American National Standard

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FIPS PUB 32-1
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Front Cover

character set for optical character recognition (OCR-A)

ANSI X3.17-1981

american national standards institute, inc.
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ANSI®
X3.17-1981
Revision of
ANSI X3.17-1977

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

Secretariat

Computer and Business Equipment Manufacturers Association

Approved June 16, 1981

American National Standards Institute, Inc

Abstract

This standard provides the description, scope, and identification for a set of graphic shapes to be used in the application of optical character recognition (OCR) systems. The style is designated OCR-A and comprises 96 graphic shapes, plus the Character Space. OCR-A was designed to provide maximum machine efficiency under a wide range of applications. Three sizes of graphic shapes are provided – I, III, and IV (II is reserved for certain international applications). In addition to graphic shapes and related information, the standard provides basic requirements related to character positioning and the ASCII code table..

Key words: optical character recognition, OCR, OCR-A, graphic shapes, character positioning, data entry, machine reading.

American National Standard

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Published by

American National Standards Institute
1430 Broadway, New York, New York 10018

Printed in the United States of America

A3½M982/11

Foreword

(This Foreword is not a part of American National Standard Character Set for Optical Character Recognition (OCR-A), ANSI X3.17-1981.)

This standard presents an alphanumeric character set for use in optical character recognition (OCR) systems. The character set contains 96 printing characters plus the Character Space, and includes digits, letters, small letters, and special symbols. Two editing characters, Character Erase and Group Erase, are also included. Alternate shapes are provided for the Period, Comma, Question Mark, Hyphen (Minus Sign), and the Apostrophe to improve performance in some printing devices and to improve recognition. The character set includes an OCR representation for all 96 characters in American National Standard Code for Information Interchange (ASCII), ANSI X3.4-1977. No graphic shapes were developed for the ASCII characters Tilde, Underline, and Grave Accent, since any need for these graphics could be represented in their respective code positions by the Hook, Fork, and Chair (if required in an information interchange application).

The character set repertoire and character shape specifications in this standard are identical to those contained in American National Standard Character Set and Print Quality for Optical Character Recognition (OCR-A), ANSI X3.17-1977. This standard, containing only character shapes and their nominal position, is a refinement of and supersedes ANSI X3.17-1977. Specifications for character positioning are contained in American National Standard for Optical Character Recognition (OCR) Character Positioning, ANSI X3.93M-1981.

The OCR-A character set for optical character recognition was first developed in the United States in 1961 as a numeric font only. In 1966 an alphanumeric font which contained 57 characters, including the existing numeric font, 4 abstract characters, and only capital letters, was issued. The revised standard was entitled American National Standard Character Set for Optical Character Recognition, ANSI X3.17-1966.

A revised edition was published in 1974, as American National Standard Character Set and Print Quality for Optical Character Recognition (OCR-A), ANSI X3.17-1974. It contained an enlarged repertoire of 86 characters by including the small letter alphabet and 3 new characters, Character Space, Character Erase, and Group Erase. Also, 5 alternate characters to improve printing and readability of the Period, Comma, Question Mark, Apostrophe, and Hyphen were added. Specifications for spectral bands, paper, character positioning, and print quality were expanded.

The OCR-A standard was revised in 1977 to enlarge the character set repertoire to 97 standard characters by the addition of 11 new characters. All OCR characters were assigned positions in the ASCII code table. This revised edition was issued as ANSI X3.17-1977.

Other standards of interest in this field are published by the International Organization for Standardization (ISO) as International Standard ISO 1073/I-1976, Alphabetic character sets for optical recognition – Part I: Character set OCR-A – Shapes and dimensions of the printed image, and ISO 1073/II-1976, Alphanumeric character sets for optical recognition – Part II: Character set OCR-B – Shapes and dimensions of the printed image. The character shapes specified in ISO 1073/I-1976 are identical to those in this American National Standard, including the 9 national letters and currency symbols shown in Appendix B. However the small letters and the 11 new characters which were added to ANSI X3.17-1977 are not included in the ISO Publication. (For availability of copies of ISO standards, see footnote 4, Appendix B of this standard).

This present standard is one of a series covering such topics as character shapes, paper, inks, forms, print quality, and character positioning. It prescribes the shapes and sizes of one style of characters to be used in optical character recognition (OCR) in keeping with the practice followed in American National Standard Character Set for Optical Character Recognition (OCR-B), ANSI X3.49-1975, and in international practice.

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 Information Processing, X3. Committee approval of the standard does not necessarily imply that all committee members voted for approval. At the time it approved this standard, the X3 Committee had the following members:

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Special appreciation is extended to the National Bureau of Standards Instrument Shops for correcting the masters to reflect a correct centerline drafting notation. In particular, special appreciation is extended to Tom Bagg of that organization.

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Contents

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

1. General

1.1 Scope. This standard prescribes shapes and sizes of OCR-A alphanumeric characters and symbols for optical character recognition (OCR) systems.

1.2 Purpose. The purpose of this standard is to establish both a machine-readable and human-readable standard character set, designed for optimizing OCR readability. In order to accommodate a wide variety of OCR applications, the character repertoire includes letters, small letters, and special symbols, in three different sizes.

1.3 Application. This standard specifies the OCR-A printed images which are designed for use in optical character recognition systems and are also suitable for general-purpose use. The standard may also be used as the design basis for OCR-A reading devices.

This standard does not specify the method of making the type that will print the nominal images. The design of the type for any printing apparatus must be inferred from the systematic printing effects and distortions inherent in the printing device to be used.

Typically, OCR applications will not require all of the characters included in this standard, and it is understood that equipment conforming to this standard will not necessarily accommodate the total OCR-A repertoire. It is advisable for users to consult with equipment manufacturers to determine the characters that are available on each specific piece of equipment.

In order to accommodate a wide variety of applications, OCR printing or reading devices may offer more characters than users need. In any specific application, the use of an unnecessarily large subset may result in additional cost and poorer performance. Again, it is advisable for users to 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 will involve considerations that are beyond the scope of this standard; for example – paper, forms design, spectral response, print quality, character positioning, etc. These considerations are or will be covered in other American National Standards. (See Appendix D.)

2. Standard Characters

2.1 Character Shapes. Fig. 1 through 68 and Fig. 95, 96, and 97 together with the dimensions given in Table 1 define the character shapes in the standard set with the exception of the small letters. The small letters, Fig. 69 through 94, are dimensioned in thousandths of an inch on the drawings and are compatible with Size I only.[1]

The nominal printed image of each character is specified by its stroke centerlines and by its nominal stroke width. Printed images should conform to the character outline shapes in Fig. 1 through 97; that is, where sharp outline corners are shown, the image should likewise be as sharp as practical. However, it is recognized that some type-making and printing processes will not be able to produce sharp corners, and it is not required that the printed corner radii be less than 0.004 in (0.10 mm).

NOTE: This standard does not specify the method of making the type that will print the nominal images. The design of the type for any printing apparatus must be inferred from the systematic printing effects and distortions inherent in the printing device to be used.

2.2 Character Sizes. The character shapes are specified in three different sizes in order to provide for their use with a wide range of printing devices. These sizes are denoted I, III, and IV.[1] However, the small letters (see Fig. 69 through 94), and the Character Erase and Group Erase (see Fig. 96 and 97) are available only in Size I. With the exception of these characters, Table 2 specifies the basic centerline dimensions (W and H) of the three sizes and indicates the nominal stroke width (T) and tolerances.

2.3 Character Repertoire. The printing graphics and the Character Space, as defined in this standard, constitute the total repertoire for optical character recognition (OCR-A) for data input purposes. In various

[1] See Appendix C for description of sizes I, II, III, and IV.

systems applications, it may be desirable to use the characters herein defined for the purpose of error correction, device control, or similar nondata functions.

The OCR characters defined in this standard include all of the graphics commonly used by the industry. The overall number of graphics, therefore, is greater than that required for most job applications. Since the use of an unnecessarily large set of characters may result in greater cost and lower performance, it is recommended that the user consult with the equipment manufacturer regarding the minimum repertoire required to attain an optimum system operation.[2]

The user is cautioned that equipment that otherwise conforms to this standard will not necessarily handle the total OCR-A repertoire. This particularly applies to equipment installed or designed prior to January 1977.

2.4 Properties of Special Characters. Certain characters have the special properties or usages described in 2.4.1 through 2.4.6.

2.4.1 Use of Special Characters. For data interchange applications, the nominally assigned information content of American National Standard for Information Interchange (ASCII), ANSI X3.4-1977, should be followed. Four special characters are provided and recommended for use where control symbols are required. These symbols are:

(1) Long Vertical Mark |
(2) Chair ⅁
(3) Fork Ψ
(4) Hook ʃ

The Hook, Fork, and Chair may also be used for the OCR representation of the stand-alone characters in the ASCII code table, Tilde, Underline, and Grave Accent, respectively, in those applications that require the use of these characters. Users are cautioned to ensure that there is a common understanding of information content in document interchange applications. No graphics for the Tilde, Underline, and Grave Accent are provided in the repertoire, as these characters are not commonly used in OCR applications.

In addition to using the minimum repertoire as noted in 2.3, the user should avoid using certain characters in the same character set unless the print quality and the character stroke width are well controlled. These combinations are:

(1) The character Fork with the letters "Y" and "V"

(2) Exclamation Point with the Opening or Closing Parenthesis

(3) Number Sign with the Ampersand

2.4.2 Character Space (See Fig. 95). The Character Space is a blank area in a print line having a width equal to the character pitch. (If the characters are printed 10 to the inch, the character pitch is 1/10 inch.)

When a blank area is bounded by narrow characters, the narrow characters shall be assigned a width of $W + T$ for the purpose of determining the number of Character Spaces between the printed characters.[3]

2.4.3 Character Erase (See Fig. 96). Character Erase is available only for Size I. Its special property is that its presence is detectable when it stands 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 that it occupies. The specific action that is taken upon recognition of this symbol is system dependent, and its use should be resolved between the user and the equipment manufacturer.

2.4.4 Group Erase (See Fig. 97). Group Erase is so designed that a long string of characters can be erased without striking a Character Erase symbol for each character to be deleted. It is defined as a continuous line between $1/6\,H$ and $5/6\,H$ above the nominal baseline, at least 0.300 in (7.62 mm) long, and having a minimum thickness of 0.008 in (0.02 mm). Group Erase is available only for Size I.

2.4.5 Long Vertical Mark (See Fig. 14). The Long Vertical Mark (LVM) is a special character that is used mainly as a field separator. The Long Vertical Mark, which is a solid line, is taller than the other characters[4] to provide a good visual indication of the division of the document into fields. No limit on the vertical height of this character is specified, and it is common practice to preprint an entire form with such format lines. These lines may be continuous over the entire height of the form. The minimum height (L) and the extension below the baseline (Y) of the Long Vertical Mark, Fig. 14, have the following dimensions:

Size	Minimum Height (L) (in)	(mm)	Extension Below Baseline (Y) (in)	(mm)
I	0.146	(3.71)	0.021	(0.53)
III	0.196	(4.98)	0.021	(0.53)
IV	0.233	(5.91)	0.031	(0.79)

[2] As an example, a commonly used journal-tape repertoire includes 22 characters – Digits One through Zero, Letters C, E, N, S, T, X, Z, Plus Sign, Less Than Sign, Greater Than Sign, Long Vertical Mark, and Character Space.

[3] The accuracy of measuring the number of Character Spaces in a given blank area is dependent on the OCR scanner, the application, the location, print tolerances, and other factors.

[4] The Long Vertical Mark (LVM) at its minimum height (L) extends beyond the highest and lowest position of any character in a printed line except for those small letter characters that have descenders.

The nominal stroke widths (T) are given in Table 2.

If a Long Vertical Mark is not collinear with another Long Vertical Mark in an adjacent printed line, the minimum line separation shall be in accordance with 2.5.1. Since this affects the minimum spacing between adjacent printed lines, the maximum number of lines per inch to be printed on a form shall be decreased when Long Vertical Marks are used.

2.4.6 Use of Alternate-Shape Punctuation Characters. The five punctuation characters Period, Comma, Apostrophe, Hyphen, and Question Mark have both preferred and alternate shapes as shown in Fig. 41, 42, 55, 56, and 53, respectively. For the Period and Comma, the preferred shapes or the alternate shapes should be used in pairs. For the Apostrophe and Hyphen, the new shapes are designated as preferred and the original shapes as alternates.

NOTE: It is intended that new OCR readers will have the capability of recognizing both the preferred and alternate shapes, as these shapes are very similar. Although some earlier existing readers may be capable of reading the preferred shapes and the alternate shapes on an intermixed basis, others may require some hardware modifications. Users are cautioned about this potential problem, and it is recommended that a verification be made to assure compatibility between printing and reading equipment.

2.5 Relative Character Positioning. Details on character positioning are addressed in a separate American National Standard for Optical Character Recognition (OCR) Character Positioning, ANSI X3.93M-1981. All of the character shape drawings, except for the Group Erase, indicate two print position reference lines, a "baseline" relative to line spacing, and a "centerline" relative to character spacing.

The characters in a row are properly aligned when their baselines are collinear. Certain characters are displaced above or below the common baseline, according to their Y values. Deviation from the character position baseline is permitted for the preferred Period, Comma, Colon, and Semicolon shapes in order to achieve a more conventional appearance. This is particularly so when the small-letter alphabet is included in the character set, provided that the minimum line separation specified in 2.5.1 is maintained.

For those characters that deviate from the baseline or the centerline, a dimension is given to define the deviation. The definitions of those dimensions are:

ΔY = Vertical displacement of the character stroke centerline from the baseline.

ΔX = Horizontal displacement of the character centerline from the half-width centerline.

2.5.1 Line Spacing. In order to maintain an adequate separation between lines, the number of lines per inch shall not exceed the following:

	Nominal Number of Lines Per Inch	
Size	Digits or Letters	Whenever Small Letters are Used
I	6	5
III	5	–
IV	4	4

To ensure a 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 of characters shall be as follows:

	Minimum Line Separation	
Size	(in)	(mm)
I	0.025	(0.64)
III	0.060	(1.52)
IV	0.080	(2.03)

The Long Vertical Mark, when used collinearly, is an exception to the minimum line separation requirements (see 2.4.5).

NOTE: The line spacing that can be handled by an OCR reader differs from reader to reader. The user is advised to consult with the OCR equipment manufacturer when the line spacing is denser than 3 lines per inch.

2.5.2 Character Spacing. The minimum and maximum spacing between characters shall be as shown below. Character spacing which approaches the maximum spacing allowable may result in a recognized Character Space. Consult the reader manufacturers' specifications.

	Minimum Spacing		Maximum Spacing	
Size	(in)	(mm)	(in)	(mm)
I	0.090	2.29	0.180	4.57
III	0.090	2.29	0.180	4.57
IV	0.130	3.30	0.260	6.60

NOTE: Journal-tape printers not providing a full character space for the decimal point will not meet the minimum spacing requirements of 2.5.2. Some OCR scanners may make provision for this exception; consult reader manufacturers' specifications.

Table 1
OCR Character Dimensions, and Formulas for Radii r_1–r_6

	Size I		Size III		Size IV	
	(in)	(mm)	(in)	(mm)	(in)	(mm)
H	0.0940	2.400	0.1260	3.200	0.1500	3.800
W	0.0550	1.400	0.0600	1.520	0.0800	2.040
T	0.0140	0.350	0.0150	0.380	0.0200	0.510
1/2 T	0.0070	0.175	0.0075	0.190	0.0100	0.255
3/2 T	0.0210	0.525	0.0225	0.570	0.0300	0.760
2 T	0.0280	0.700	0.0300	0.760	0.0400	1.020
1/8 W	0.0069	0.175	0.0075	0.190	0.0100	0.255
1/4 W	0.0138	0.350	0.0150	0.380	0.0200	0.510
5/16 W	0.0172	0.430	0.0188	0.475	0.0250	0.635
3/8 W	0.0206	0.525	0.0225	0.570	0.0300	0.760
7/16 W	0.0241	0.612	0.0263	0.665	0.0350	0.892
1/2 W	0.0275	0.700	0.0300	0.760	0.0400	1.020
9/16 W	0.0309	0.788	0.0338	0.855	0.0450	1.148
5/8 W	0.0344	0.875	0.0375	0.950	0.0500	1.275
11/16 W	0.0378	0.960	0.0413	1.050	0.0550	1.297
3/4 W	0.0413	1.050	0.0450	1.140	0.0600	1.530
1/16 H	0.0059	0.150	0.0079	0.200	0.0094	0.238
1/8 H	0.0118	0.300	0.0158	0.400	0.0188	0.475
1/6 H	0.0160	0.410	–	–	–	–
3/16 H	0.0176	0.450	0.0236	0.600	0.0281	0.713
1/4 H	0.0235	0.600	0.0315	0.800	0.0375	0.950
9/32 H	0.0264	0.675	0.0354	0.900	0.0422	1.069
5/16 H	0.0294	0.750	0.0394	1.000	0.0469	1.188
3/8 H	0.0353	0.900	0.0473	1.200	0.0563	1.425
7/16 H	0.0411	1.050	0.0551	1.400	0.0656	1.663
15/32 H	0.0441	1.125	0.0591	1.500	0.0703	1.781
1/2 H	0.0470	1.200	0.0630	1.600	0.0750	1.900
17/32 H	0.0499	1.275	0.0669	1.700	0.0797	2.019
9/16 H	0.0529	1.350	0.0709	1.800	0.0844	2.138
5/8 H	0.0588	1.500	0.0788	2.000	0.0938	2.375
11/16 H	0.0646	1.650	0.0866	2.200	0.1031	2.613
23/32 H	0.0676	1.725	0.0906	2.300	0.1078	2.731
3/4 H	0.0705	1.800	0.0945	2.400	0.1125	2.850
13/16 H	0.0764	1.950	0.1024	2.600	0.1219	3.088
5/6 H	0.0780	1.980	–	–	–	–
7/8 H	0.0823	2.100	0.1103	2.800	0.1313	3.325
15/16 H	0.0881	2.240	0.1181	3.000	0.1406	3.563
r_1	0.0248	0.635	0.0401	1.022	0.0431	1.094
r_2	0.0111	0.283	0.0112	0.283	0.0156	0.398
r_3	0.0100	0.255	0.0105	0.266	0.0143	0.366
r_4	0.0087	0.223	0.0122	0.310	0.0142	0.360
r_5*	0.0186	0.476	0.0297	0.755	0.0320	0.807
r_6*	0.0132	0.336	0.0129	0.327	0.0183	0.468

$$r_1 = \frac{H}{16}\left(\frac{7H}{6W} + \sqrt{\left(\frac{7H}{6W}\right)^2 + 1}\right) \qquad r_4 = \frac{H}{16}\left(1 - \frac{4W}{3H} + \sqrt{\left(\frac{4W}{3H}\right)^2 + 1}\right)$$

$$r_2 = \frac{W}{8}\left(\frac{6W}{7H} + \sqrt{\left(\frac{6W}{7H}\right)^2 + 1}\right) \qquad r_5^* = \frac{H}{16}\left(\frac{5H}{6W} + \sqrt{\left(\frac{5H}{6W}\right)^2 + 1}\right)$$

$$r_3 = \frac{W}{8}\left(1 - \frac{H}{2W} + \sqrt{\left(\frac{H}{2W}\right)^2 + 1}\right) \qquad r_6^* = \frac{W}{8}\left(\frac{6W}{5H} + \sqrt{\left(\frac{6W}{5H}\right)^2 + 1}\right)$$

*Radii for O only.

NOTE: The millimeter dimensions are not precisely equivalent to the inch dimensions. The values given in this standard are those adopted by the International Organization for Standardization and approved for use in the United States. For consistency, designers should adopt one system or the other but should not intermix them.

Table 2
Nominal Character Sizes and Stroke Width Tolerances

	Nominal Centerline				Nominal Stroke		Tolerances					
	Height (*H*)		Width (*W*)		Width (*T*)		Range *x**†		Range *y*†		Range *z*†	
Size	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)
1	0.094	2.40	0.055	1.40	0.014	0.36	±0.003	±0.08	±0.006	±0.15	±0.008	±0.20
III	0.126	3.20	0.060	1.52	0.015	0.38	±0.003	±0.08	±0.007	±0.18	+0.011 −0.007	+0.28 −0.18
IV	0.150	3.81	0.080	2.03	0.020	0.51	±0.005	±0.13	±0.010	±0.25	+0.016 −0.010	+0.41 −0.25

*Range *x* tolerances do not apply to the Character Erase symbol.

†For explanation of print quality ranges *x*, *y*, and *z*, see American National Standard Guideline for OCR Print Quality (see Appendix D).

NOTES:

(1) The Size II designation is reserved for international use.

(2) When using the small-letter alphabet of Size I in the OCR repertoire, the range *x* tolerance should be applicable to all characters in the repertoire.

(3) The small letters i, j, m, p, and w of OCR-A were designed to exceed the nominal *H* or *W* values given in this table because of their unique characteristics (see Fig. 77, 78, 81, 84, and 91).

(4) Character Erase, Group Erase, Character Space, and Long Vertical Mark (LVM) were designed to exceed the nominal *H* or *W* values given in this table because of their unique characteristics (see Fig. 14, 95, 96, and 97).

(5) The millimeter dimensions are not precisely equivalent to the inch dimensions. The values given in this standard are those adopted by the International Organization for Standardization and approved for use in the United States. For consistency, designers should adopt one system or the other but should not intermix them.

