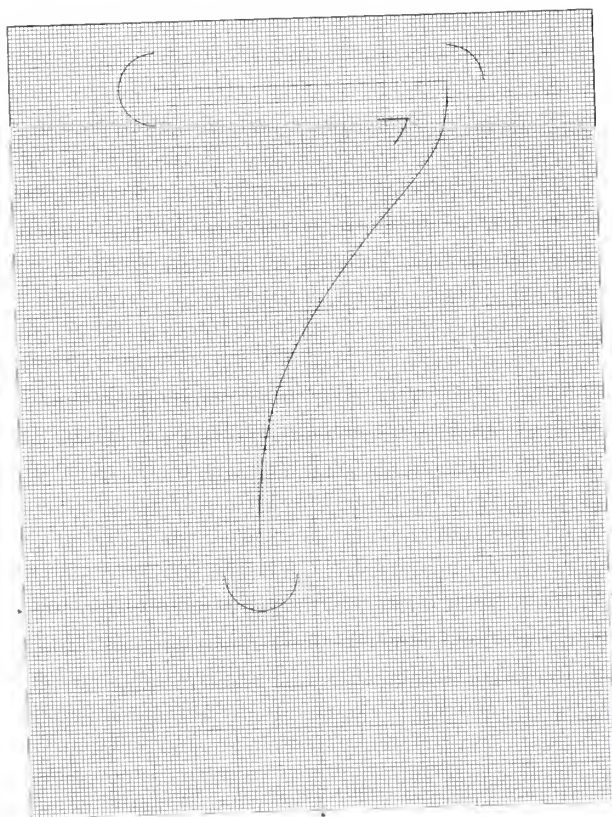


Fig. 7
Digit Seven (RDN 7)

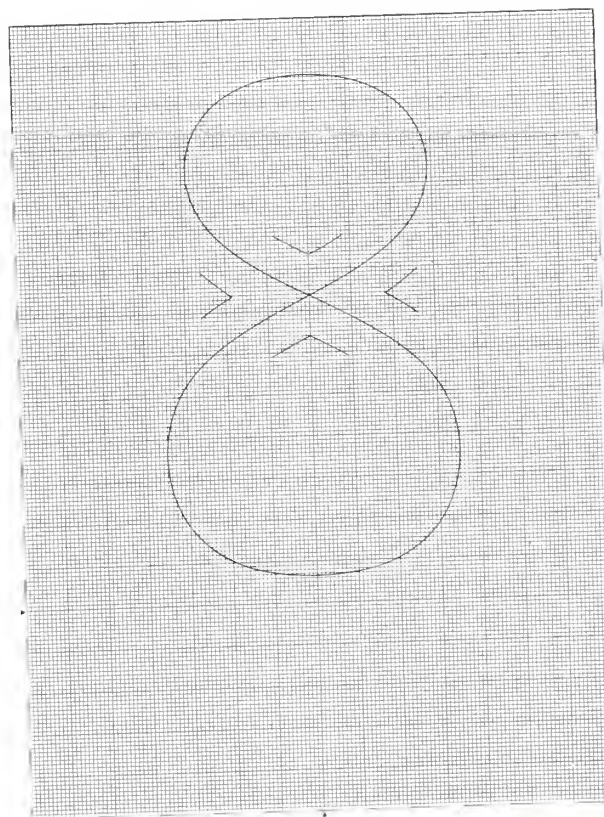


Fig. 8
Digit Eight (RDN 8)

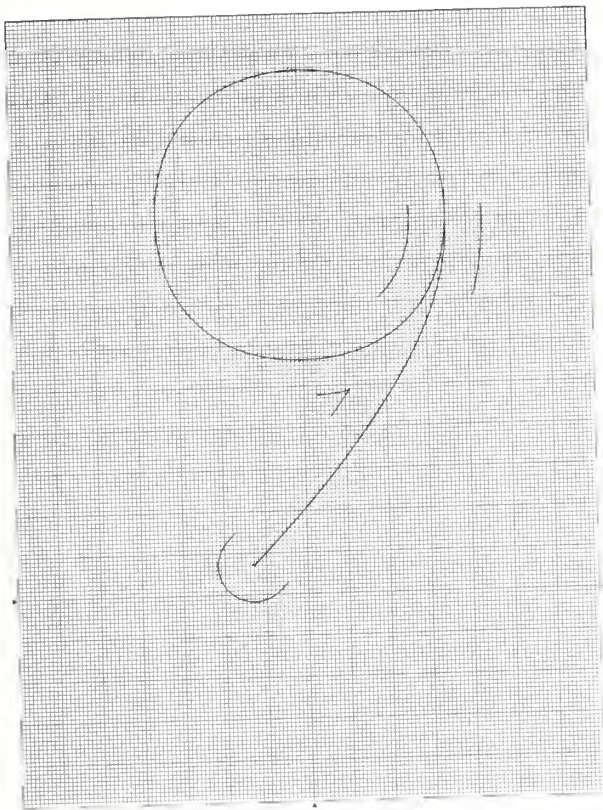


Fig. 9
Digit Nine (RDN 9)

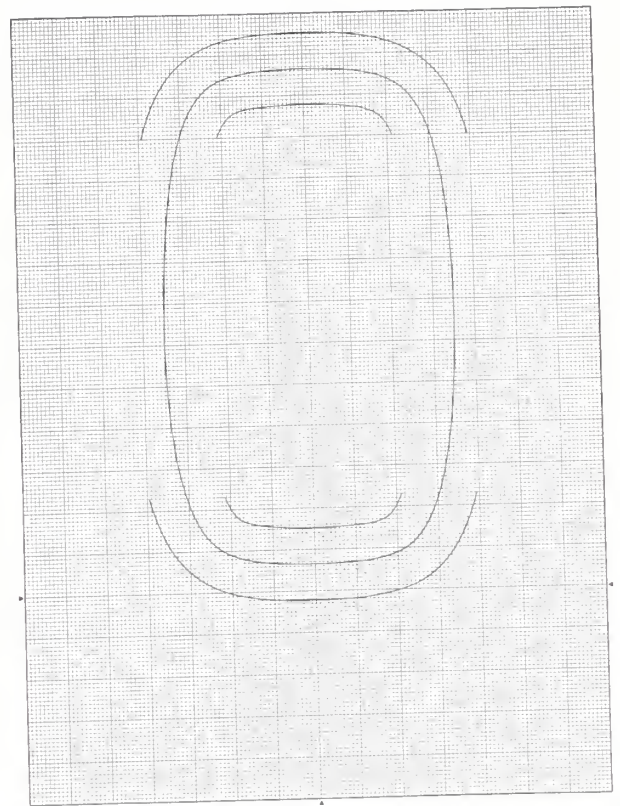


Fig. 10
Digit Zero (RDN 10)

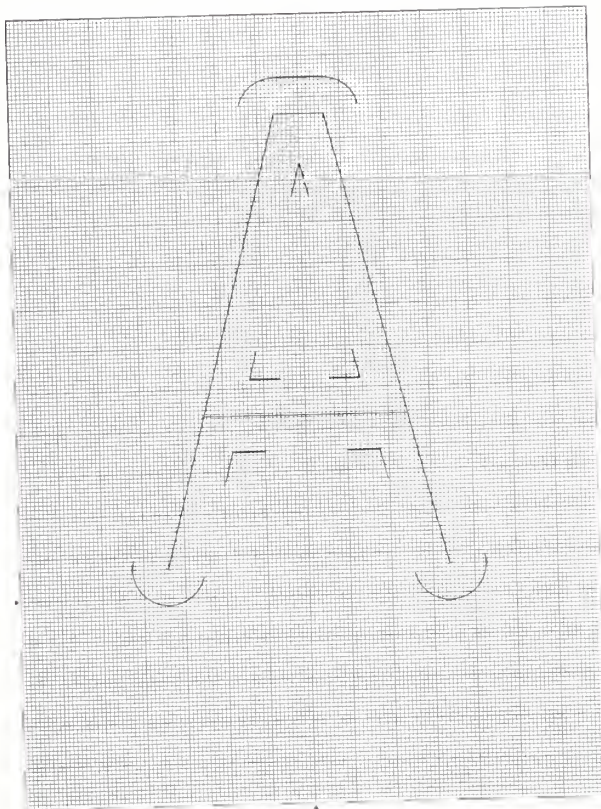


Fig. 11
Capital Letter A (RDN 11)

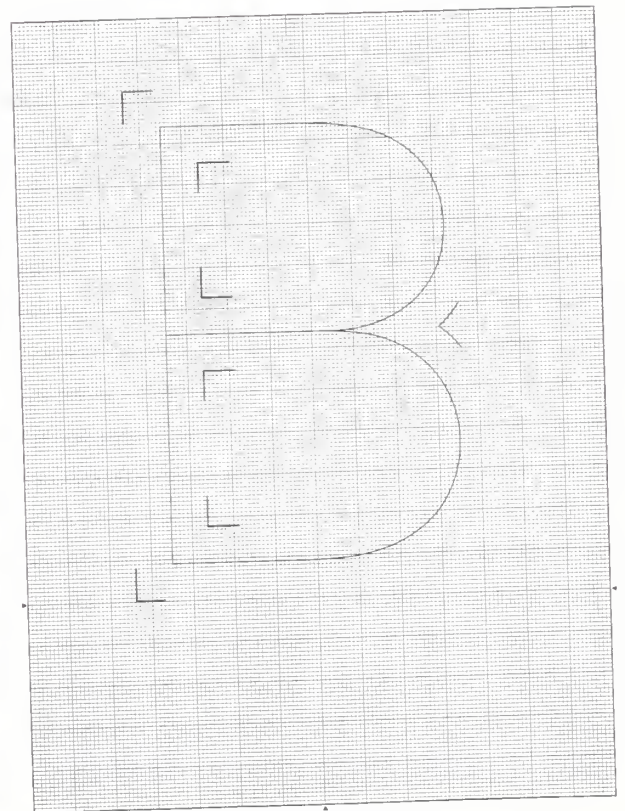


Fig. 12
Capital Letter B (RDN 12)

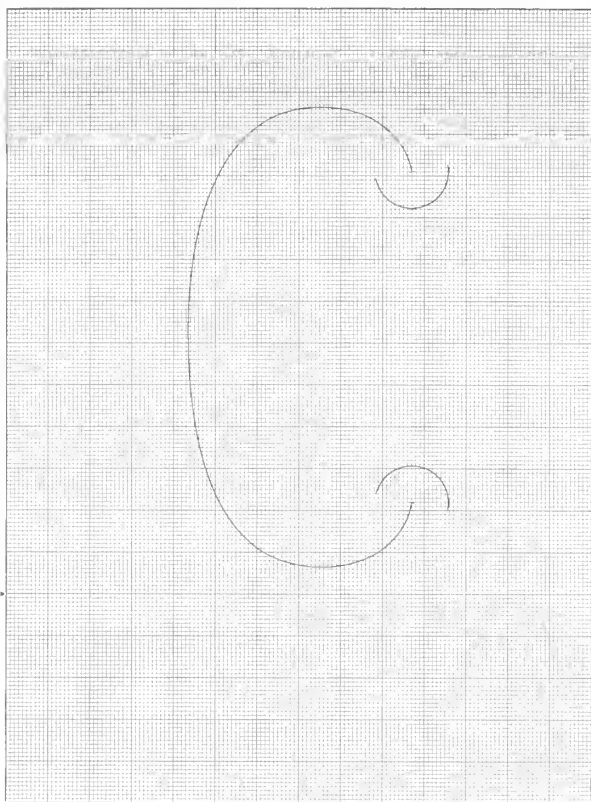


Fig. 13
Capital Letter C (RDN 13)

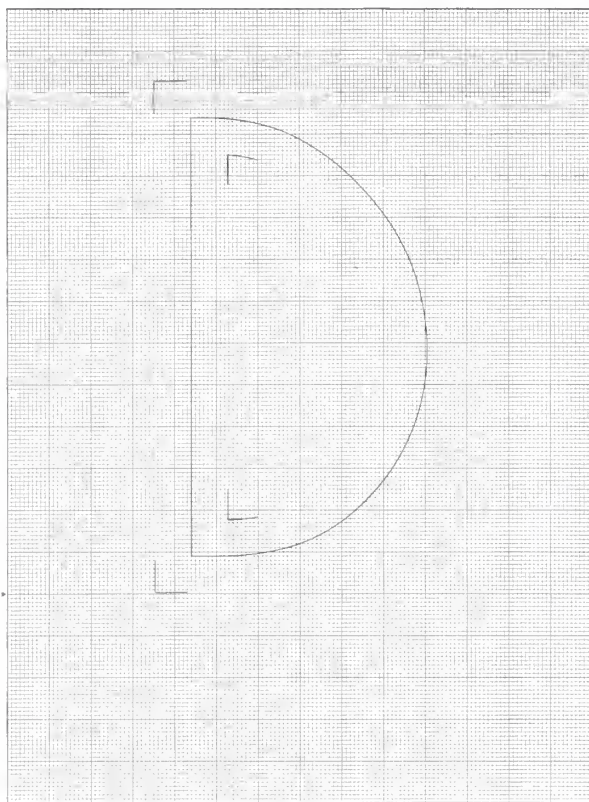


Fig. 14
Capital Letter D (RDN 14)

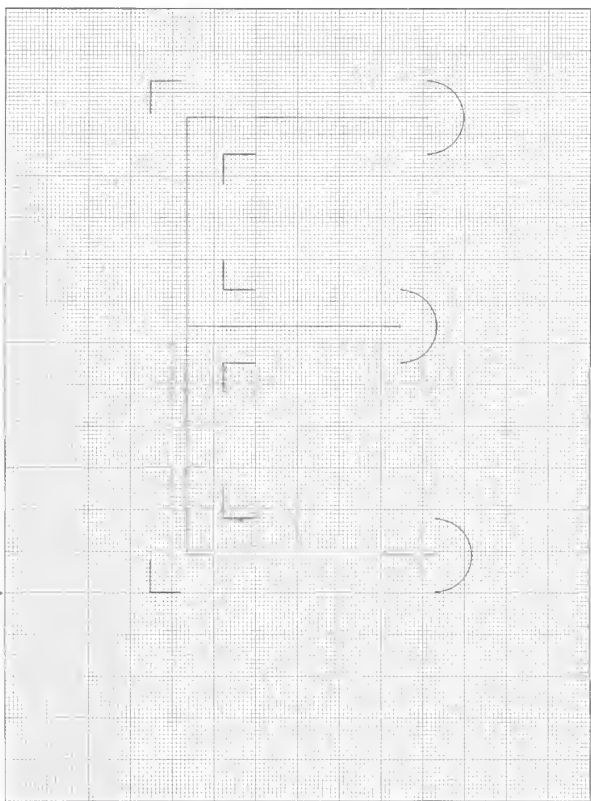


Fig. 15
Capital Letter E (RDN 15)

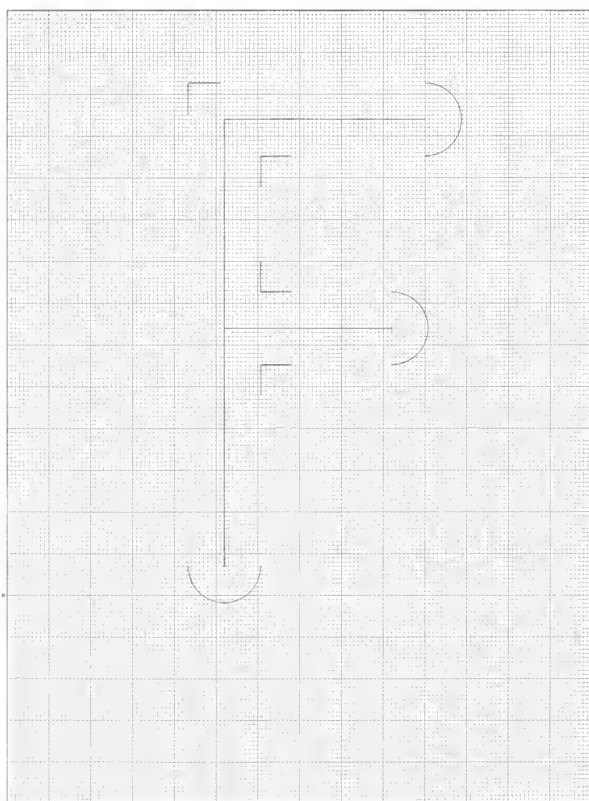


Fig. 16
Capital Letter F (RDN 16)

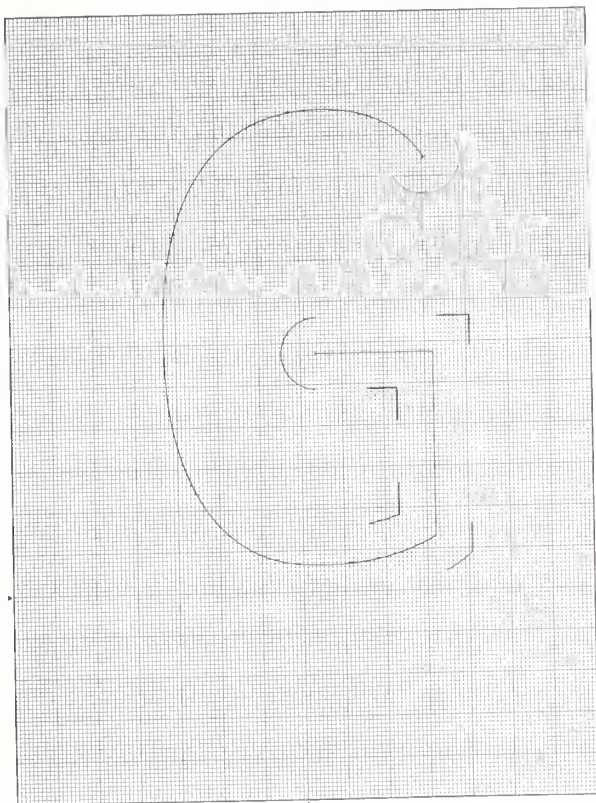


Fig. 17
Capital Letter G (RDN 17)

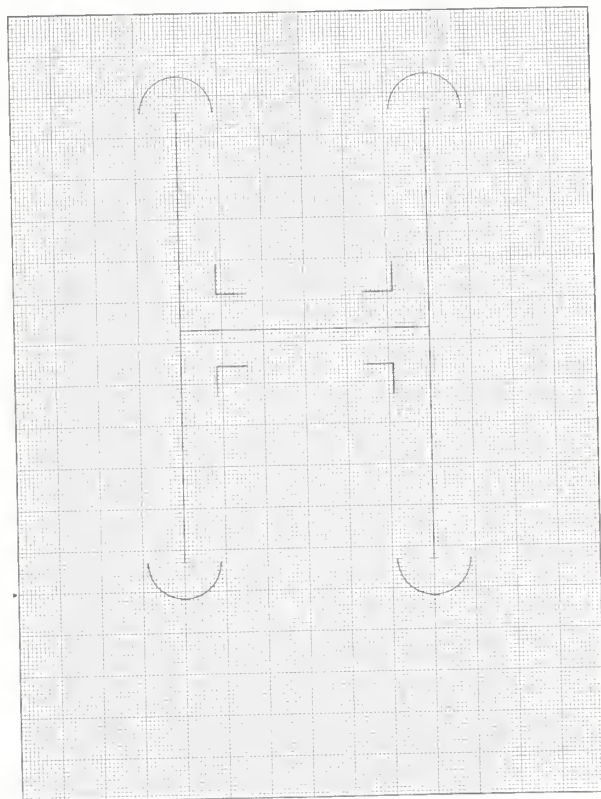


Fig. 18
Capital Letter H (RDN 18)

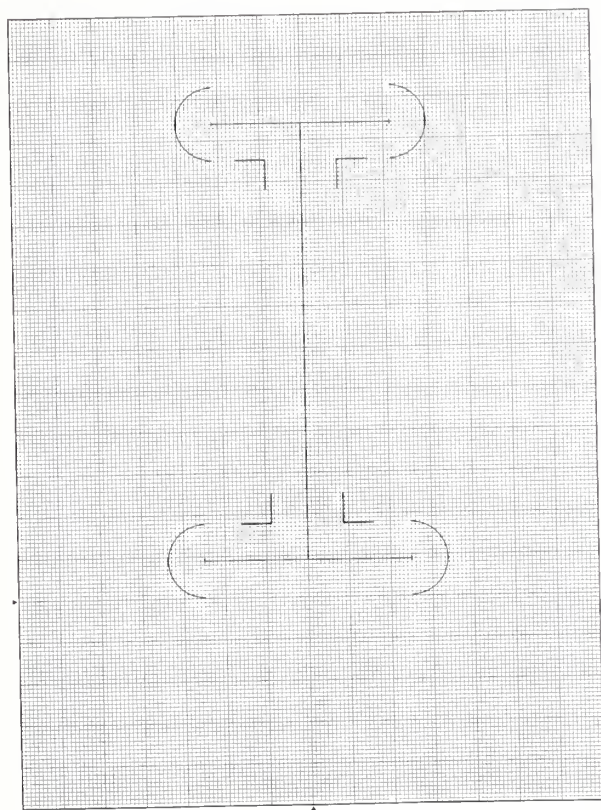


Fig. 19
Capital Letter I (RDN 19)

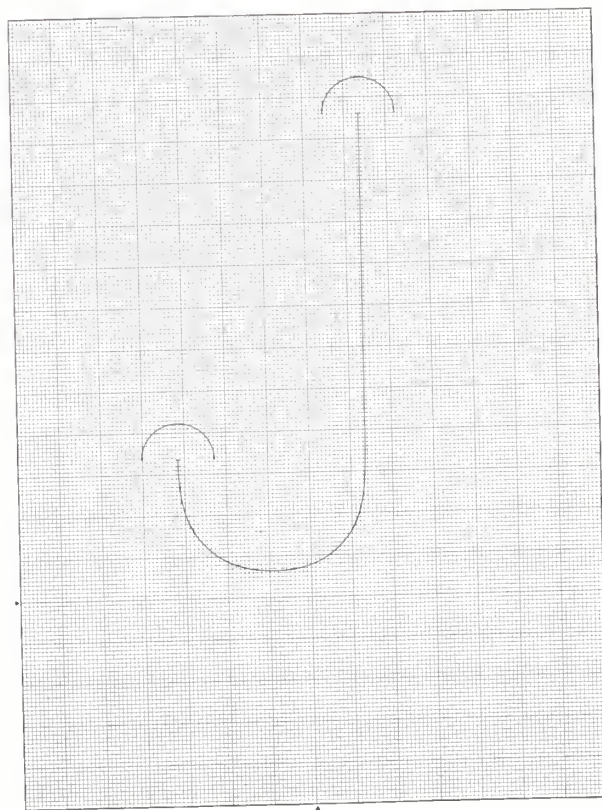


Fig. 20
Capital Letter J (RDN 20)

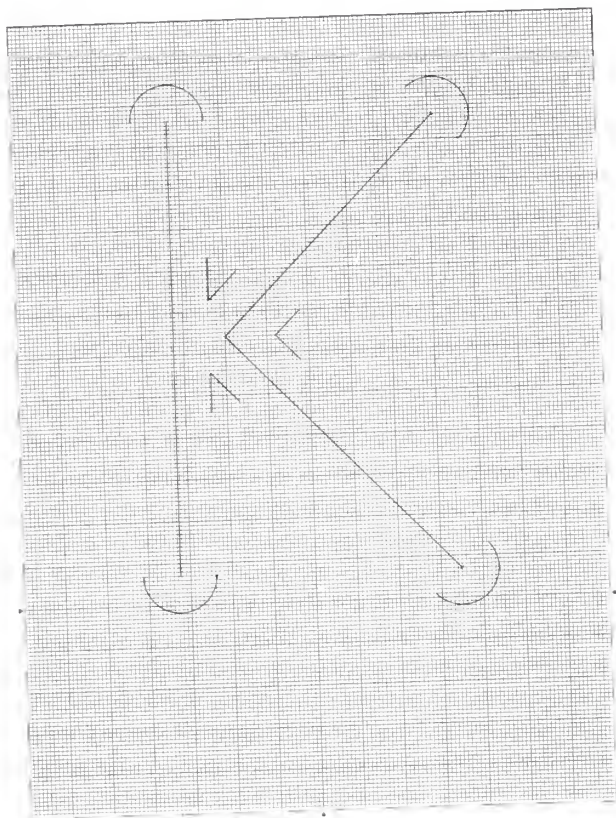


Fig. 21
Capital Letter K (RDN 21)

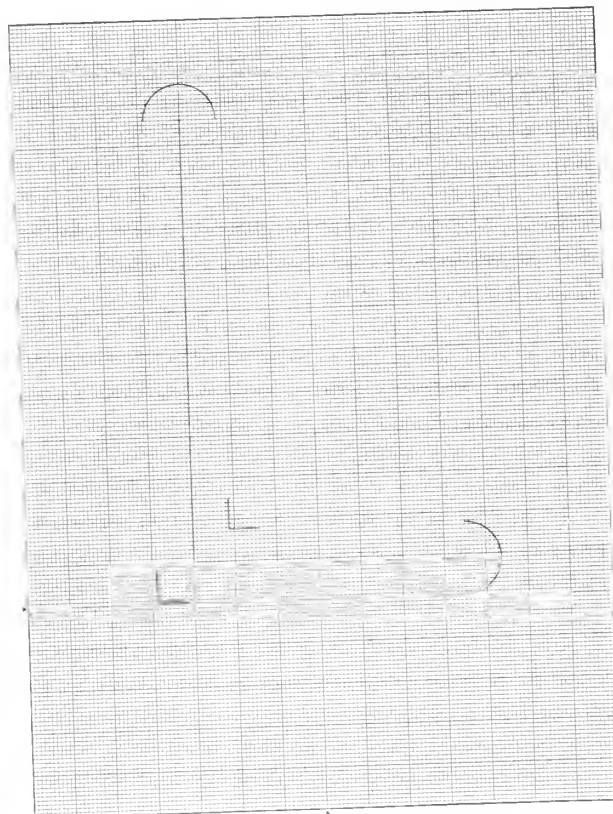


Fig. 22
Capital Letter L (RDN 22)

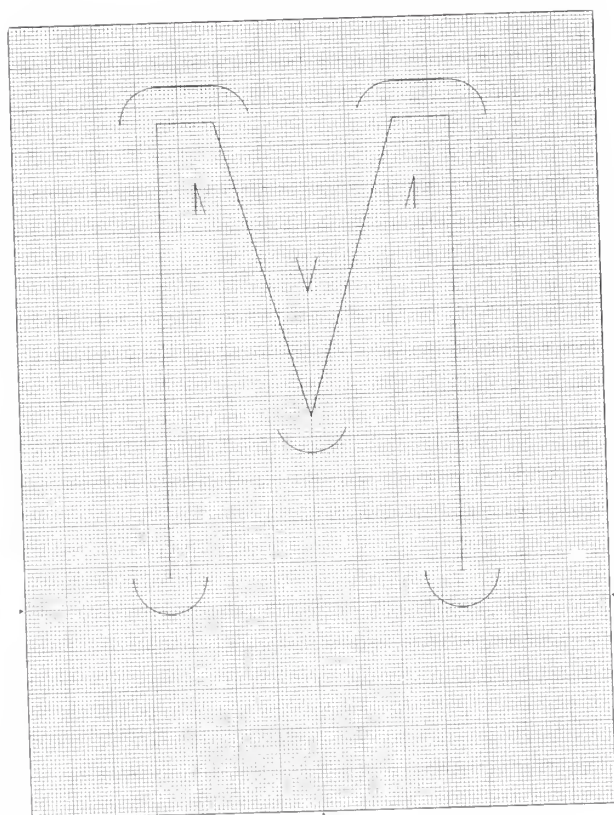


Fig. 23
Capital Letter M (RDN 23)

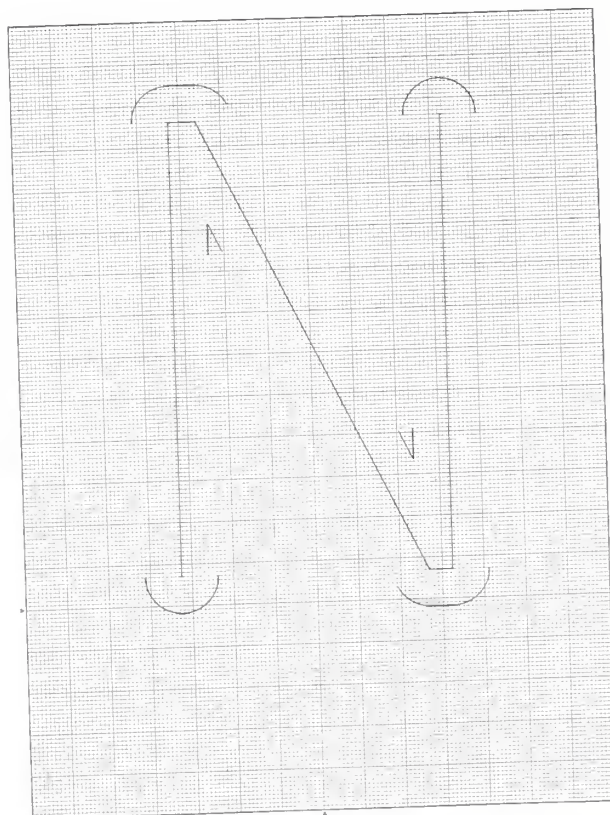


Fig. 24
Capital Letter N (RDN 24)

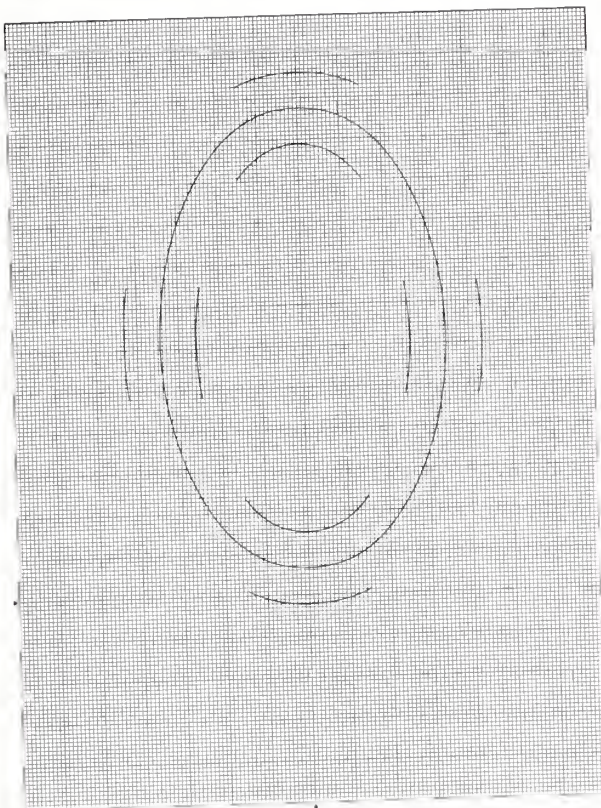


Fig. 25
Capital Letter O (RDN 25)

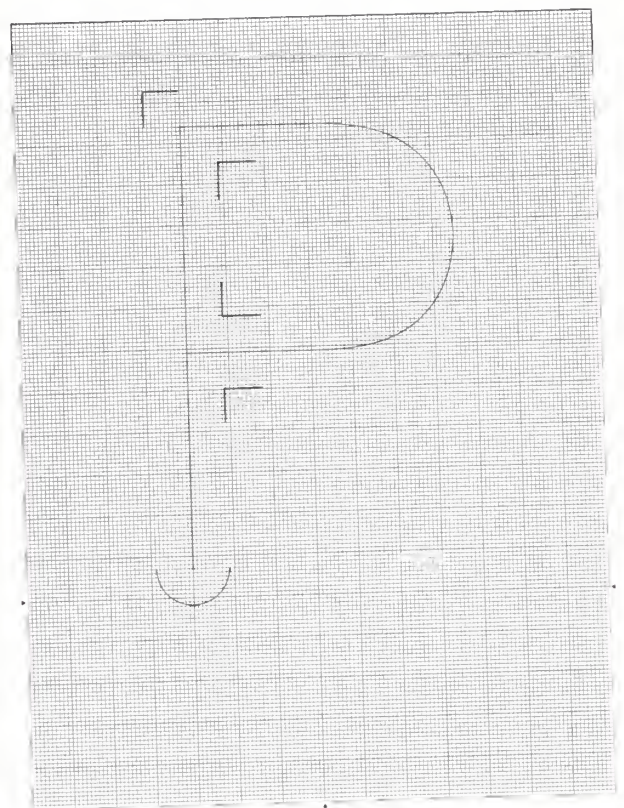


Fig. 26
Capital Letter P (RDN 26)

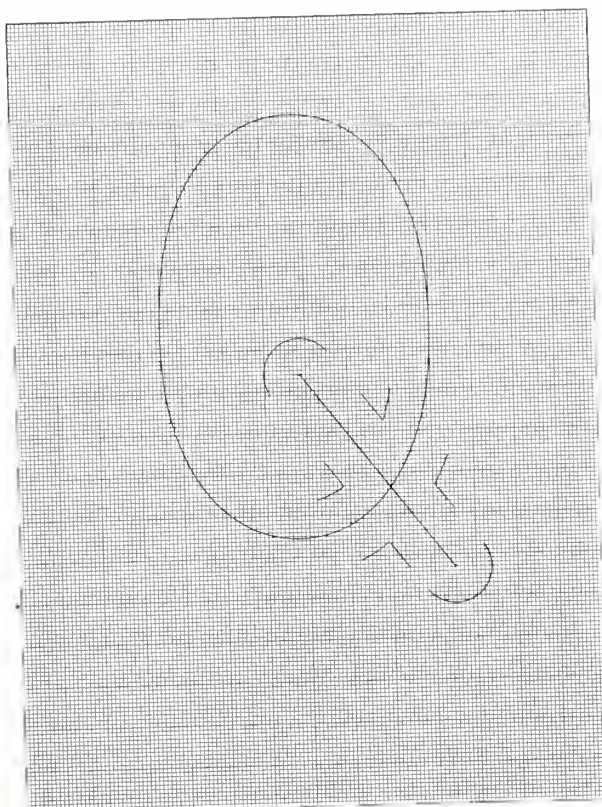


Fig. 27
Capital Letter Q (RDN 27)

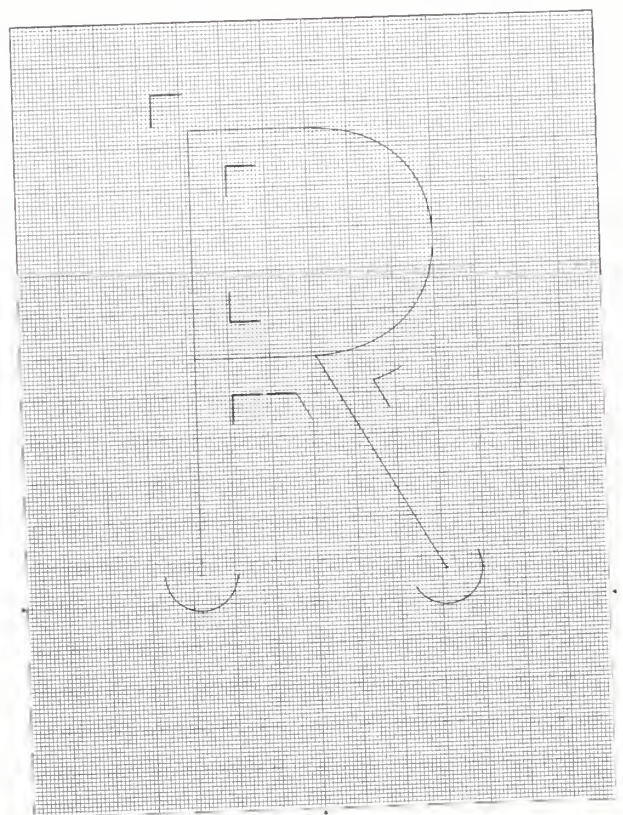


Fig. 28
Capital Letter R (RDN 28)

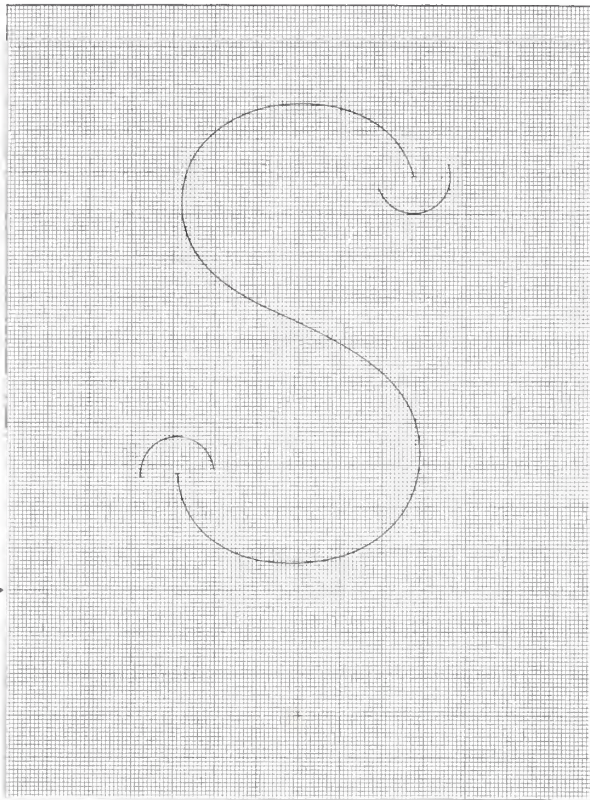


Fig. 29
Capital Letter S (RDN 29)

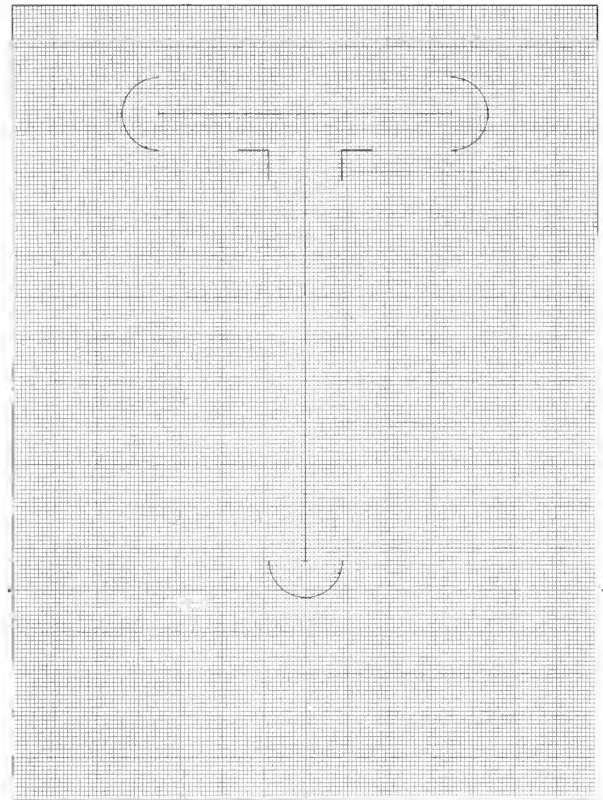


Fig. 30
Capital Letter T (RDN 30)

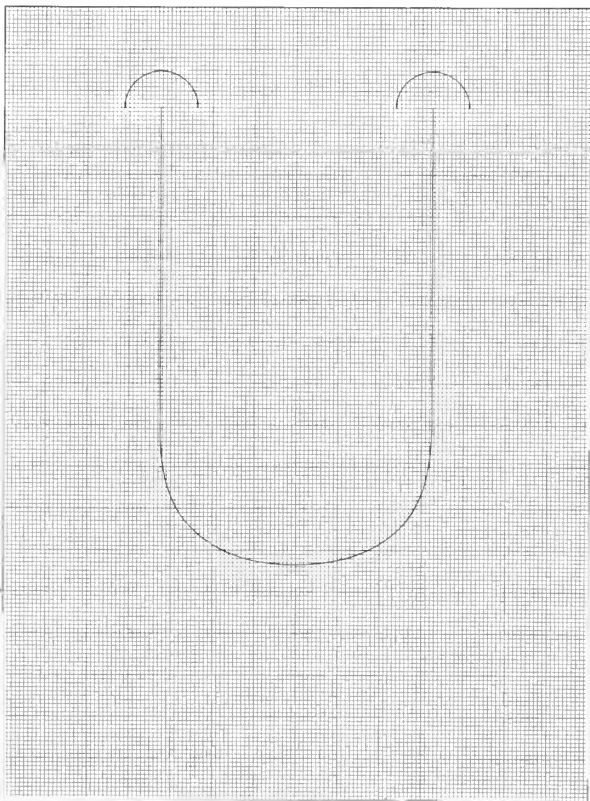


Fig. 31
Capital Letter U (RDN 31)

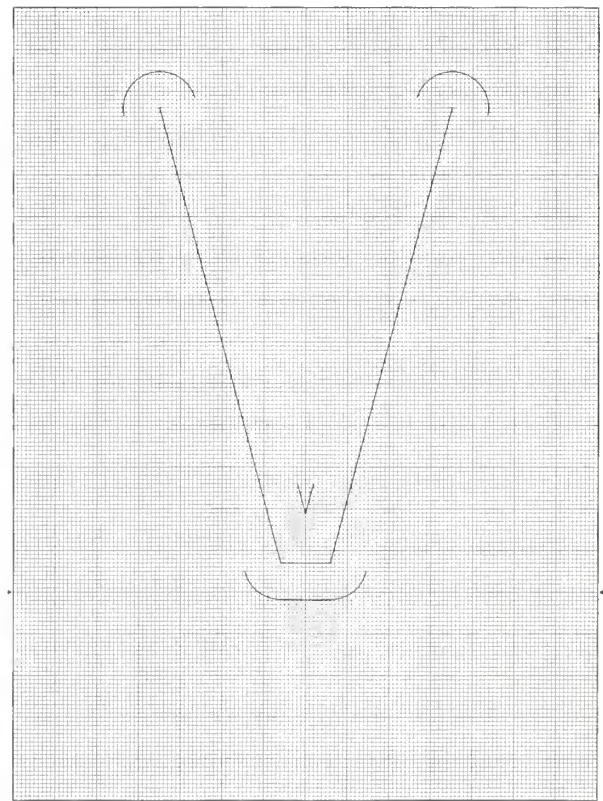


Fig. 32
Capital Letter V (RDN 32)

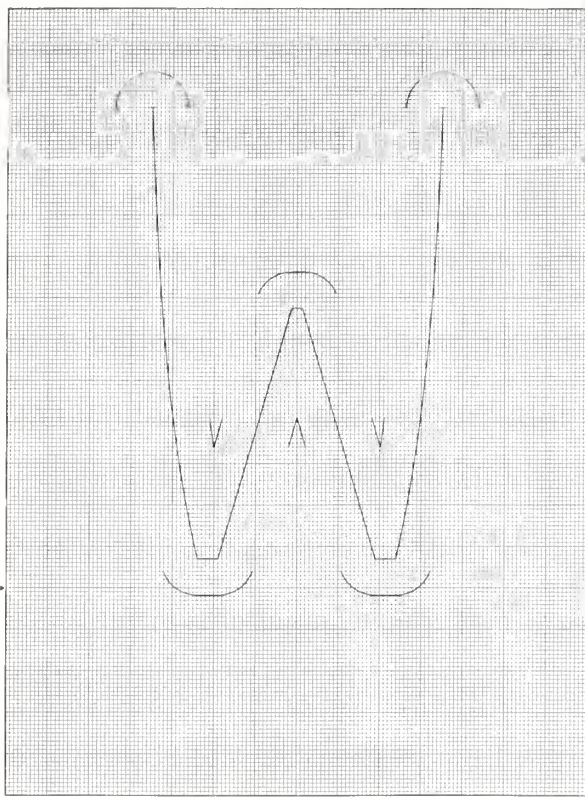


Fig. 33
Capital Letter W (RDN 33)

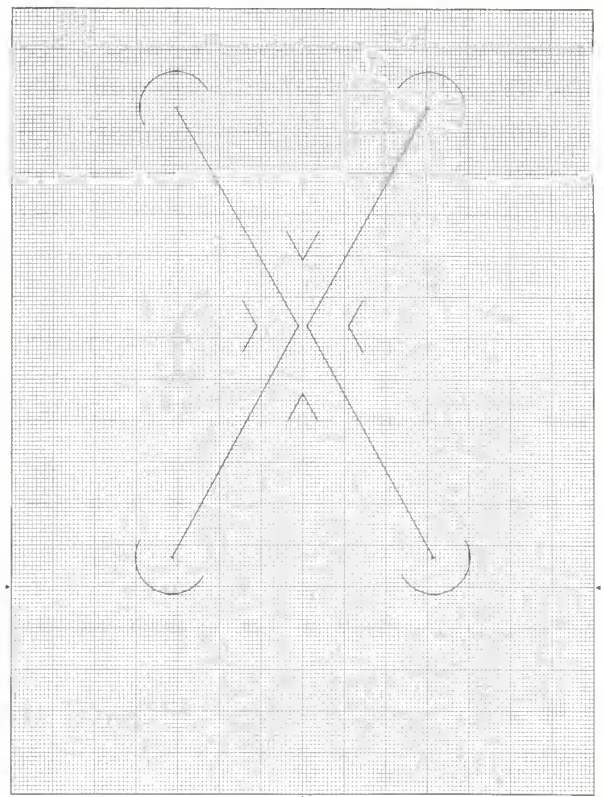


Fig. 34
Capital Letter X (RDN 34)

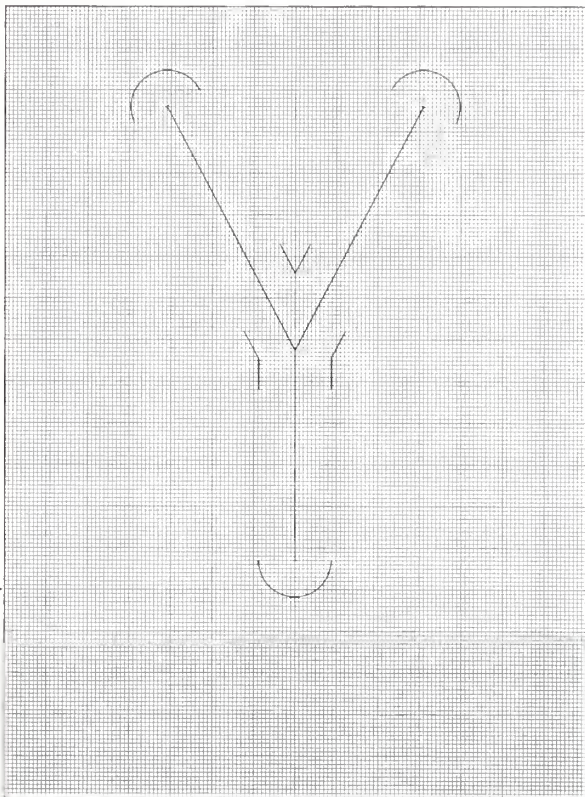


Fig. 35
Capital Letter Y (RDN 35)

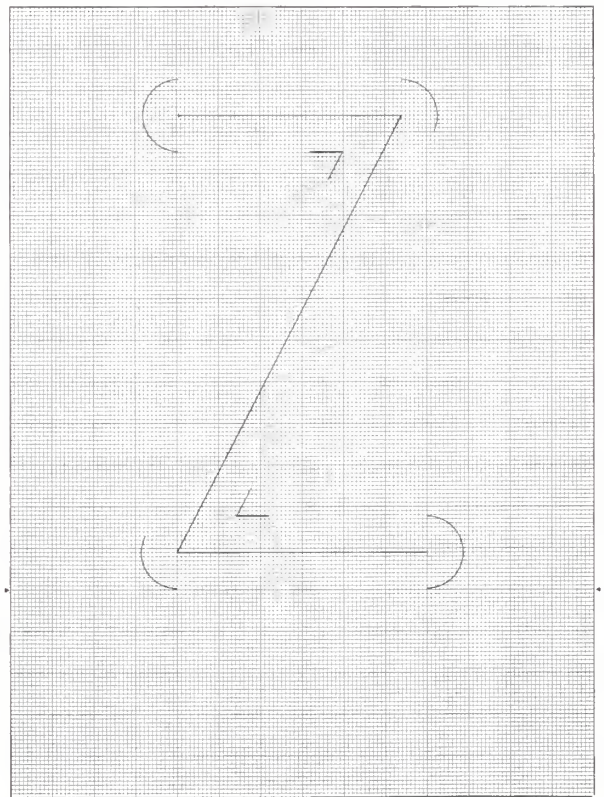


Fig. 36
Capital Letter Z (RDN 36)

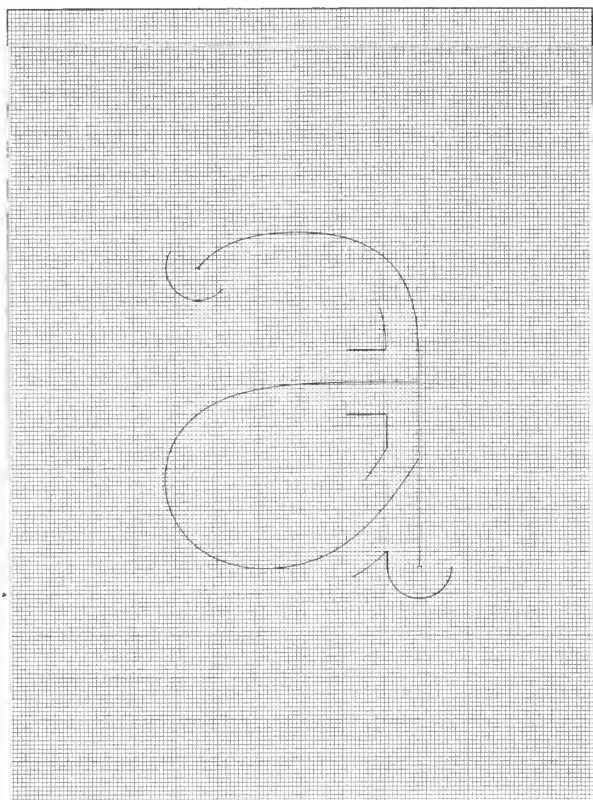


Fig. 37
Small Letter A (RDN 37)

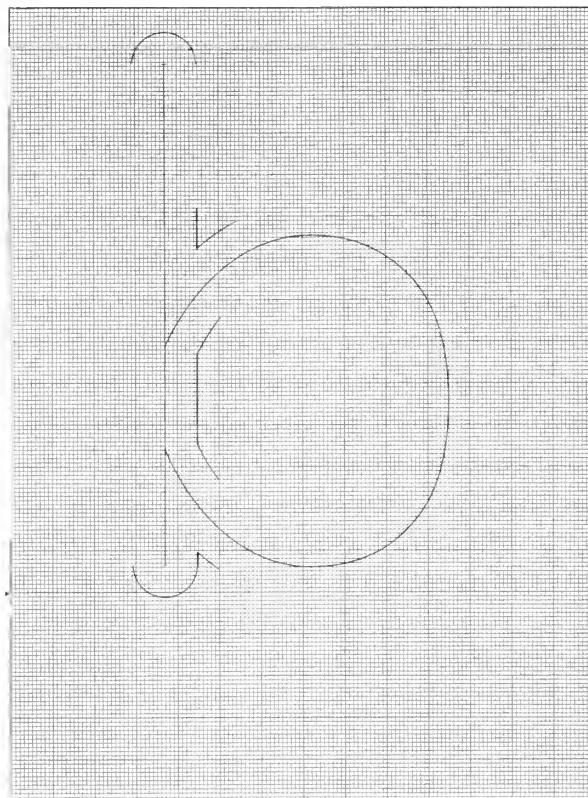


Fig. 38
Small Letter B (RDN 38)

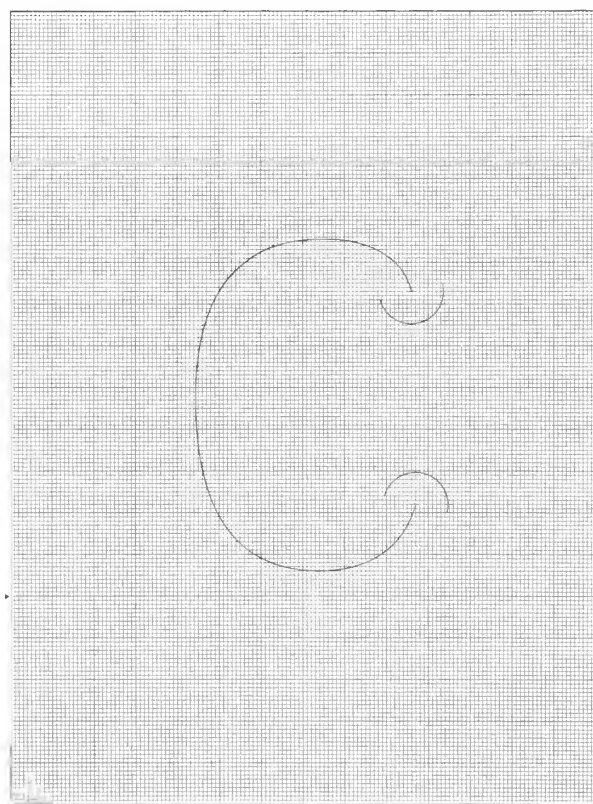


Fig. 39
Small Letter C (RDN 39)

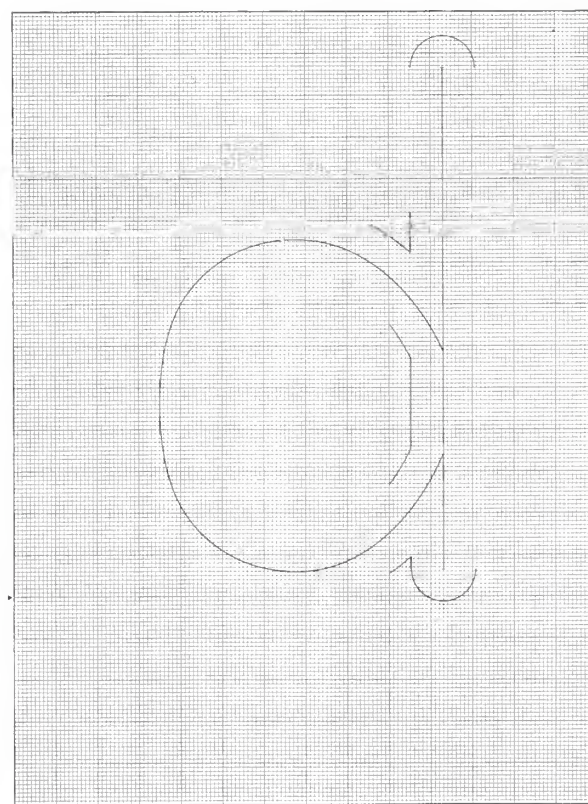


Fig. 40
Small Letter D (RDN 40)

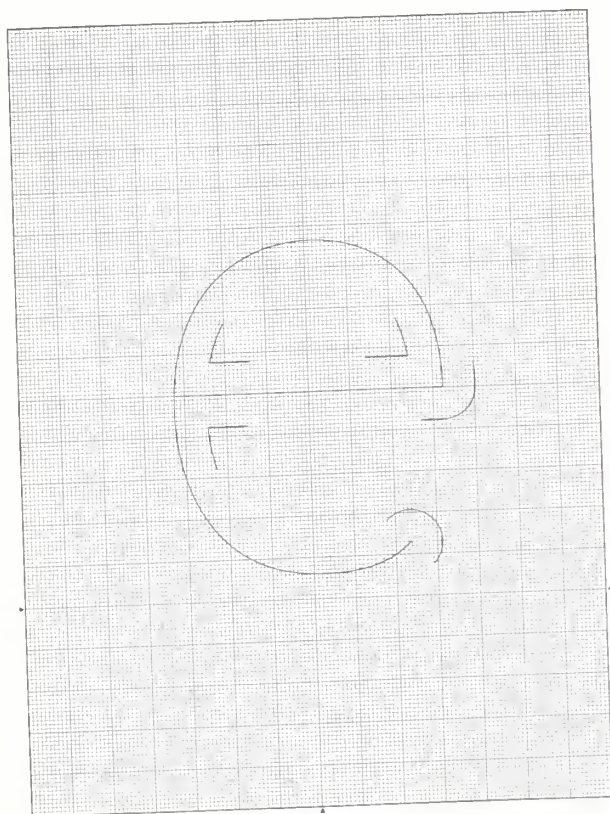


Fig. 41
Small Letter E (RDN 41)

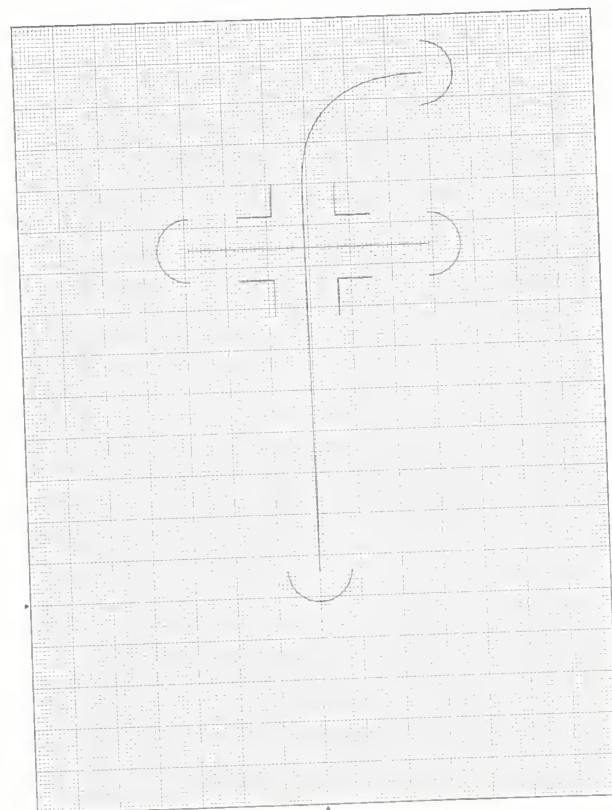


Fig. 42
Small Letter F (RDN 42)

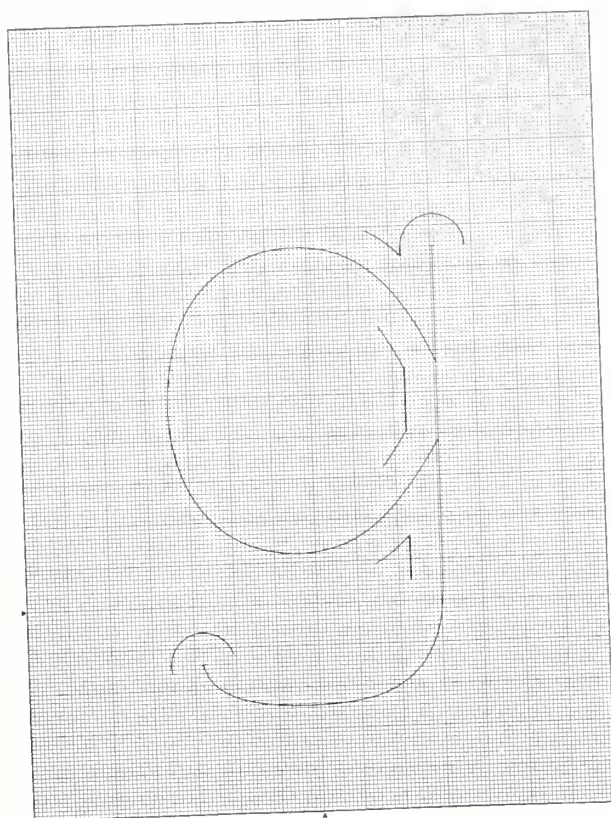


Fig. 43
Small Letter G (RDN 43)