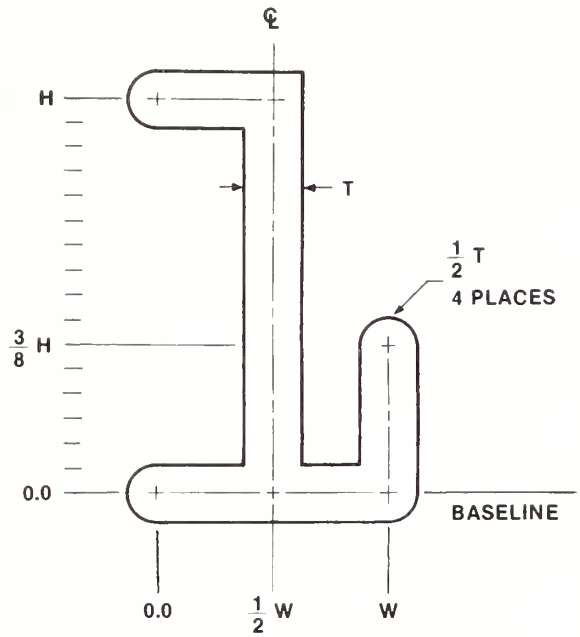


Fig. 1
Digit One

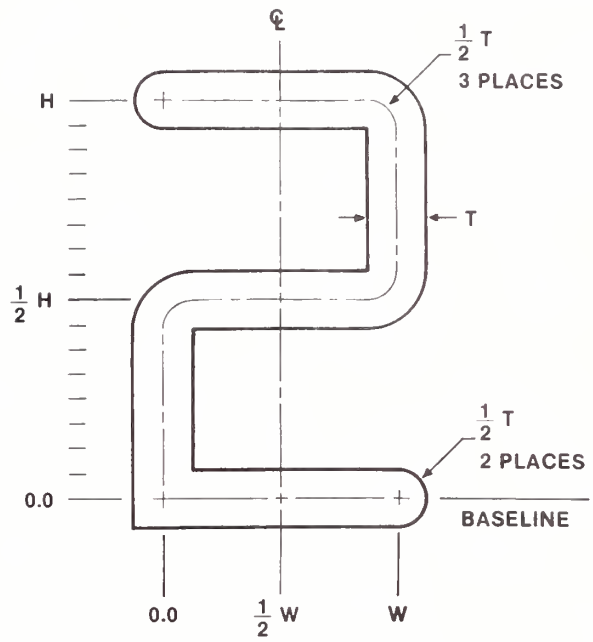


Fig. 2
Digit Two

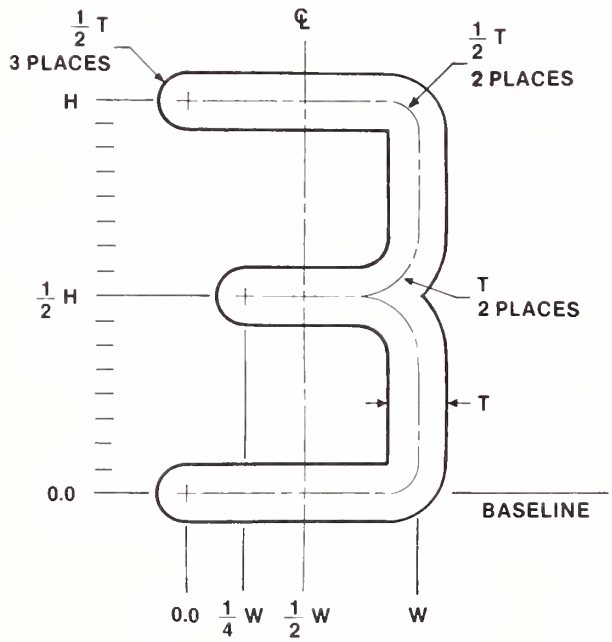


Fig. 3
Digit Three

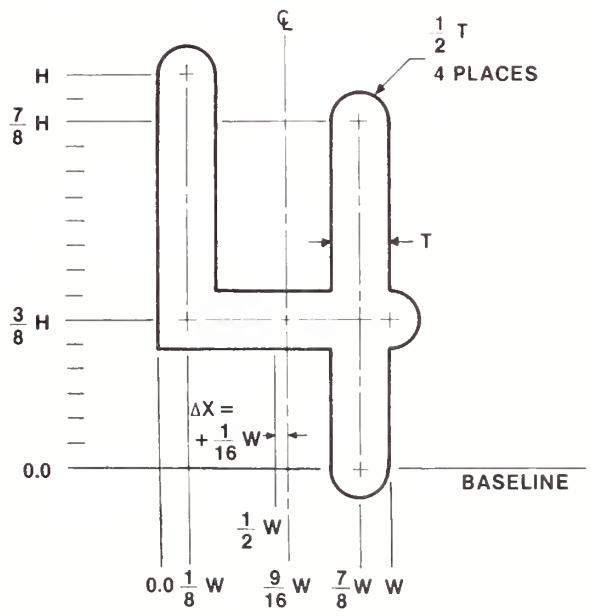


Fig. 4
Digit Four

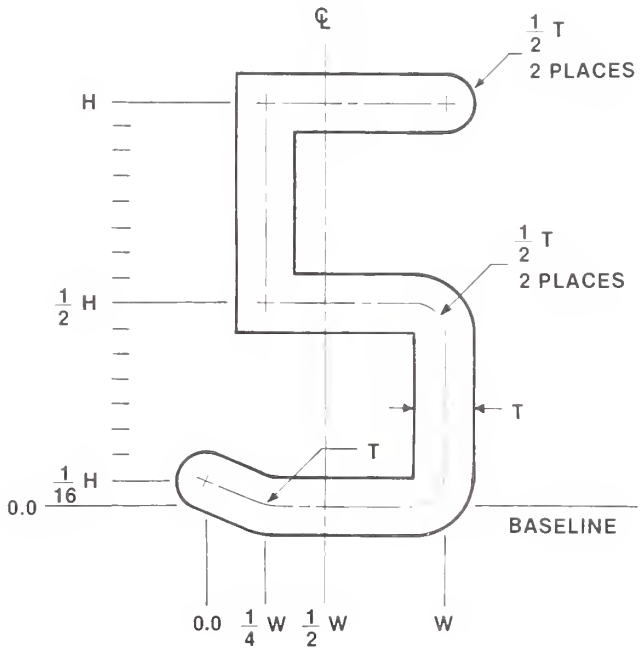


Fig. 5
Digit Five

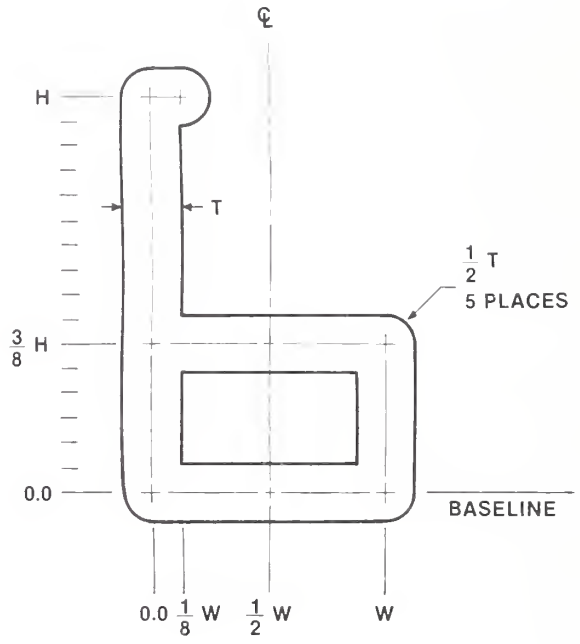


Fig. 6
Digit Six

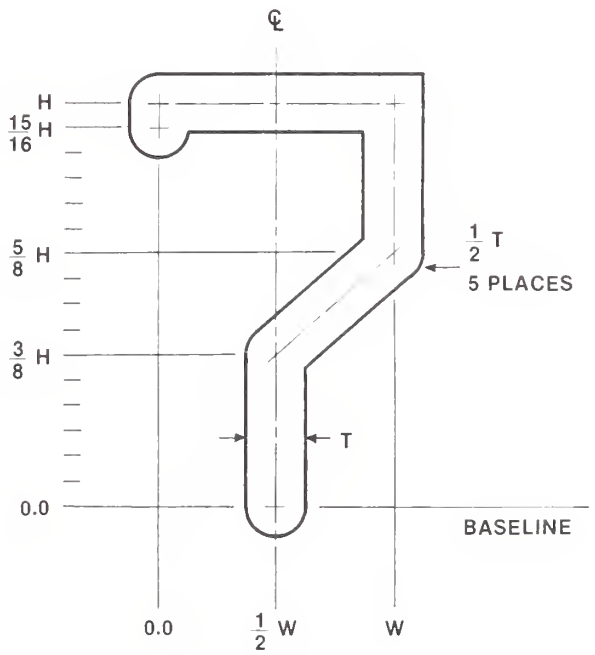


Fig. 7
Digit Seven

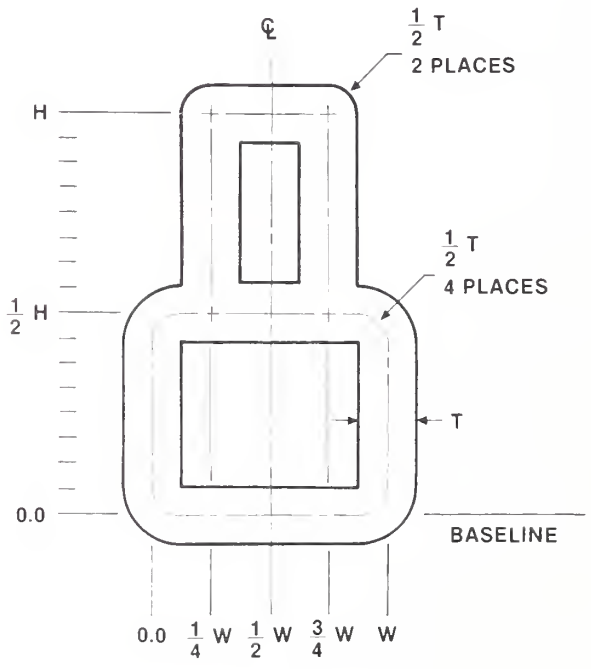


Fig. 8
Digit Eight

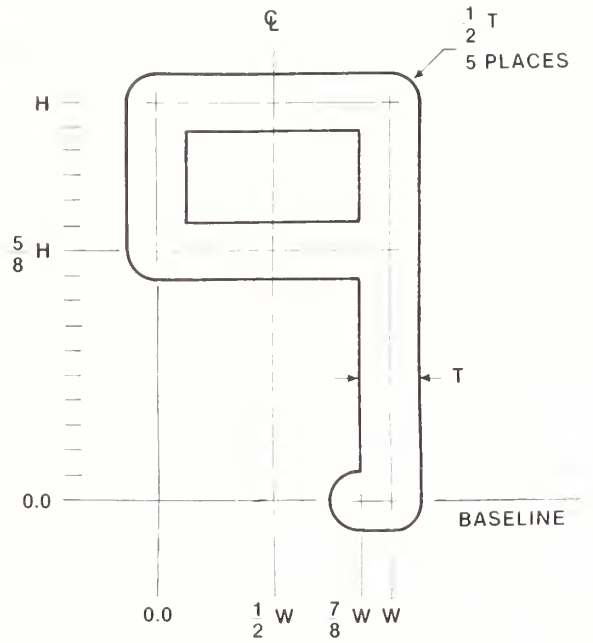


Fig. 9
Digit Nine

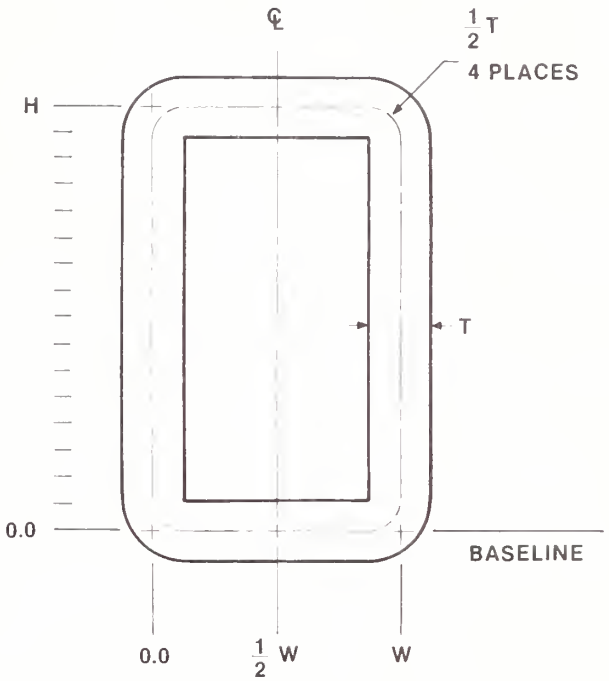


Fig. 10
Digit Zero

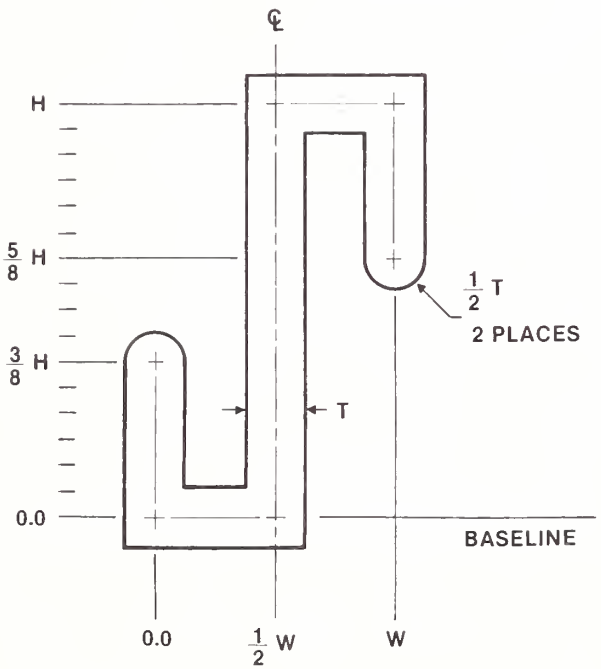


Fig. 11
Symbol Hook

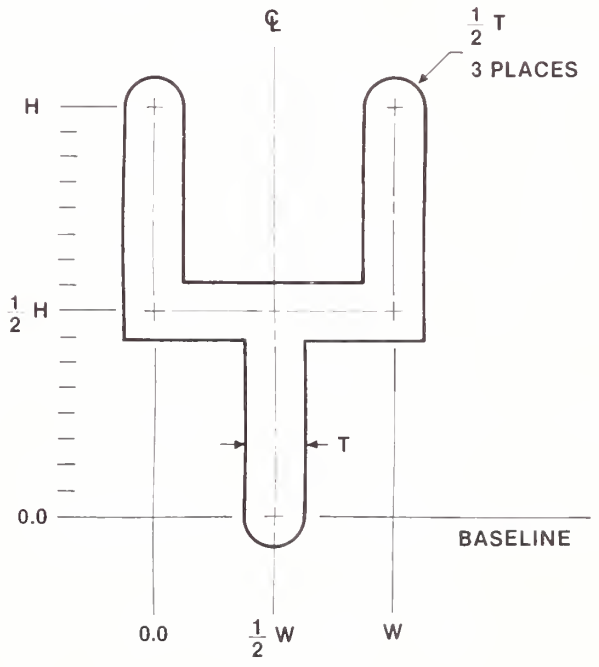


Fig. 12
Symbol Fork

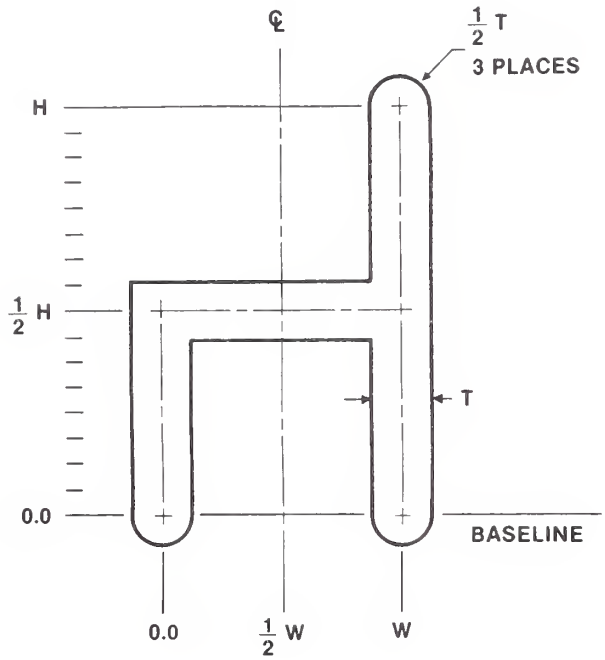
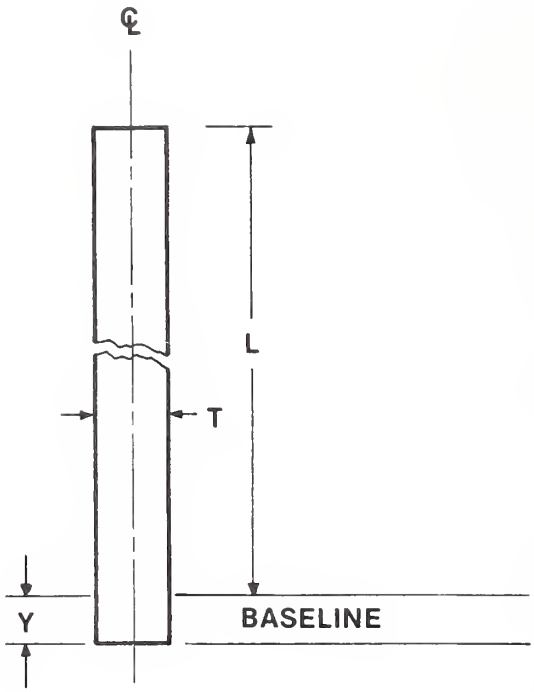


Fig. 13
Symbol Chair



NOTES:
(1) For application and values see 2.4.5.
(2) Not to scale.

Fig. 14
Long Vertical Mark

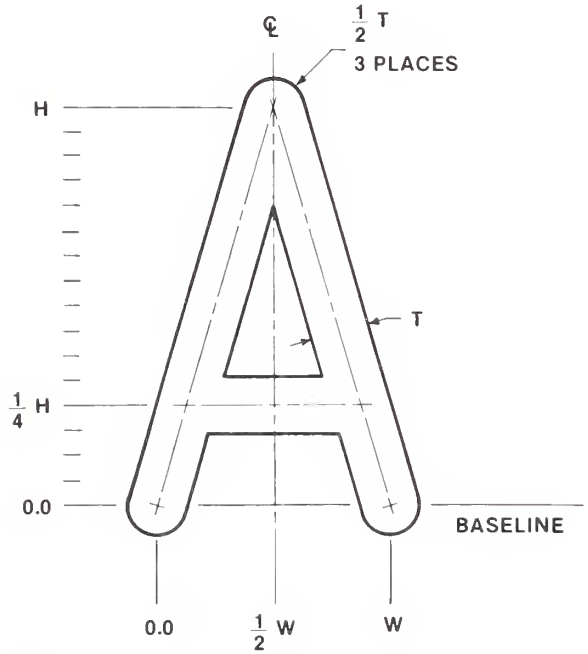


Fig. 15
Letter A

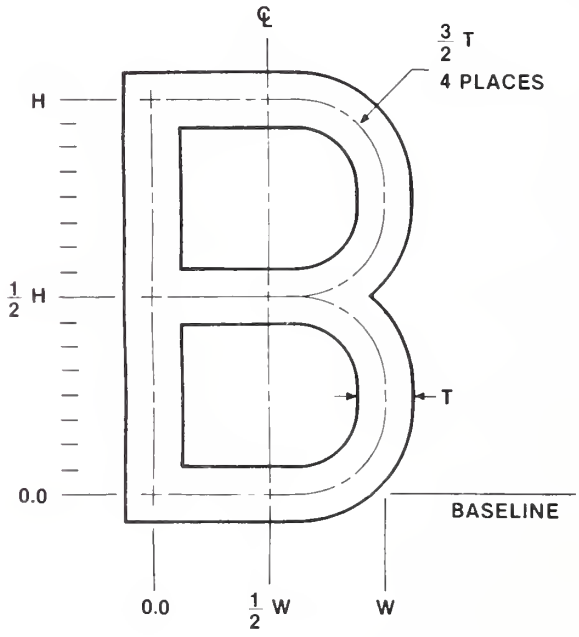


Fig. 16
Letter B

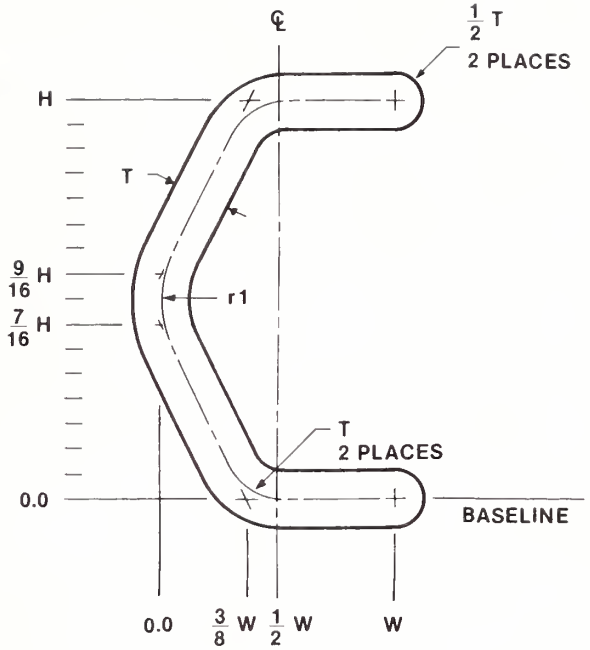


Fig. 17
Letter C

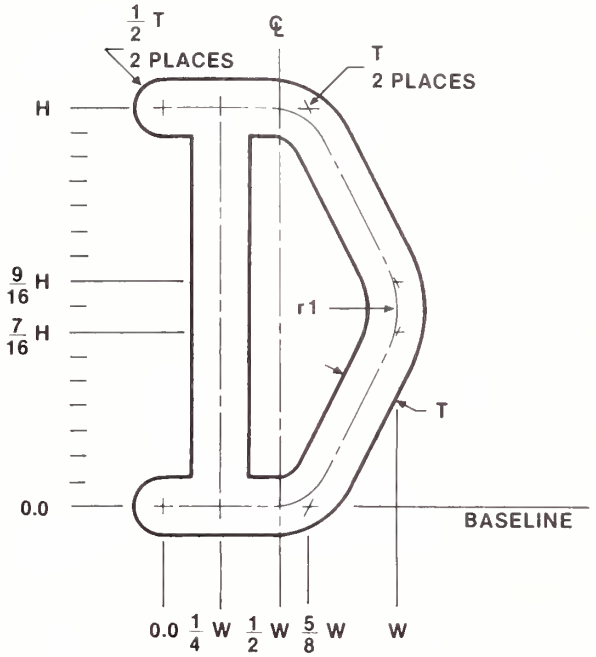


Fig. 18
Letter D

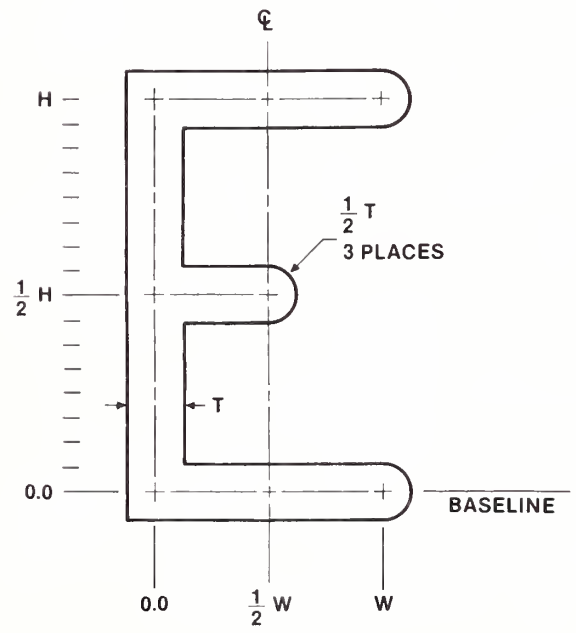


Fig. 19
Letter E

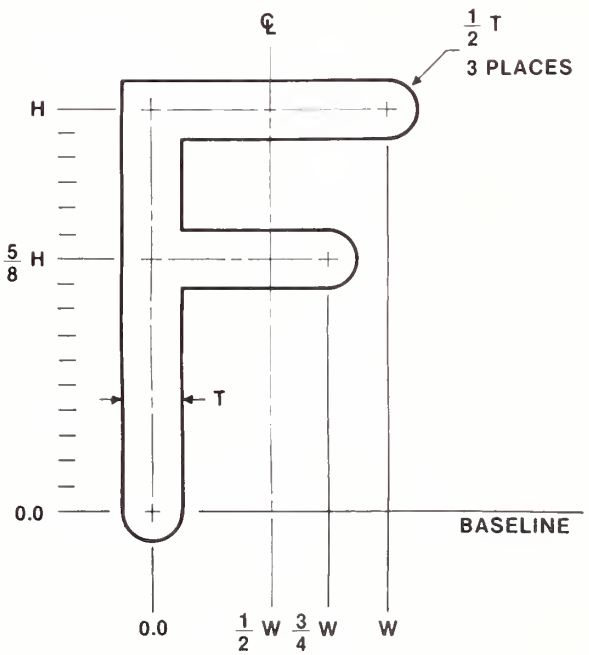


Fig. 20
Letter F

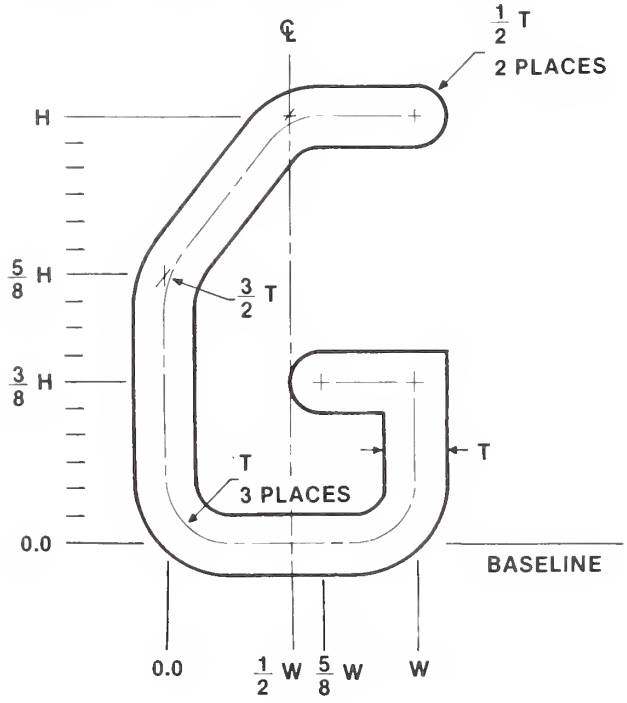


Fig. 21
Letter G

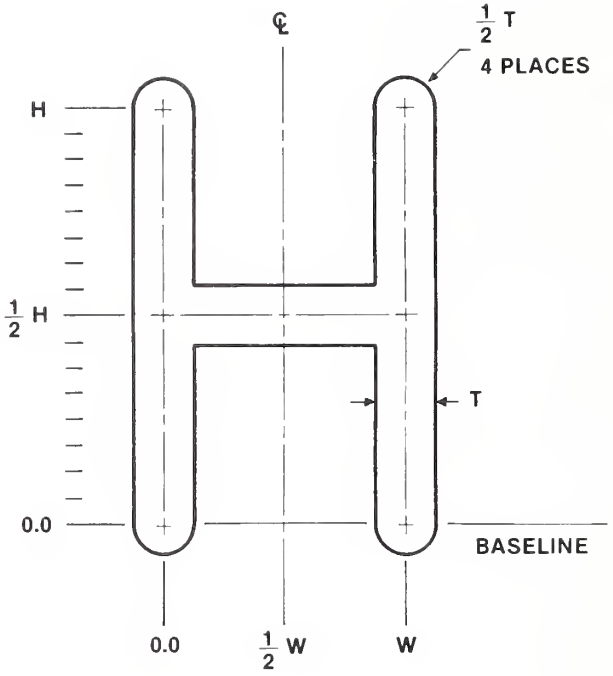


Fig. 22
Letter H

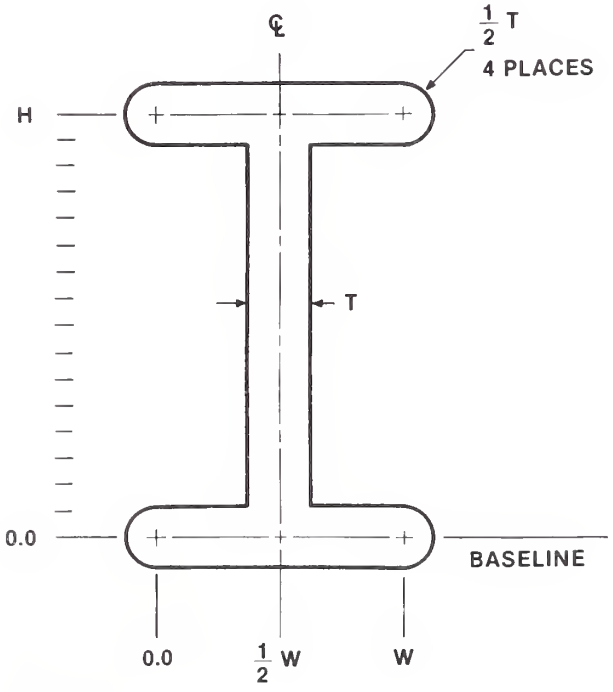


Fig. 23
Letter I

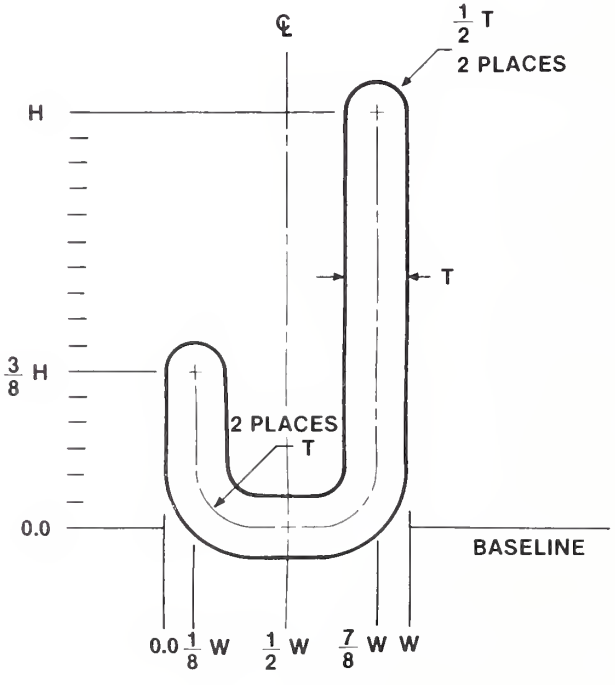


Fig. 24
Letter J

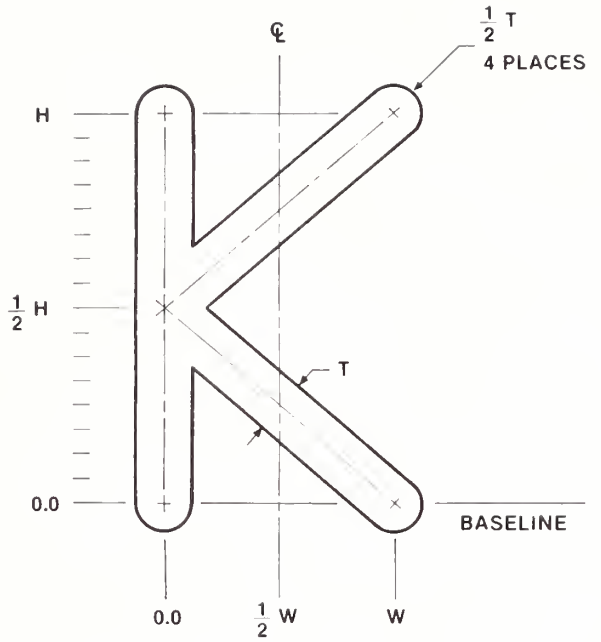


Fig. 25
Letter K

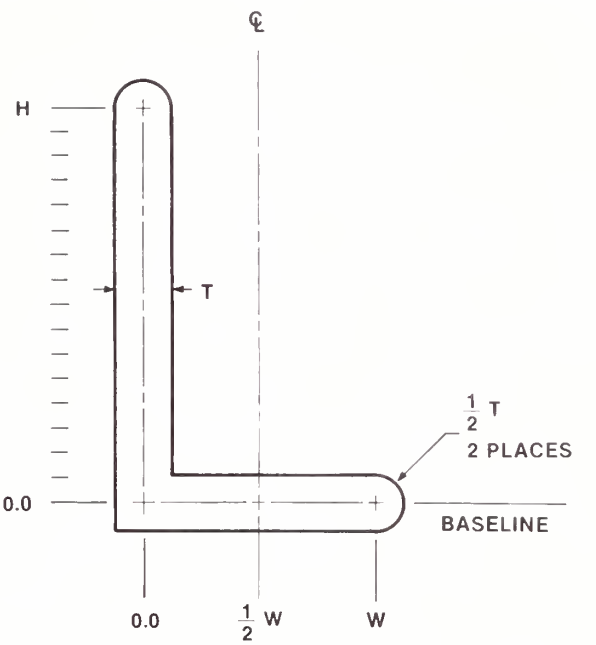


Fig. 26
Letter L

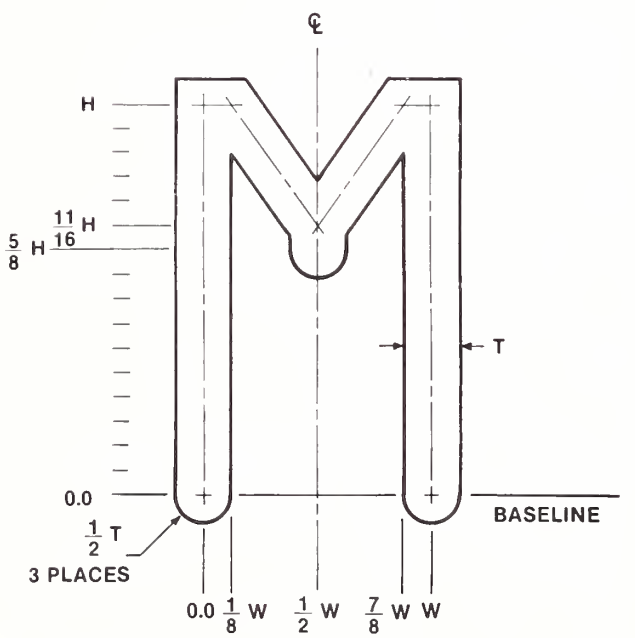


Fig. 27
Letter M

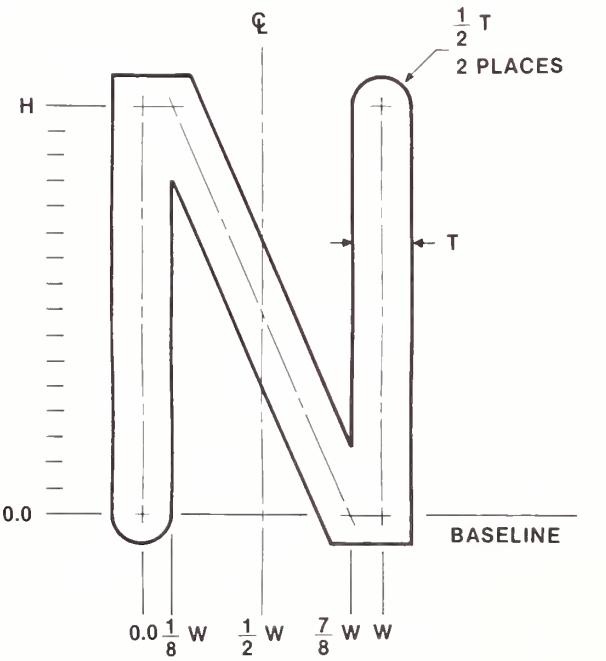


Fig. 28
Letter N

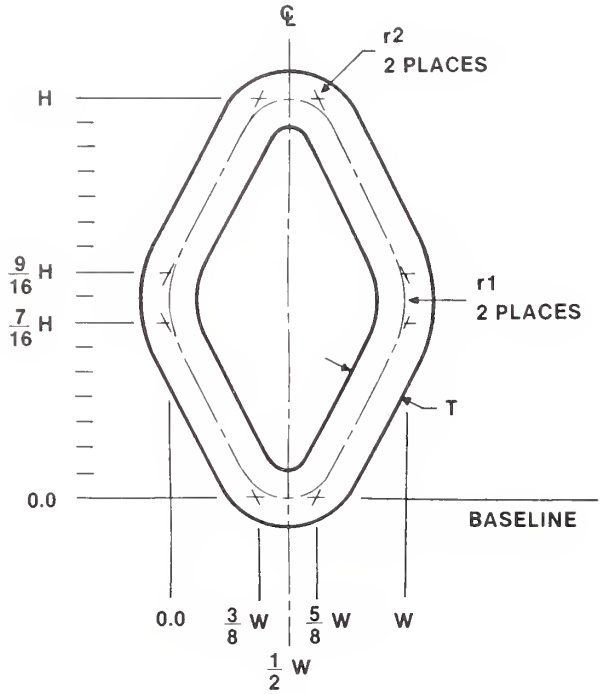


Fig. 29
Letter O

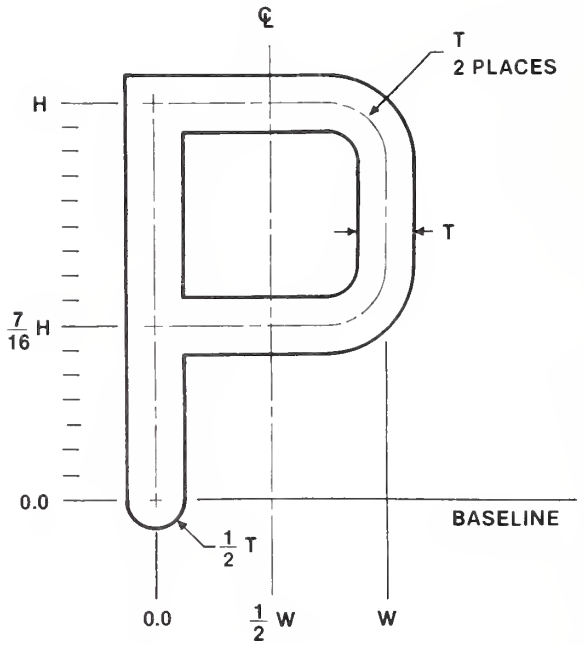


Fig. 30
Letter P

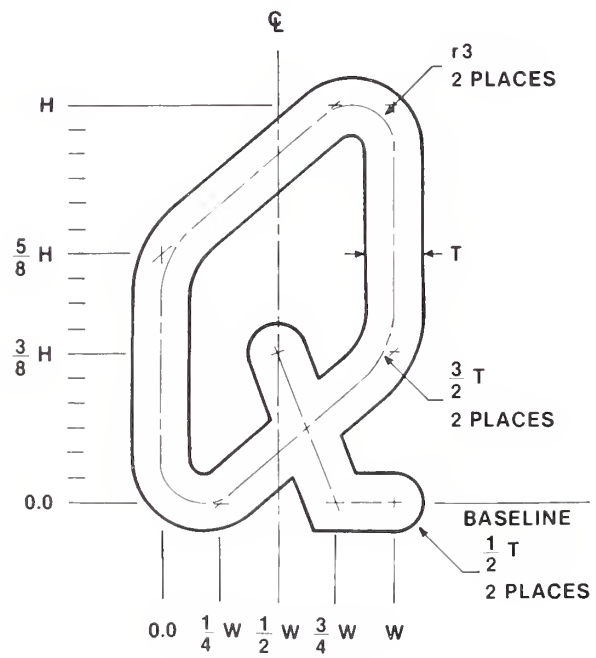


Fig. 31
Letter Q

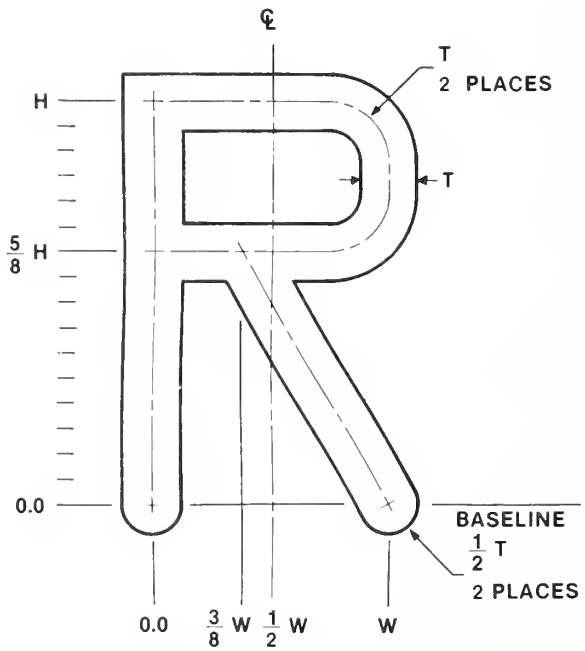


Fig. 32
Letter R

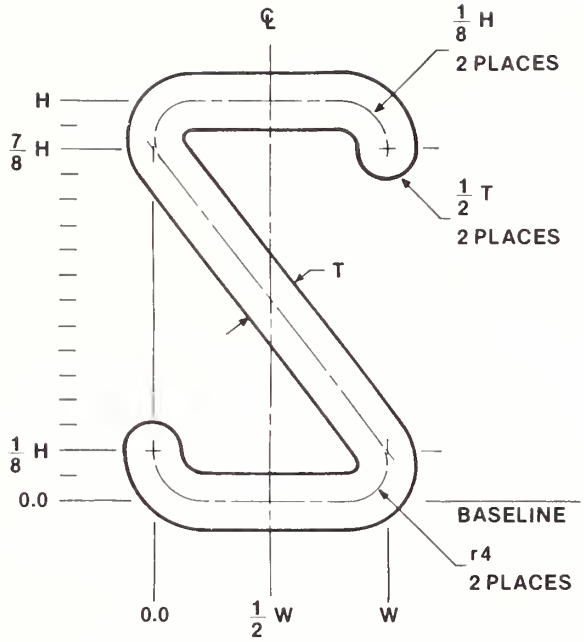


Fig. 33
Letter S

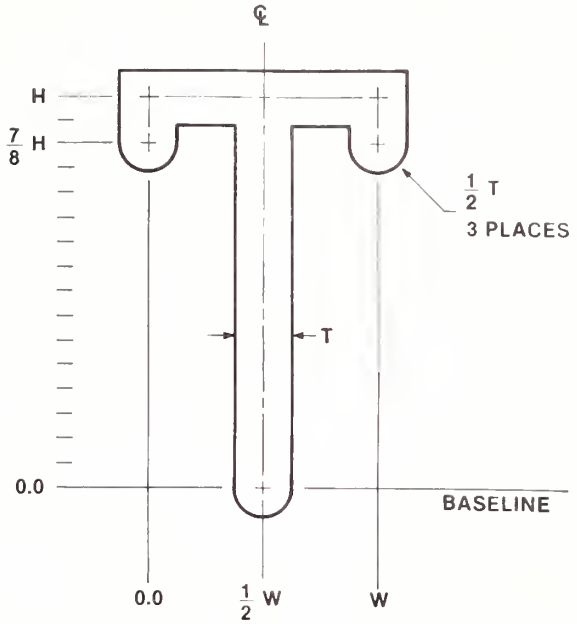


Fig. 34
Letter T

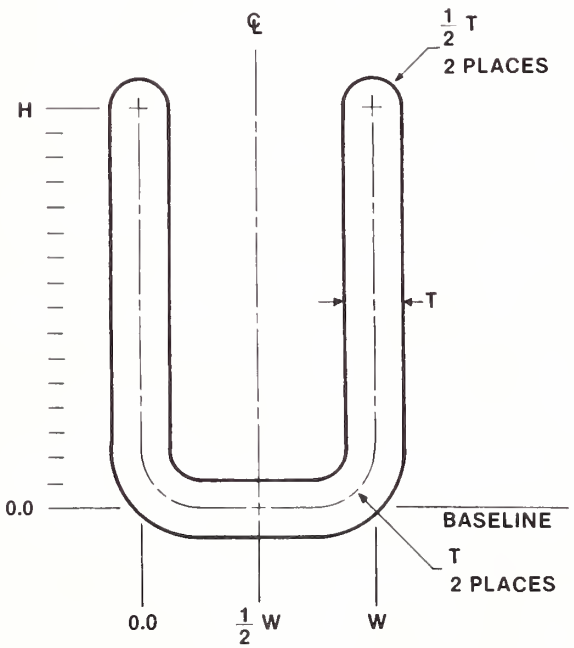


Fig. 35
Letter U