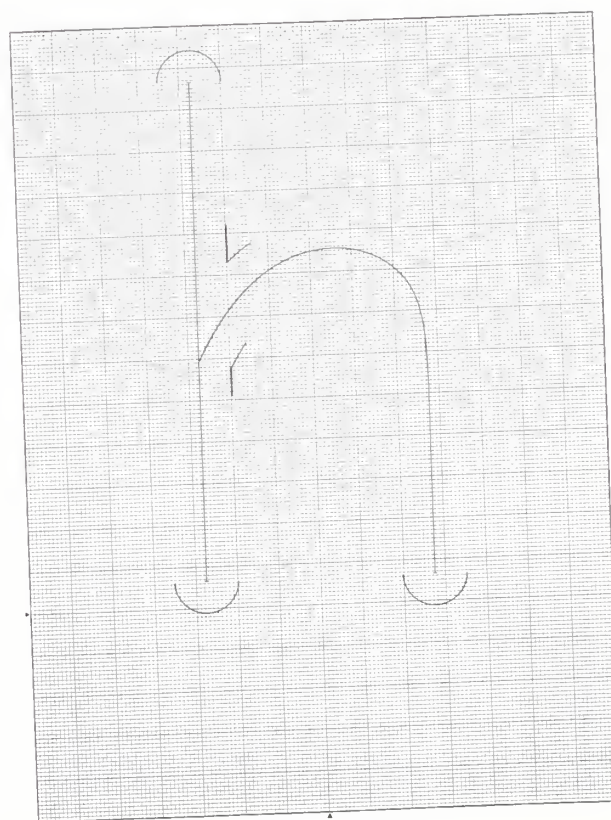


Fig. 44
Small Letter H (RDN 44)

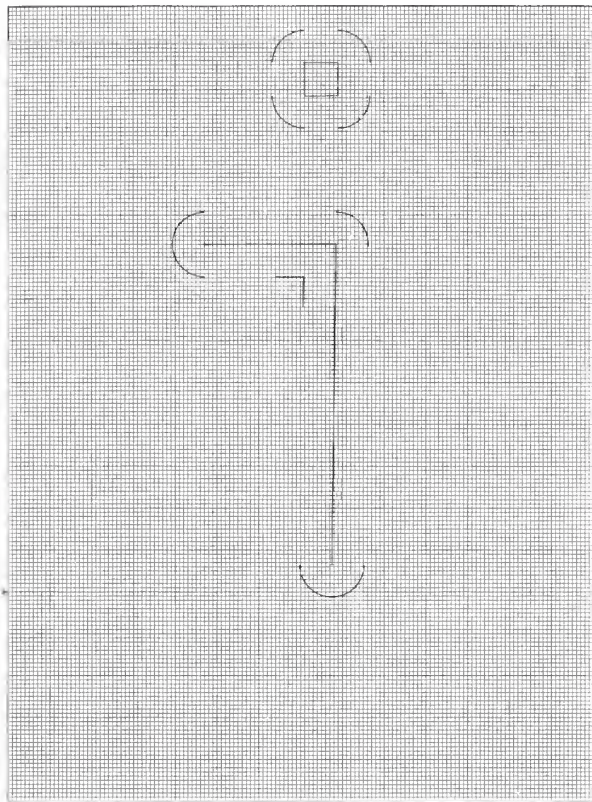


Fig. 45
Small Letter I (RDN 45)

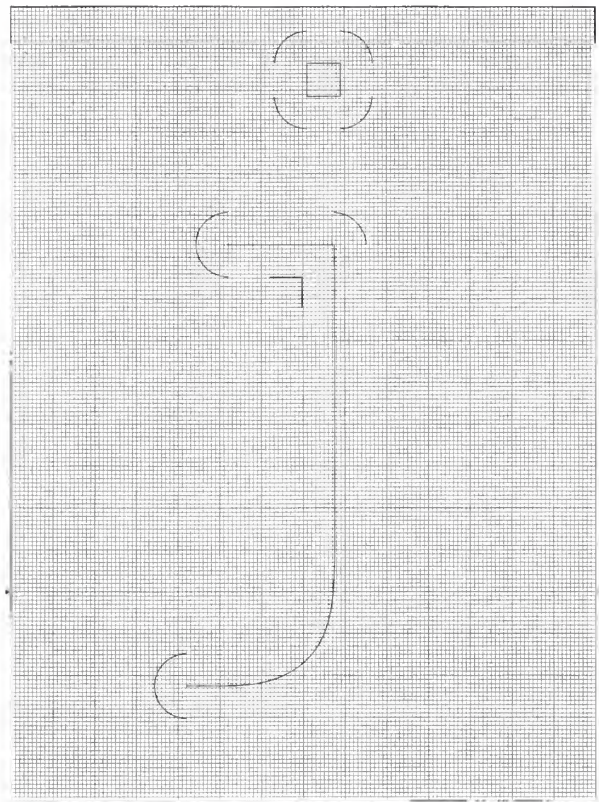


Fig. 46
Small Letter J (RDN 46)

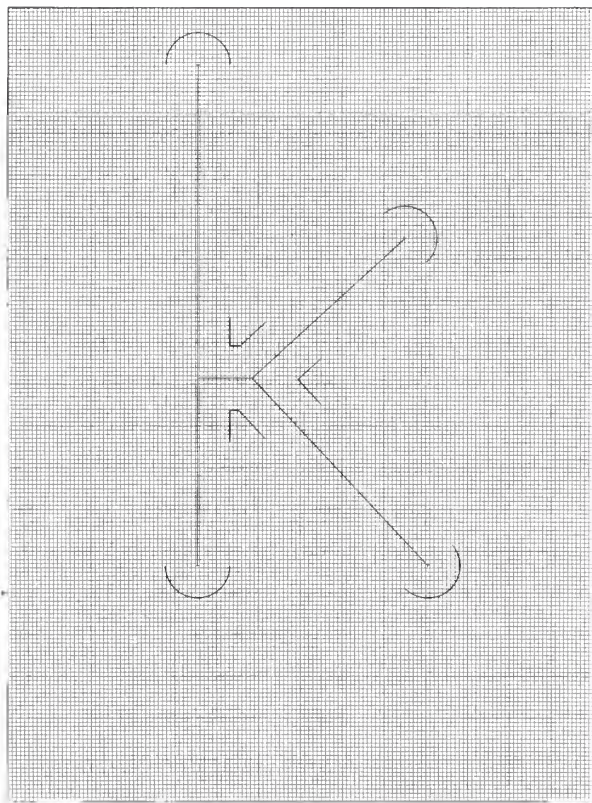


Fig. 47
Small Letter K (RDN 47)

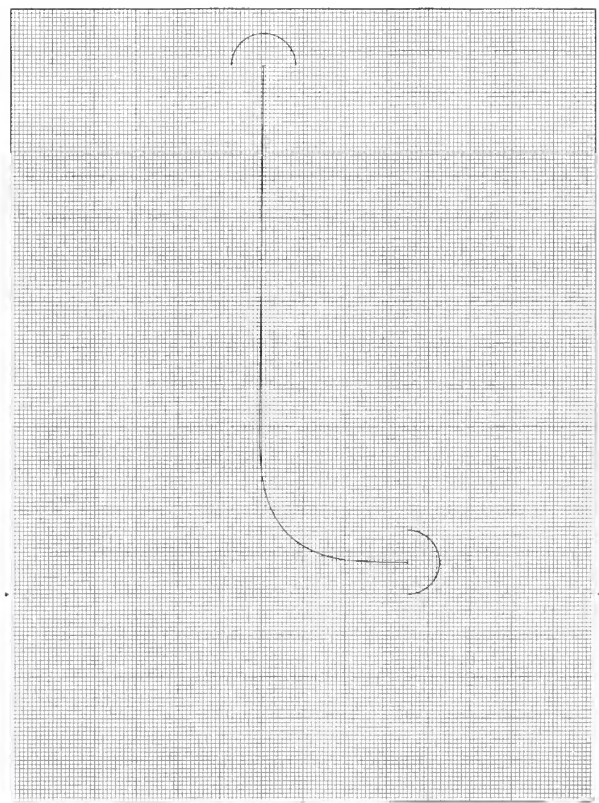


Fig. 48
Small Letter L (RDN 48)

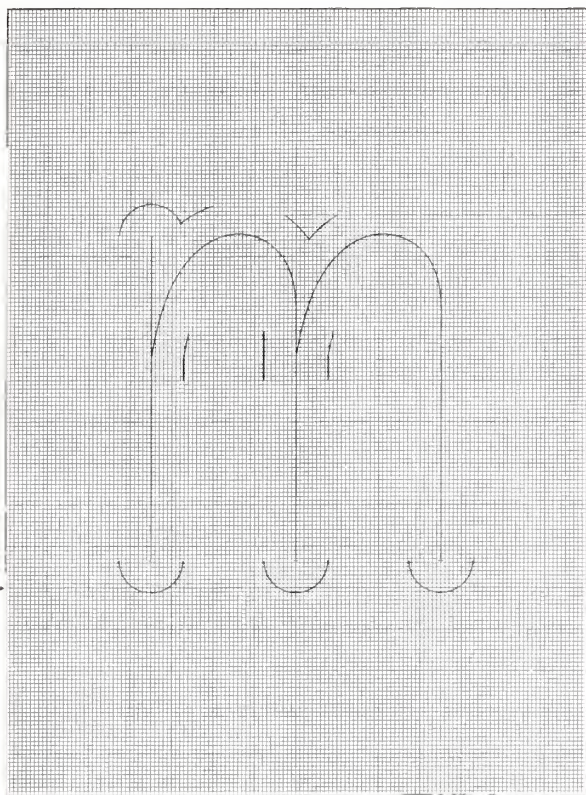


Fig. 49
Small Letter M (RDN 49)

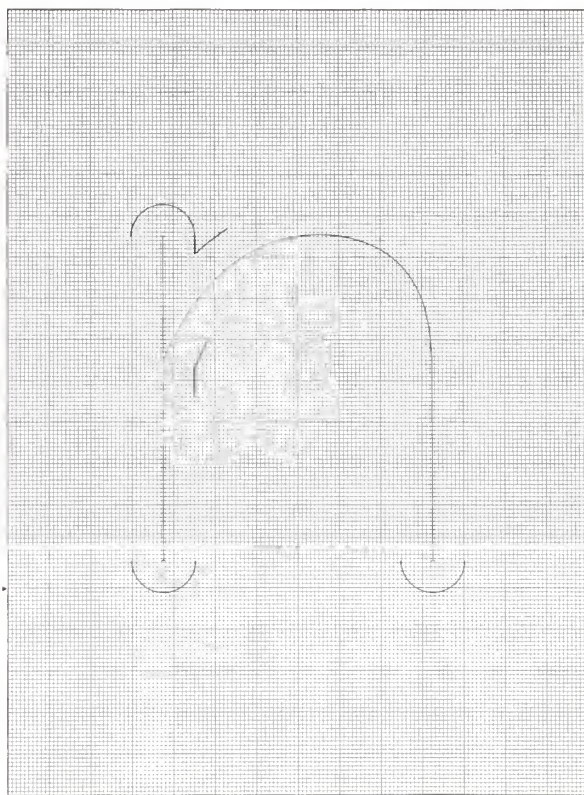


Fig. 50
Small Letter N (RDN 50)

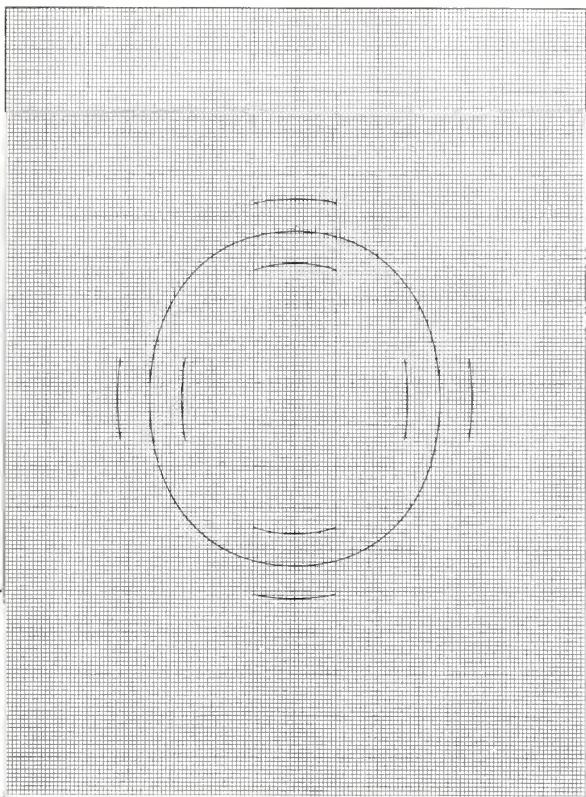


Fig. 51
Small Letter O (RDN 51)

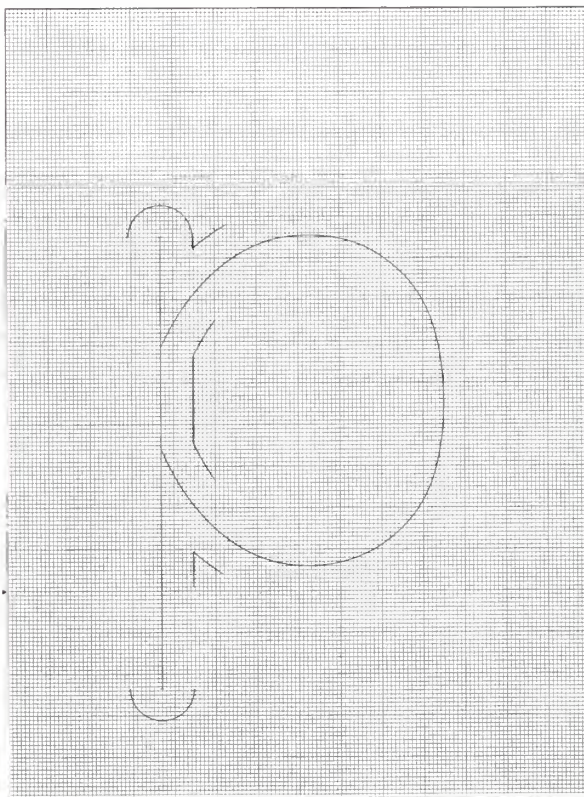


Fig. 52
Small Letter P (RDN 52)

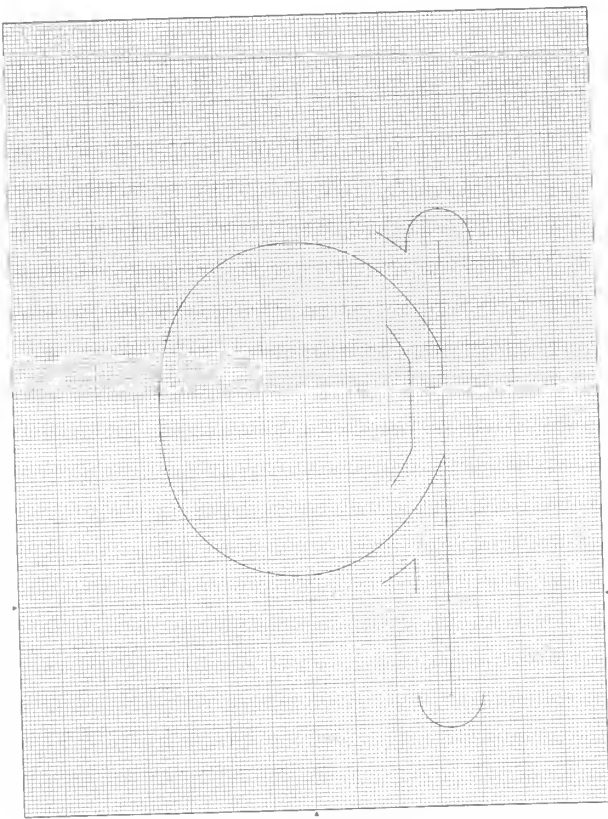


Fig. 53
Small Letter Q (RDN 53)

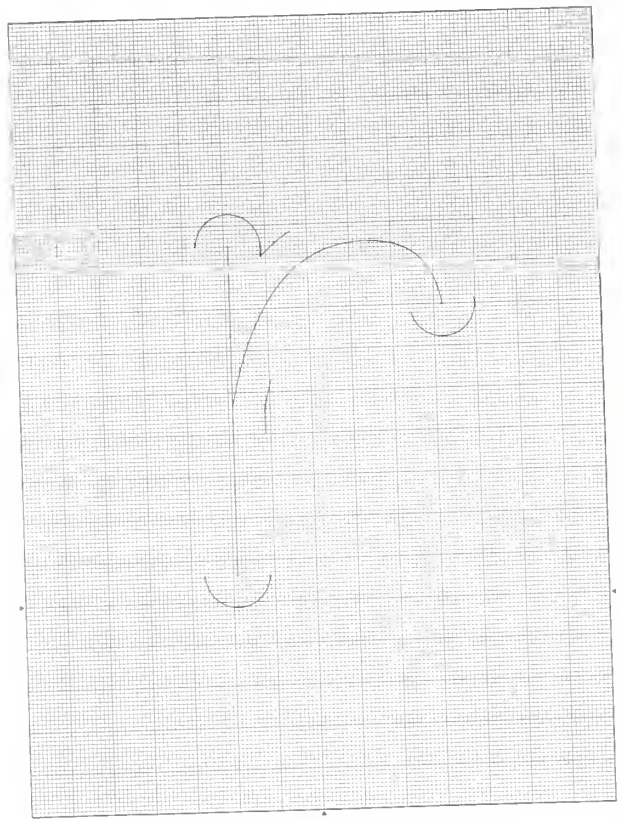


Fig. 54
Small Letter R (RDN 54)

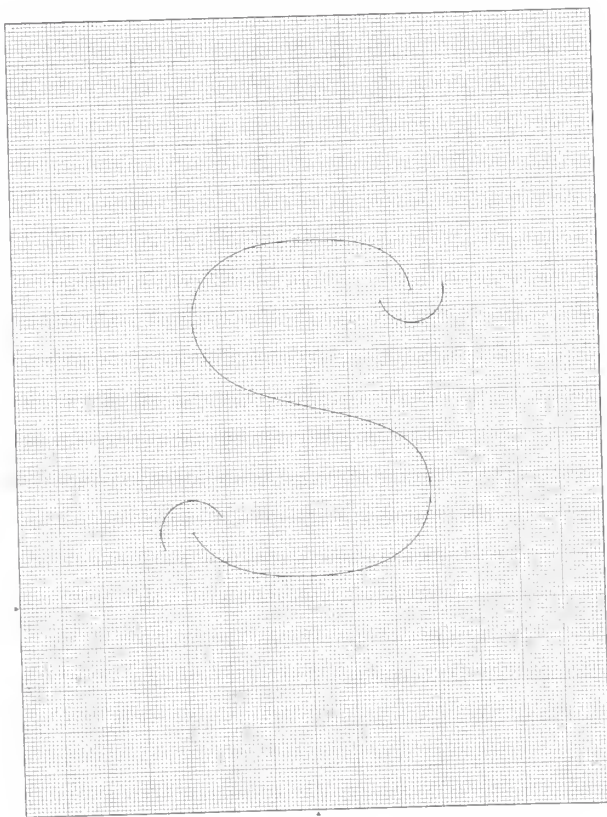


Fig. 55
Small Letter S (RDN 55)

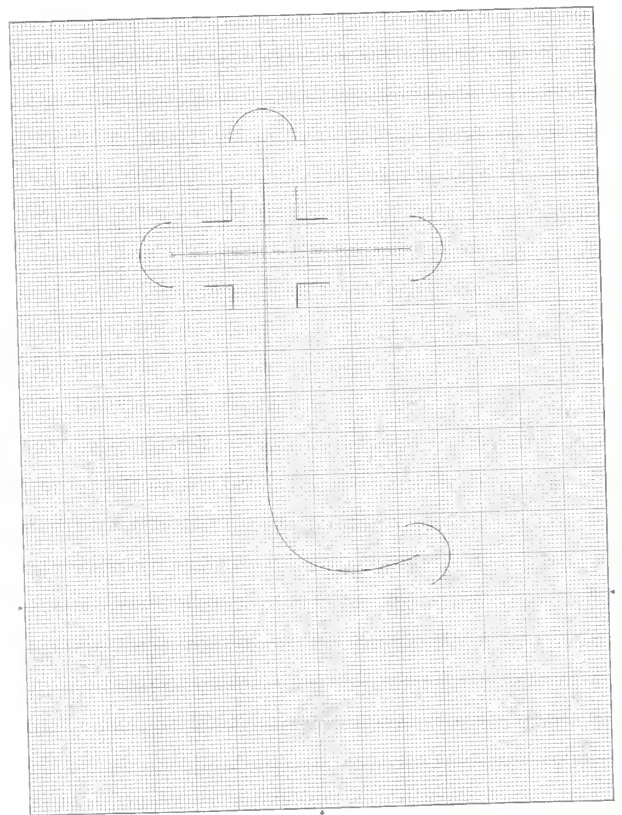


Fig. 56
Small Letter T (RDN 56)

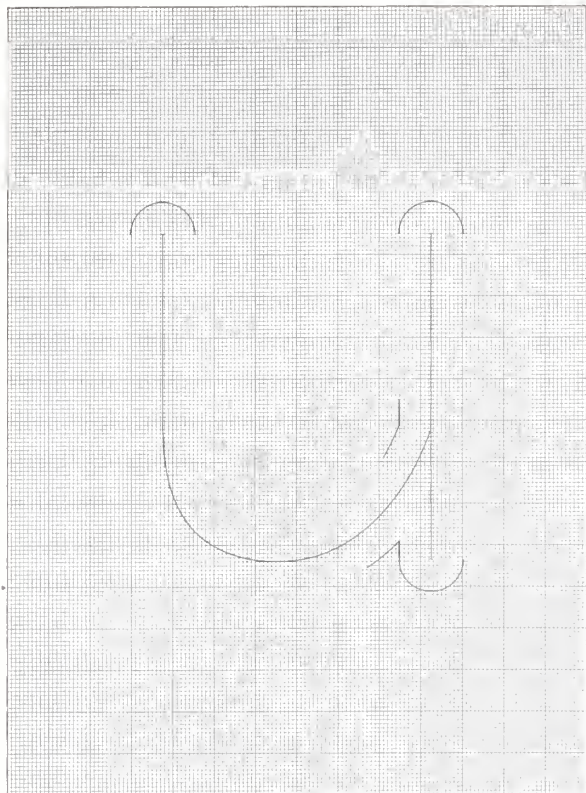


Fig. 57
Small Letter U (RDN 57)

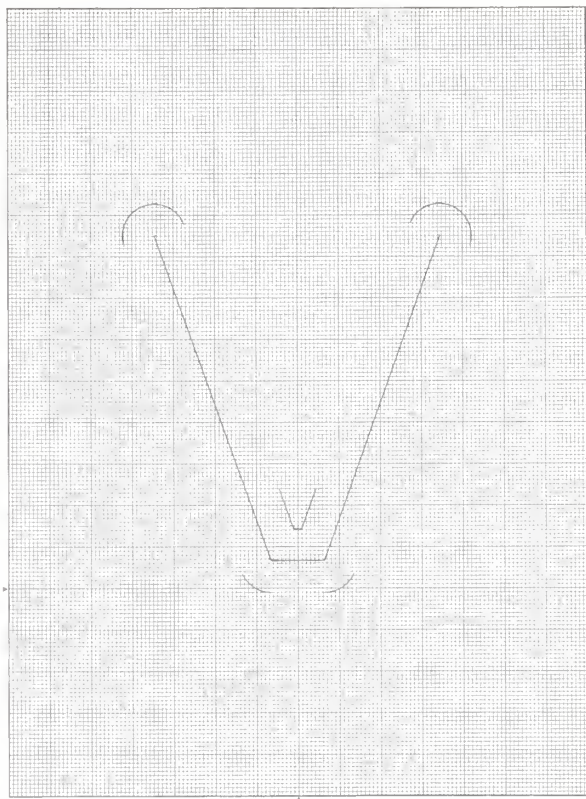


Fig. 58
Small Letter V (RDN 58)

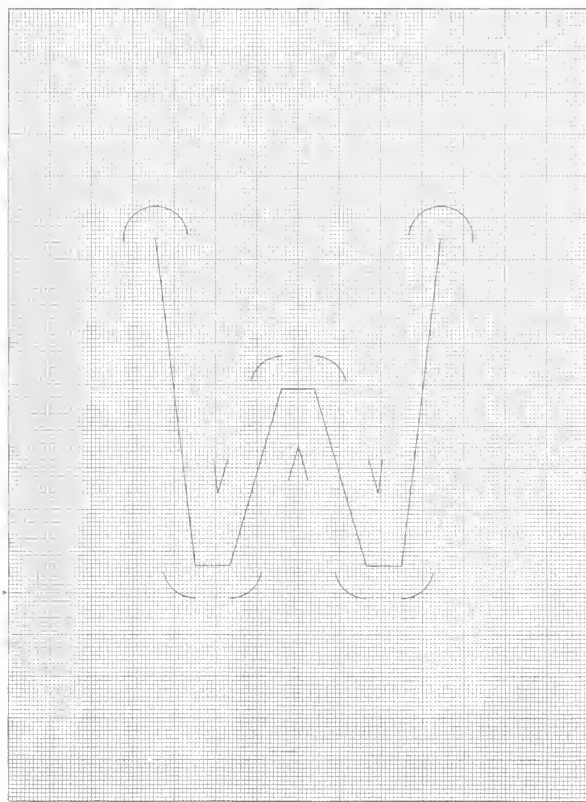


Fig. 59
Small Letter W (RDN 59)

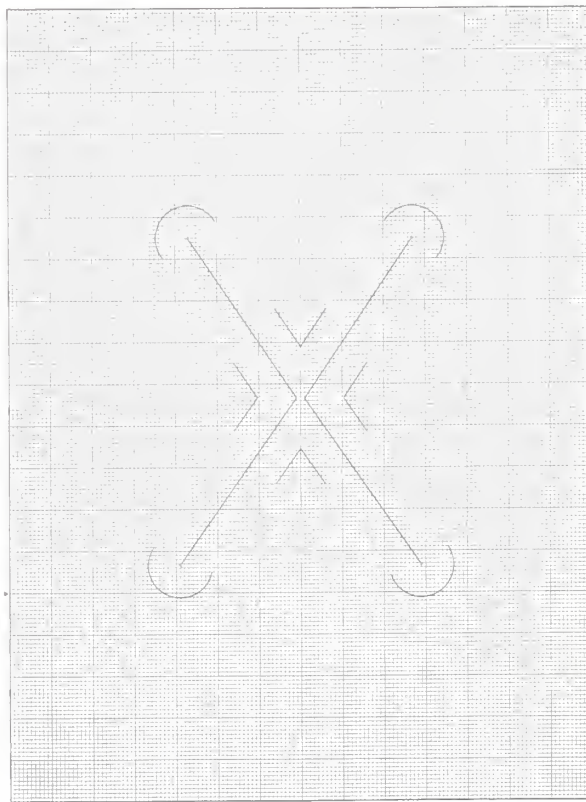


Fig. 60
Small Letter X (RDN 60)

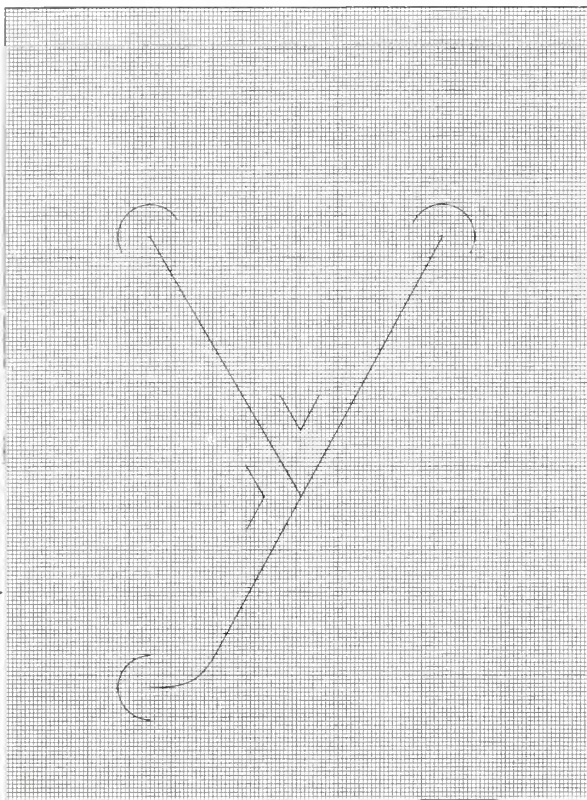


Fig. 61
Small Letter Y (RDN 61)

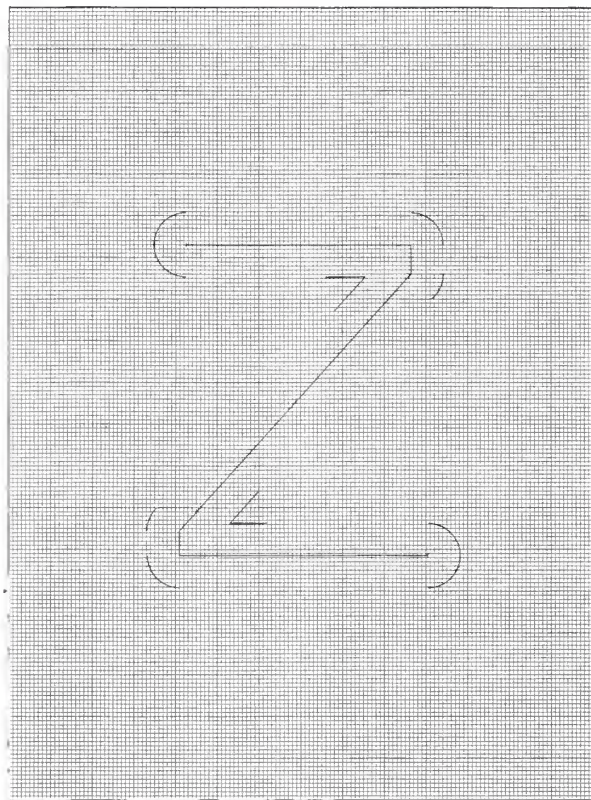


Fig. 62
Small Letter Z (RDN 62)

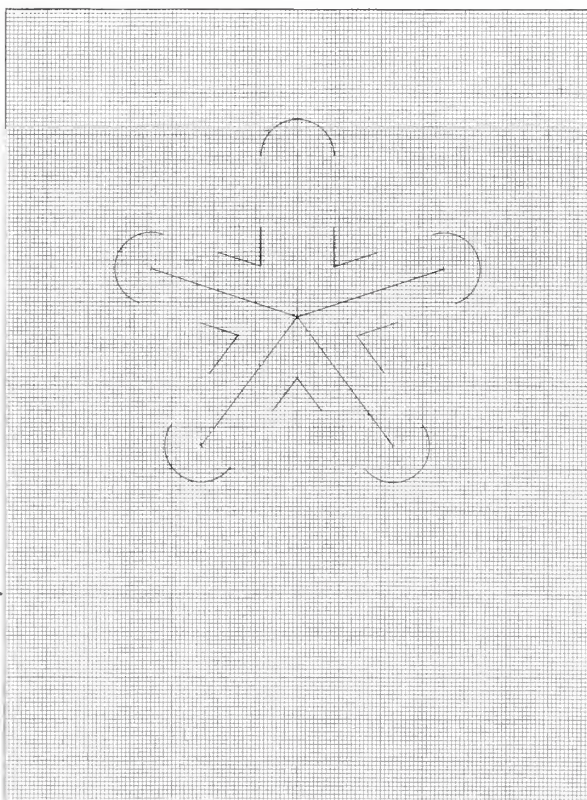


Fig. 63
Asterisk (RDN 63)

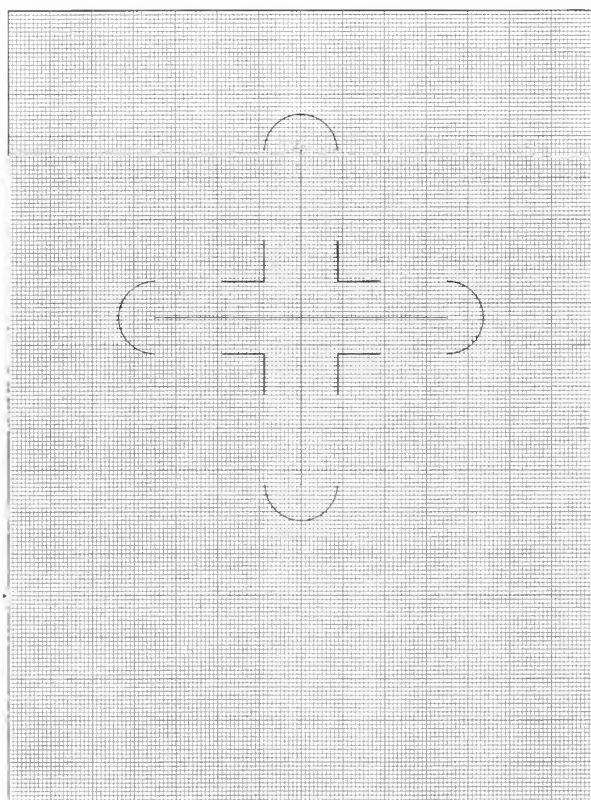


Fig. 64
Plus Sign (RDN 64)

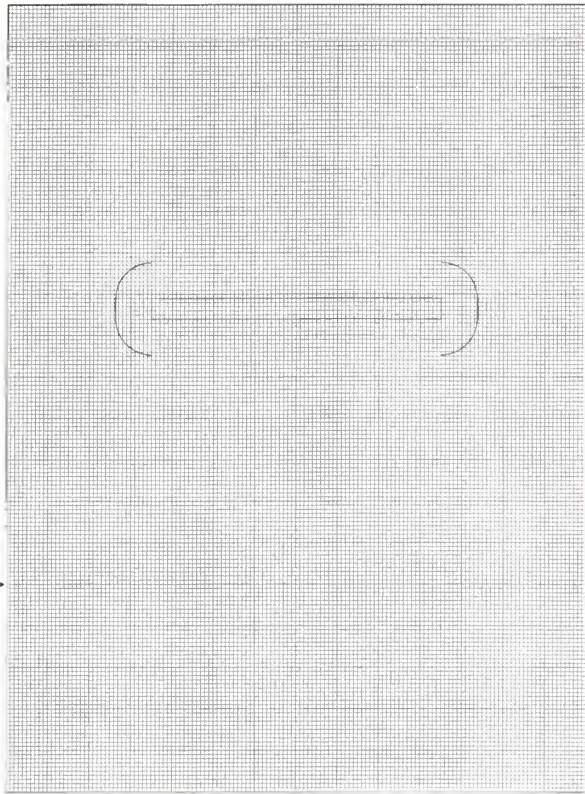


Fig. 65
Hyphen (RDN 65)

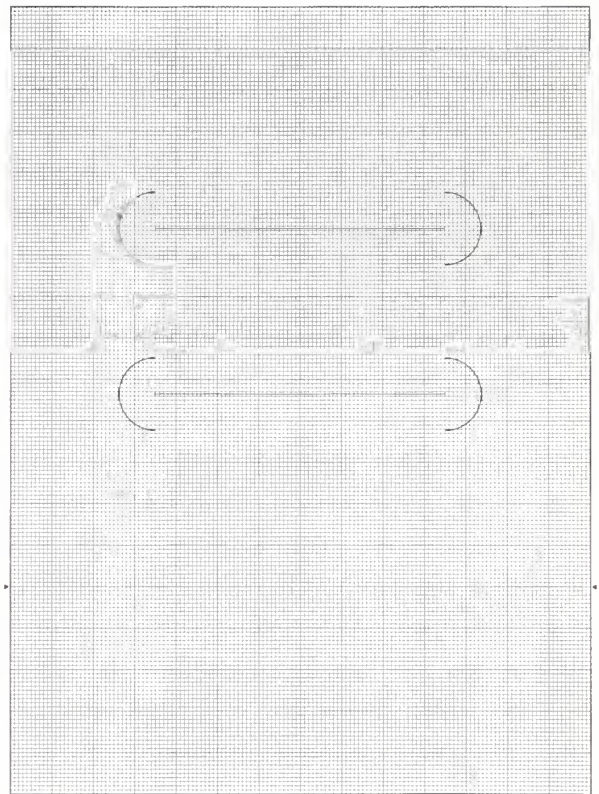


Fig. 66
Equals Sign (RDN 66)

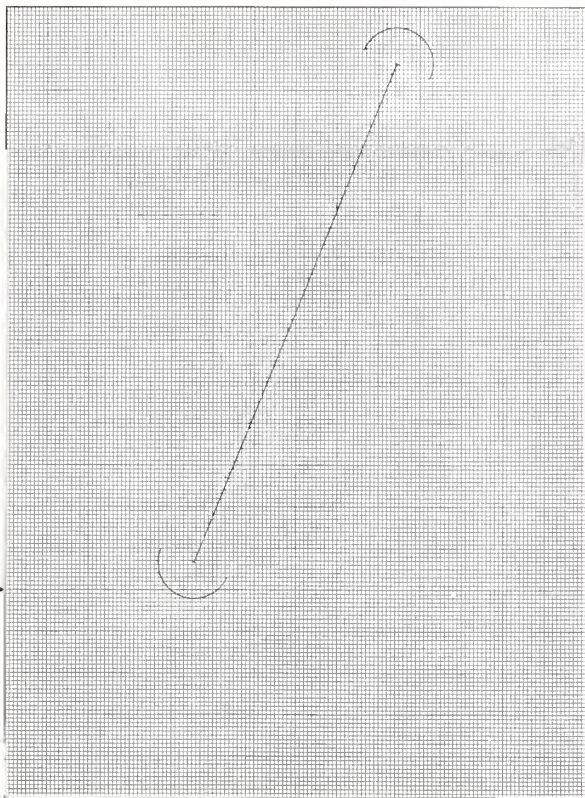


Fig. 67
Slant (RDN 67)

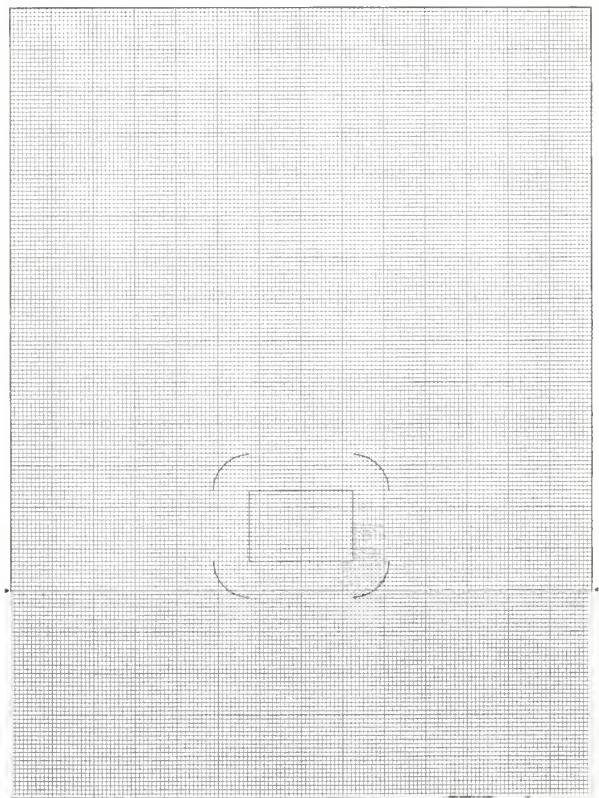


Fig. 68
Period (RDN 68)

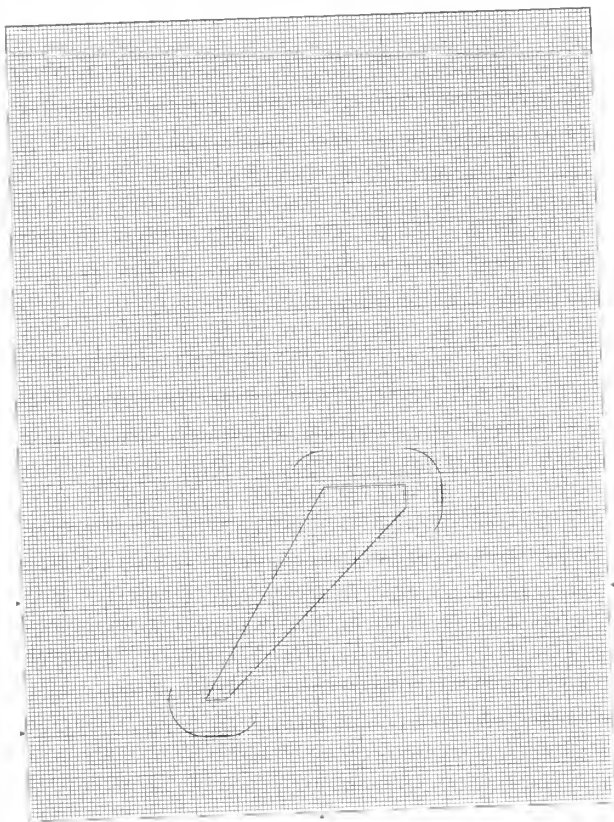


Fig. 69
Comma (RDN 69)



Fig. 70
Colon (RDN 70)

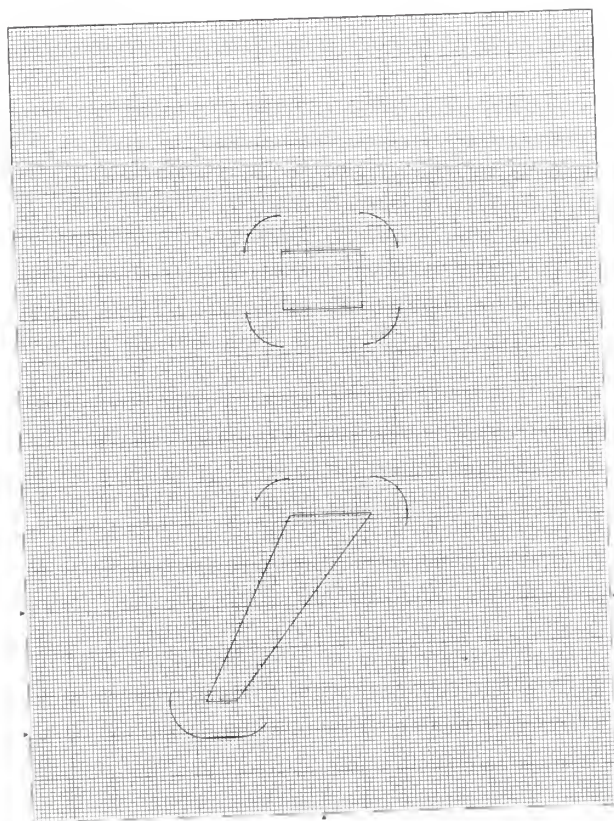


Fig. 71
Semicolon (RDN 71)

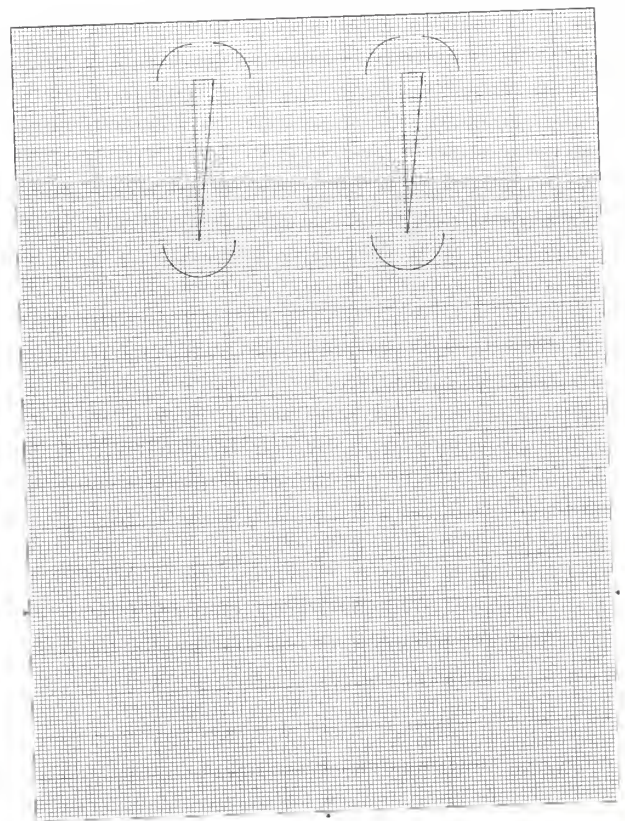


Fig. 72
Quotation Mark (RDN 72)

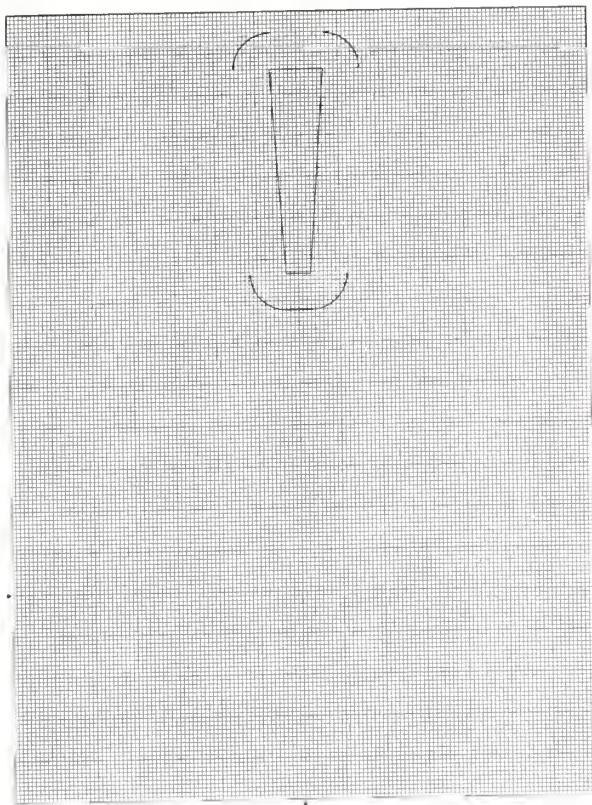


Fig. 73
Apostrophe (RDN 73)

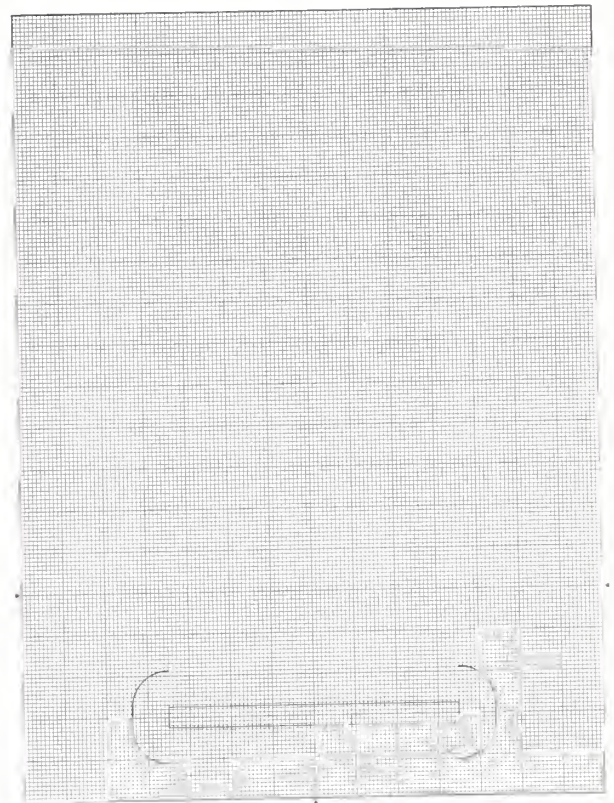


Fig. 74
Discontinuous Underline (RDN 74)

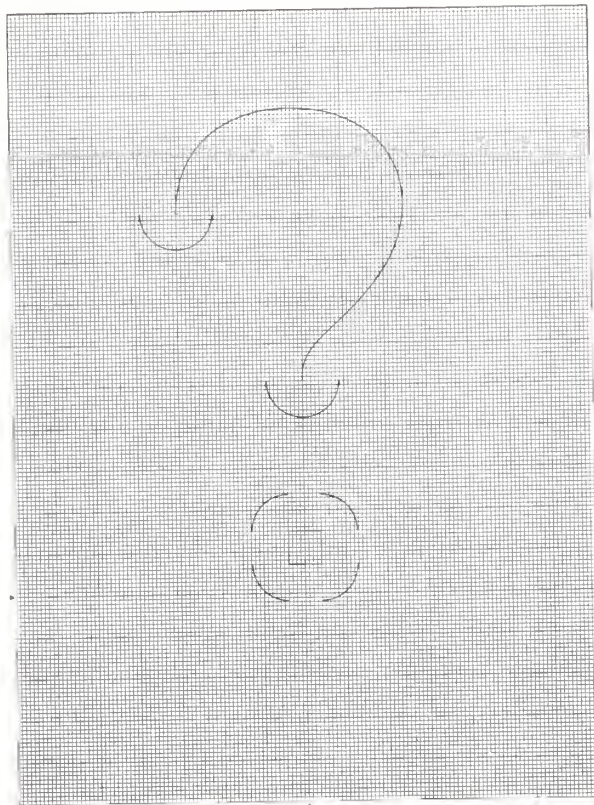


Fig. 75
Question Mark (RDN 75)

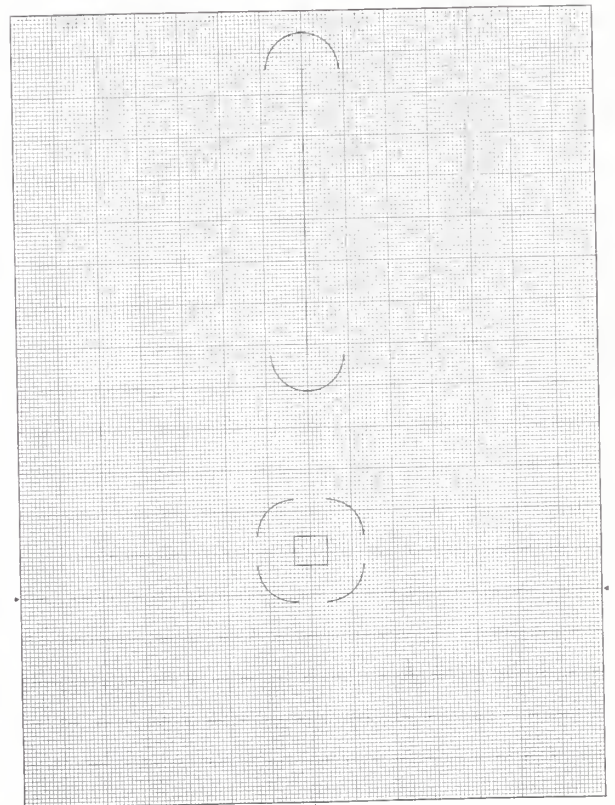


Fig. 76
Exclamation Point (RDN 76)

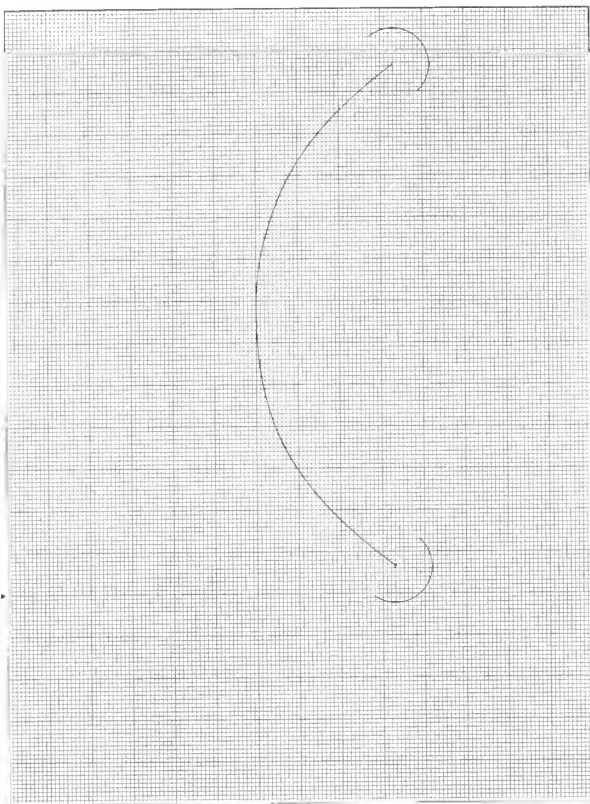


Fig. 77
Opening Parenthesis (RDN 77)

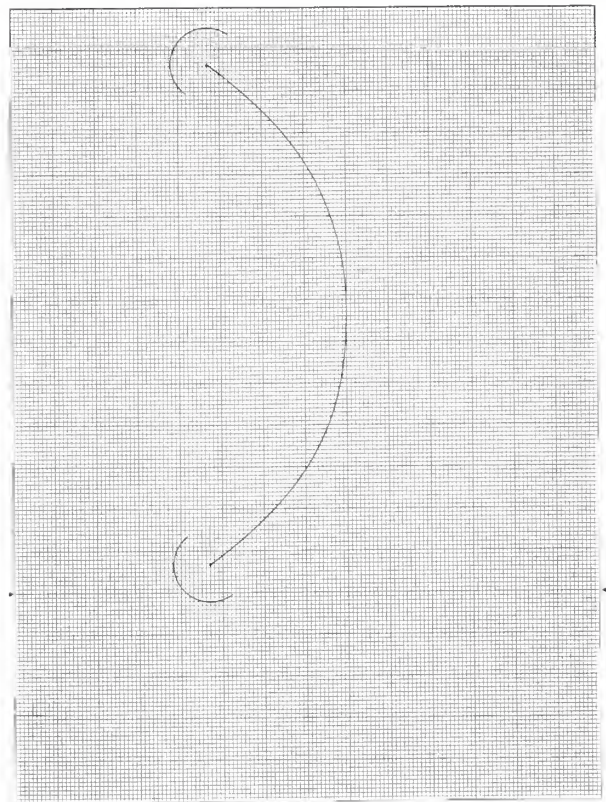


Fig. 78
Closing Parenthesis (RDN 78)

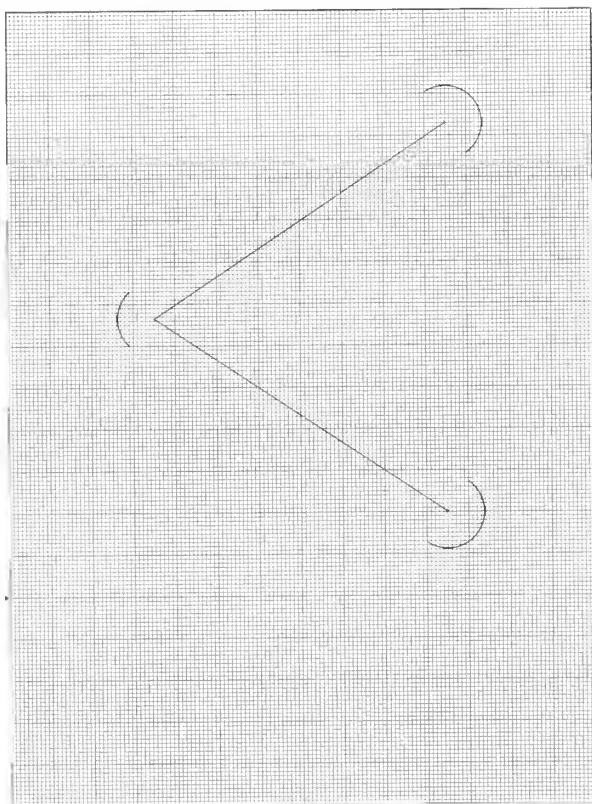


Fig. 79
Less Than Sign (RDN 79)

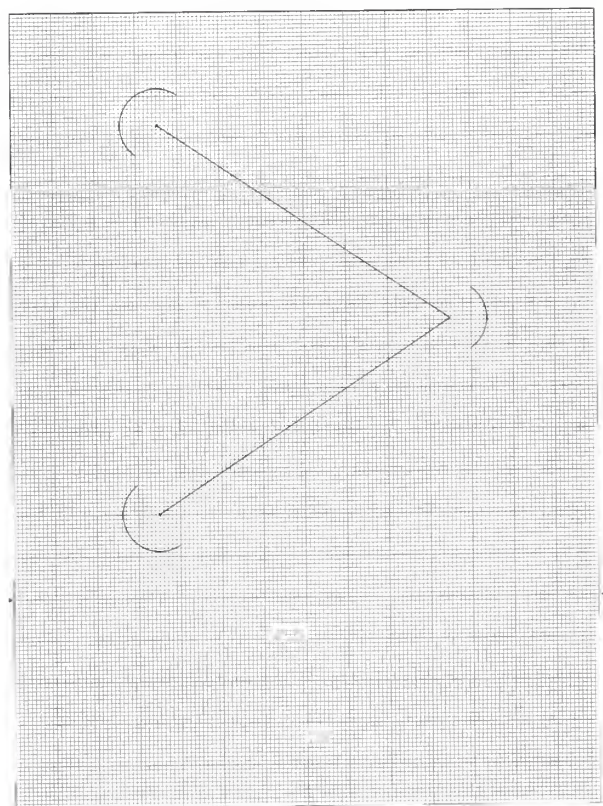


Fig. 80
Greater Than Sign (RDN 80)

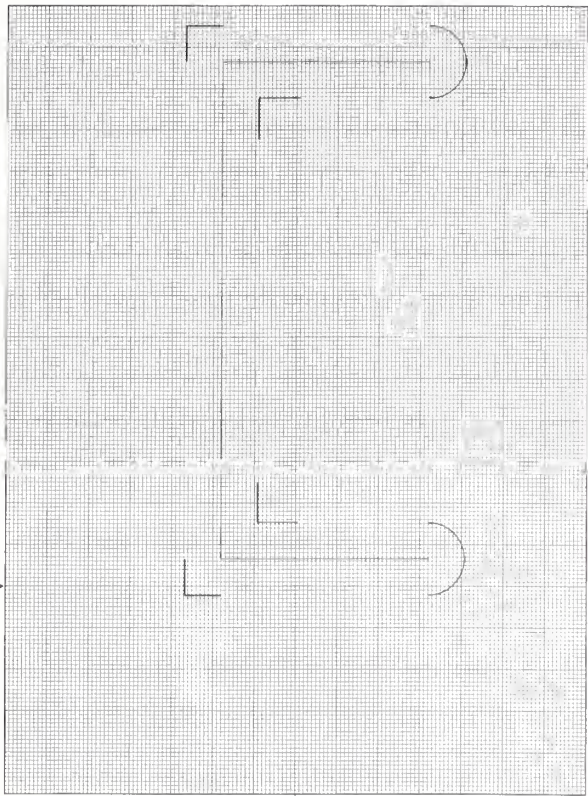


Fig. 81
Opening Bracket (RDN 81)