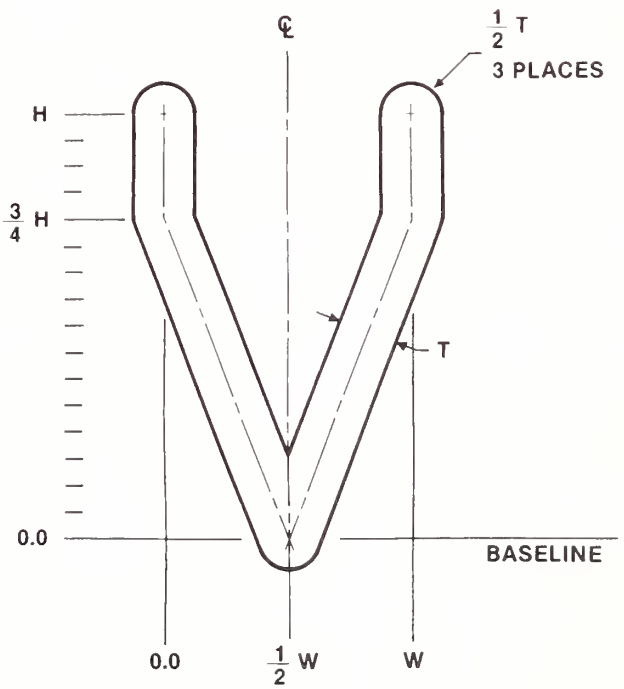


Fig. 36
Letter V

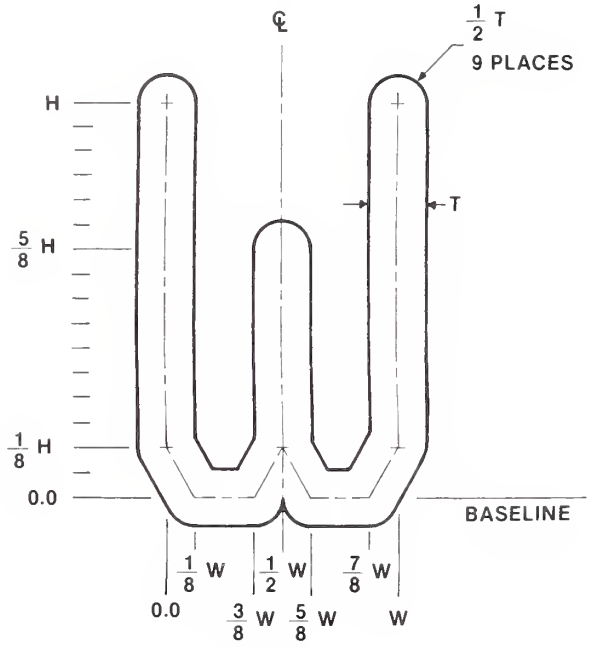


Fig. 37
Letter W

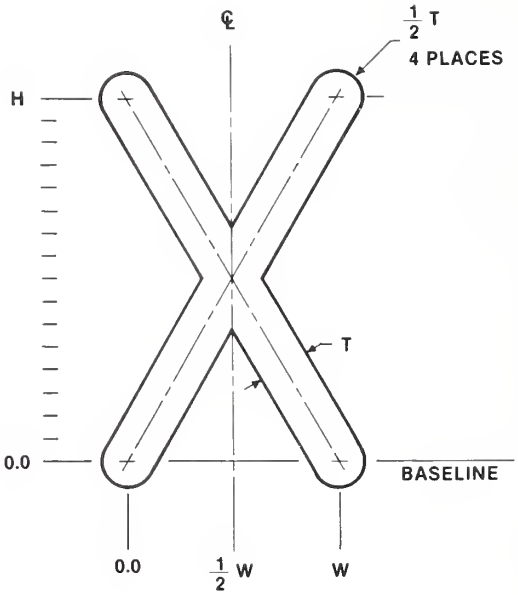


Fig. 38
Letter X

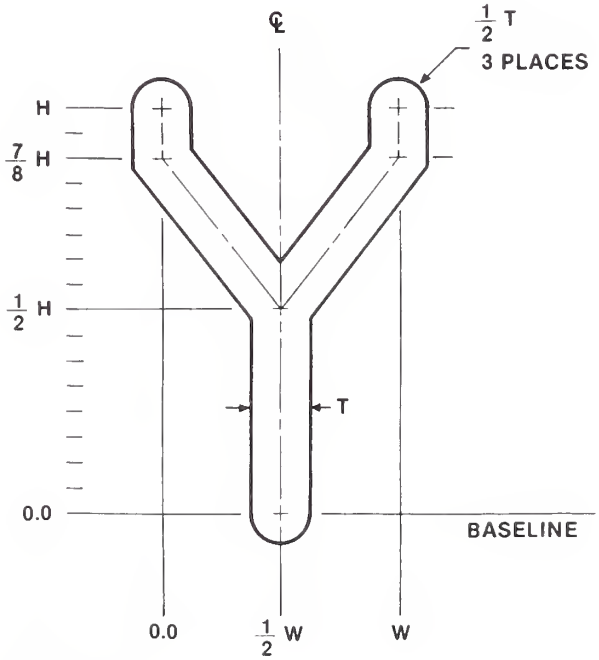


Fig. 39
Letter Y

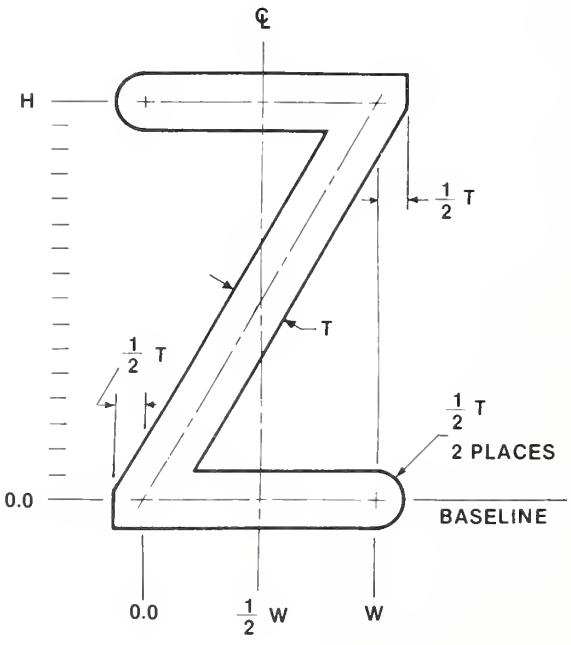
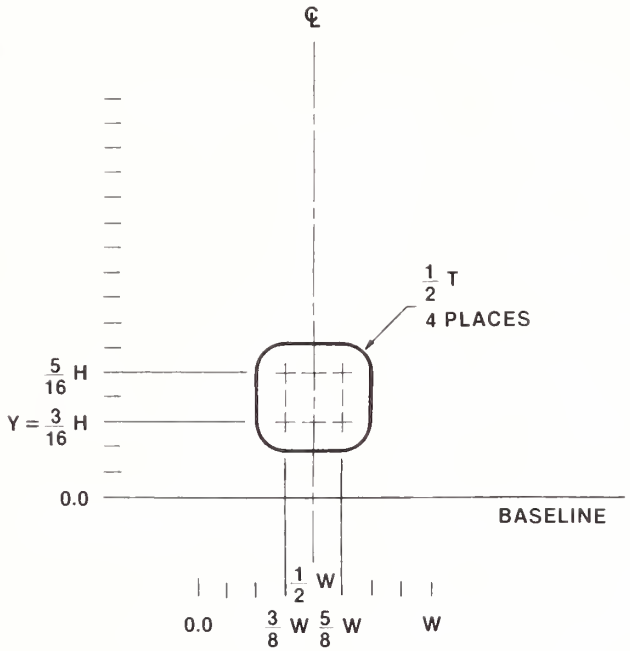
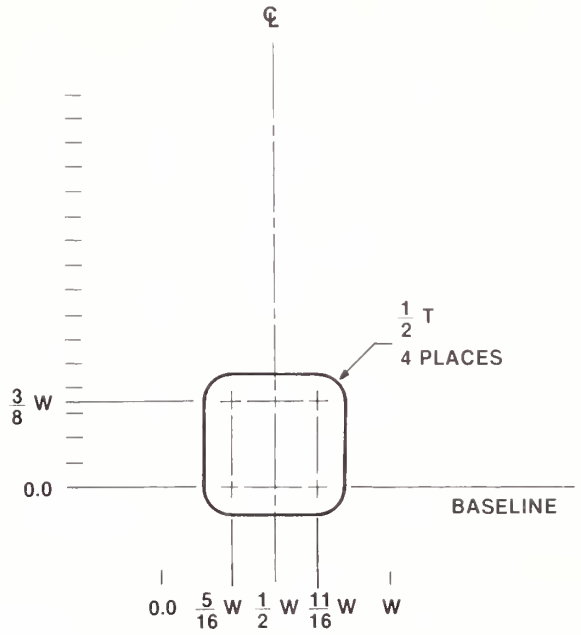


Fig. 40
Letter Z

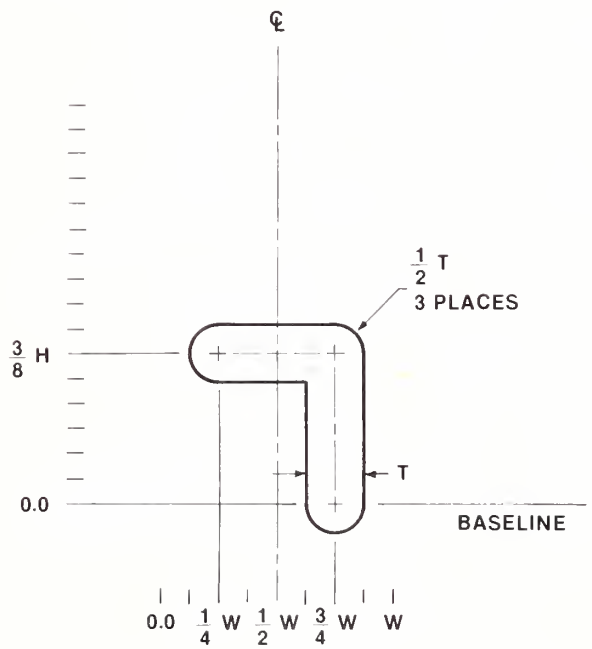


Preferred Shape

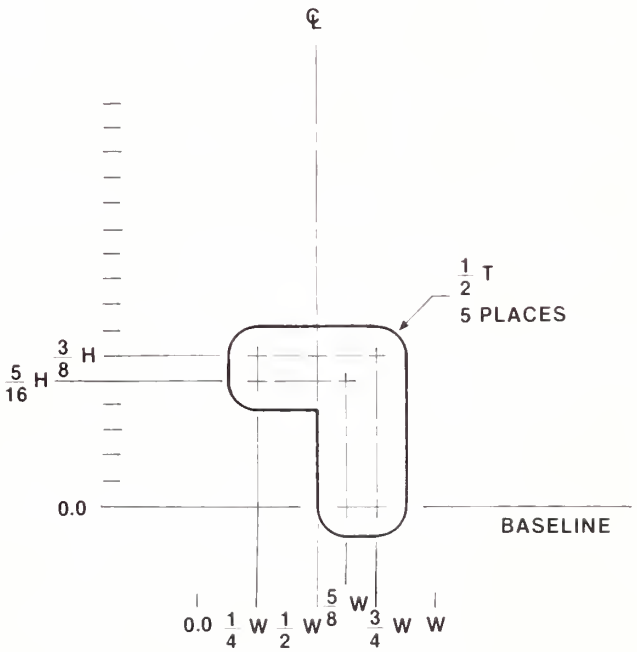


Alternate Shape
(See 2.4.6)

Fig. 41
Period (Decimal Point)



Preferred Shape



Alternate Shape
(See 2.4.6)

Fig. 42
Comma

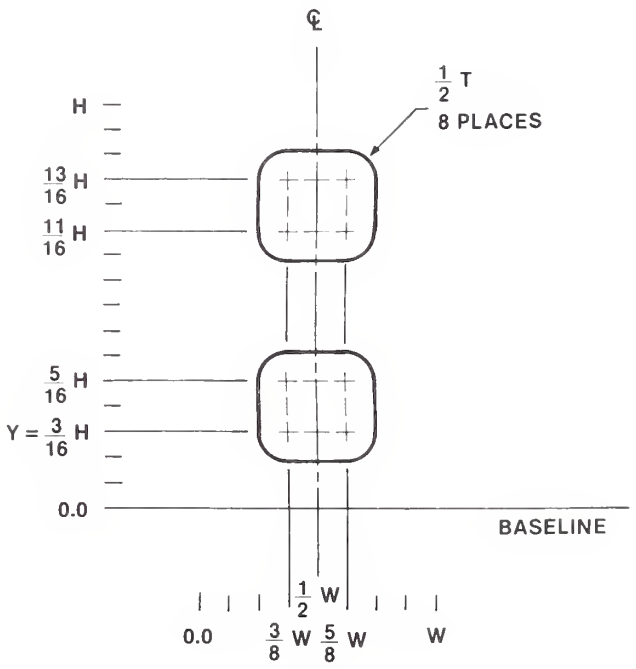


Fig. 43
Colon

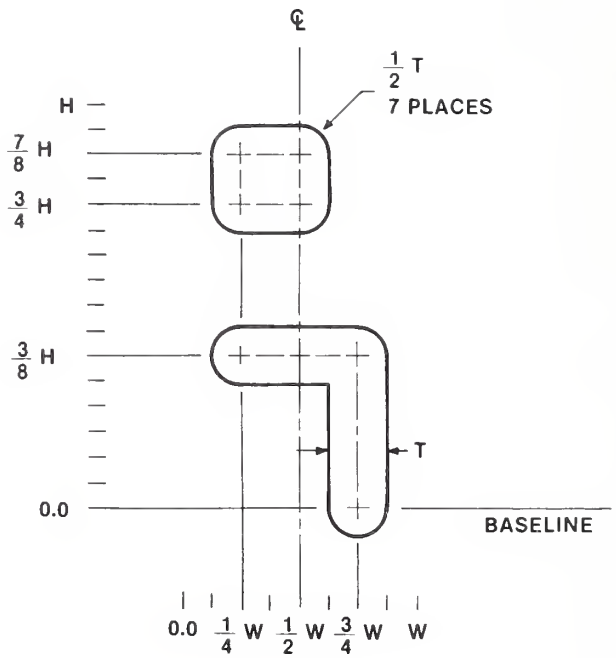


Fig. 44
Semicolon

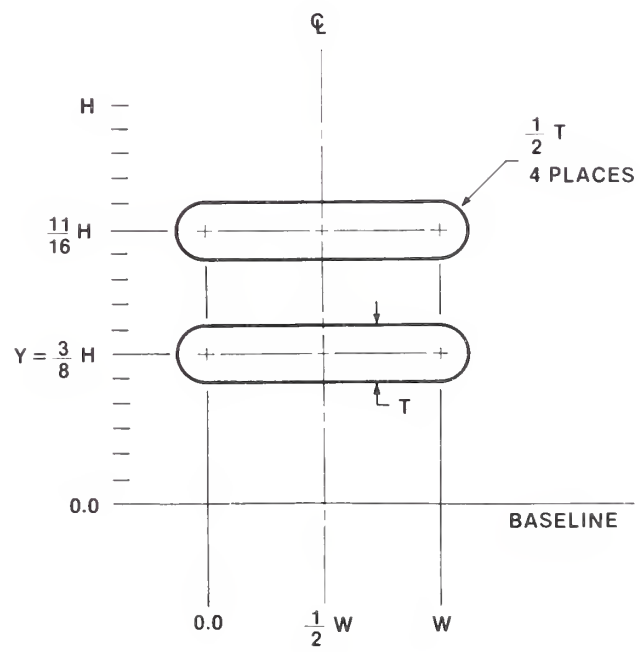


Fig. 45
Equals Sign

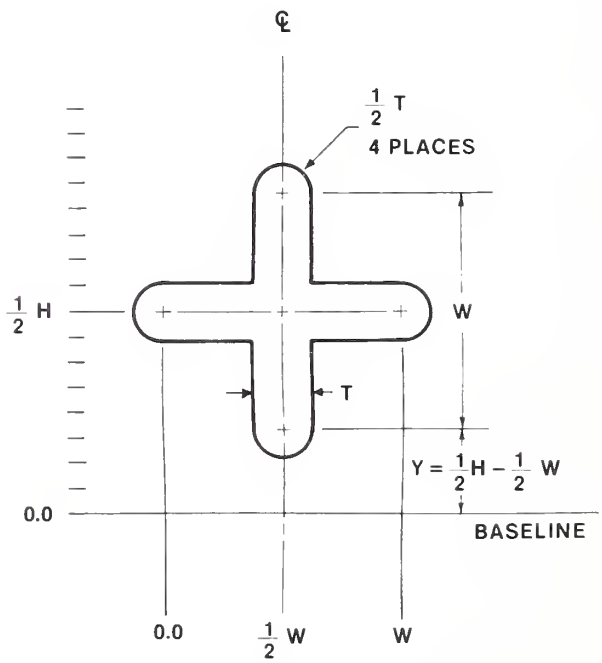


Fig. 46
Plus Sign

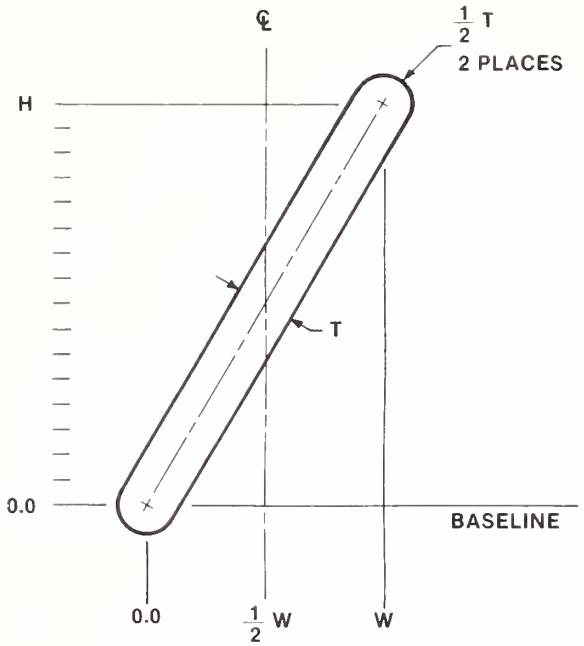


Fig. 47
Slant

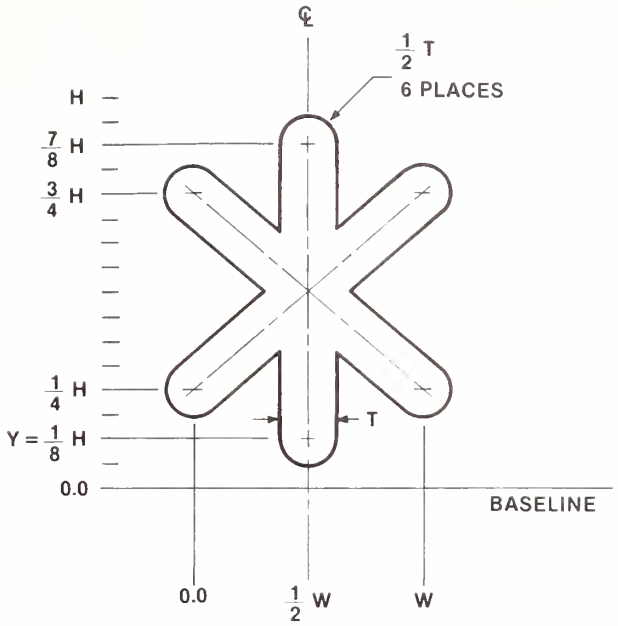


Fig. 48
Asterisk

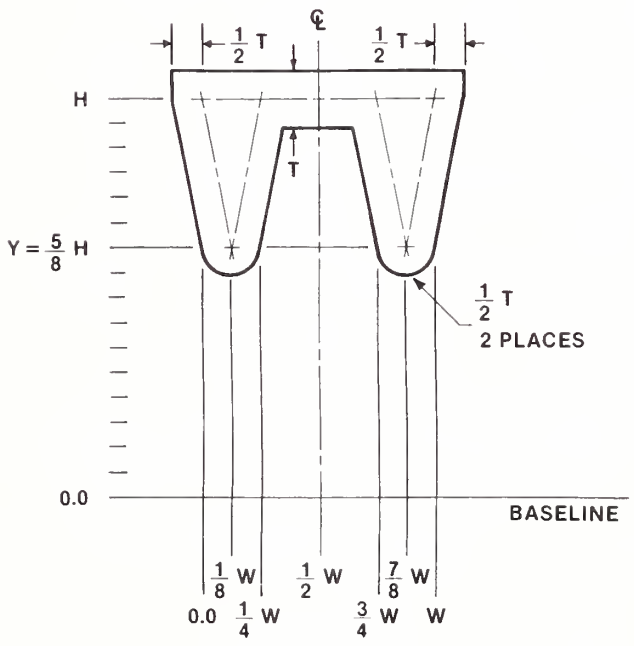


Fig. 49
Quotation Mark

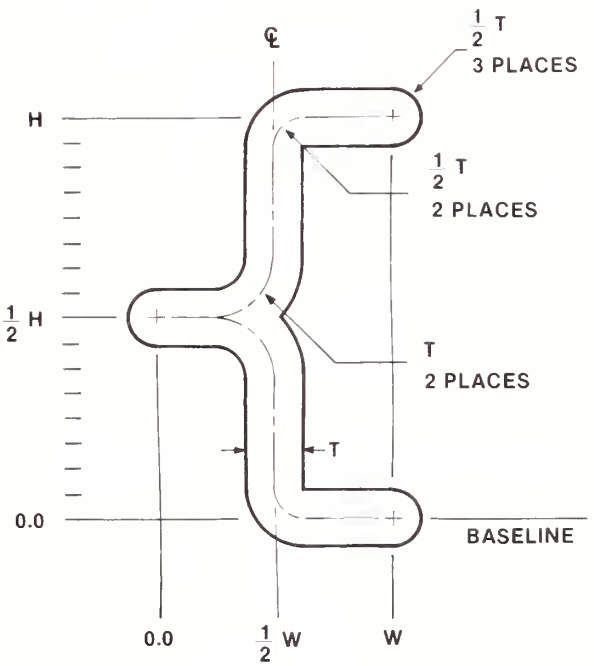


Fig. 50
Opening Brace

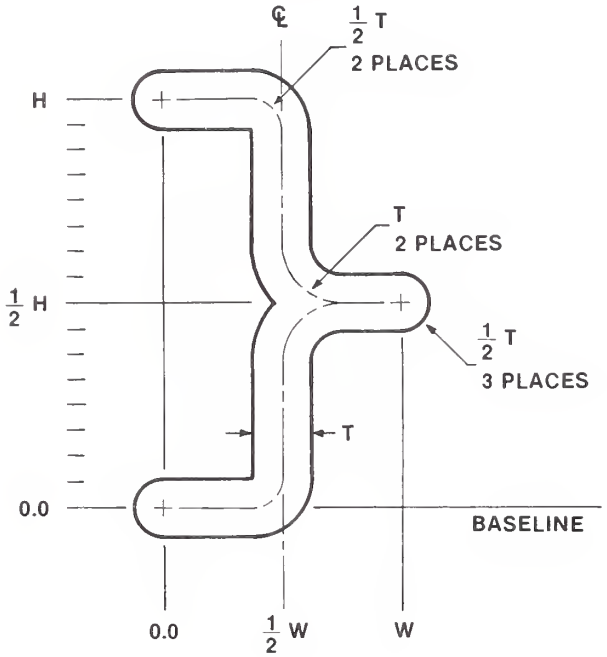


Fig. 51
Closing Brace

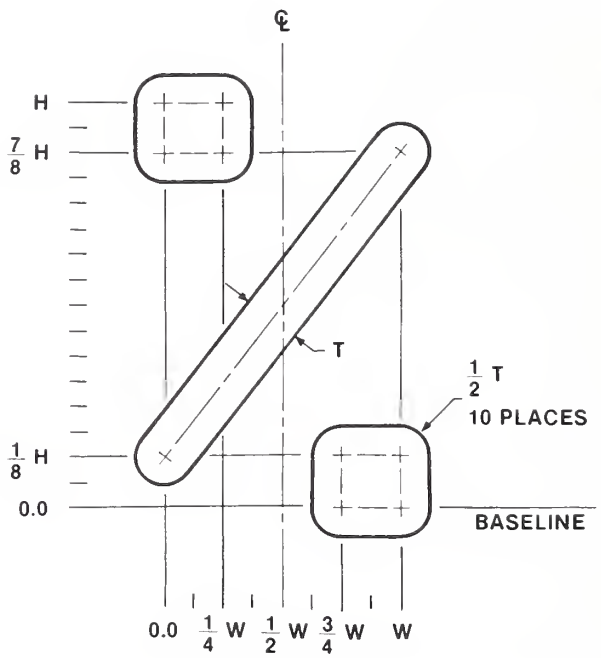
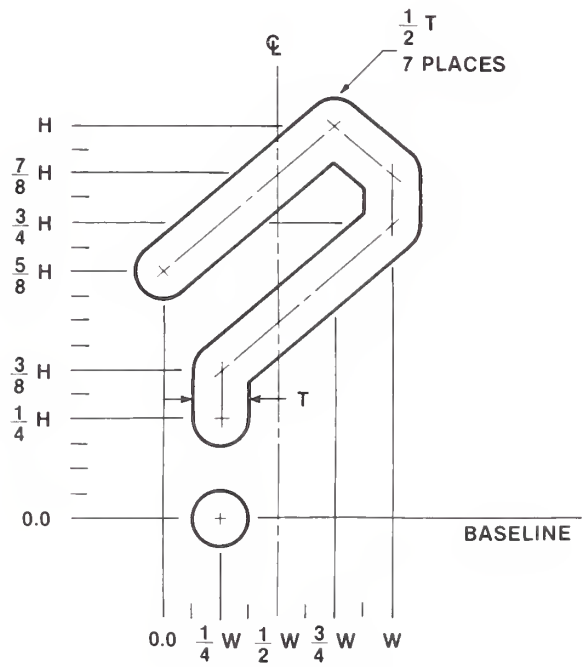
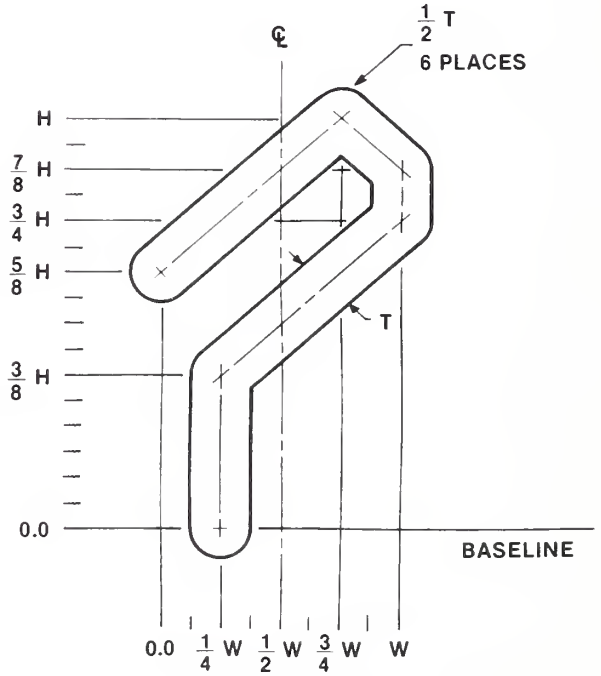