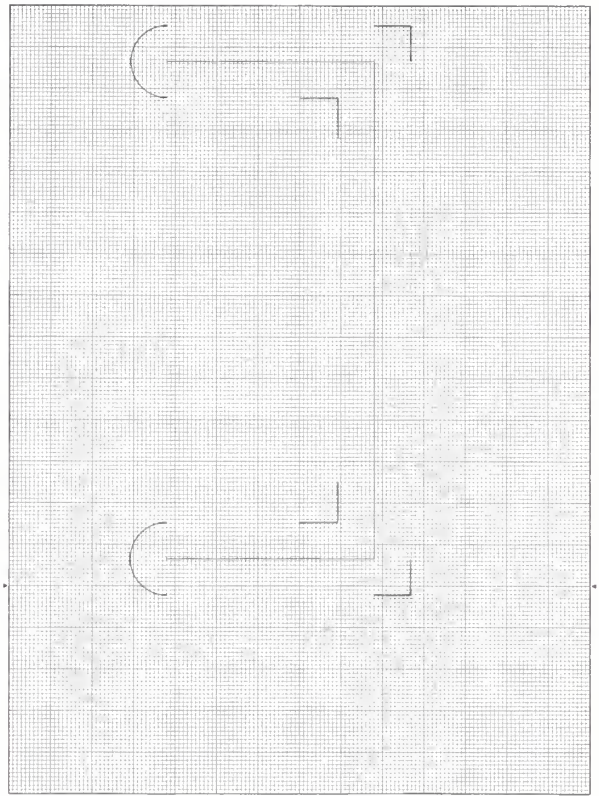


Fig. 82
Closing Bracket (RDN 82)

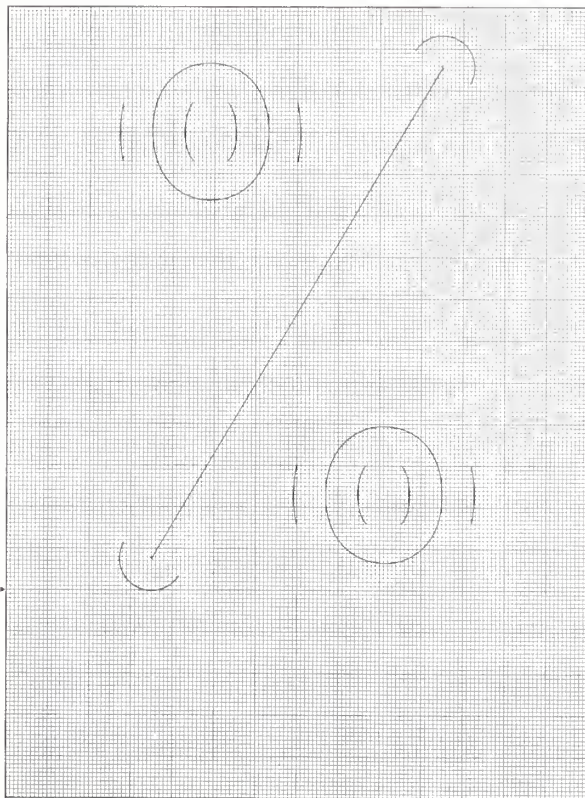


Fig. 83
Percent Sign (RDN 83)

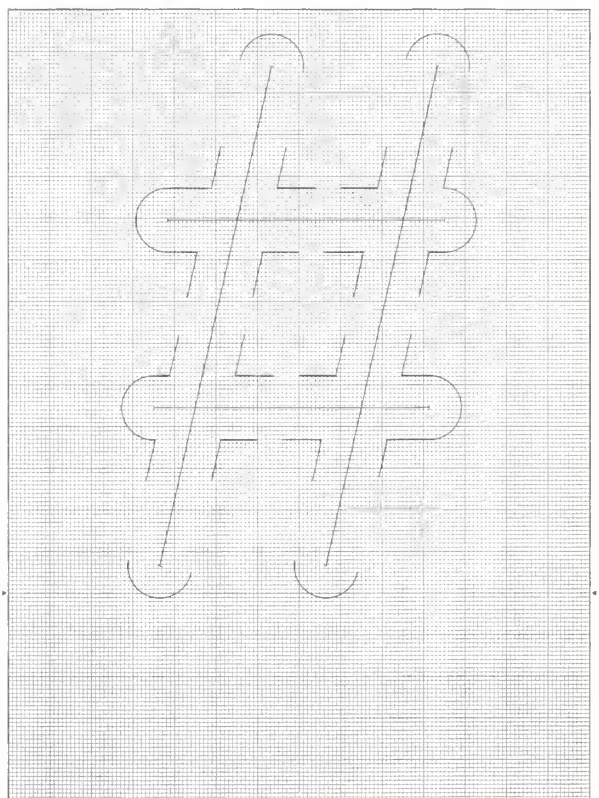


Fig. 84
Number Sign (RDN 84)

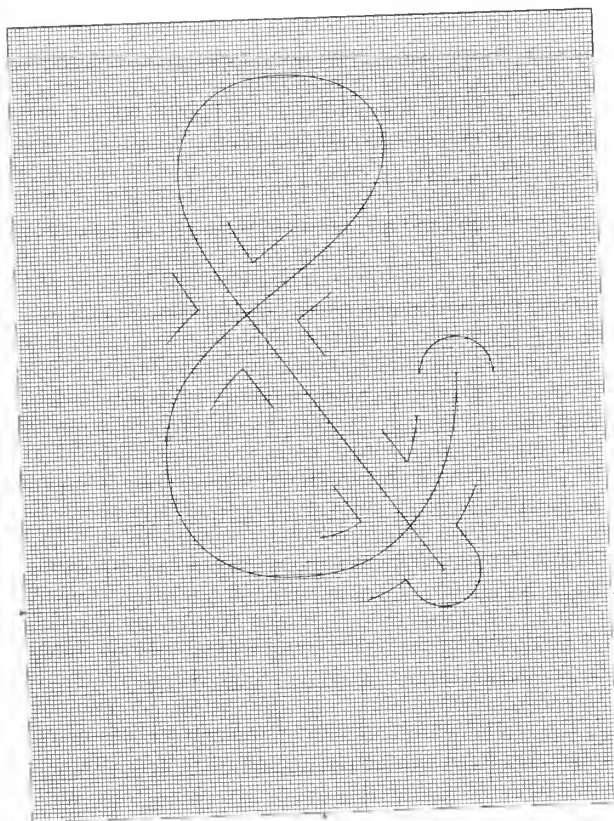


Fig. 85
Ampersand (RDN 85)

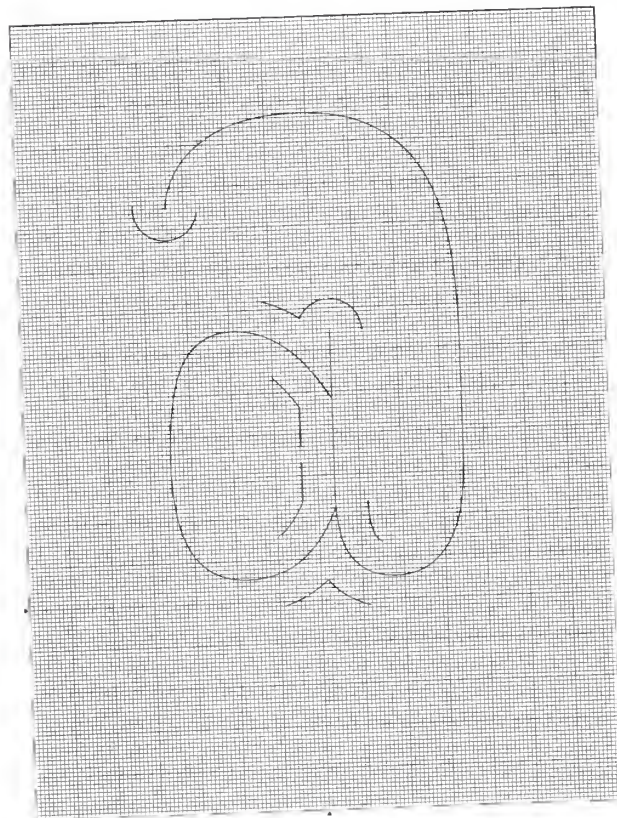


Fig. 86
Commercial At (RDN 86)

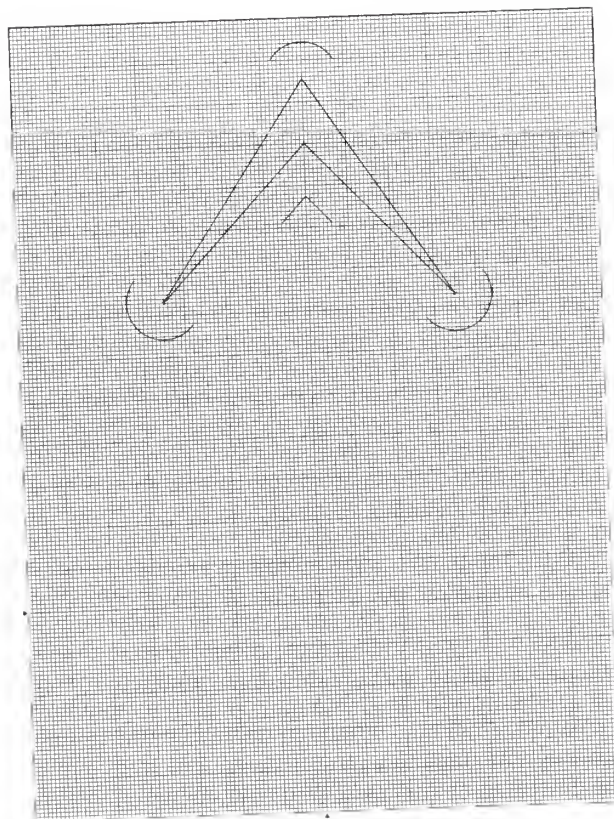


Fig. 87
Upward Arrowhead (RDN 87)

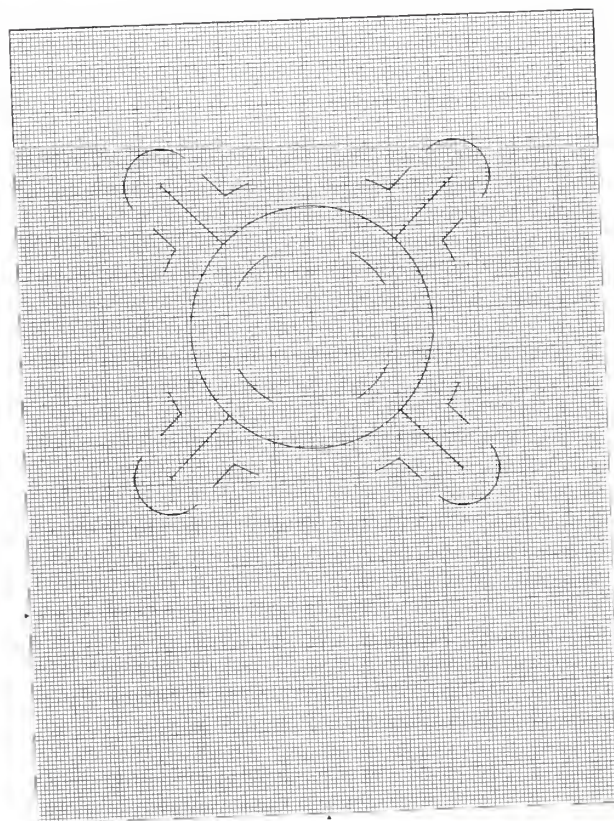


Fig. 88
Currency Sign (RDN 88)

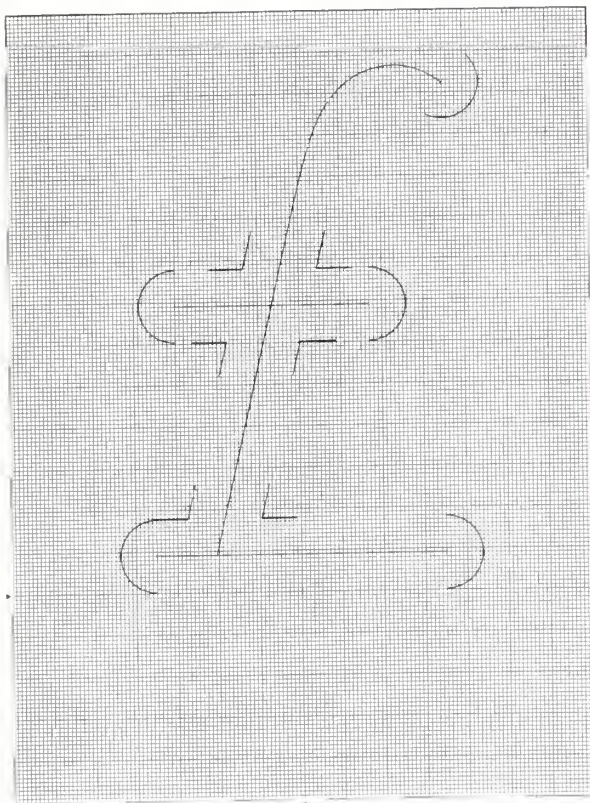


Fig. 89
Pound Sign (RDN 89)

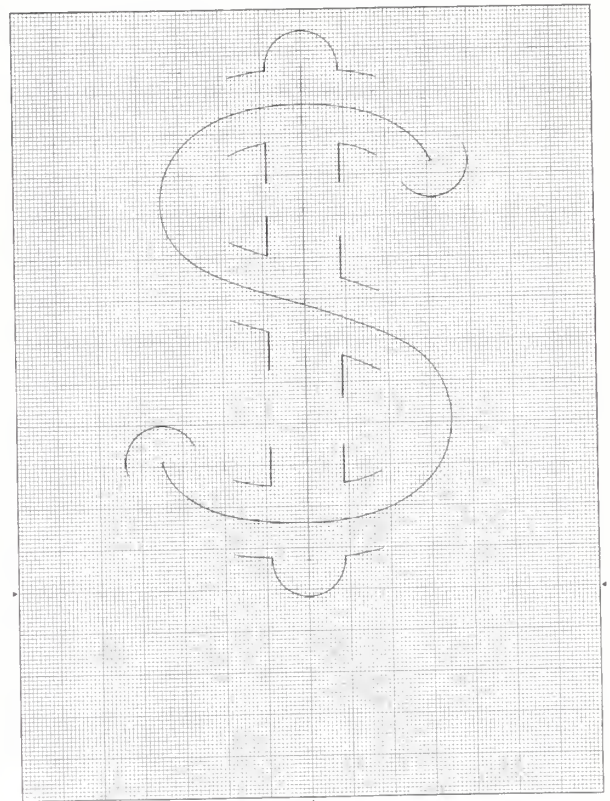


Fig. 90
Dollar Sign (RDN 90)



NOTES:
(1) For application and values see 2.4.3.
(2) Not to scale.

Fig. 91
Long Vertical Mark – Sizes I, III, and IV (RDN 92)

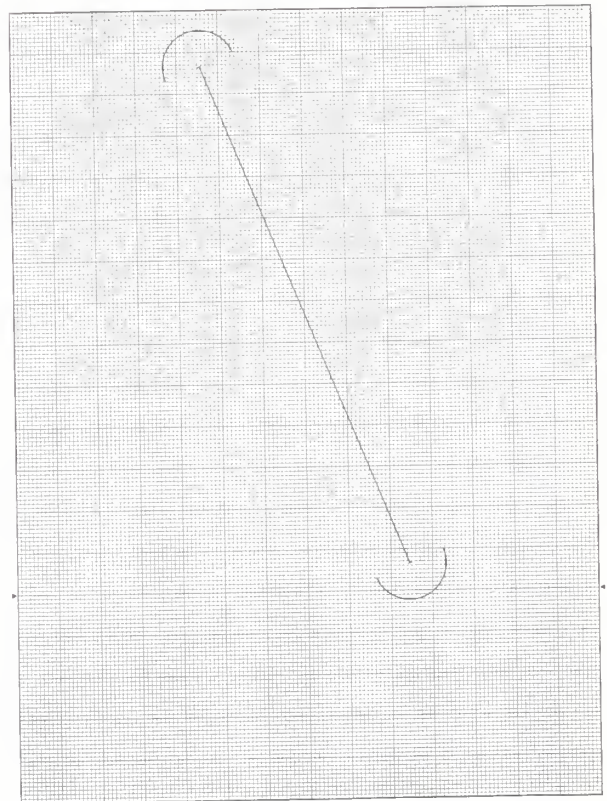
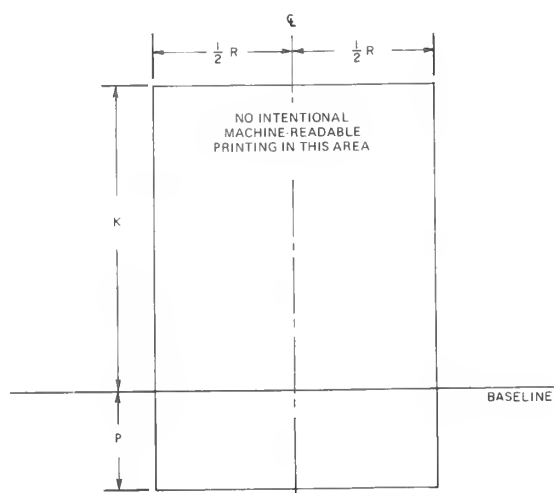


Fig. 92
Reverse Slant (RDN 93)



NOTE: For application and values see 2.4.2.

Fig. 93
Character Space – Sizes I, III, and IV (RDN 117)

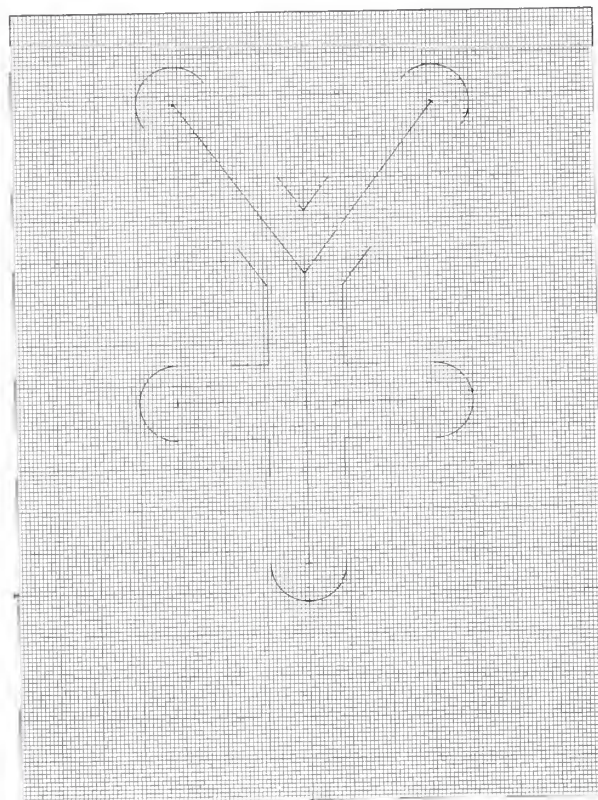
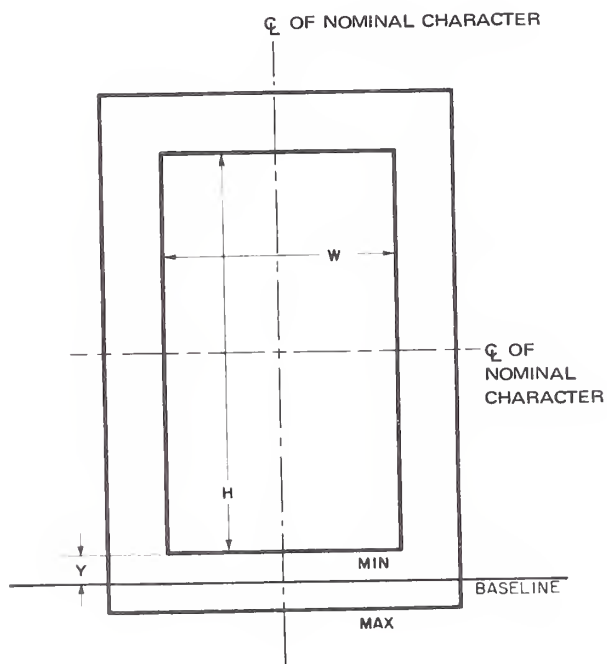
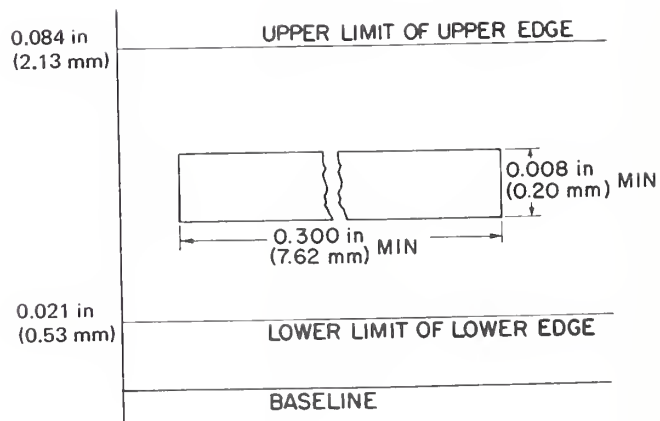


Fig. 94
Yen Sign (RDN 119)



NOTE: For application and values see 2.4.4.

Fig. 95
Character Erase – Size I Only (RDN 120)



NOTE: For application see 2.4.5.

Fig. 96
Group Erase – Size I Only (RDN 121)

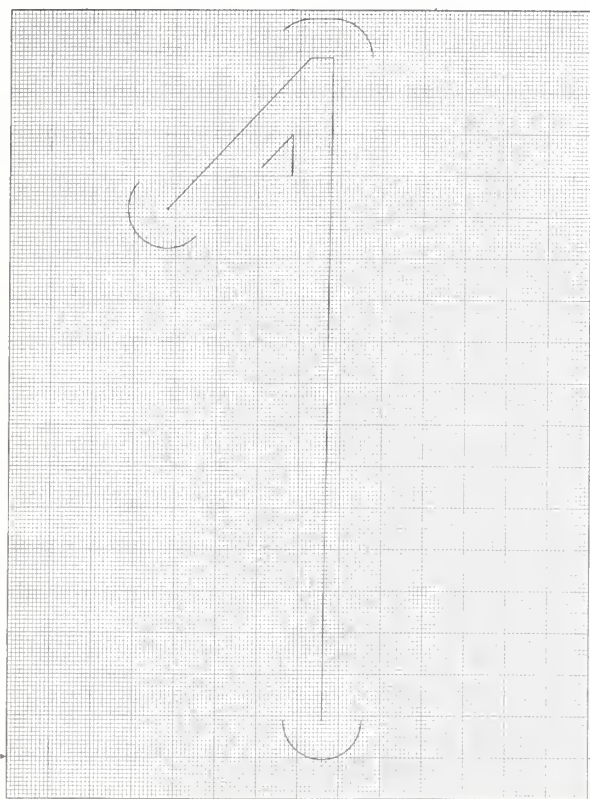


Fig. 97
Digit One – Size III (RDN 1)

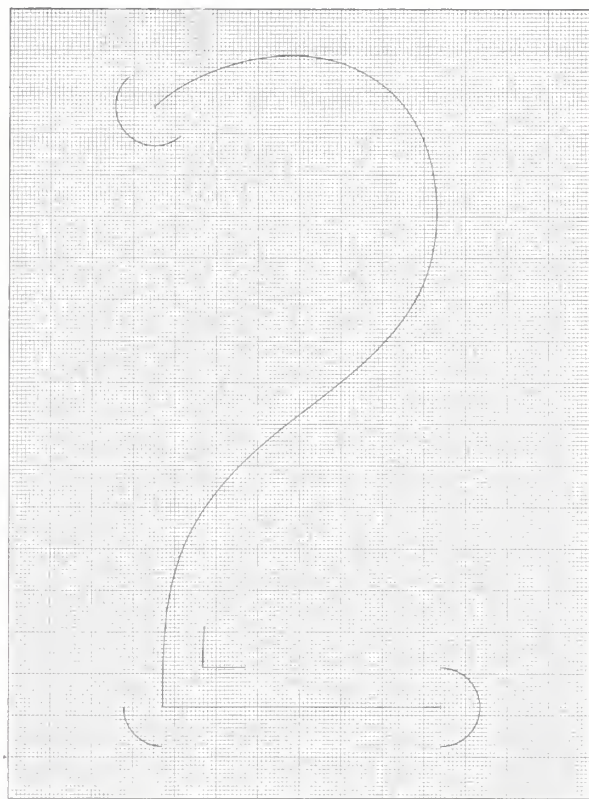


Fig. 98
Digit Two – Size III (RDN 2)

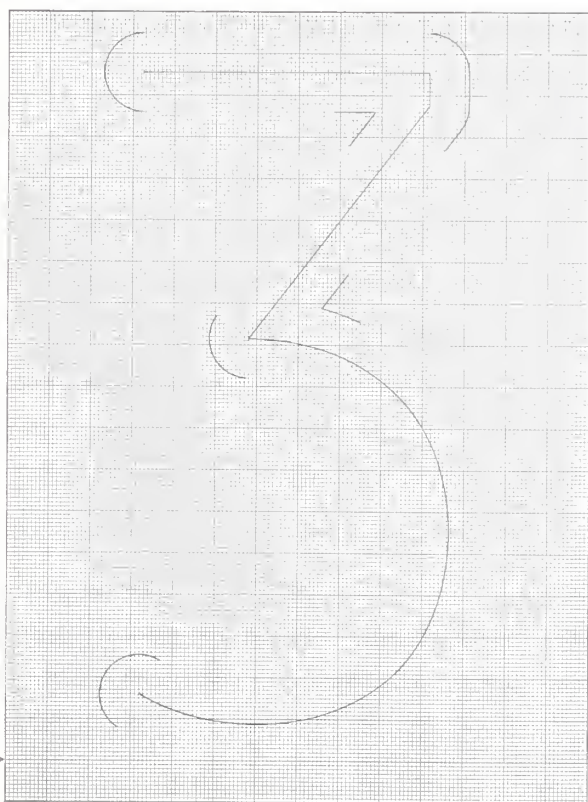


Fig. 99
Digit Three – Size III (RDN 3)

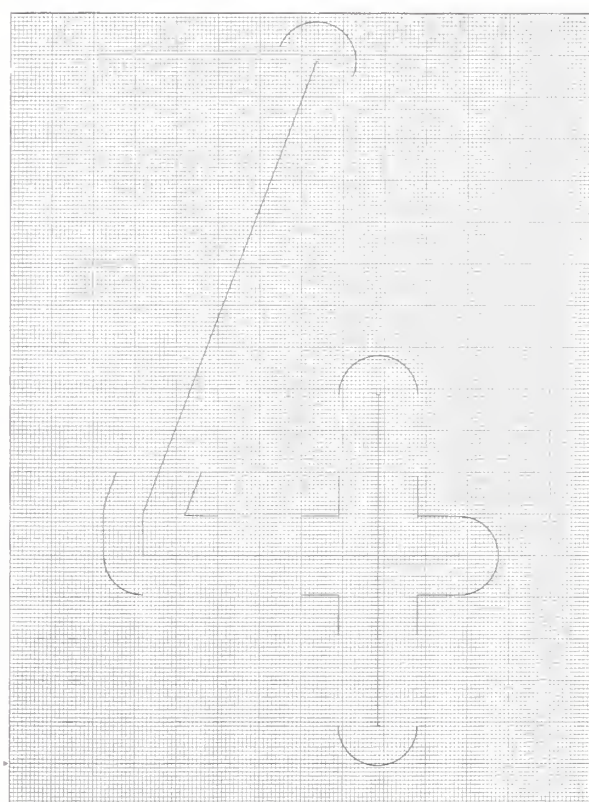


Fig. 100
Digit Four – Size III (RDN 4)

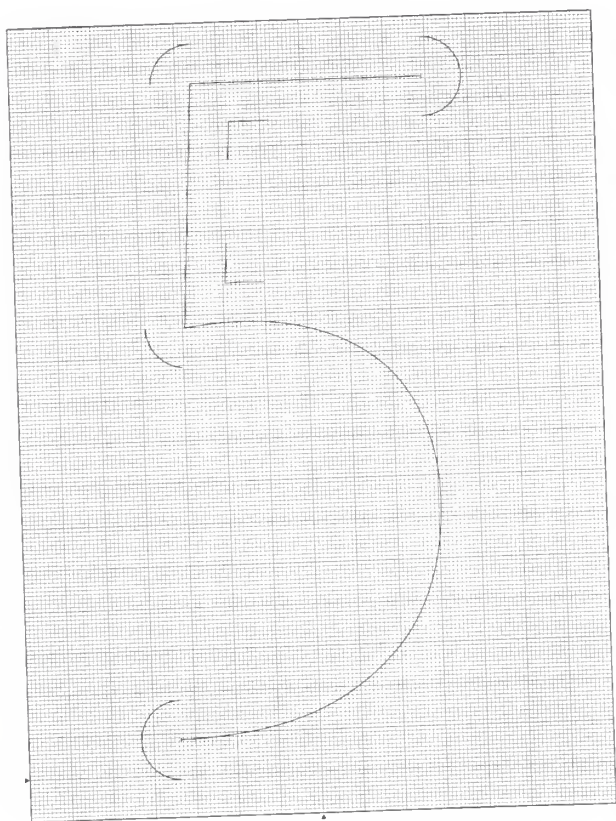


Fig. 101
Digit Five – Size III (RDN 5)