Fig. 52
Percent Sign



Preferred Shape



Alternate Shape
(See 2.4.6)

Fig. 53
Question Mark

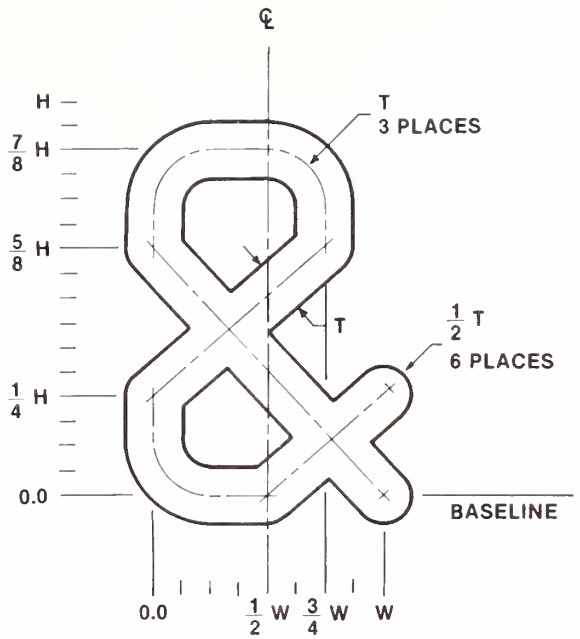
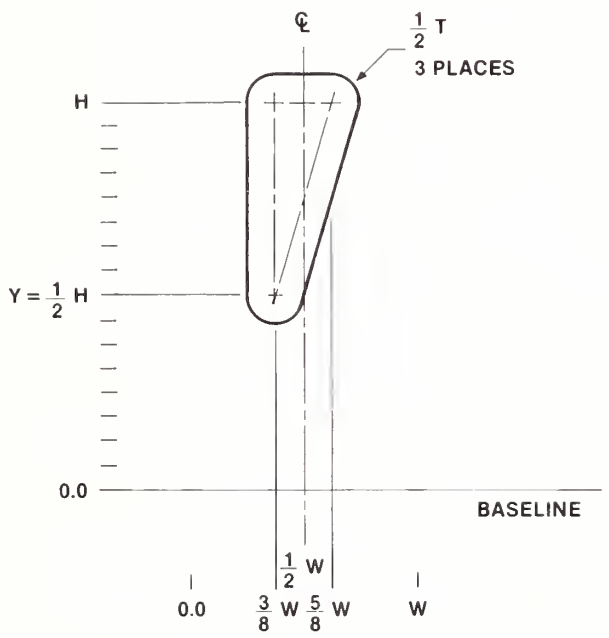
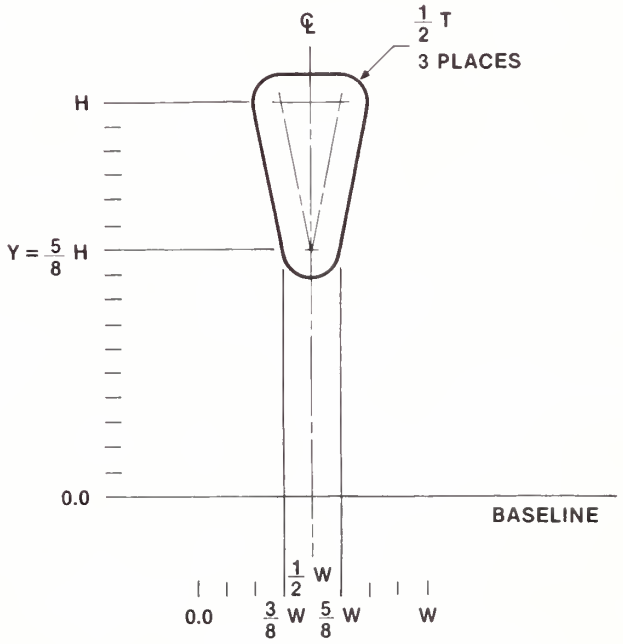


Fig. 54
Ampersand

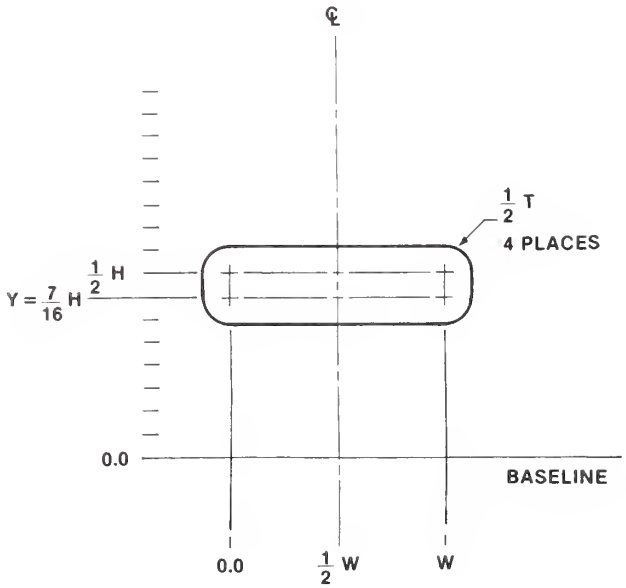


Preferred Shape (New)

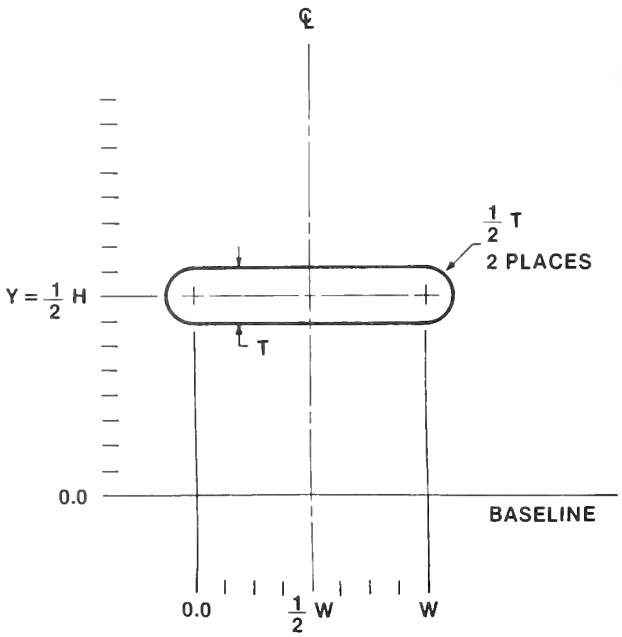


Alternate Shape (Original)
(See 2.4.6)

Fig. 55
Apostrophe (Opening or Closing Single Quotation Mark)



Preferred Shape (New)



Alternate Shape (Original)
(See 2.4.6)

Fig. 56
Hyphen (Minus Sign)

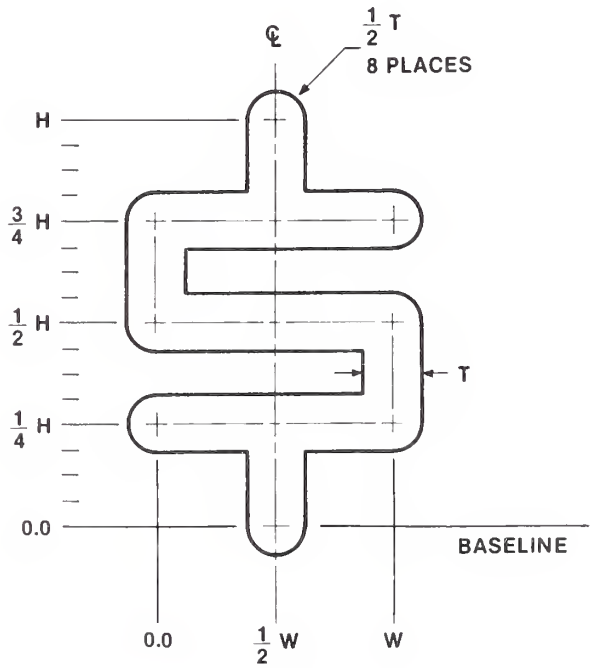


Fig. 57
Dollar Sign

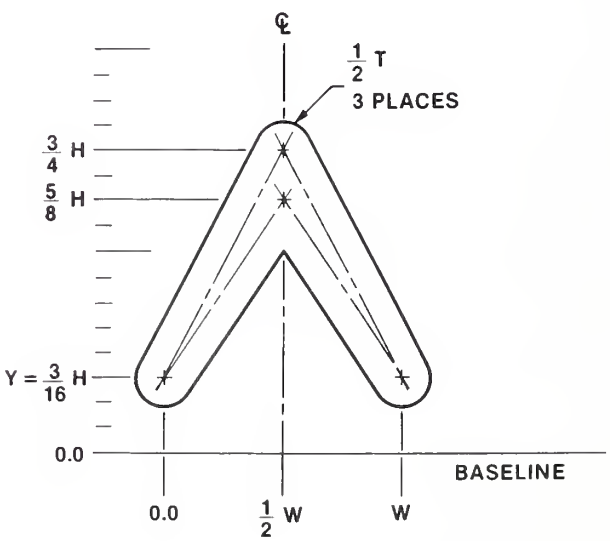


Fig. 58
Upward Arrowhead

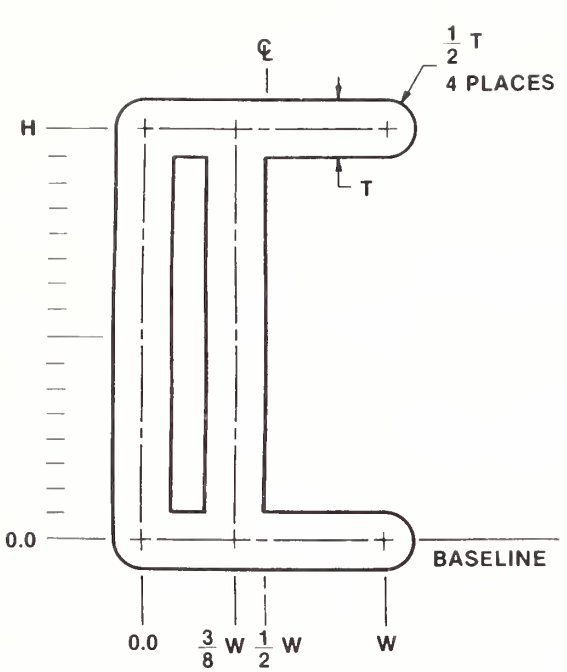


Fig. 59
Opening Bracket

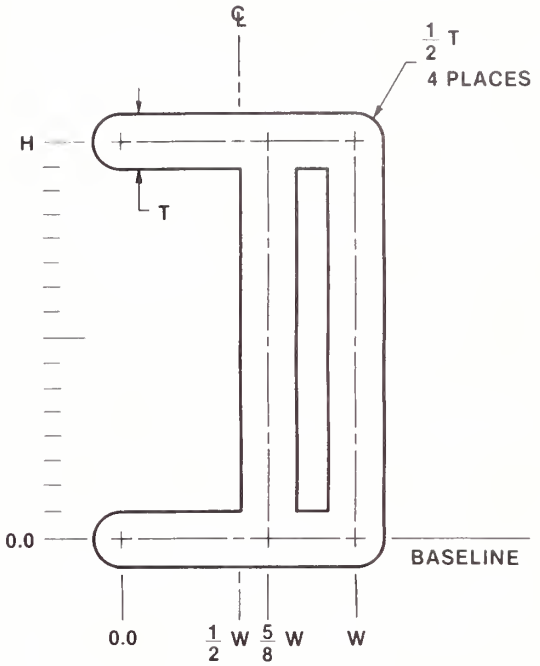


Fig. 60
Closing Bracket

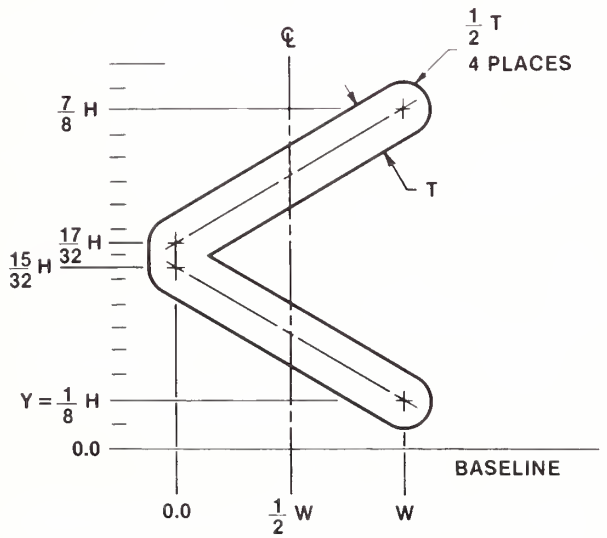


Fig. 61
Less Than Sign

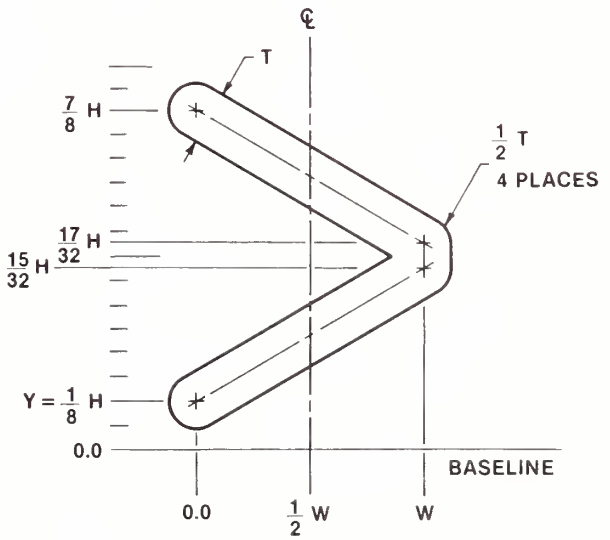


Fig. 62
Greater Than Sign

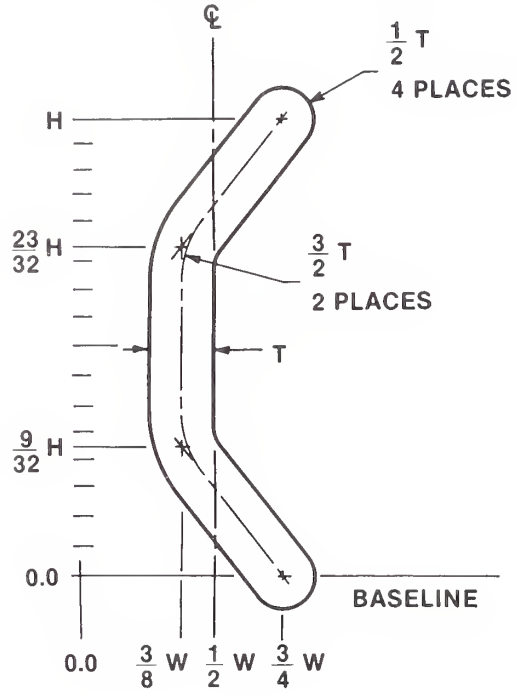


Fig. 63
Opening Parenthesis

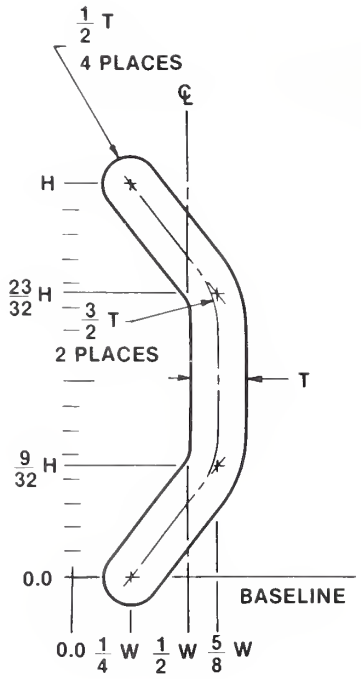


Fig. 64
Closing Parenthesis

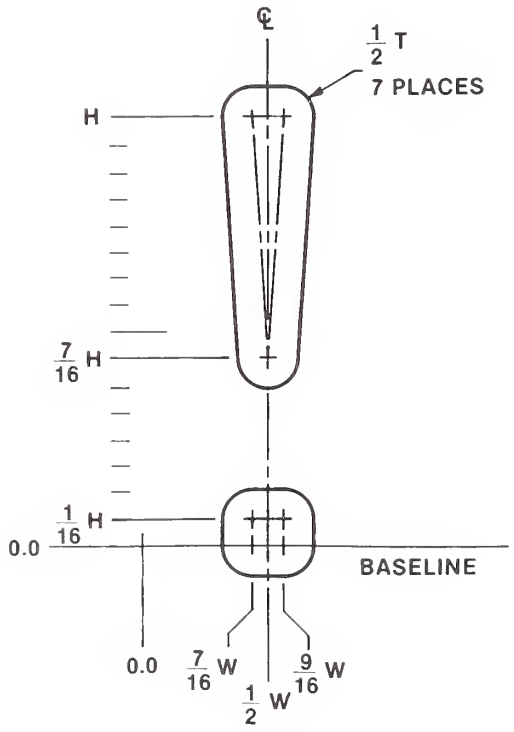


Fig. 65
Exclamation Point

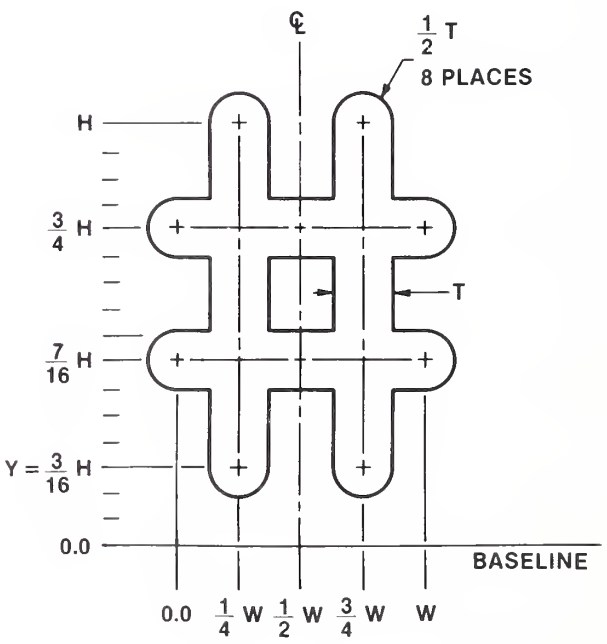


Fig. 66
Number Sign

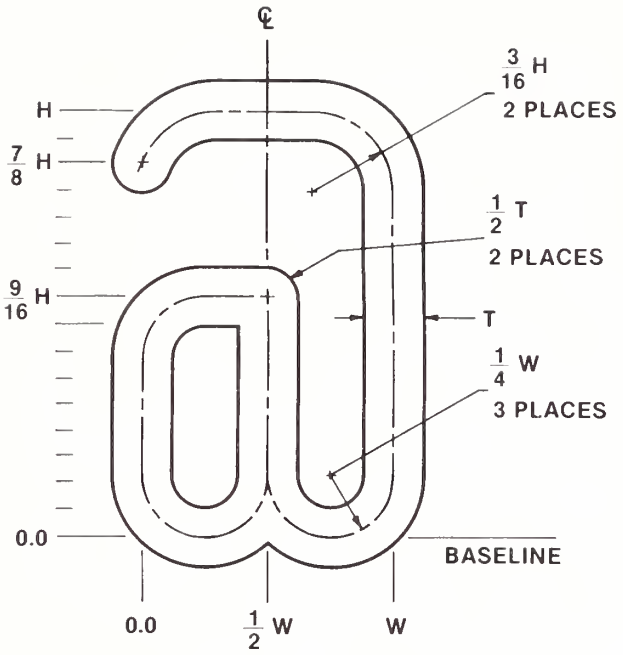


Fig. 67
Commercial At

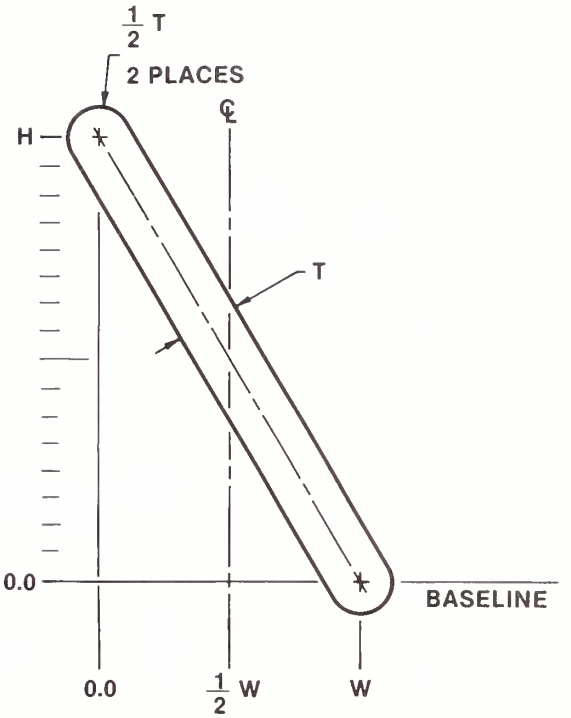
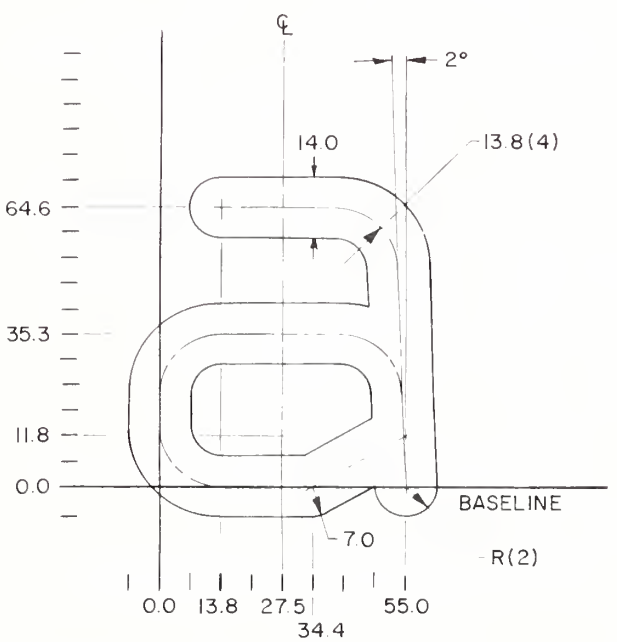


Fig. 68
Reverse Slant



NOTE: In Fig. 69 through 94, all dimensions are in thousandths of an inch (mils).

Fig. 69
Small Letter a

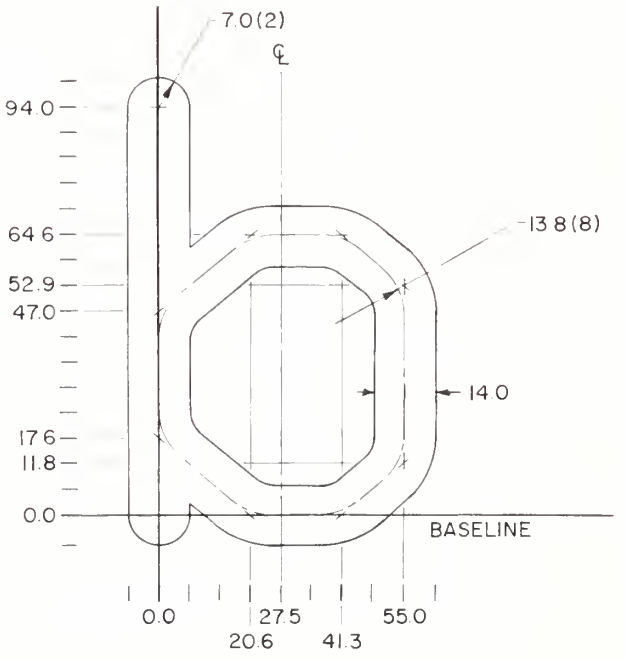


Fig. 70
Small Letter b

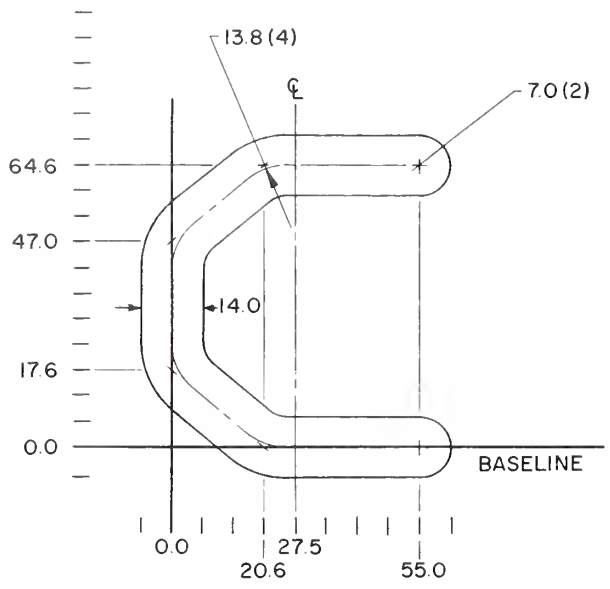


Fig. 71
Small Letter c

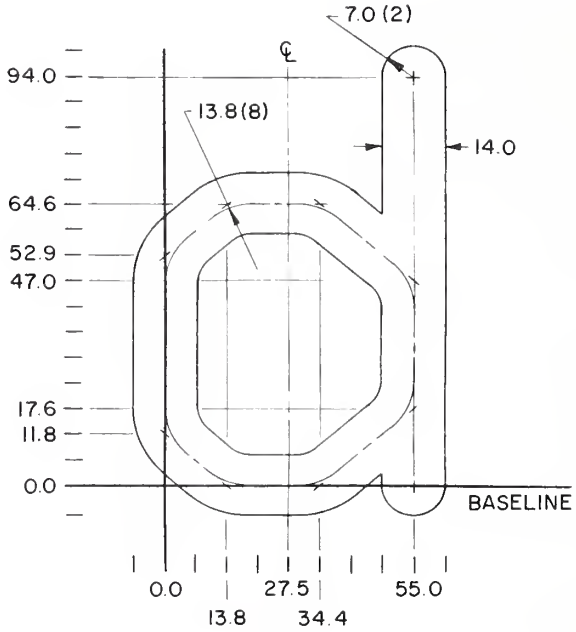


Fig. 72
Small Letter d

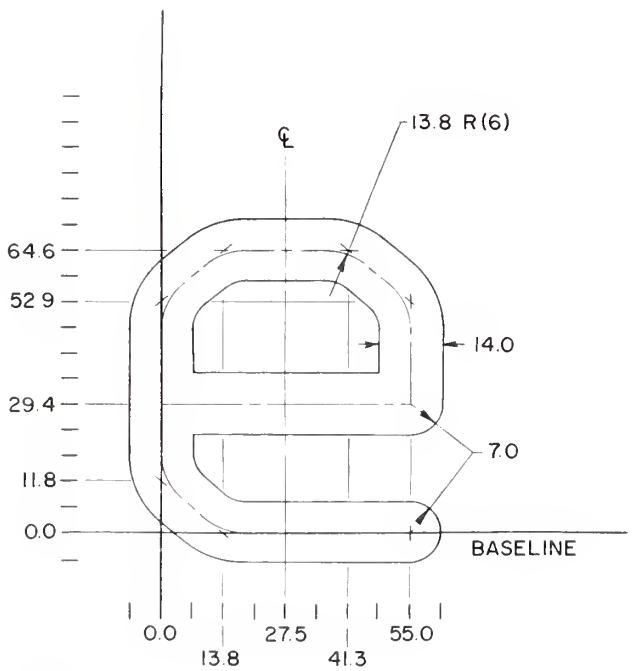


Fig. 73
Small Letter e

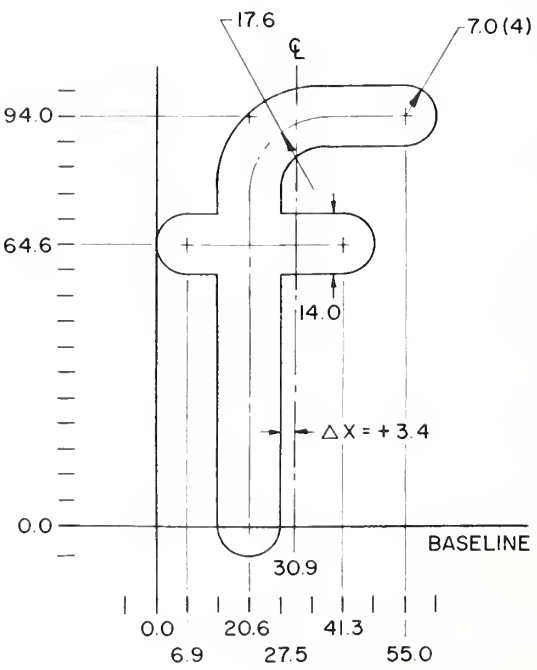


Fig. 74
Small Letter f

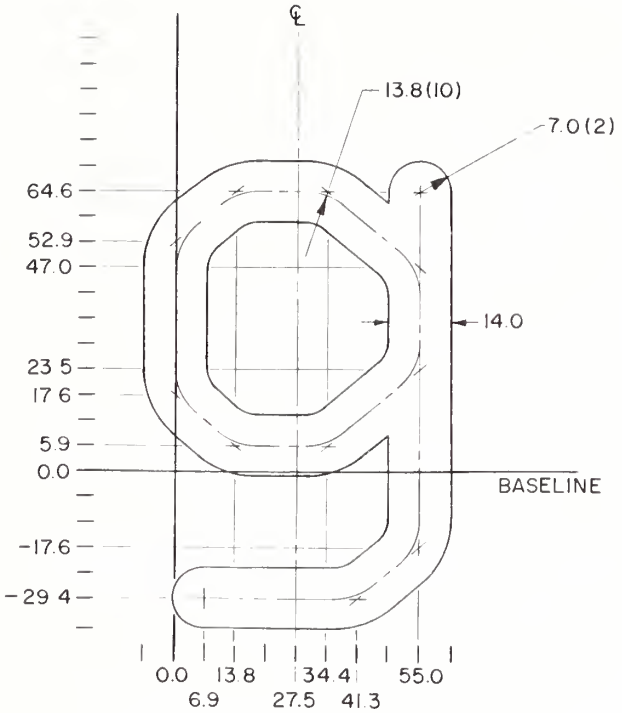


Fig. 75
Small Letter g

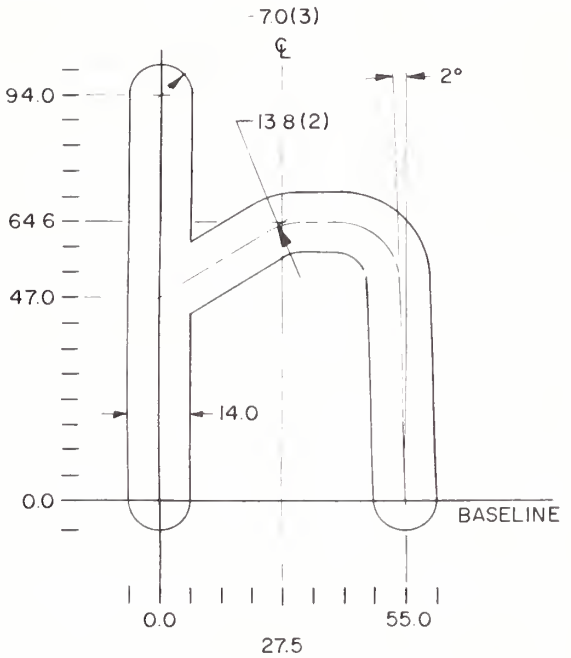


Fig. 76
Small Letter h

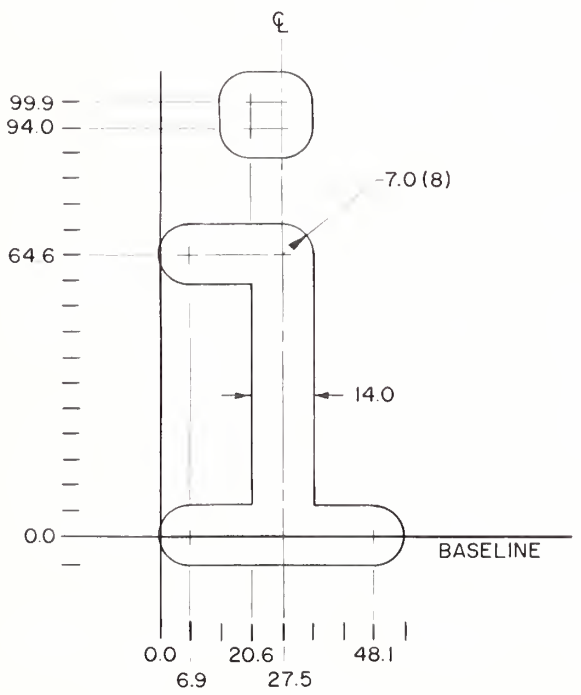


Fig. 77
Small Letter i

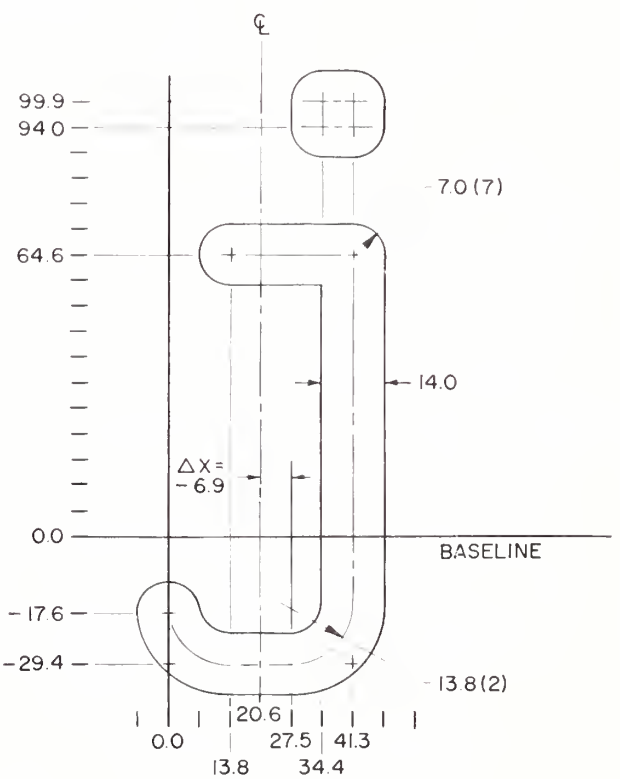


Fig. 78
Small Letter j

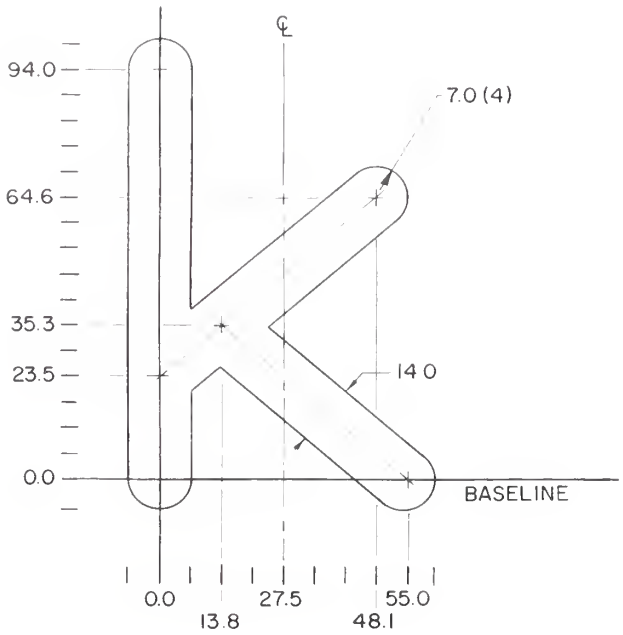


Fig. 79
Small Letter k

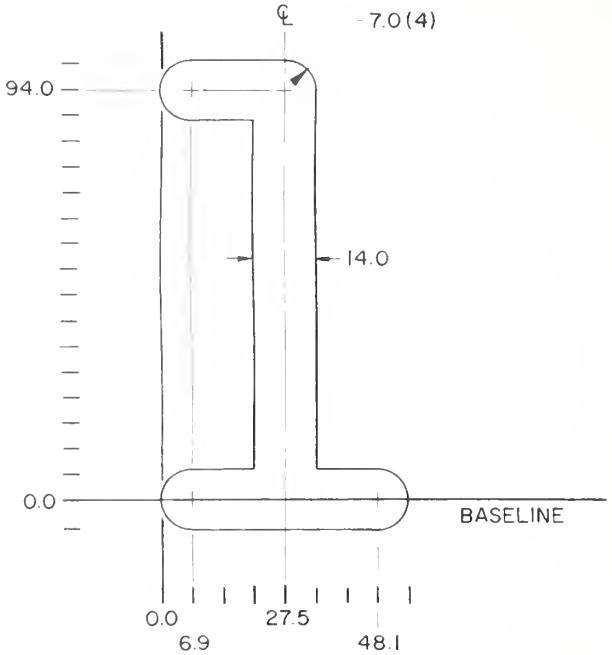


Fig. 80
Small Letter l

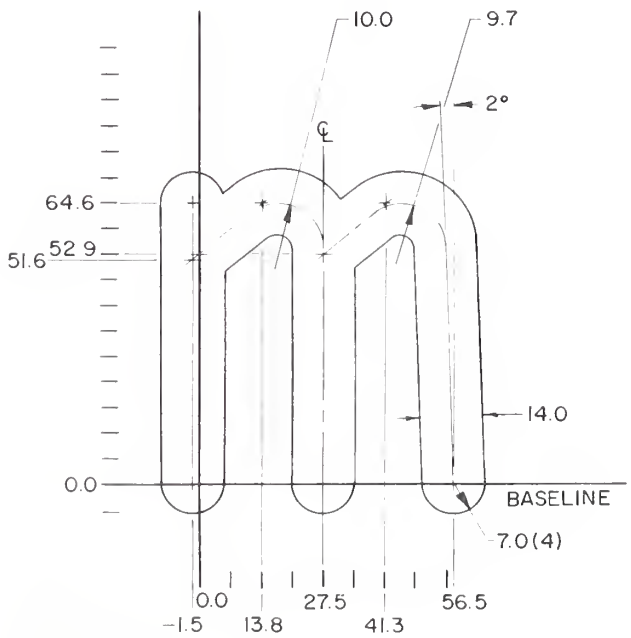


Fig. 81
Small Letter m

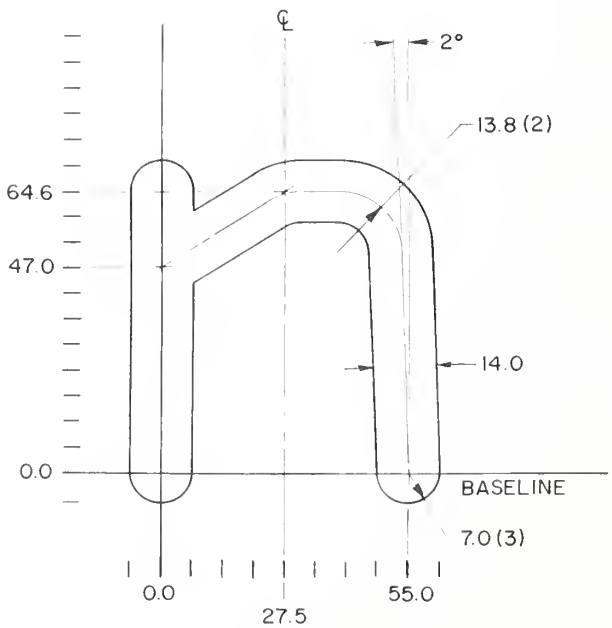


Fig. 82
Small Letter n

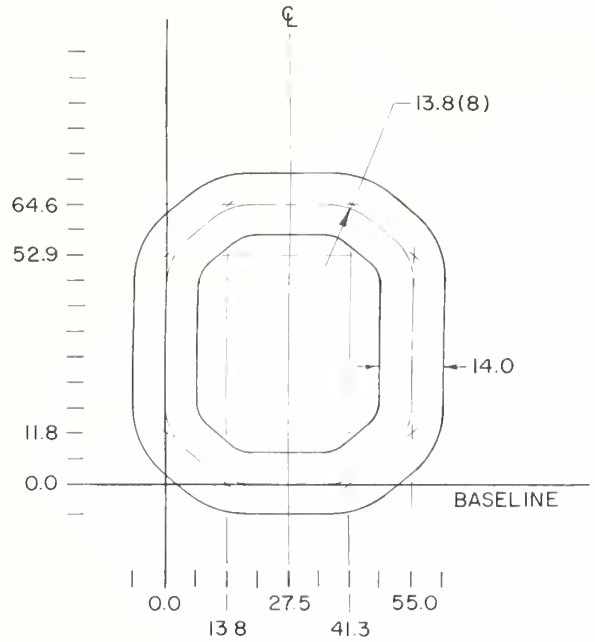


Fig. 83
Small Letter o

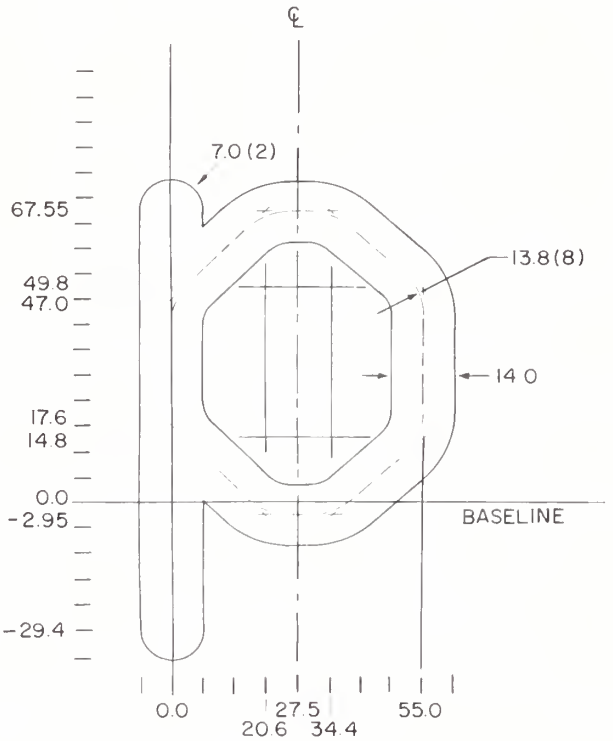


Fig. 84
Small Letter p

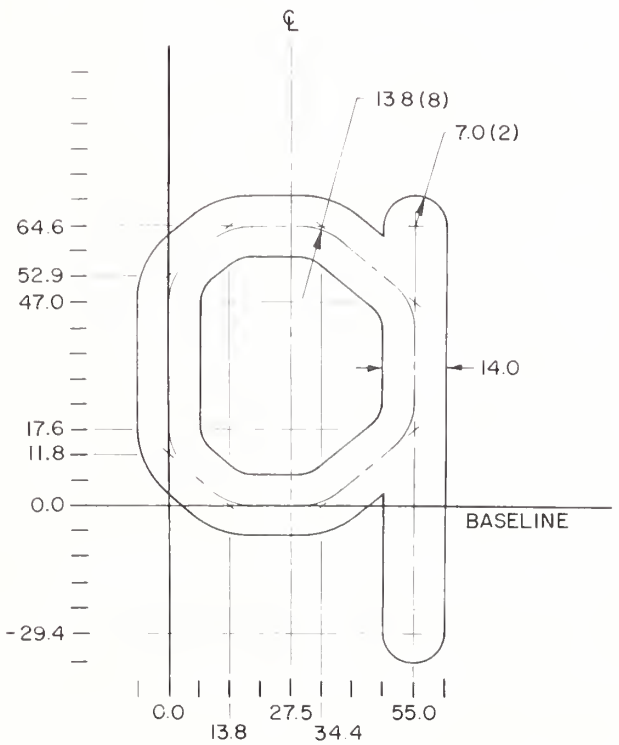


Fig. 85
Small Letter q

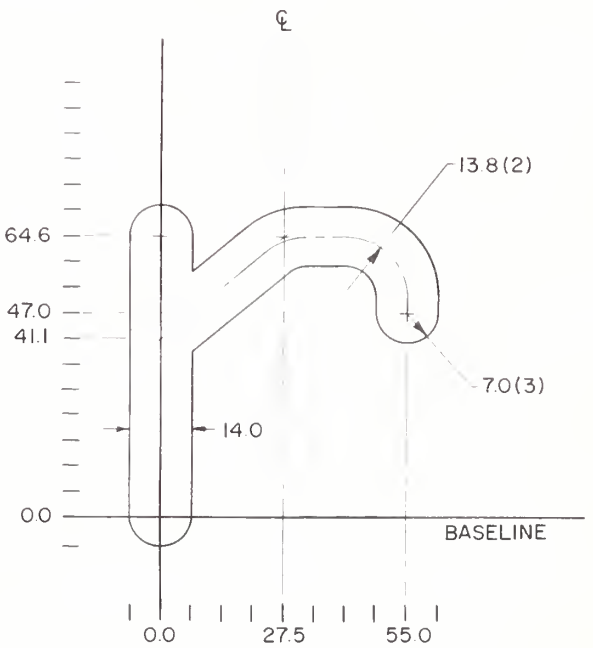


Fig. 86
Small Letter r

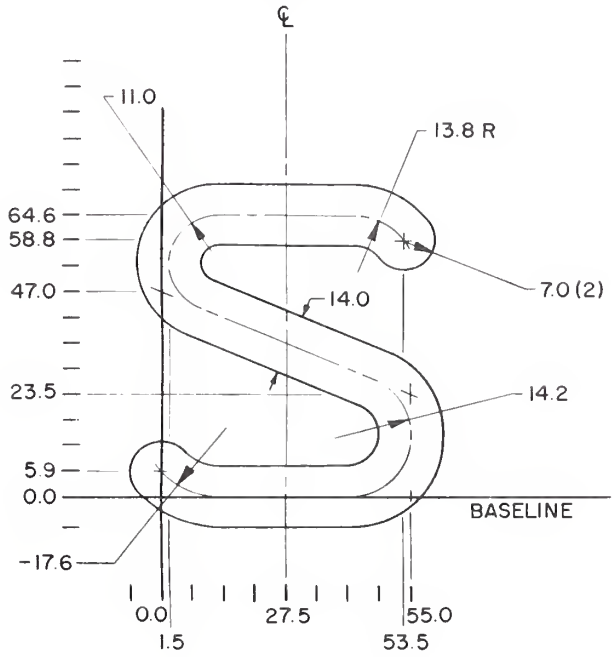


Fig. 87
Small Letter s

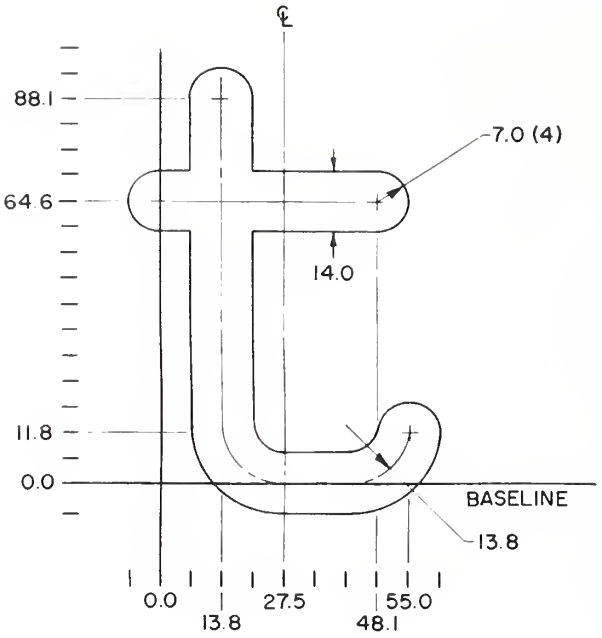


Fig. 88
Small Letter t

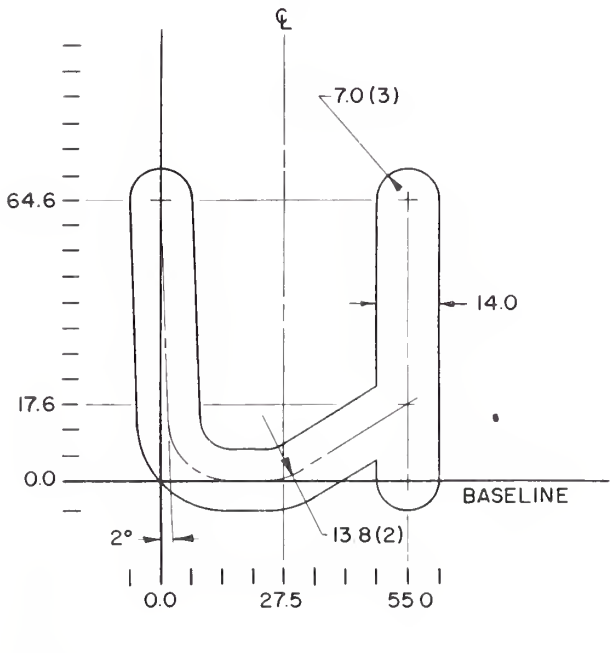


Fig. 89
Small Letter u

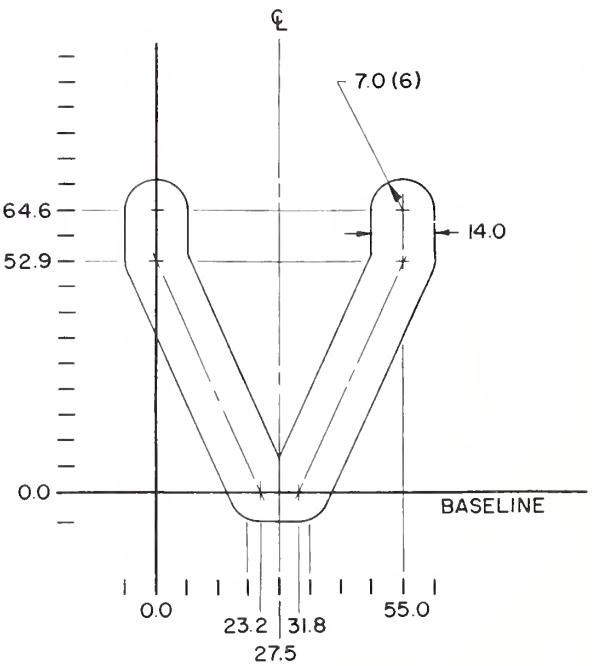


Fig. 90
Small Letter v

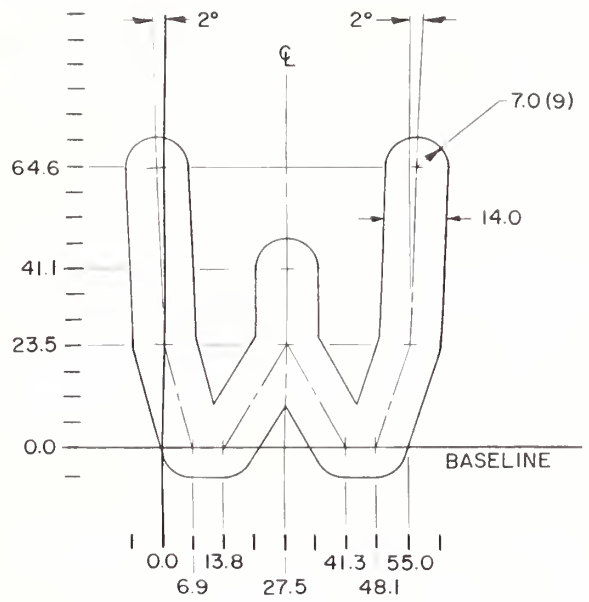


Fig. 91
Small Letter w

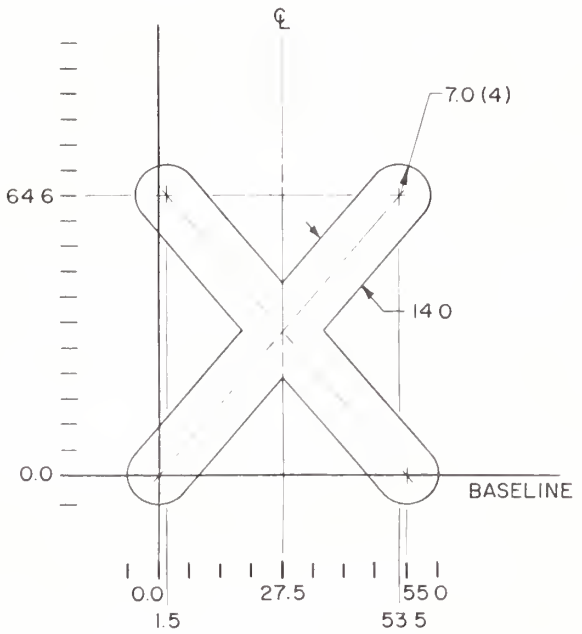


Fig. 92
Small Letter x

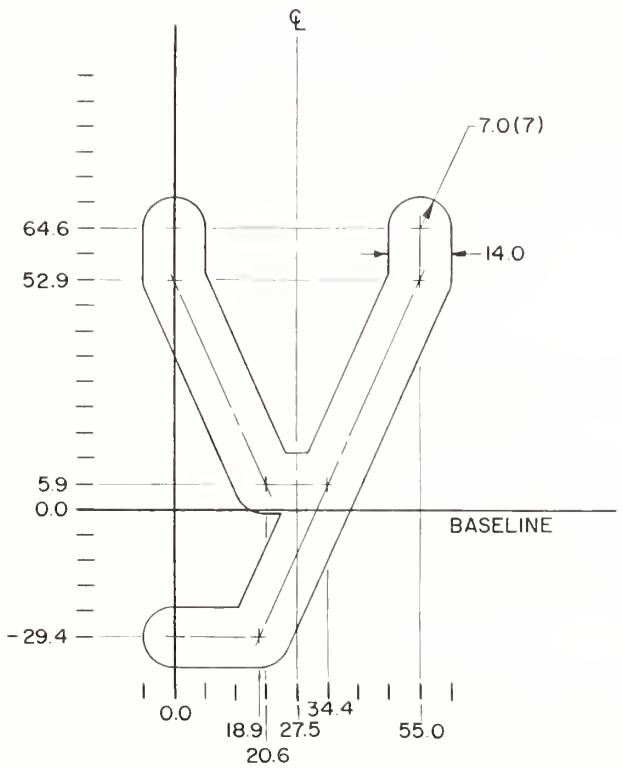