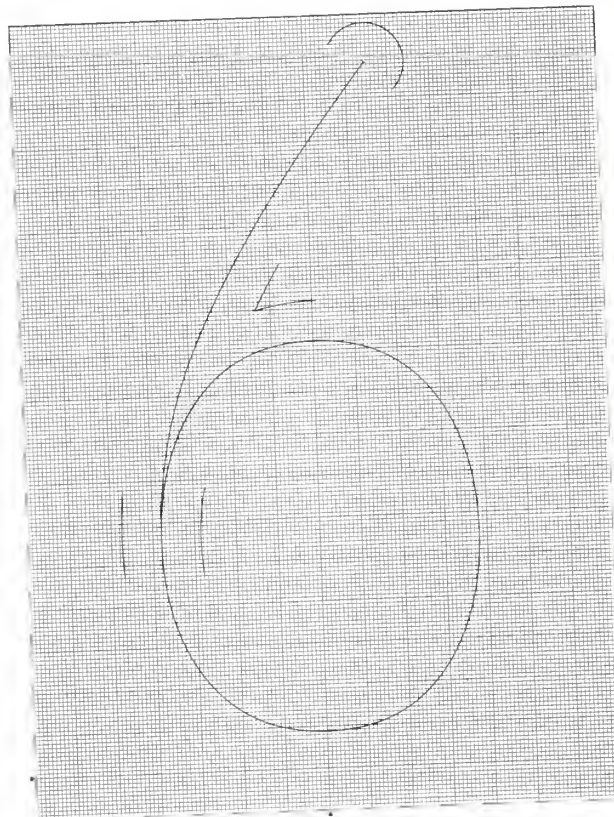


Fig. 102
Digit Six – Size III (RDN 6)

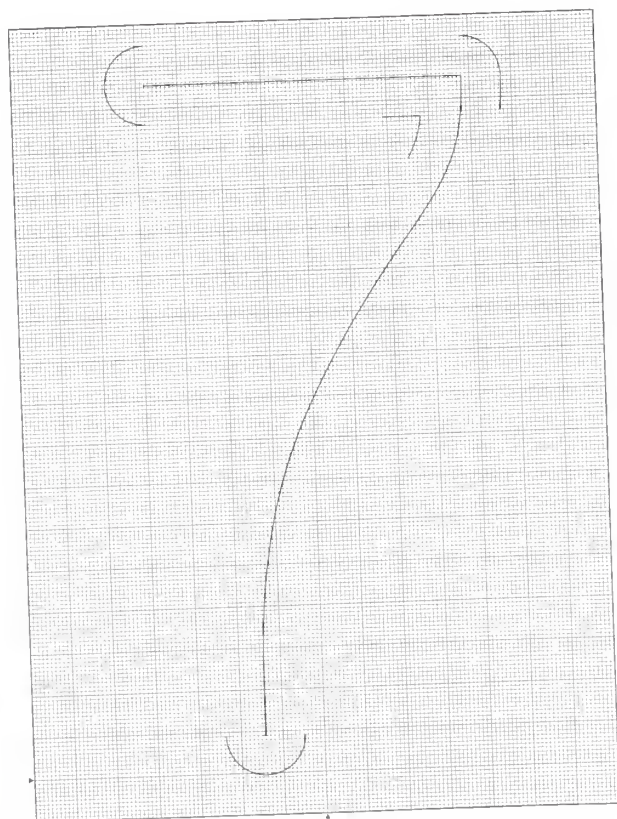


Fig. 103
Digit Seven – Size III (RDN 7)

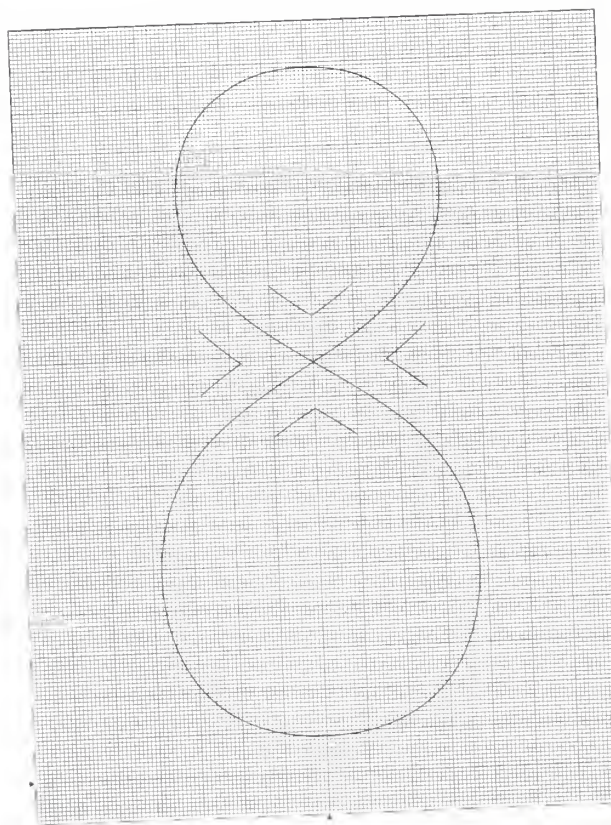


Fig. 104
Digit Eight – Size III (RDN 8)

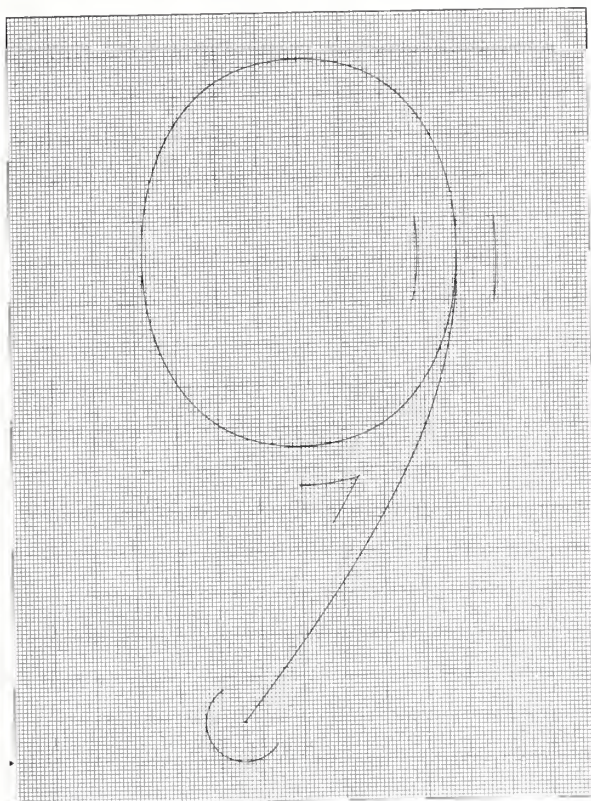


Fig. 105
Digit Nine – Size III (RDN 9)

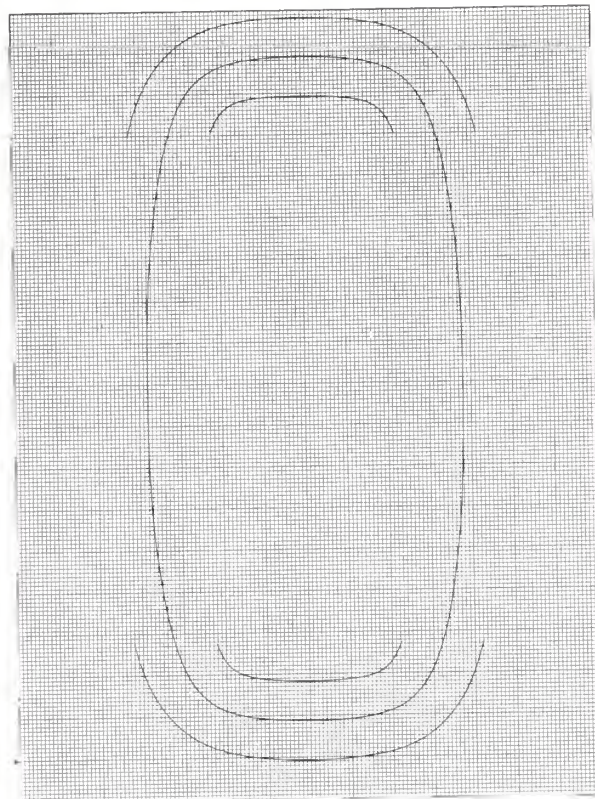


Fig. 106
Digit Zero – Size III (RDN 10)

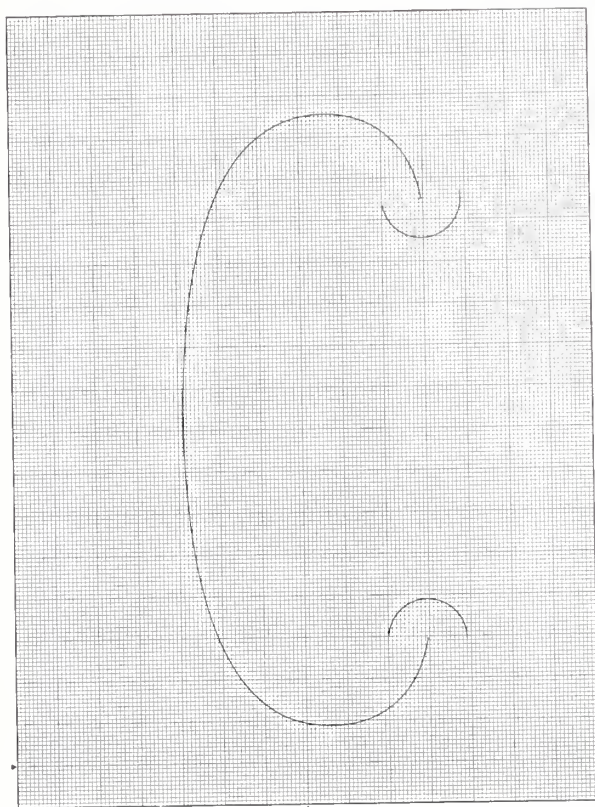


Fig. 107
Capital Letter C – Size III (RDN 13)

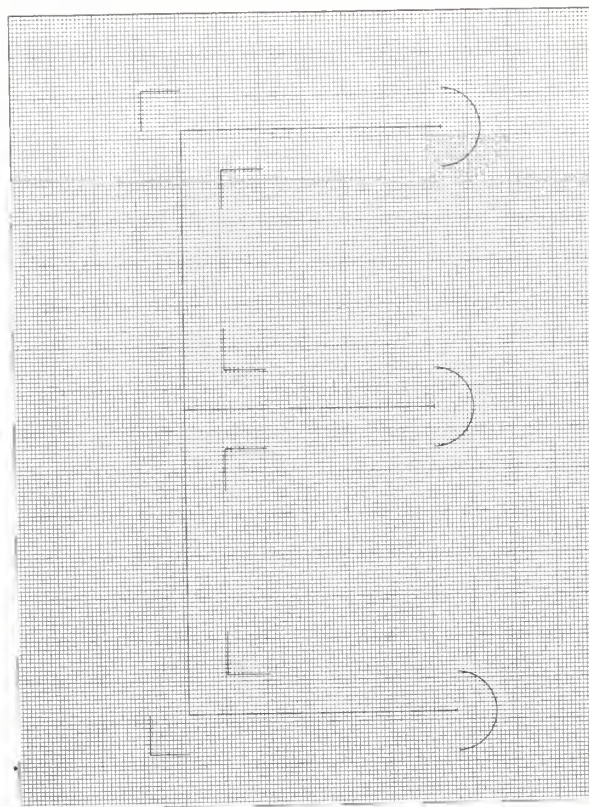


Fig. 108
Capital Letter E – Size III (RDN 15)

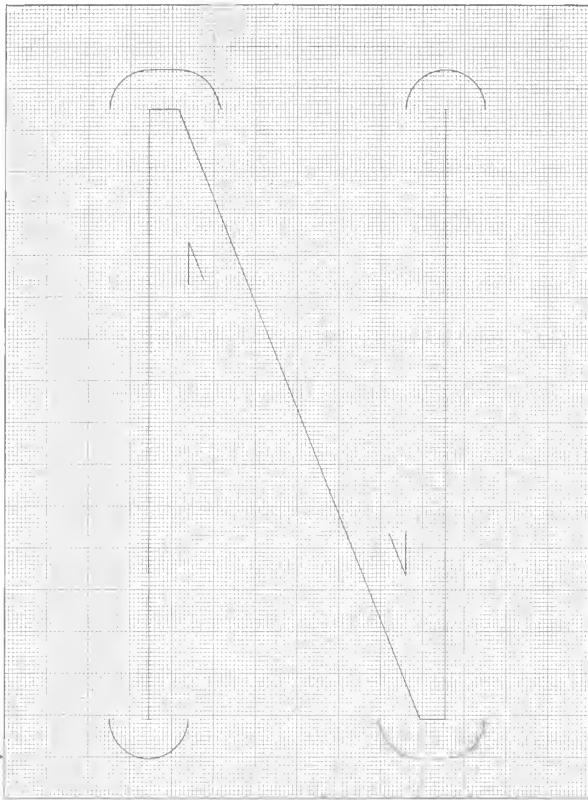


Fig. 109
Capital Letter N – Size III (RDN 24)

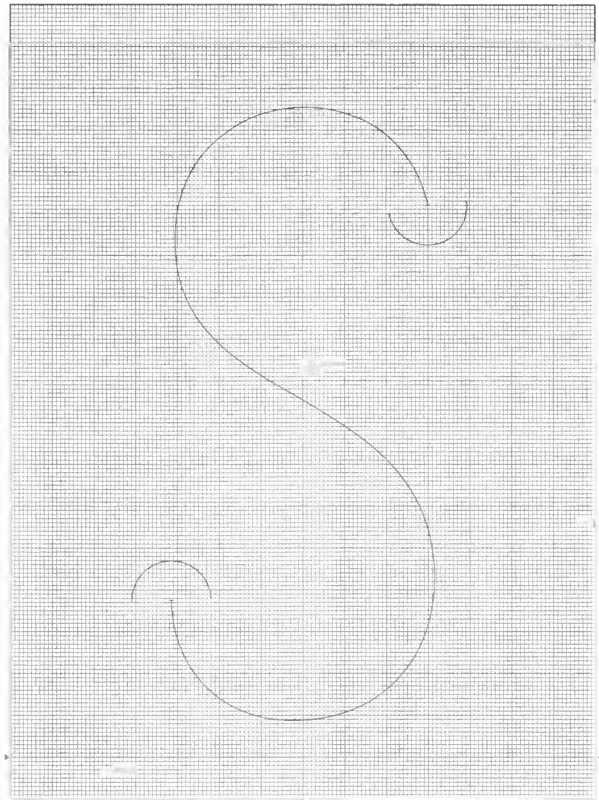


Fig. 110
Capital Letter S – Size III (RDN 29)

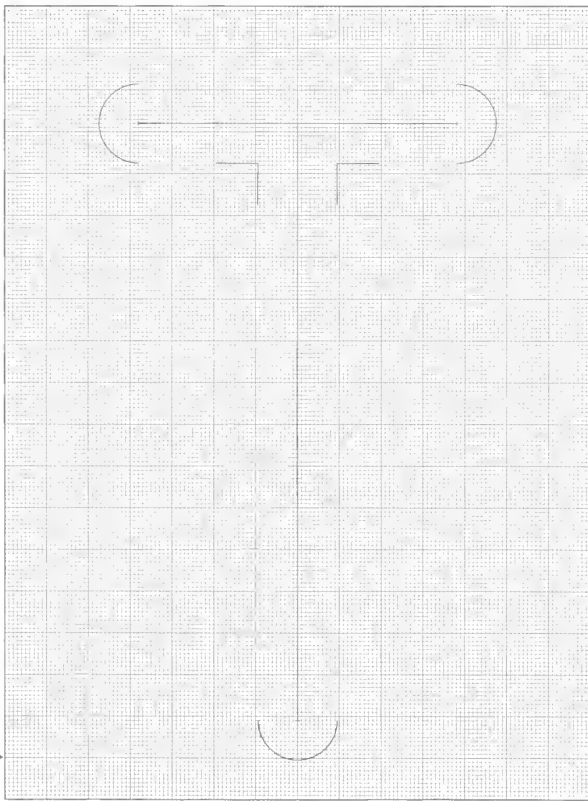


Fig. 111
Capital Letter T – Size III (RDN 30)

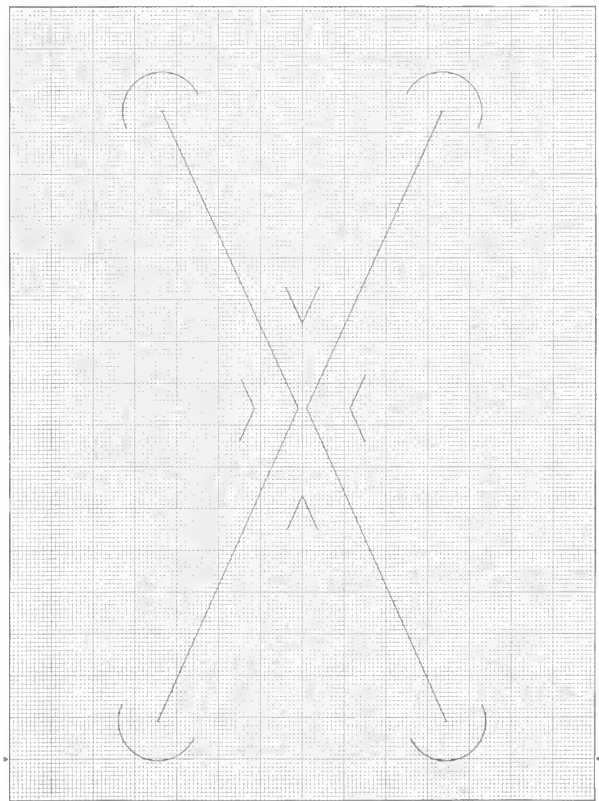


Fig. 112
Capital Letter X – Size III (RDN 34)

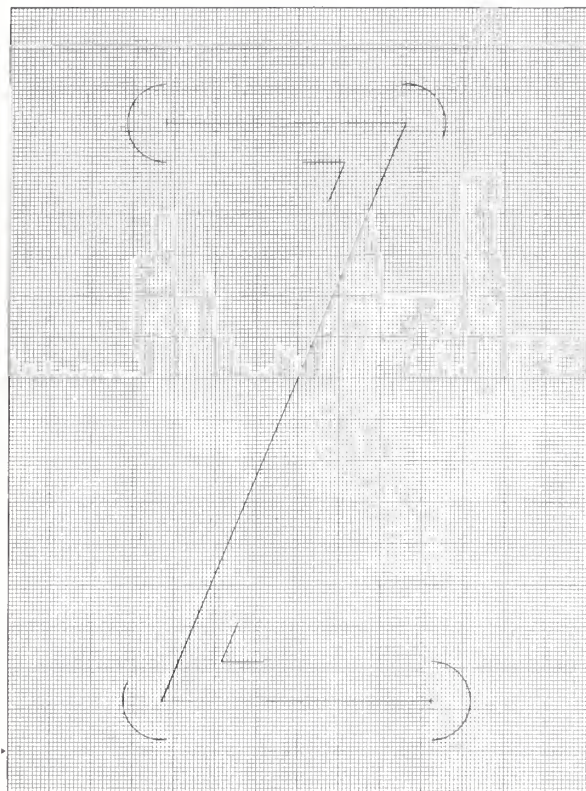


Fig. 113
Capital Letter Z – Size III (RDN 36)

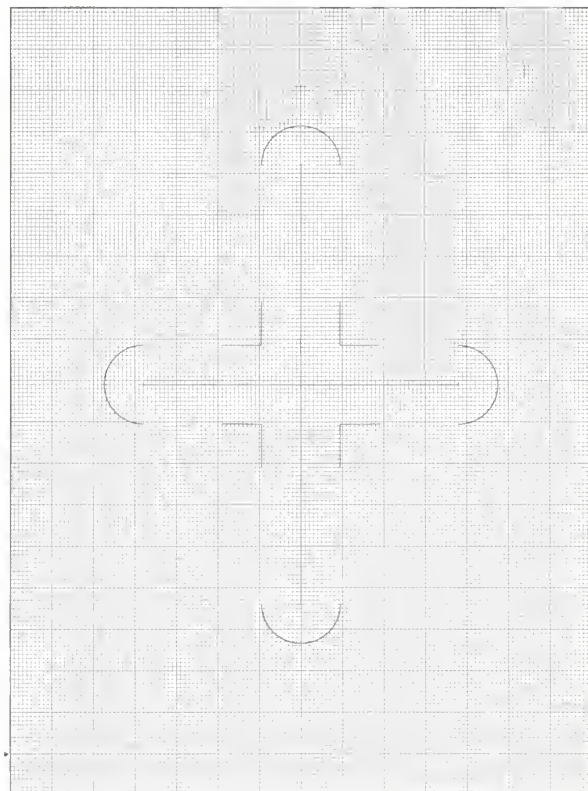


Fig. 114
Plus Sign – Size III (RDN 64)

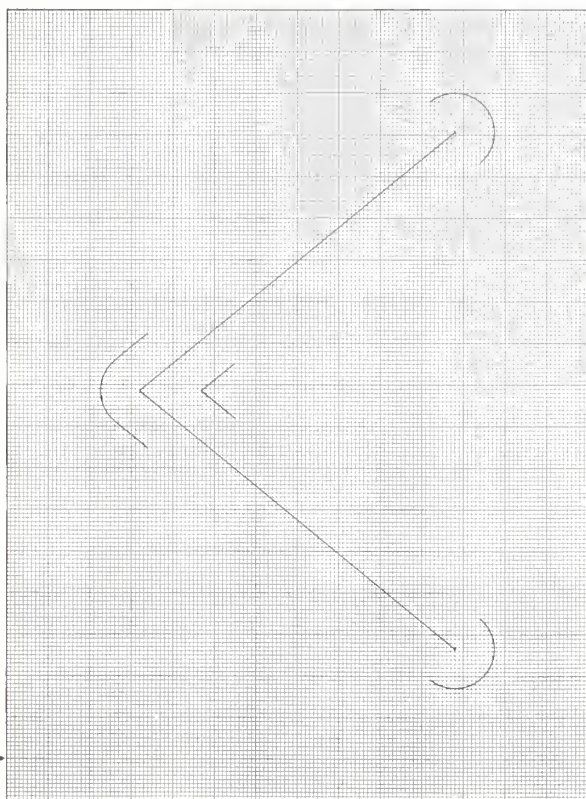


Fig. 115
Less Than Sign – Size III (RDN 79)

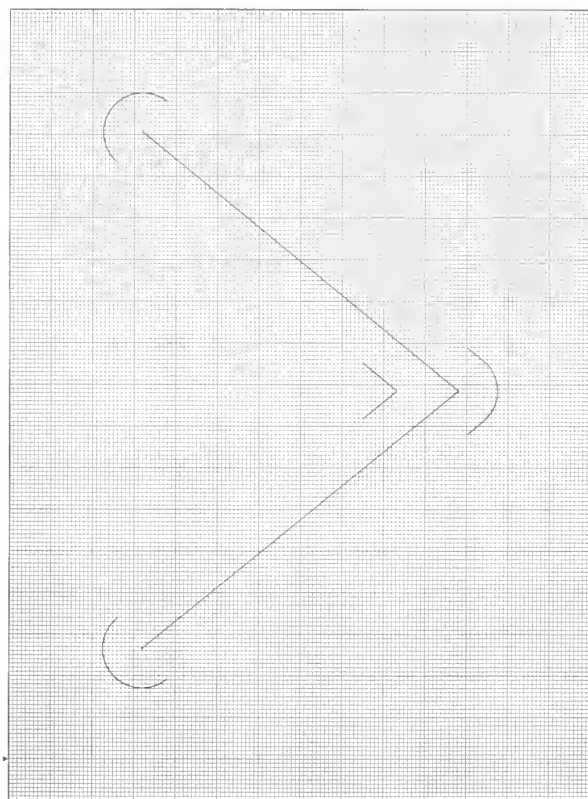


Fig. 116
Greater Than Sign – Size III (RDN 80)

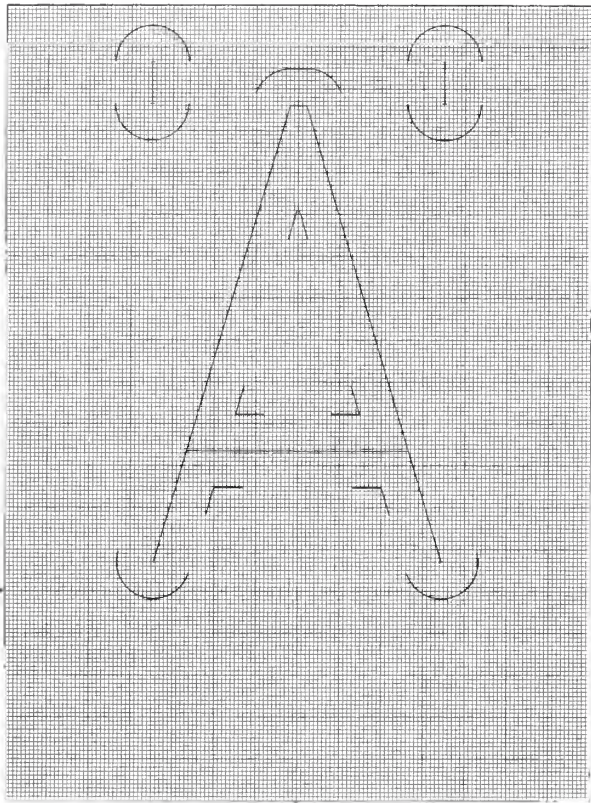


Fig. 117
Capital Letter A (RDN 94)

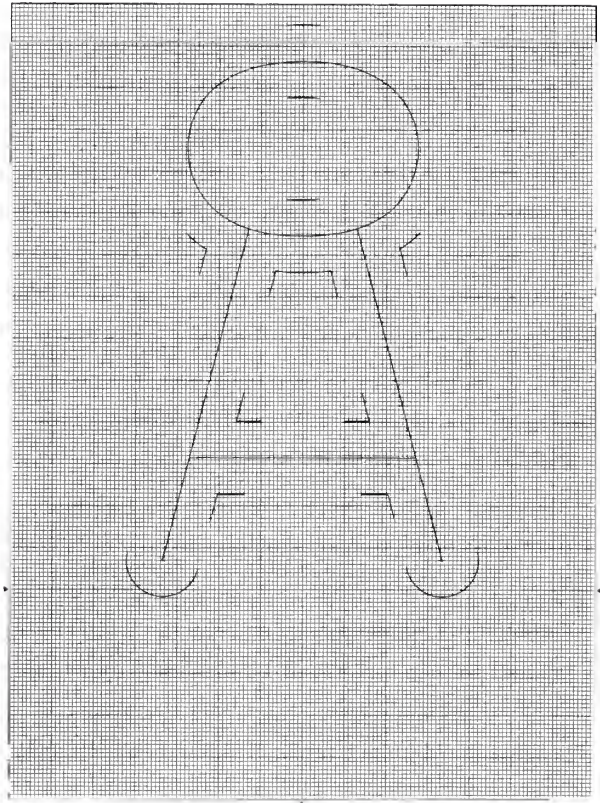


Fig. 118
Capital Letter Å (RDN 95)

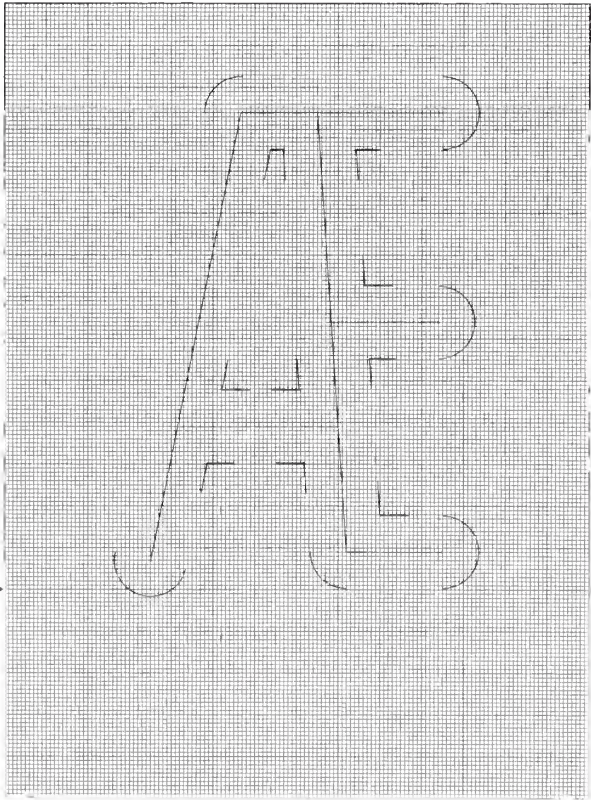


Fig. 119
Capital Letter AE (RDN 96)

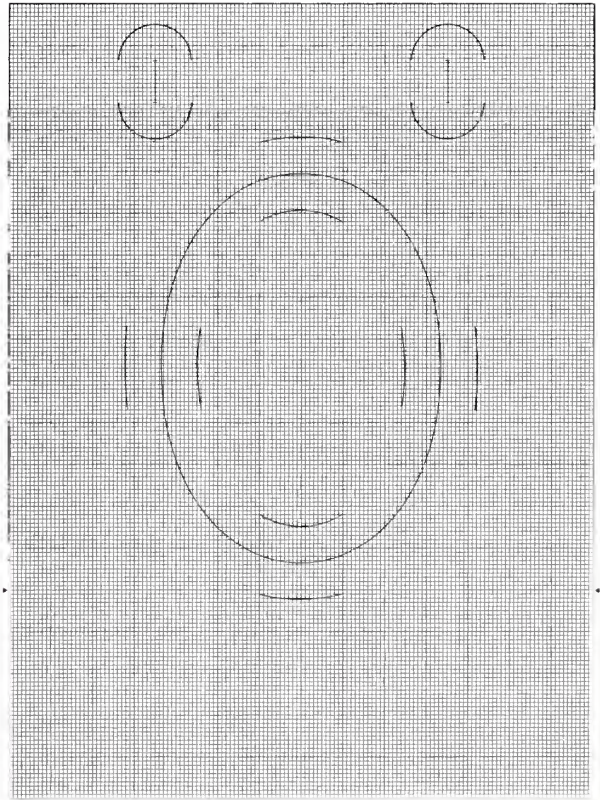


Fig. 120
Capital Letter Ö (RDN 97)