Fig. 93
Small Letter y

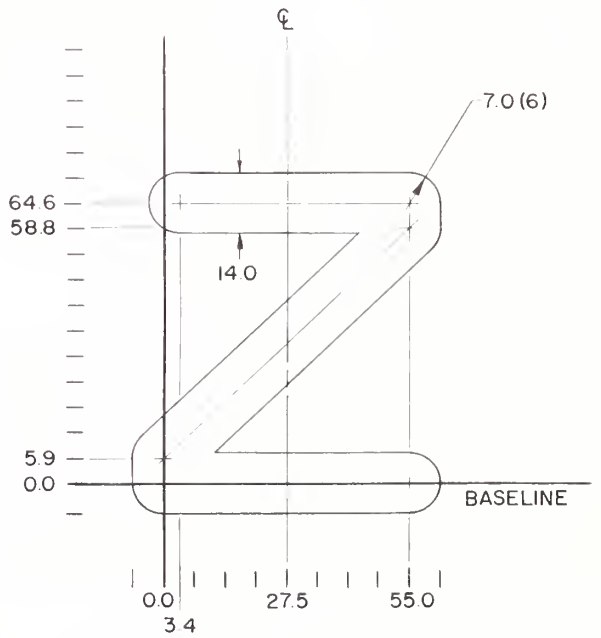
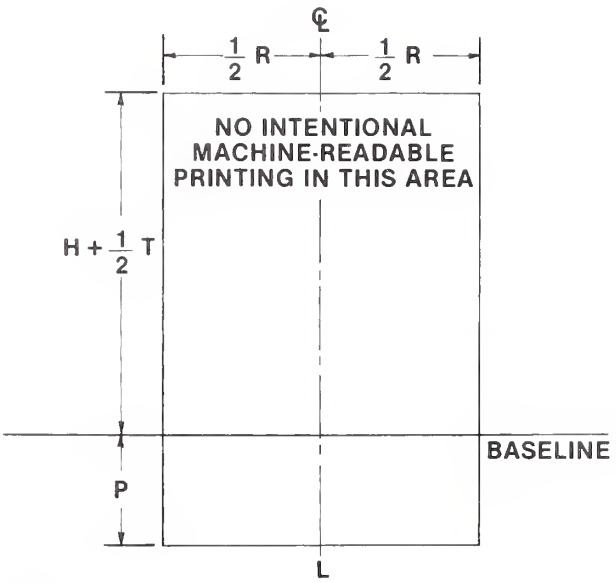


Fig. 94
Small Letter z



NOTE:
L = nominal centerline position for a character as defined by the pitch of the printing mechanism and characters on the line
P = 5/16 H + 1/2 T if small letters are used, or 1/2 T if small letters are not used
R = nominal character spacing (pitch of printer), W + 2 T min

Fig. 95
Character Space

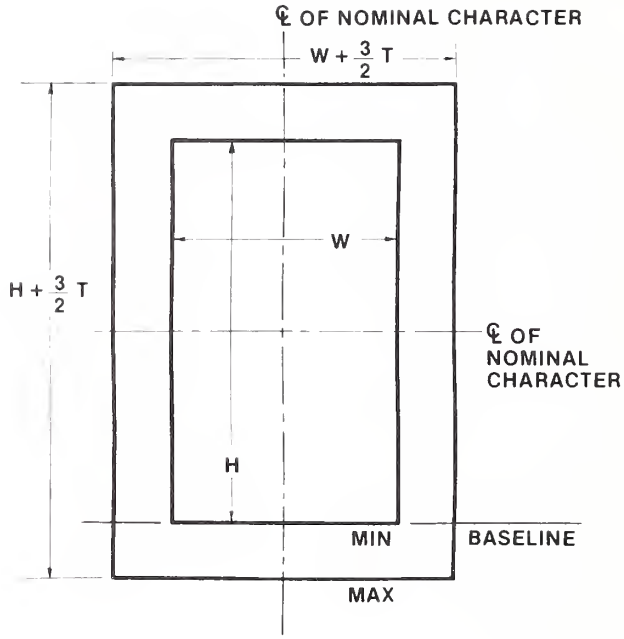


Fig. 96
Character Erase (Size I Only)

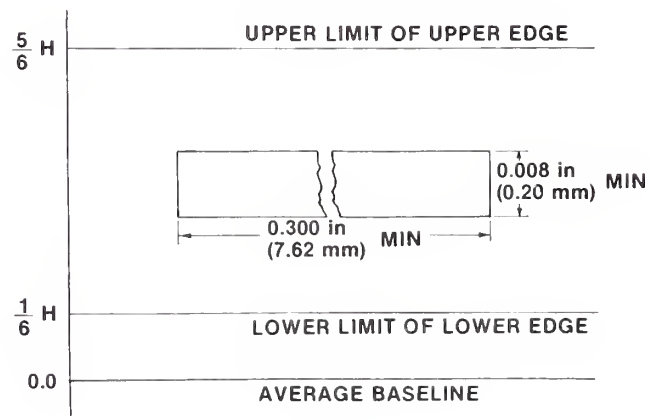


Fig. 97
Group Erase (Size I Only)

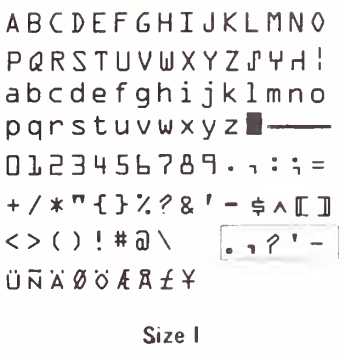
Appendixes (These Appendixes are not a part of American National Standard Character Set for Optical Character Recognition (OCR-A), ANSI X3.17-1981, but are included for information purposes only.)

Appendix A

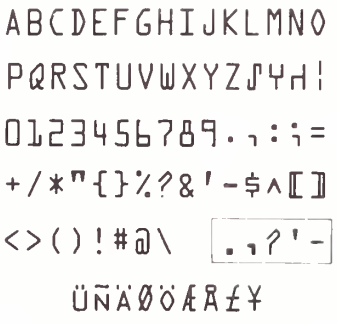
Black-and-White Character Drawings

Fig. A1 through A4 are 1:1 and 4:1 representations of the standard character set in each of the three sizes specified, that is, Size I, Size III, and Size IV.[5] The bottom row of the Size I and Size III, and the corresponding characters of the Size IV, illustrations are not part of the standard set, but are shown for information only. Characters within outline boxes are alternate shapes. The ISO national letters and currency signs are explained in Appendix B.

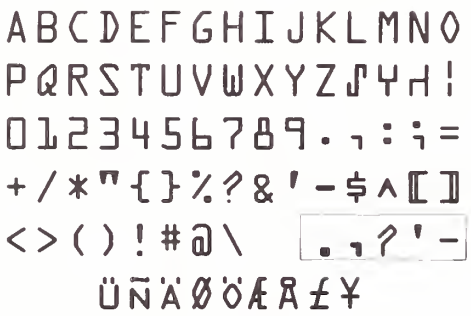
[5] These are illustrations only. The dimensions of the characters shown may not be in exact agreement with the specifications contained in 2.1 and Table 1 of this standard.