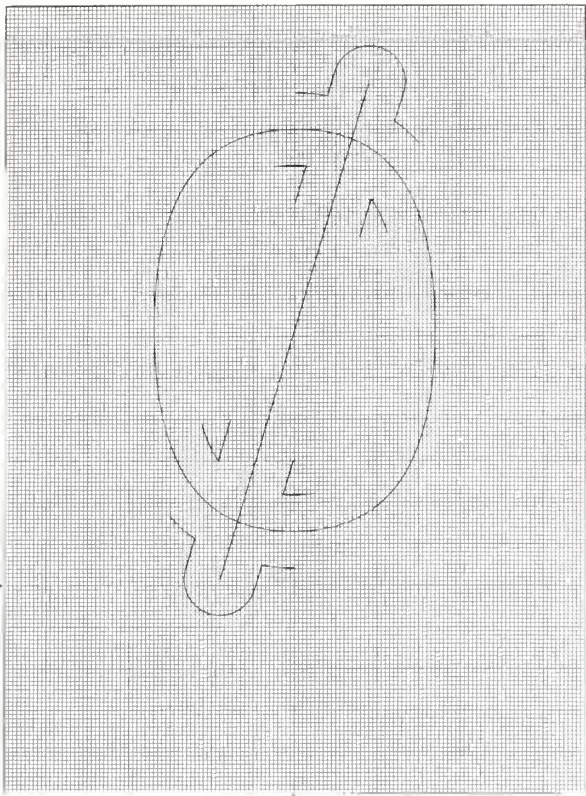


Fig. 121
Capital Letter Ø (RDN 98)

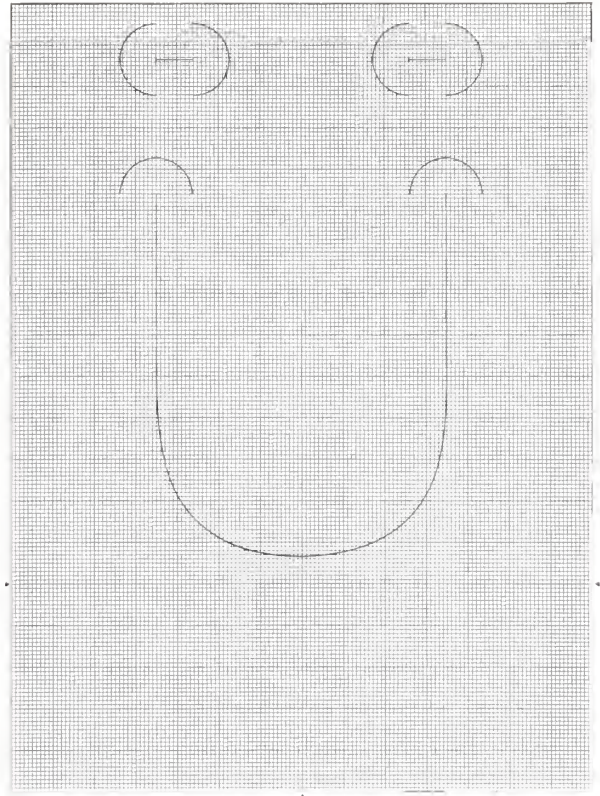


Fig. 122
Capital Letter Ů (RDN 99)

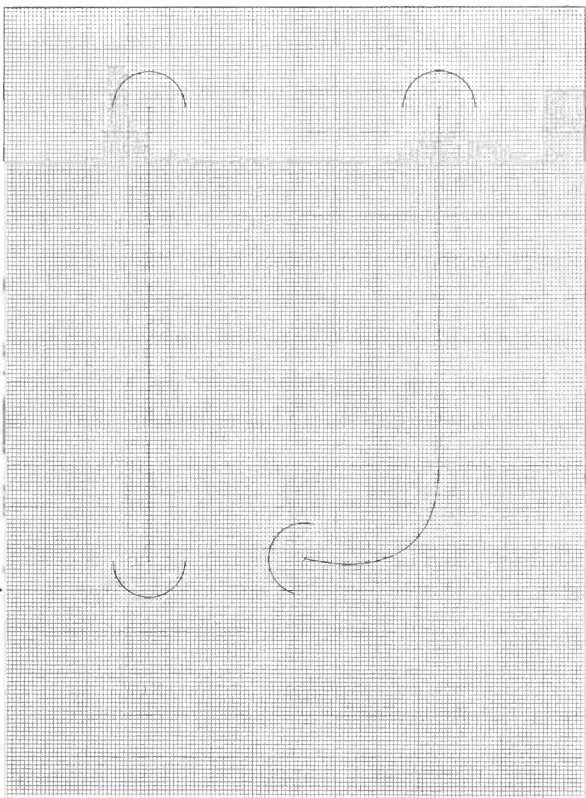


Fig. 123
Capital Letter Dutch IJ (RDN 100)

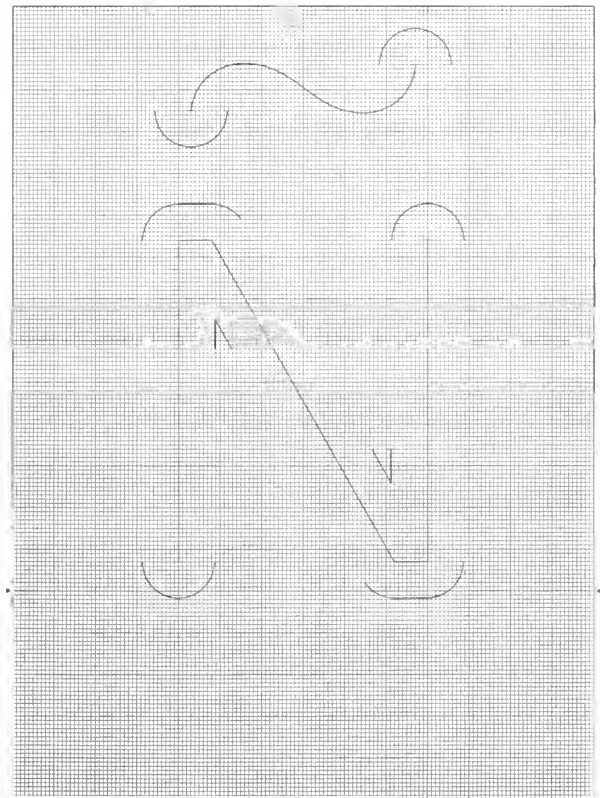


Fig. 124
Capital Letter Ñ (RDN 101)

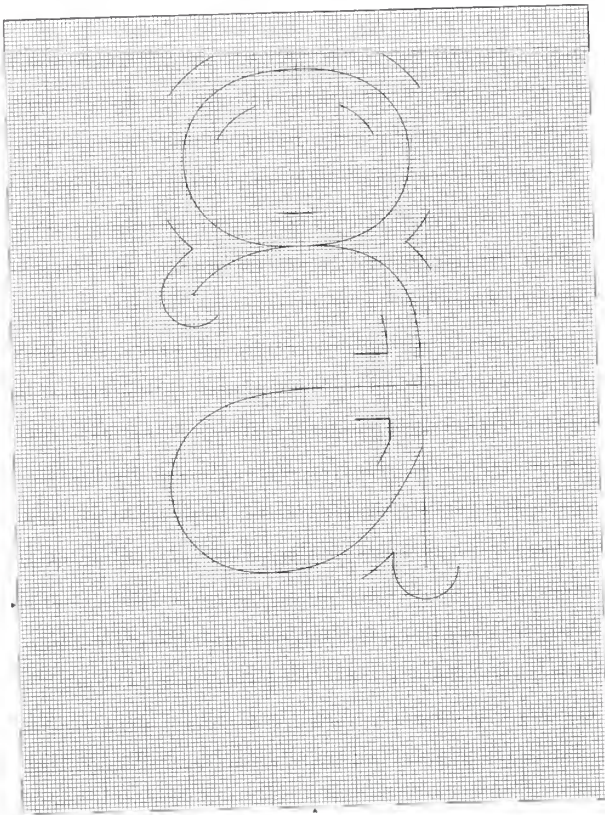


Fig. 125
Small Letter Å (RDN 102)

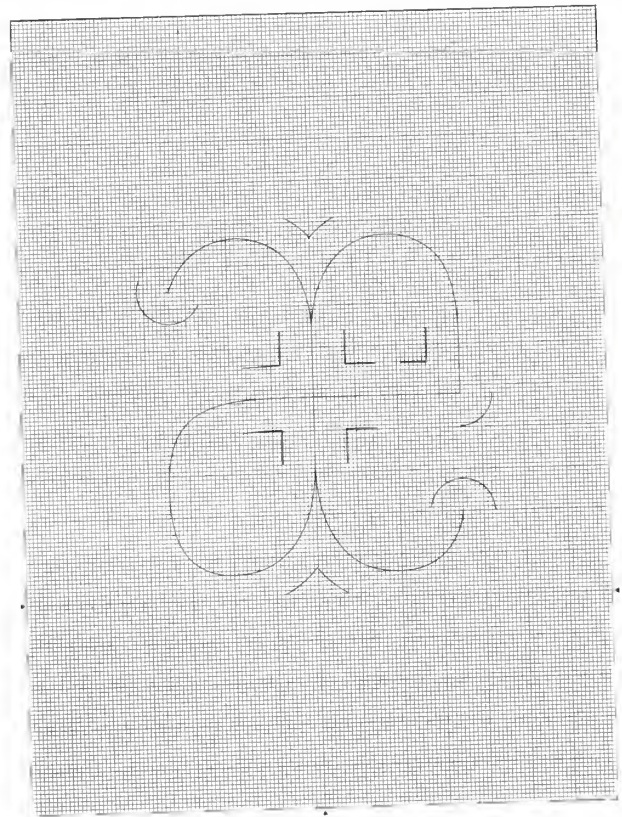


Fig. 126
Small Letter AE (RDN 103)

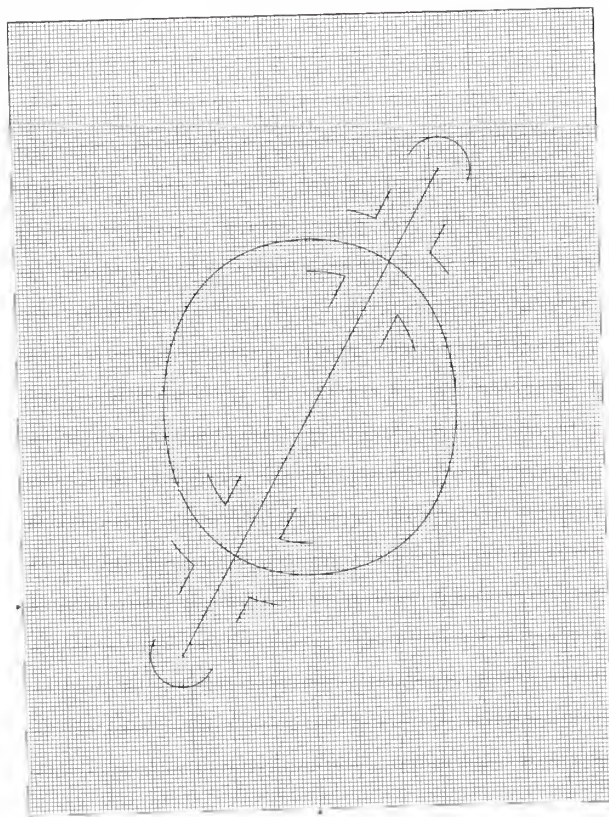


Fig. 127
Small Letter Ø (RDN 104)

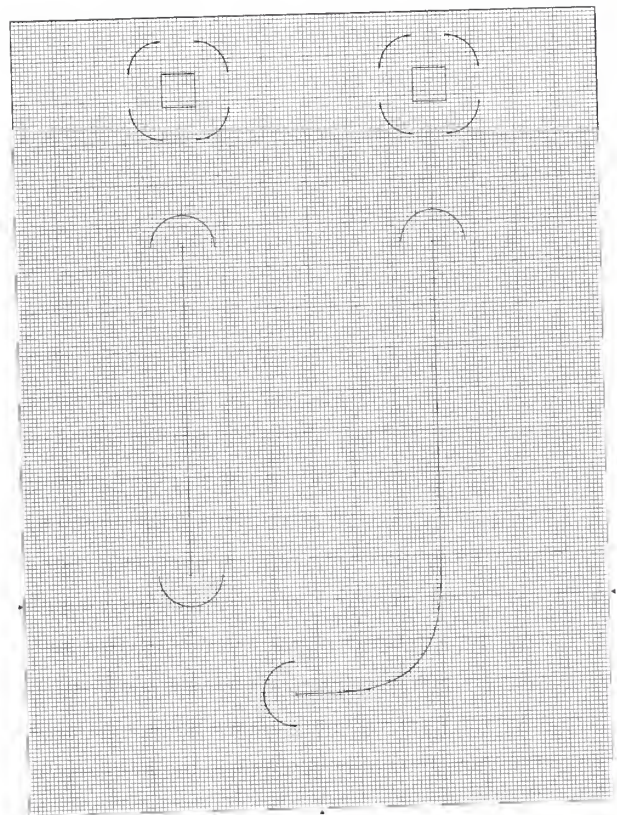


Fig. 128
Small Letter Dutch IJ (RDN 105)

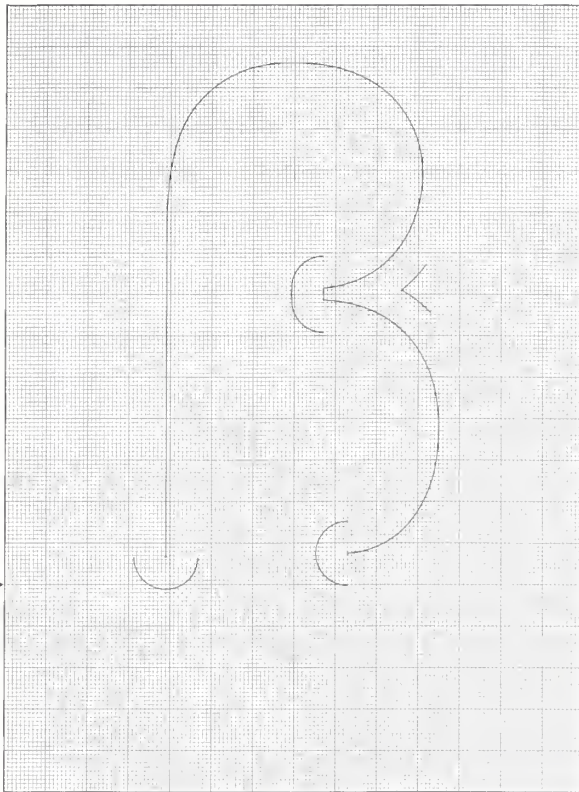


Fig. 129
Small Letter German Double S (RDN 106)

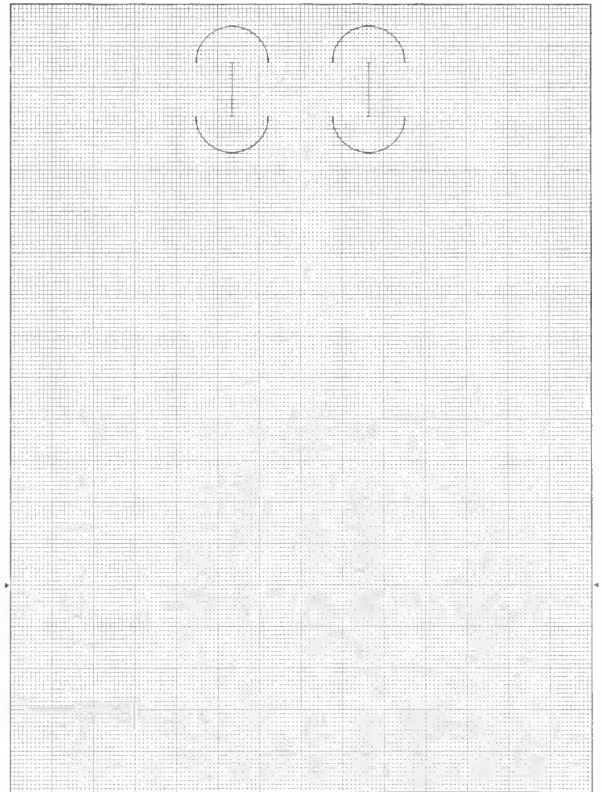


Fig. 130
Diaeresis (RDN 107)

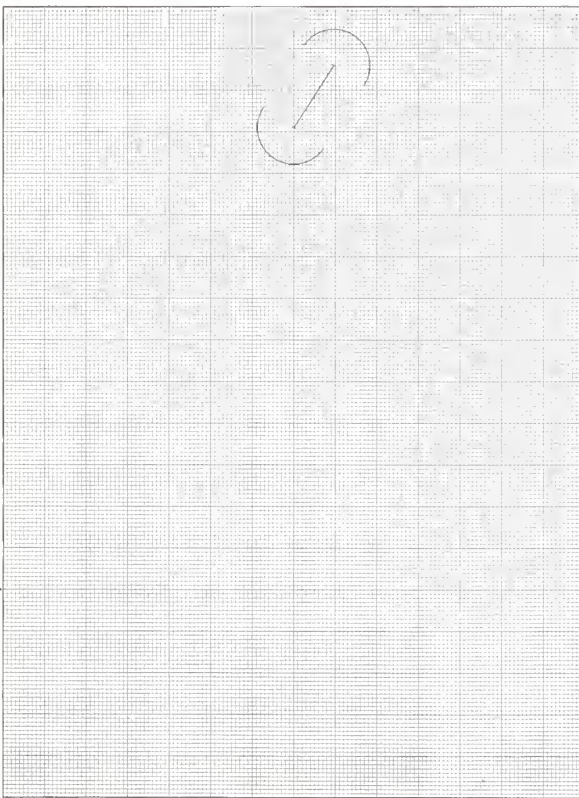


Fig. 131
Acute Accent (RDN 108)

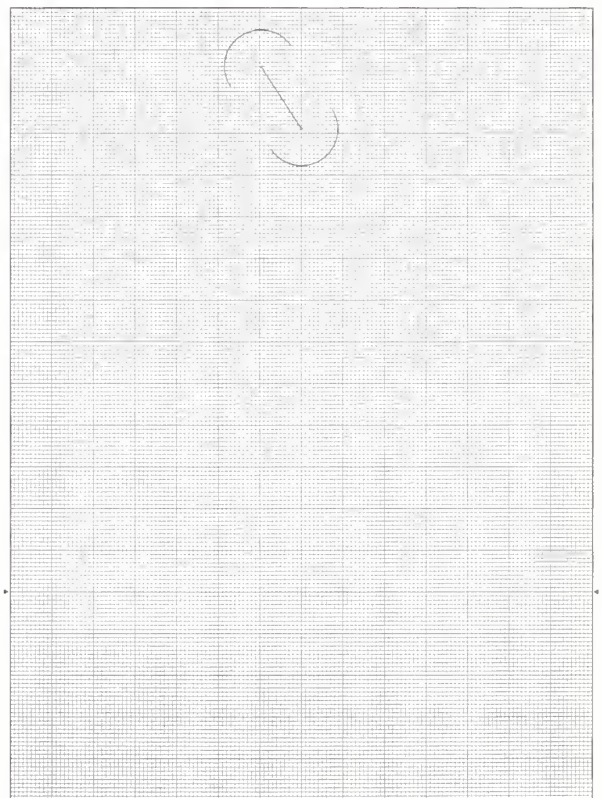


Fig. 132
Grave Accent (RDN 109)

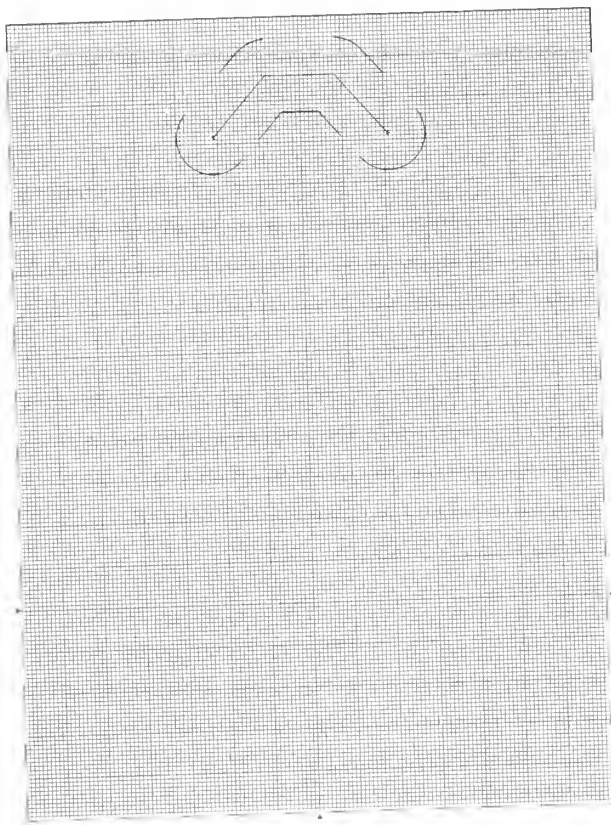


Fig. 133
Circumflex Accent (RDN 110)

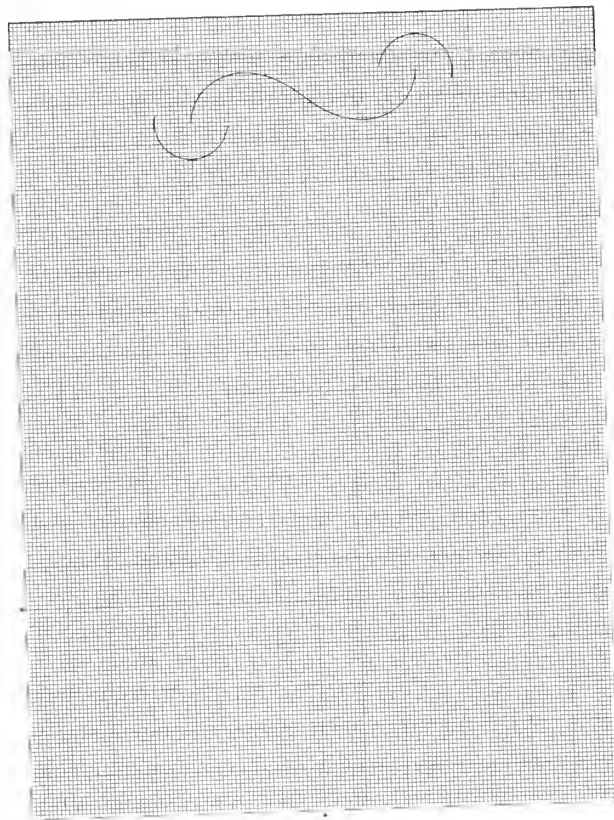


Fig. 134
Tilde (RDN 111)

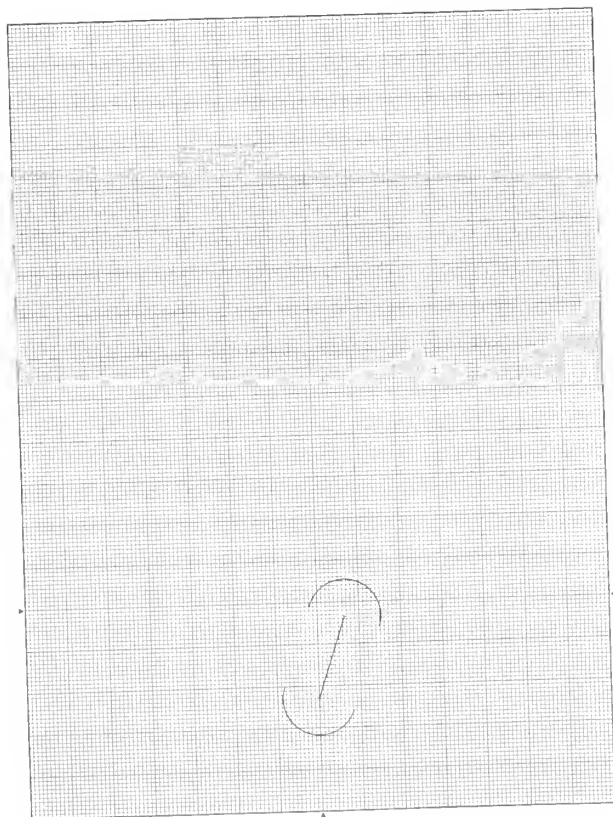


Fig. 135
Cedilla (RDN 112)

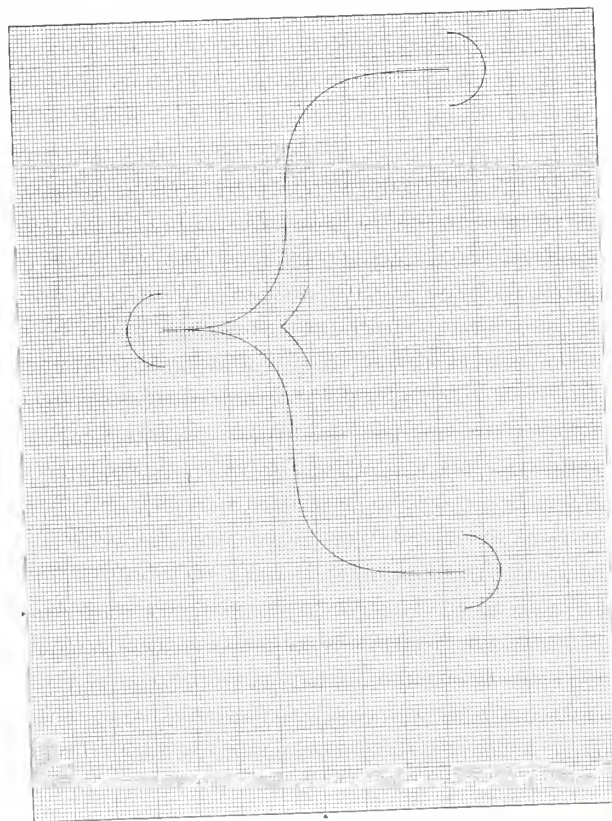
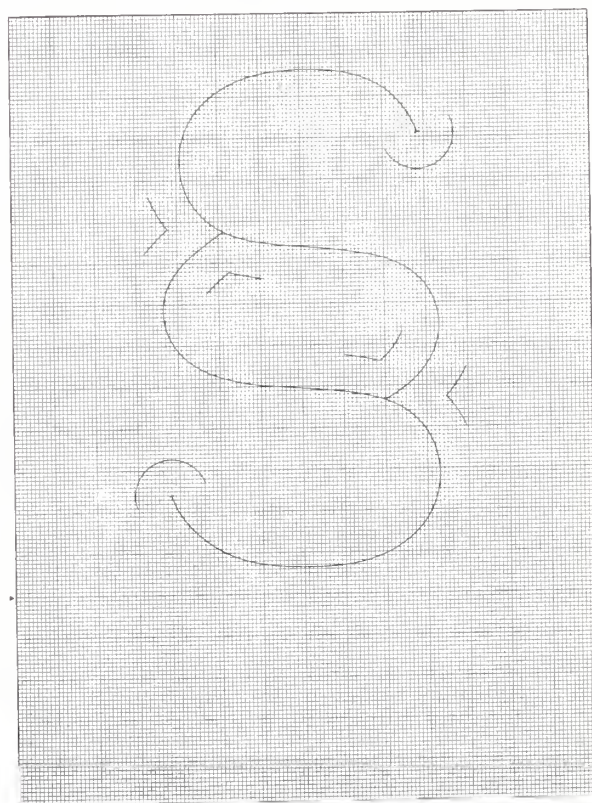
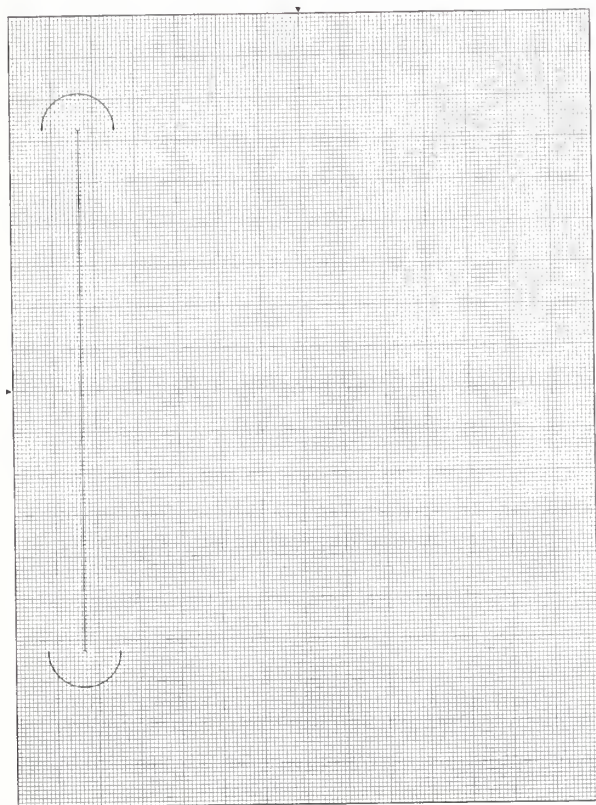
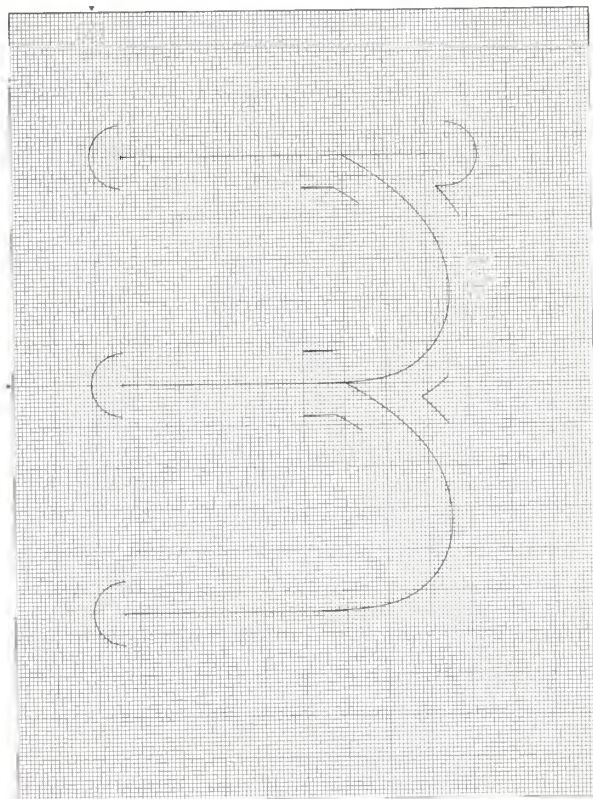
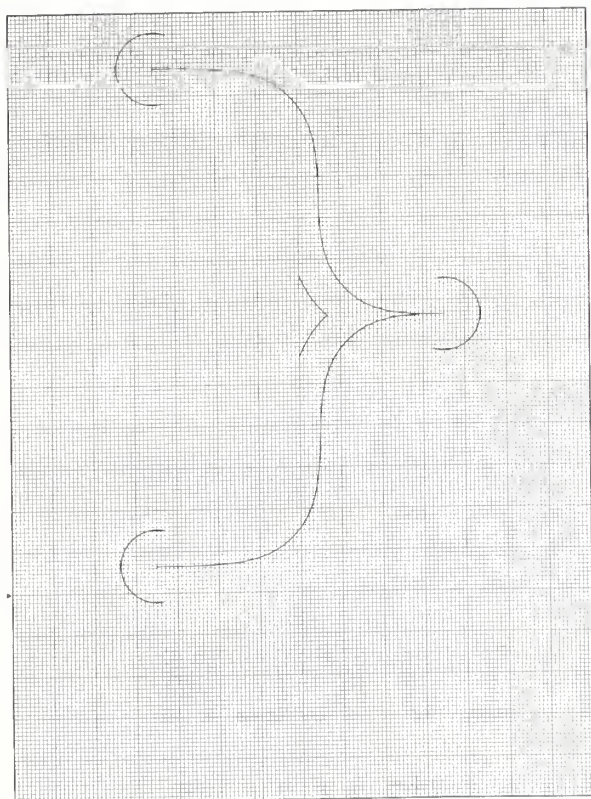


Fig. 136
Opening Brace (RDN 113)



1234567890
 ABCDEFGHIJKLM
 NOPQRSTUVWXYZ
 abcdefghijklm
 nopqrstuvwxyz
 *+-=/.,:;"' _
 ?!()<>[]%#&@^
 ¤£\$| \ ¥ ■ —

Scale 1:1

1234567890
 ABCDEFGHIJKLM
 NOPQRSTUVWXYZ
 abcdefghijklm
 nopqrstuvwxyz
 *+-=/.,:;"' _
 ?!()<>[]%#&@^
 ¤£\$| \ ¥ ■ —

Scale 4:1

Fig. 141
 Illustration of Standard Character Set
 for OCR Usage

À Á Â Ã Ä Å Æ Ø Ù Ú Û Ü
 à á â ã ä å æ ø ù ú û ü
 " ' , \ ^ ~
 { } m _ §

Scale 1:1

À Á Â Ã Ä Å Æ Ø Ù Ú Û Ü
 à á â ã ä å æ ø ù ú û ü
 " ' , \ ^ ~
 { } m _ §

Scale 4:1

Fig. 142
 Illustration of Standard Character Set
 for Extended Repertoire

2.4 Properties of Special Characters. Certain characters have special properties or usages given in 2.4.1 through 2.4.5.

2.4.1 Hyphen and Discontinuous Underline (See Fig. 65 and 74). The Hyphen and the Discontinuous Underline are not OCR separable except by their vertical print location. Since some OCR readers are not sensitive to this difference the use of these characters should be undertaken only with the advice of the OCR equipment manufacturer concerned.

2.4.2 Character Space (See Fig. 93). The character *Space* is a blank area in a print line having a width equal to the width of the character pitch. If a pair of printed characters are separated by one or more *Space* characters, the extent of the blank area between the printed characters depends on the number of *Space* characters and on the width of the bounding characters.

The accuracy with which the number of contiguous *Space* characters can be determined depends upon the OCR reader used, the print location tolerances, and other factors.

The dimensions of the character *Space* are as given in Table 3.

2.4.3 Long Vertical Mark (See Fig. 91). The *Long Vertical Mark* (LVM) is a special character that is most often used as a field separator. The *Long Vertical Mark* is taller than the normal character so as to provide a good visual indication of the division of the document into fields. No limit on the vertical extent of this character is specified. Where *Long Vertical Marks* on adjacent printing lines are collinear they may be printed as one continuous line. It is common practice to pre-print an entire form with such format lines. These may extend over the entire height of the form.

Table 3
Dimensions of the Character Space

Dimension	Size I		Size III		Size IV	
	in	mm	in	mm	in	mm
<i>K</i>	0.101	2.57	0.134	3.39	0.160	4.06
<i>P</i>	0.036	0.91	0.047	1.19	0.057	1.45
<i>R</i>	0.083	2.11	0.090	2.29	0.120	3.05
$1/2 R$	0.042	1.05	0.045	1.14	0.060	1.52

The minimum height of the *Long Vertical Mark* is:

<i>Size</i>	<i>Minimum Height</i>
I	0.146 inch (3.71 mm)
III	0.196 inch (4.98 mm)
IV	0.220 inch (5.59 mm)

The nominal stroke width of the *Long Vertical Mark* (see dimension *T* of Fig. 91) is:

<i>Size</i>	<i>Nominal Stroke Width</i>
I	0.014 inch (0.36 mm)
III	0.015 inch (0.38 mm)
IV	0.020 inch (0.51 mm)

The extension below the baseline of the *Long Vertical Mark* (see dimension *Y* of Fig. 91) is:

<i>Size</i>	<i>Extension below Baseline</i>
I	0.021 inch (0.53 mm)
III	0.021 inch (0.53 mm)
IV	0.031 inch (0.79 mm)

It is common practice to distinguish between the *Long Vertical Mark* and other characters using only the greater height of the *Long Vertical Mark*. When the *Long Vertical Mark* is to be distinguished from the lowercase "g" or "j," which are of greater than normal height, it is recommended that either: (1) the shape as well as the height of the character be used, or (2) a *Long Vertical Mark* be used that is at least of the following height:

<i>Size</i>	<i>Minimum Height with Characters "g" or "j"</i>
I	0.180 inch (4.57 mm)
IV	0.268 inch (6.81 mm)

NOTE 1: Characters "g" or "j" are not provided in Size III.

NOTE 2: The top edge of the *Long Vertical Mark* used with the lowercase "j" shall be in the same vertical position as the minimum height *Long Vertical Mark*.

If a *Long Vertical Mark* is not collinear with a *Long Vertical Mark* in the vertically adjacent printed line then the minimum line separation criterion given in 2.5 applies to the *Long Vertical Mark* as well as to other

characters. This affects the minimum spacing between vertically adjacent lines; that is, the maximum number of lines that can be printed per inch on a form shall be decreased when *Long Vertical Marks* are used.

2.4.4 Character Erase (See Fig. 95). The *Character Erase* symbol is specified for Size I only and has the special property that its presence is detectable when standing alone or when it is superimposed on any other character of the repertoire or on nonstandard characters. It is used to delete the character that it covers and the space it occupies. The specific action that is taken upon recognition of this symbol is system dependent and its use should be resolved between user and equipment manufacturer.

The dimensions of *Character Erase* are as given in Table 4.

2.4.5 Group Erase (See Fig. 96). *Group Erase* is specified for Size I only and is designed so that a long string of characters can be deleted without striking a *Character Erase* for each character to be deleted.

The *Group Erase* is a continuous line at least 0.300 inch (7.62 mm) long, and having a minimum thickness of 0.008 inch (0.20 mm). It lies between 0.021 inch (0.53 mm) and 0.084 inch (2.13 mm) above the character horizontal baseline. The specific action that is taken upon recognition of this symbol is system dependent and its use should be resolved between user and supplier.

2.5 Relative Character Positioning. Most of the master drawings have indexing marks to indicate a horizontal baseline (◄) and a print position centerline (▲).

A row of characters is properly aligned when the horizontal baselines are collinear. Characters may be

Table 4
Dimensions of Character Erase

Dimension	Size I	
	in	mm
H_{min}	0.094	2.39
H_{max}	0.115	2.92
W_{min}	0.055	1.40
W_{max}	0.076	1.93
<i>Y</i>	0.005	0.13

spaced horizontally either uniformly (constant pitch) or nonuniformly (proportionally spaced). For constant-pitch printing the character centerlines are nominally spaced at a distance of at least 0.100 inch (2.54 mm) for Sizes I and III and 0.143 inch (3.63 mm) for Size IV. For either constant-pitch or proportionally spaced printing, adjacent characters are separated horizontally by a blank area of at least one nominal stroke width in extent (see 2.2). The use of proportional-spaced printing is system dependent and should be resolved between the user and equipment suppliers.

In order to achieve sufficient separation between lines, the minimum distance from the lowest vertical extension of one line of characters to the highest extension of the next lower line is given in the following table:

<u>Size</u>	<u>Minimum Line Separation</u>
I	0.025 inch (0.64 mm)
III	0.060 inch (1.52 mm)
IV	0.080 inch (2.03 mm)

Long Vertical Marks when used collinearly are an exception (see 2.4).

The spacing between printed lines that can be handled by an OCR reader differs from reader to reader. The user is advised to consult with the OCR manufacturer for line spacing less than 3 lines per inch.

3. Procedure for Obtaining Precise, Stable Copies of OCR-B Characters

Copies of the standard master centerline drawings for OCR-B characters can be obtained on a stable-base material at 100:1 scale on a 2-mm by 2-mm grid, 280-mm by 380-mm field. Paper reproductions are also available.

Note that Size-IV characters are derived from Size-I master drawings as described in 2.2. Character drawings

for *Space*, *Character Erase*, and *Group Erase* are not provided in any set.

Drawings will generally be provided in the following groups:

(1) This includes the complete set of 117 Size-I OCR-B character drawings for OCR-usage and extended repertoire in Tables 1 and 2.²

(2) This includes the set of 93 character drawings for OCR usage in Table 1.

(3) This includes the 21 Size-I character drawings used in journal-tape applications: Digits One through Zero, Capital Letters "C," "E," "N," "S," "T," "X," "Z," Plus Sign, Less Than Sign, Greater Than Sign, *Long Vertical Mark*.

(4) This includes the 21 character drawings of group (3), above, in Size III.

When referring to individual character drawings, always include the Reference Drawing Number (RDN) and size number for clarity of reference.

Requests for stable-base master drawings, prices, or related information should be addressed to:

Office of Standard Reference Materials
Room B311 Chemistry Building
National Bureau of Standards
Washington, D.C. 20234
Phone: 301 921-2045

Requests for paper copies of master drawings, prices, or related information should be addressed to:

Computer Systems Engineering Division
Institute for Computer Sciences and Technology
Room A231 Technology Building
National Bureau of Standards
Washington, D.C. 20234
Phone: 301 921-3436

² In addition, the drawing for *Vertical Line* (RDN 91) of ECMA-11-1975 will be supplied with group (1).

Appendix A

Relation to Other Standards

A1. Differences between Original and Current OCR-B Character Sets

The design of the characters described in American National Standard Character Set for Optical Character Recognition (OCR-B), X3.49-1975, evolved in the following manner. A character set known as OCR-B had been developed in Europe with objectives similar to those of this standard. This character set was published by the European Computer Manufacturers Association (ECMA) as Standard ECMA-11 for the Alphanumeric Character Set OCR-B for Optical Recognition, November 1965 (ECMA-11-1965), and by the International Organization for Standardization (ISO) in ISO Recommendation R 1073, Alphanumeric Character Sets for Optical Recognition, May 1969 (ISO R 1073-1969).

In considering this character set for standardization in the United States, it appeared that there were several character pairs, particularly the capital letter "O" and numeral Zero, that were too much alike for reliable OCR separation. A joint ECMA/ANSI experts group was convened to modify the character set and correct these problems. The revised set was then published in October 1971 as ECMA-11-1971. A new revision, ECMA-11-1975, was released in March 1975.

The characters of the original OCR-B set, ECMA-11-1965, were defined by extensive tabulations of the coordinates for points selected along the character centerlines. The original recording and subsequent interpretation of these coordinates led to inaccuracies sufficiently large to be of practical significance. The revised method of character description (centerlines drawn on a 2-mm by 2-mm grid) used in ECMA-11-1975 and American National Standard X3.49-1975 avoids this problem. However, this redefinition of character shapes for OCR-B makes all of the characters different from their original version, even those that were not reconfigured. In some instances, variations are of the order of 0.001 or 0.002 inch (0.025 or 0.050 mm). Differences of this magnitude have OCR significance, especially with respect to precise print

quality determination. For example, the tolerance within which the centerline of a printed character should correspond to an ideal centerline is, in one instance, specified at 0.003 inch (0.075 mm).

The user is cautioned regarding these changes from ECMA-11-1965 to ECMA-11-1975, and is advised to consult his OCR printing and reading equipment manufacturers about problems that may arise. These problems will warrant special concern during the period of transition from the old to the new character sets.

A2. Repertoires of Various OCR-B Character Sets

The original design and subsequent redesign of the OCR-B characters was a multinational effort and the specific repertoire usage varies from country to country. The user should consult the appropriate standards organization in the country of concern to obtain information about the specific repertoire of OCR-B that is used in that country.

In this respect, the character sets in American National Standard X3.49-1975 and ECMA-11-1975 are for the most part identical. There are the following exceptions:

(1) ECMA-11-1975 includes both a constant stroke-width and a letterpress version; American National Standard X3.49-1975 includes only the constant stroke-width version.

(2) ECMA-11-1975 includes the characters *Vertical Line* and *Preprinted Long Vertical Mark*; American National Standard X3.49-1975 has only a *Long Vertical Mark* (which is similar to the ECMA-11-1975 *Preprinted Long Vertical Mark*).

At the time of preparation of American National Standard X3.49-1975, ISO Technical Committee 97, Subcommittee 3 (ISO/TC 97/SC 3) on Character and Mark Recognition was in the process of revising ISO R 1073 so that the ISO version of OCR-B would agree

with ECMA-11-1975 and American National Standard X3.49-1975. In addition, the ISO standard will include a letterpress version of OCR-B as does ECMA-11-1975.

A3. Letterpress Version of OCR-B

The characters of American National Standard X3.49-1975 are defined to have essentially constant stroke-widths. This design provides for a substantial deterioration of printed image quality while still maintaining OCR separability. ECMA-11-1975 includes a second version of OCR-B, which may be used with very high quality printing processes such as letterpress. This version is based on identical centerline descriptions, but the stroke widths vary and the stroke endings are especially designed. The objective is to improve the appearance of the set for printing processes that are

extremely accurate. The reader is referred to ECMA-11-1975 for illustrations and further details.³

A4. Character Names

The characters of American National Standard X3.49-1975 and ECMA-11-1975 have different names in several instances. Individual characters of the two standards may be identified by their common Reference Drawing Number (RDN), which should be used in ordering copies of stable-base masters. The name equivalents for the differently named characters of the two standards are listed in Table A1.

³Copies of ECMA-11-1975 are available from the European Computer Manufacturers Association, 114 Rue du Rhône, 1204 Geneva, Switzerland.

Table A1
Name Equivalents for OCR-B Characters as Used in
American National Standard X3.49-1975 and ECMA-11-1975

Fig.	RDN	Name for ANSI X3.49-1975	Name for ECMA-11-1975
67	67	Slant	Solidus
68	68	Period (Decimal Point)	Full Stop
76	76	Exclamation Point	Exclamation Mark
77	77	Opening Parenthesis	Left Parenthesis
78	78	Closing Parenthesis	Right Parenthesis
81	81	Opening Bracket	Left Square Bracket
82	82	Closing Bracket	Right Square Bracket
—	91	(Not Used)	<i>Vertical Line</i>
91	92	<i>Long Vertical Mark</i>	<i>Preprinted Long Vertical Mark</i>
92	93	Reverse Slant	Reverse Solidus
136	113	Opening Brace	Left Curly Bracket
137	114	Closing Brace	Right Curly Bracket
140	118	Section Sign	Paragraph

Appendix B

Supplementary Information

Although American National Standard Character Set for Optical Character Recognition (OCR-B), X3.49-1975, suffices for the purpose for which it was written, there are some environmental conditions that, if standardized, might enable a more successful use of OCR-B, especially in interchange applications. These conditions include paper specifications and print quality (tolerances for the characteristics and relative positions of the printed images). Subcommittee X3A1 on Optical Character Recognition, of American National Standards Committee X3, is presently engaged in standardizing OCR paper specifications and OCR print quality. When this work is completed appropriate standards will be issued to augment this standard. Until such standards are approved the reader is referred to appropri-

ate sections of American National Standard Character Set and Print Quality for Optical Character Recognition (OCR-A), X3.17-1974, for information relating to OCR paper specifications and OCR print quality.

The choice of sizes for OCR-B characters is generally based on requirements for the following kinds of printing equipment:

Size I — typewriters, high-speed printers

Size III — cash registers, adding machines

Size IV — credit card im printers

The Size-III repertoire is limited to those characters that are standardized for journal-tape usage. Otherwise, the above correspondence between sizes and equipment is not intended to restrict usage of the various sizes of OCR-B.

Appendix C

Correspondence to the ASCII Code Table

Fig. C1 and C2 are included to indicate a correspondence between the characters of this standard and those graphics used in Section 2 of American National Standard Code for Information Interchange, X3.4-1968 (ASCII).

Fig. C1 provides a correspondence for the characters of Table 1, Repertoire for OCR Usage. Note that there are several table positions in Fig. C1 for which no OCR character is provided. Fig. C2 provides a correspondence

in which both the OCR usage characters and the additional characters of Table 2, Extended Repertoire, are accommodated.

Fig. C1 and C2 are given as an example for reference purposes only, and no specific correspondence is prescribed between the characters of this standard and those of American National Standard X3.4-1968 other than that which is understood by the users.

					b ₇	0	0	0	0	1	1	1	1
					b ₆	0	0	1	1	0	0	1	1
					b ₅	0	1	0	1	0	1	0	1
						0	1	2	3	4	5	6	7
b ₄	b ₃	b ₂	b ₁		0	0	0	0	0	NUL	DLE	(SP)	¹
0	0	0	0	0						0	@	P	p
0	0	0	1	1						1	A	Q	a
0	0	1	0	2						2	B	R	b
0	0	1	1	3						²			
					ETX	DC3	#	£	3	C	S	c	s
0	1	0	0	4						²			
					EOT	DC4	\$	¤	4	D	T	d	t
0	1	0	1	5						5	E	U	e
					ENQ	NAK	%						u
0	1	1	0	6						6	F	V	f
					ACK	SYN	&						v
0	1	1	1	7						7	G	W	g
					BEL	ETB	'						w
1	0	0	0	8			³			8	H	X	h
					BS	—	(						x
1	0	0	1	9						9	I	Y	i
					HT	EM	)						y
1	0	1	0	10			⁴						
					LF	REJ	*	:	J	Z	j	z	
1	0	1	1	11									¹
					VT	ESC	+	;	K	[	k		
1	1	0	0	12							²		
					FF	FS	,	<	L	\	¥	l	|
1	1	0	1	13									¹
					CR	GS	-	=	M	]	m		
1	1	1	0	14									¹
					SO	RS	.	>	N	^	n		
1	1	1	1	15									
					SI	US	/	?	O	_	o	■	

¹ There is no OCR character for these positions. (See Table 1.)

² Additional currency symbols are provided in these positions.

³ Group Erase.

⁴ REJ is the OCR function of not recognizing a character.

Fig. C1
Correspondence between OCR-B Usage Characters and ASCII Code Table

					b ₇	0	0	0	0	1	1	1	1
					b ₆	0	0	1	1	0	0	1	1
					b ₅	0	1	0	1	0	1	0	1
						0	1	2	3	4	5	6	7
b ₄	b ₃	b ₂	b ₁										
0	0	0	0	0	NUL	DLE	(SP)	0	@	P	'	p	
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q	
0	0	1	0	2	STX	DC2	" ¹ "	2	B	R	b	r	
0	0	1	1	3	ETX	DC3	# ² £	3	C	S	c	s	
0	1	0	0	4	EOT	DC4	\$ ² ¤	4	D	T	d	t	
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u	
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v	
0	1	1	1	7	BEL	ETB	' ¹ .	7	G	W	g	w	
1	0	0	0	8	BS	³—	(	8	H	X	h	x	
1	0	0	1	9	HT	EM	)	9	I	Y	i	y	
1	0	1	0	10	LF	REJ ⁴	* :	J	Z	j	z		
1	0	1	1	11	VT	ESC	+ ;	K	² [AÆ	k	{ ² æ		
1	1	0	0	12	FF	FS	¹ , . <	L	² Ø Ñ Ü \\¥ö	l	|² ø ij		
1	1	0	1	13	CR	GS	- =	M	²] & Ü	² m m	² } ð		
1	1	1	0	14	SO	RS	. >	N	¹ ^ ^	n	ß ² ~		
1	1	1	1	15	SI	US	/ ?	O	_	o	■		

¹ Additional diacritical marks.

³ Group Erase.

² Alternate shapes, national use, and currency symbols.

⁴ REJ is the OCR function of not recognizing a character.

Fig. C2
Correspondence between OCR-B Extended Repertoire and ASCII Code Table

American National Standards for Information Processing

- X3.1-1976** Synchronous Signaling Rates for Data Transmission
X3.2-1970 (R1976) Print Specifications for Magnetic Ink Character Recognition
X3.3-1970 (R1976) Bank Check Specifications for Magnetic Ink Character Recognition
X3.4-1977 Code for Information Interchange
X3.5-1970 Flowchart Symbols and Their Usage in Information Processing
X3.6-1965 (R1973) Perforated Tape Code for Information Interchange
X3.9-1978 Programming Language FORTRAN
X3.11-1969 Specification for General Purpose Paper Cards for Information Processing
X3.14-1973 Recorded Magnetic Tape for Information Interchange (200 CPI, NRZI)
X3.15-1976 Bit Sequencing of the American National Standard Code for Information Interchange in Serial-by-Bit Data Transmission
X3.16-1976 Character Structure and Character Parity Sense for Serial-by-Bit Data Communication in the American National Standard Code for Information Interchange
X3.17-1981 Character Set for Optical Character Recognition (OCR-A)
X3.18-1974 One-Inch Perforated Paper Tape for Information Interchange
X3.19-1974 Eleven-Sixteenths-Inch Perforated Paper Tape for Information Interchange
X3.20-1967 (R1974) Take-Up Reels for One-Inch Perforated Tape for Information Interchange
X3.21-1967 Rectangular Holes in Twelve-Row Punched Cards
X3.22-1973 Recorded Magnetic Tape for Information Interchange (800 CPI, NRZI)
X3.23-1974 Programming Language COBOL
X3.24-1968 Signal Quality at Interface between Data Processing Terminal Equipment and Synchronous Data Communication Equipment for Serial Data Transmission
X3.25-1976 Character Structure and Character Parity Sense for Parallel-by-Bit Data Communication in the American National Standard Code for Information Interchange
X3.26-1980 Hollerith Punched Card Code
X3.27-1978 Magnetic Tape Labels and File Structure for Information Interchange
X3.28-1976 Procedures for the Use of the Communication Control Characters of American National Standard Code for Information Interchange in Specified Data Communication Links
X3.29-1971 Specifications for Properties of Unpunched Oiled Paper Perforator Tape
X3.30-1971 Representation for Calendar Date and Ordinal Date for Information Interchange
X3.31-1973 Structure for the Identification of the Counties of the United States for Information Interchange
X3.32-1973 Graphic Representation of the Control Characters of American National Standard Code for Information Interchange
X3.34-1972 Interchange Rolls of Perforated Tape for Information Interchange
X3.36-1975 Synchronous High-Speed Data Signaling Rates between Data Terminal Equipment and Data Communication Equipment
X3.37-1980 Programming Language APT
X3.38-1972 (R1977) Identification of States of the United States (Including the District of Columbia) for Information Interchange
X3.39-1973 Recorded Magnetic Tape for Information Interchange (1600 CPI, PE)
X3.40-1976 Unrecorded Magnetic Tape for Information Interchange (9-Track 200 and 800 CPI, NRZI, and 1600 CPI, PE)
X3.41-1974 Code Extension Techniques for Use with the 7-Bit Coded Character Set of American National Standard Code for Information Interchange
X3.42-1975 Representation of Numeric Values in Character Strings for Information Interchange
X3.43-1977 Representations of Local Time of the Day for Information Interchange
X3.44-1974 Determination of the Performance of Data Communication Systems
X3.45-1974 Character Set for Handprinting
X3.46-1974 Unrecorded Magnetic Six-Disk Pack (General, Physical, and Magnetic Characteristics)
X3.47-1977 Structure for the Identification of Named Populated Places and Related Entities of the States of the United States for Information Interchange
X3.48-1977 Magnetic Tape Cassettes for Information Interchange (3.810-mm [0.150-Inch] Tape at 32 bps [800 bpi], PE)
X3.49-1975 Character Set for Optical Character Recognition (OCR-B)
X3.50-1976 Representations for U.S. Customary, SI, and Other Units to Be Used in Systems with Limited Character Sets
X3.51-1975 Representations of Universal Time, Local Time Differentials, and United States Time Zone References for Information Interchange
X3.52-1976 Unrecorded Single-Disk Cartridge (Front Loading, 2200 BPI) (General, Physical, and Magnetic Requirements)
X3.53-1976 Programming Language PL/I
X3.54-1976 Recorded Magnetic Tape for Information Interchange (6250 CPI, Group Coded Recording)
X3.55-1977 Unrecorded Magnetic Tape Cartridge for Information Interchange, 0.250 Inch (6.30 mm), 1600 bpi (63 bps), Phase Encoded
X3.56-1977 Recorded Magnetic Tape Cartridge for Information Interchange, 4 Track, 0.250 Inch (6.30 mm), 1600 bpi (63 bps), Phase Encoded
X3.57-1977 Structure for Formatting Message Headings for Information Interchange Using the American National Standard Code for Information Interchange for Data Communication Systems Control
X3.58-1977 Unrecorded Eleven-Disk Pack (General, Physical, and Magnetic Requirements)
X3.59-1981 Magnetic Tape Cassettes for Information Interchange, Dual Track Complementary Return-to-Bias (CRB) Four-States Recording on 3.81-mm (0.150-Inch) Tape
X3.60-1978 Programming Language Minimal BASIC
X3.61-1978 Representation of Geographic Point Locations for Information Interchange
X3.62-1979 Paper Used in Optical Character Recognition (OCR) Systems
X3.63-1981 Unrecorded Twelve-Disk Pack (100 Megabytes) (General, Physical, and Magnetic Requirements)
X3.64-1979 Additional Controls for Use with American National Standard Code for Information Interchange
X3.66-1979 Advanced Data Communication Control Procedures (ADCCP)
X3.72-1981 Parallel Recorded Magnetic Tape Cartridge for Information Interchange, 4 Track, 0.250 Inch (6.30 mm), 1600 bpi (63 bps), Phase Encoded
X3.73-1980 Single-Sided Unformatted Flexible Disk Cartridge (for 6631-BPR Use)
X3.74-1981 Programming Language PL/I, General-Purpose Subset
X3.76-1981 Unformatted Single-Disk Cartridge (Top Loading, 200 tpi 4400 bpi) (General, Physical, and Magnetic Requirements)
X3.77-1980 Representation of Pocket Select Characters in Information Interchange
X3.79-1981 Determination of Performance of Data Communications Systems That Use Bit-Oriented Communication Procedures
X3.80-1981 Interfaces between Flexible Disk Cartridge Drives and Their Host Controllers
X3.82-1980 One-Sided Single-Density Unformatted 5.25-Inch Flexible Disk Cartridge (for 3979-BPR Use)
X3.83-1980 ANSI Sponsorship Procedures for ISO Registration According to ISO 2375
X3.84-1981 Unformatted Twelve-Disk Pack (200 Megabytes) (General, Physical, and Magnetic Requirements)
X3.85-1981 1/2-Inch Magnetic Tape Interchange Using a Self Loading Cartridge
X3.86-1980 Optical Character Recognition (OCR) Inks
X3.88-1981 Computer Program Abstracts
X3.89-1981 Unrecorded Single-Disk, Double-Density Cartridge (Front Loading, 2200 bpi, 200 tpi) (General, Physical, and Magnetic Requirements)
X3.92-1981 Data Encryption Algorithm
X3.93M-1981 OCR Character Positioning
X3/TRI-77 Dictionary for Information Processing (Technical Report)