Size I



Size III



Size IV

Fig. A1
1:1 Illustration of Standard Character Set
(in the Three Standard Sizes – Size I, Size III, and Size IV)

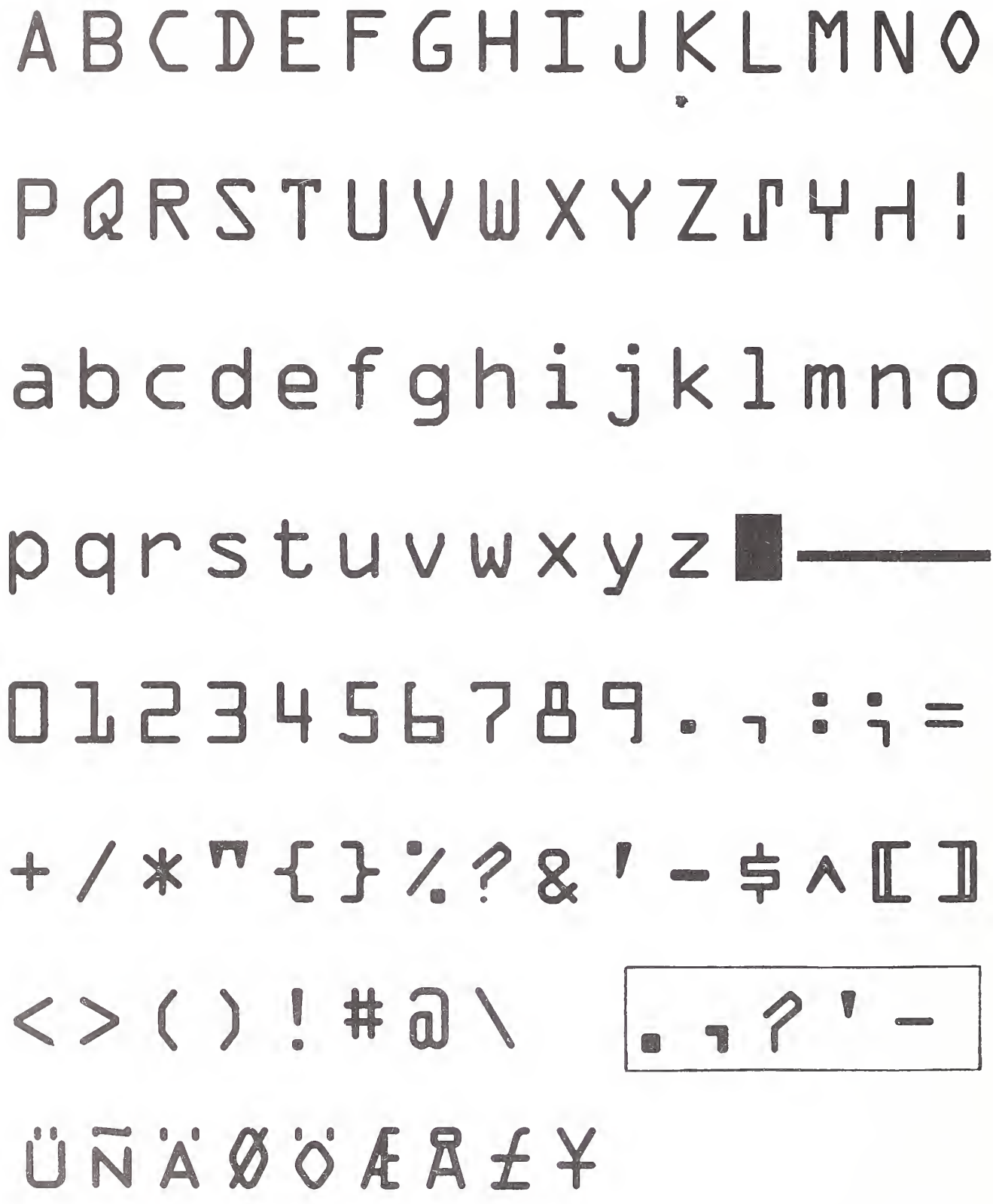


Fig. A2
4:1 Illustration of Standard Character Set (Size I)

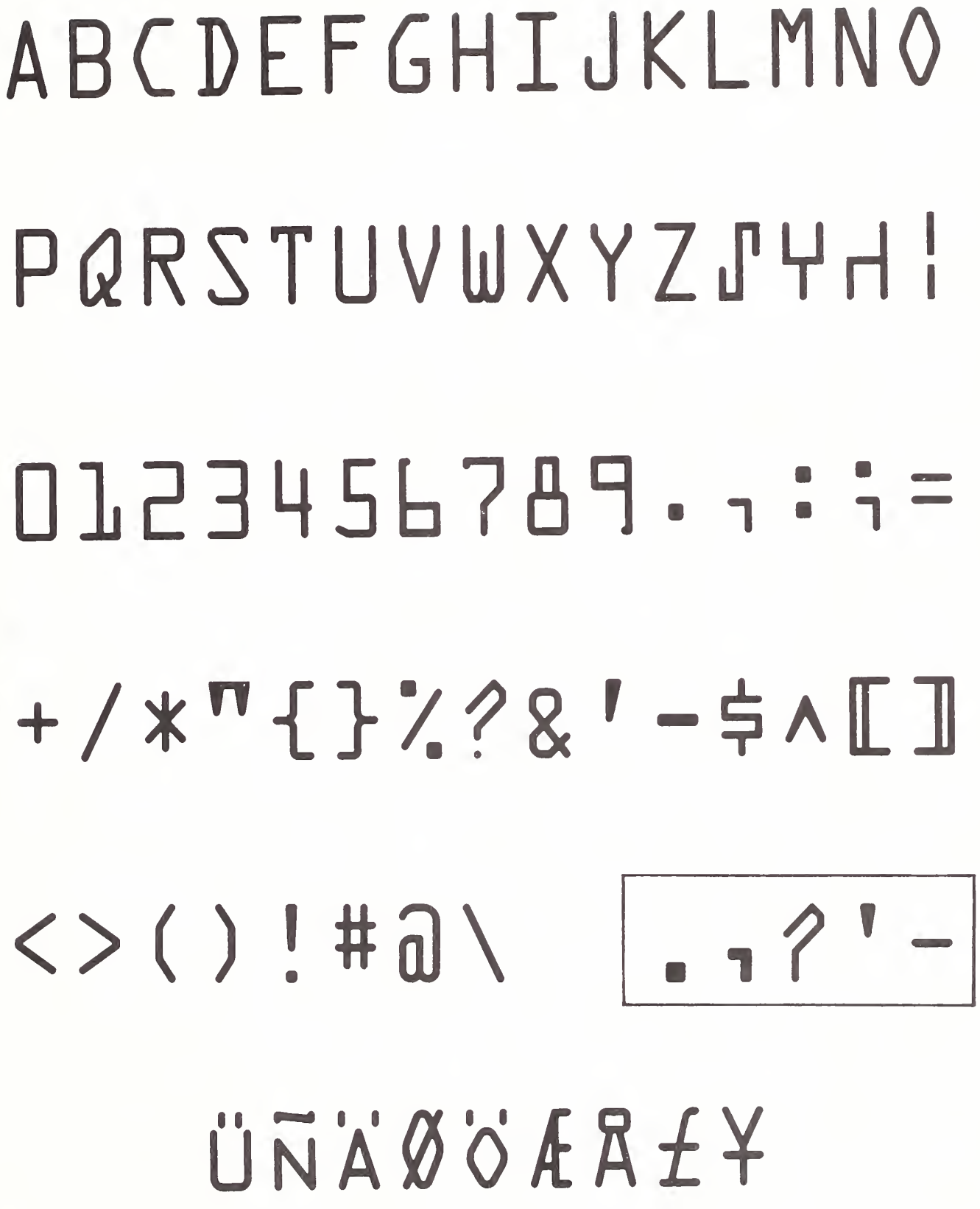


Fig. A3
4:1 Illustration of Standard Character Set (Size III)

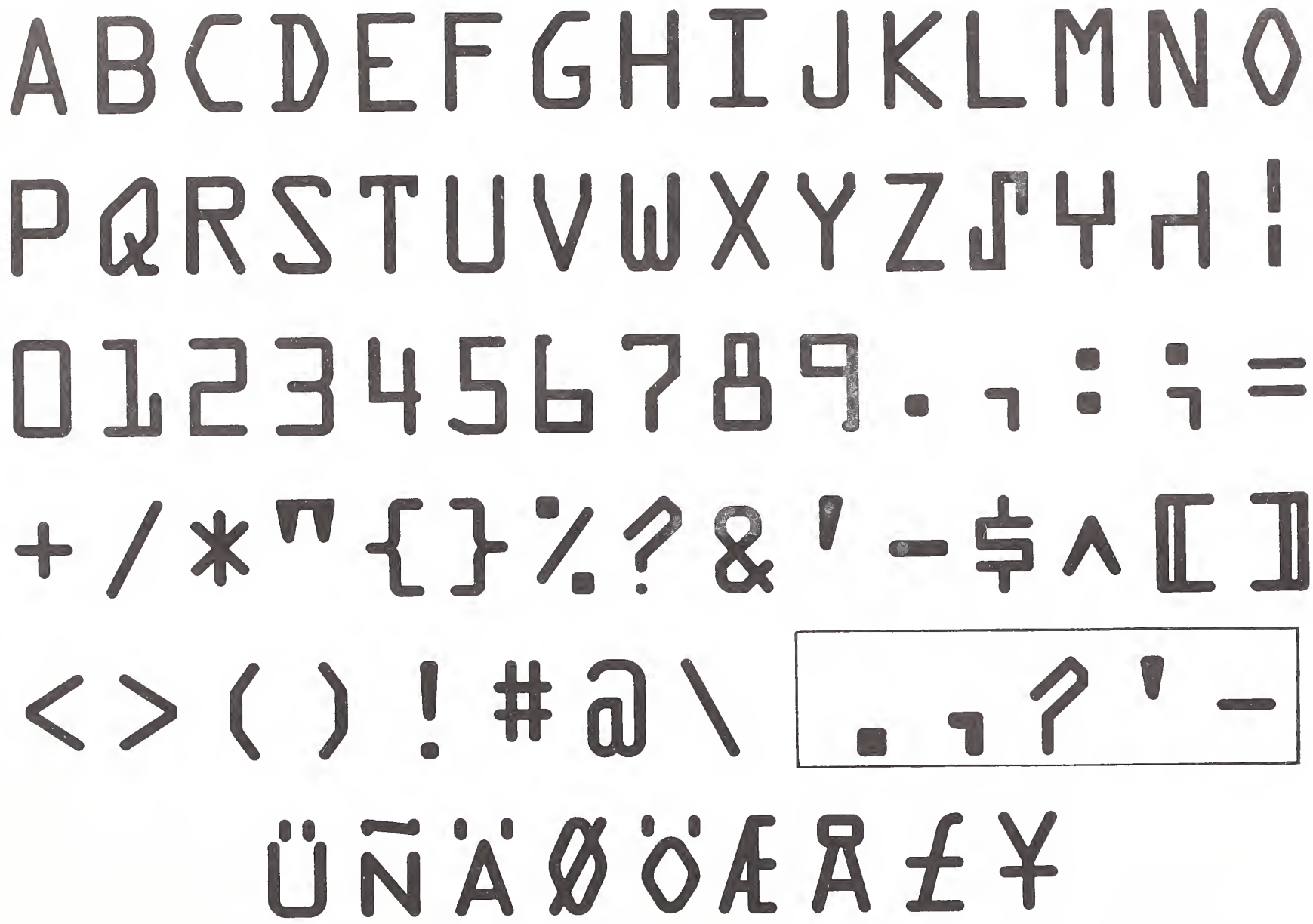


Fig. A4
4:1 Illustration of Standard Character Set (Size IV)

Appendix B
ISO National Letters and Currency Signs

The national characters and currency signs given in Fig. B1 through B9 are not a part of this standard and likewise are not contained in American National Standard Code for Information Interchange (ASCII), ANSI X3.4-1977. These characters are included and described in ISO (International Organization for Standardization) International Standard 646-1973, 7-Bit Coded Character Set for Information Processing Interchange, and ISO International Standard 1073/I-1976, Alphanumeric Character Sets for Optical Recognition – Part I: Character Set OCR-A – Shapes and Dimensions of the Printed Image.[6]

The encoding of these characters varies from country to country; the reader is advised to refer to the coding standards of the countries of interest.

[6] Publications of the International Organization for Standardization are available from the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

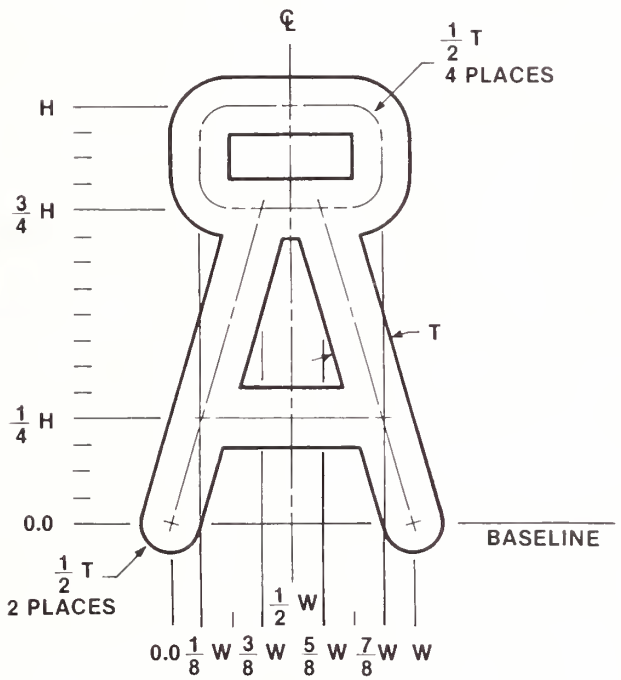


Fig. B1
Letter Å

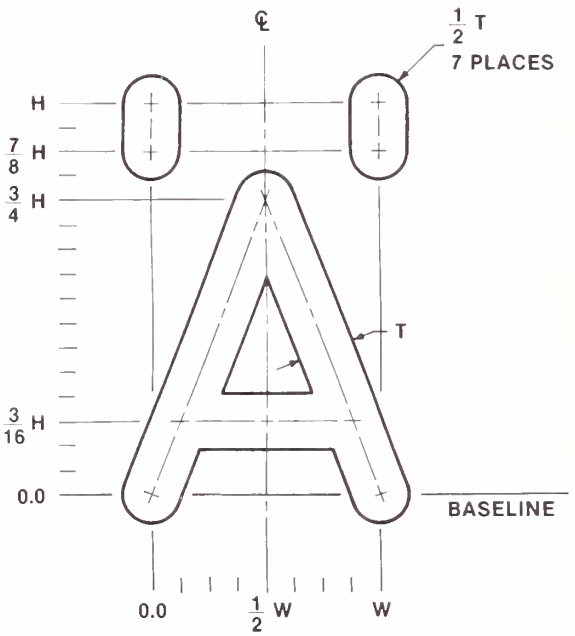


Fig. B2
Letter A

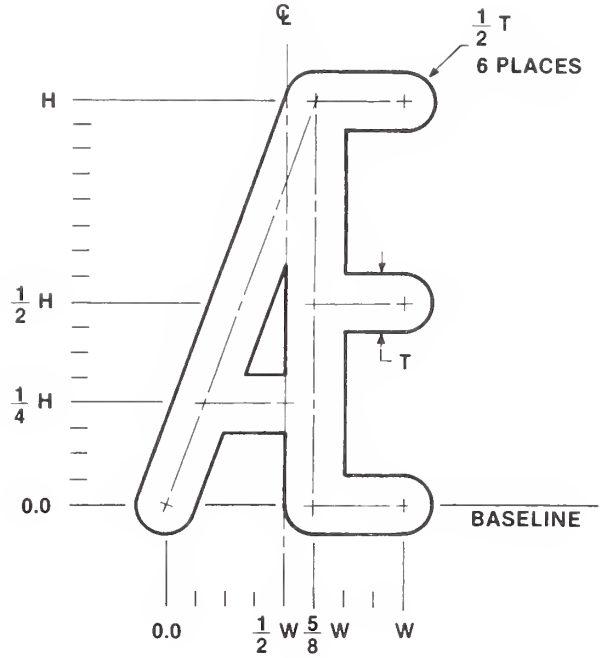


Fig. B3
Letter AE

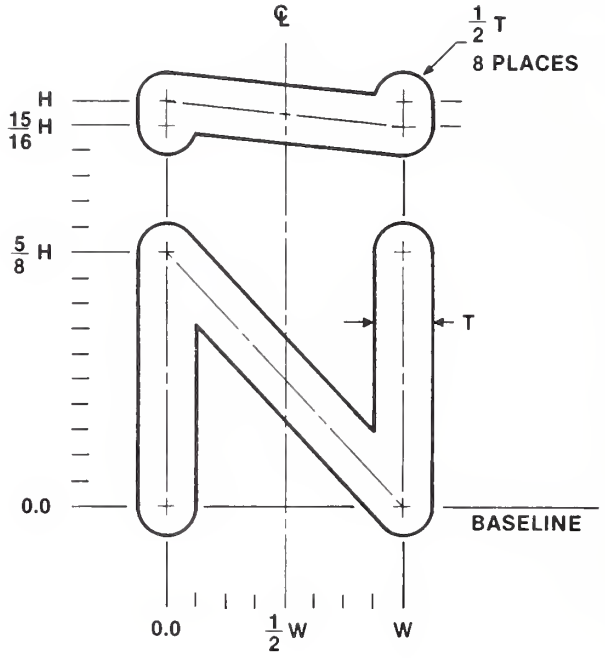


Fig. B4
Letter $\widetilde{N}$

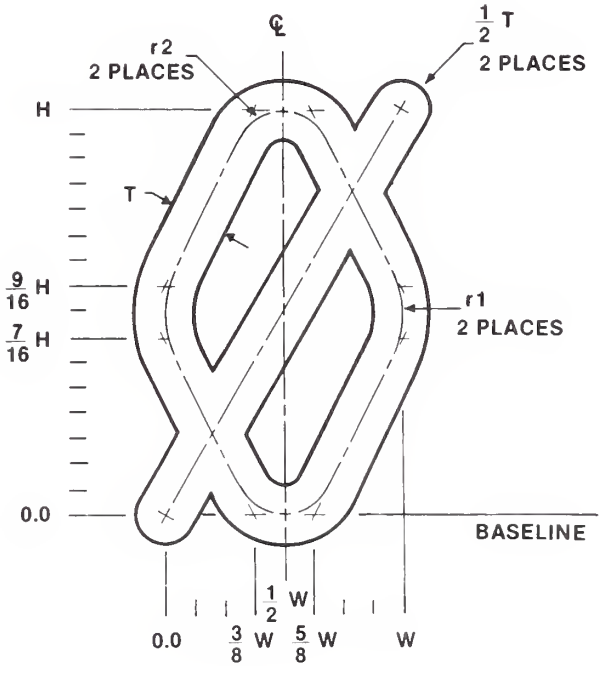


Fig. B5
Letter Ø

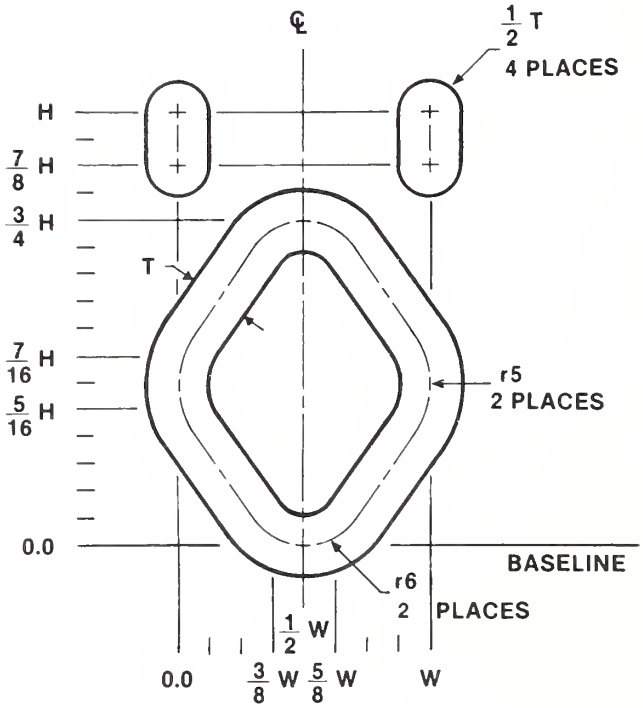


Fig. B6
Letter O

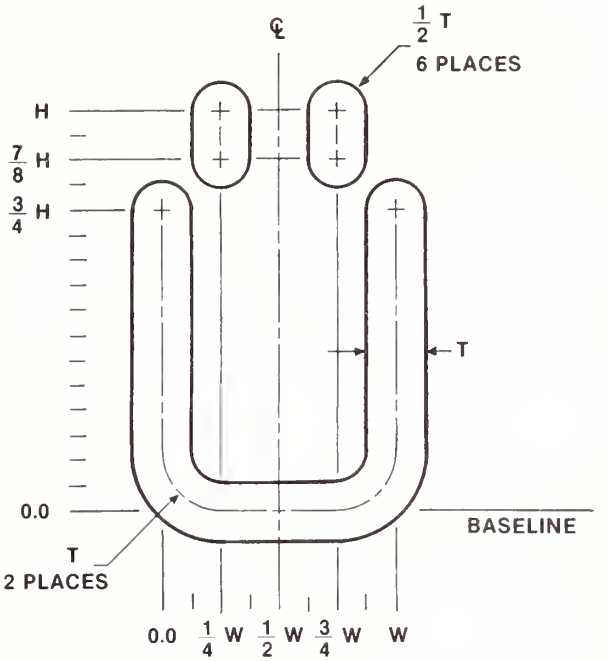


Fig. B7
Letter U

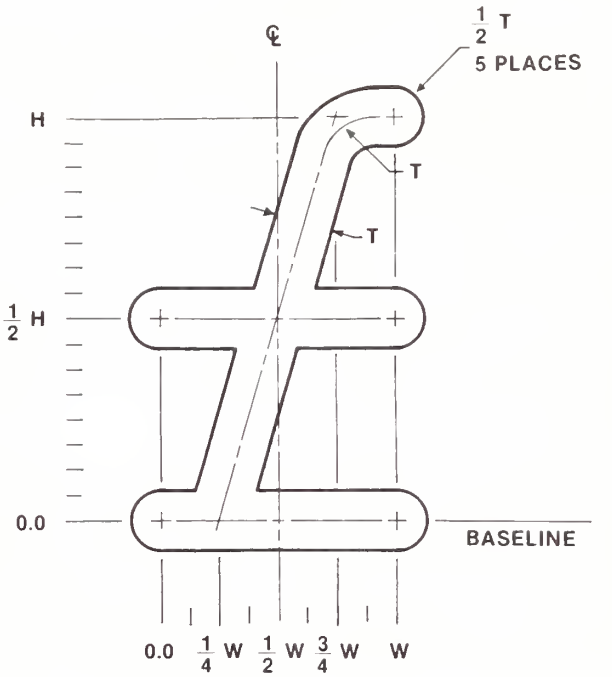


Fig. B8
Pound Sign

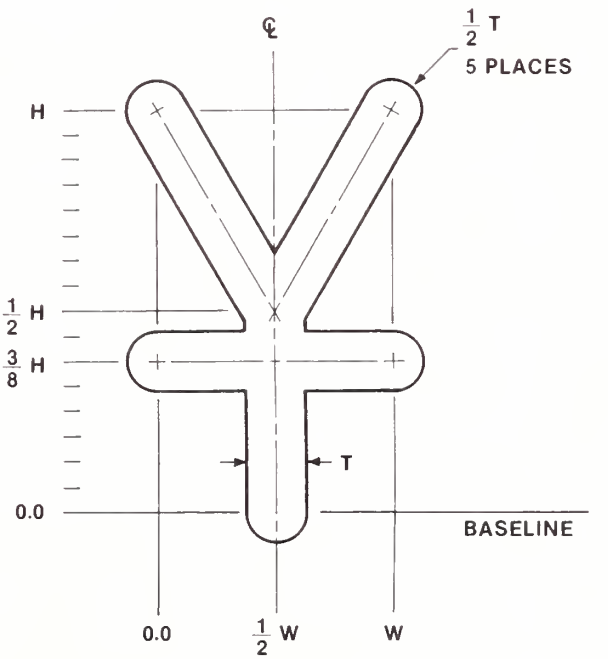


Fig. B9
Yen Sign

Appendix C
Supplementary Information

Although this American National Standard suffices for the purpose for which it was written, there are certain environmental conditions which, if standardized, would permit a more successful use of OCR-A, especially in interchange applications. Subcommittee X3A1 on Optical Character Recognition, of American National Standards Committee X3, is presently engaged in standardizing or formulating guidelines for OCR forms, OCR paper, OCR inks, OCR print quality characteristics and tolerances of the printed images, character positioning, and OCR reflectance properties of the printed image. Some of these documents have already been finished and some are nearing completion (see Appendix D).

The OCR font described in this standard can be printed in three different sizes: I, III, and IV. These sizes were developed to meet the requirements of a wide variety of printing techniques.

Size I was developed for devices such as high-speed line printers and typewriters. The lower-case alphabet shown in Fig. 69 through 94 is intended for Size I only.

Size II was developed in Europe and is not used in the United States, nor is it included in this standard. This designation is, however, reserved for international usage.

Size III was developed to meet the needs of printers such as cash registers and accounting machines and is limited to those characters that are standardized for journal-tape usage. This size is limited to 22 characters (see Note 2 in 2.3).

Size IV was developed because of the problems encountered in printing from embossed plastic cards and metal plates.

The foregoing correspondence between sizes and equipment is not intended to restrict usage of the various sizes of OCR-A.

Nothing in the preceding statements is intended in any way to limit the applications of any of the sizes to any particular printing device. However, due consideration should be given to the selection of font sizes for a given application.

Appendix D

Optical Character Recognition Standards

This standard is one of several that the user should be aware of. The following American National Standards are intended to form a complete spectrum of references that pertain directly to this standard or are complementary to it:

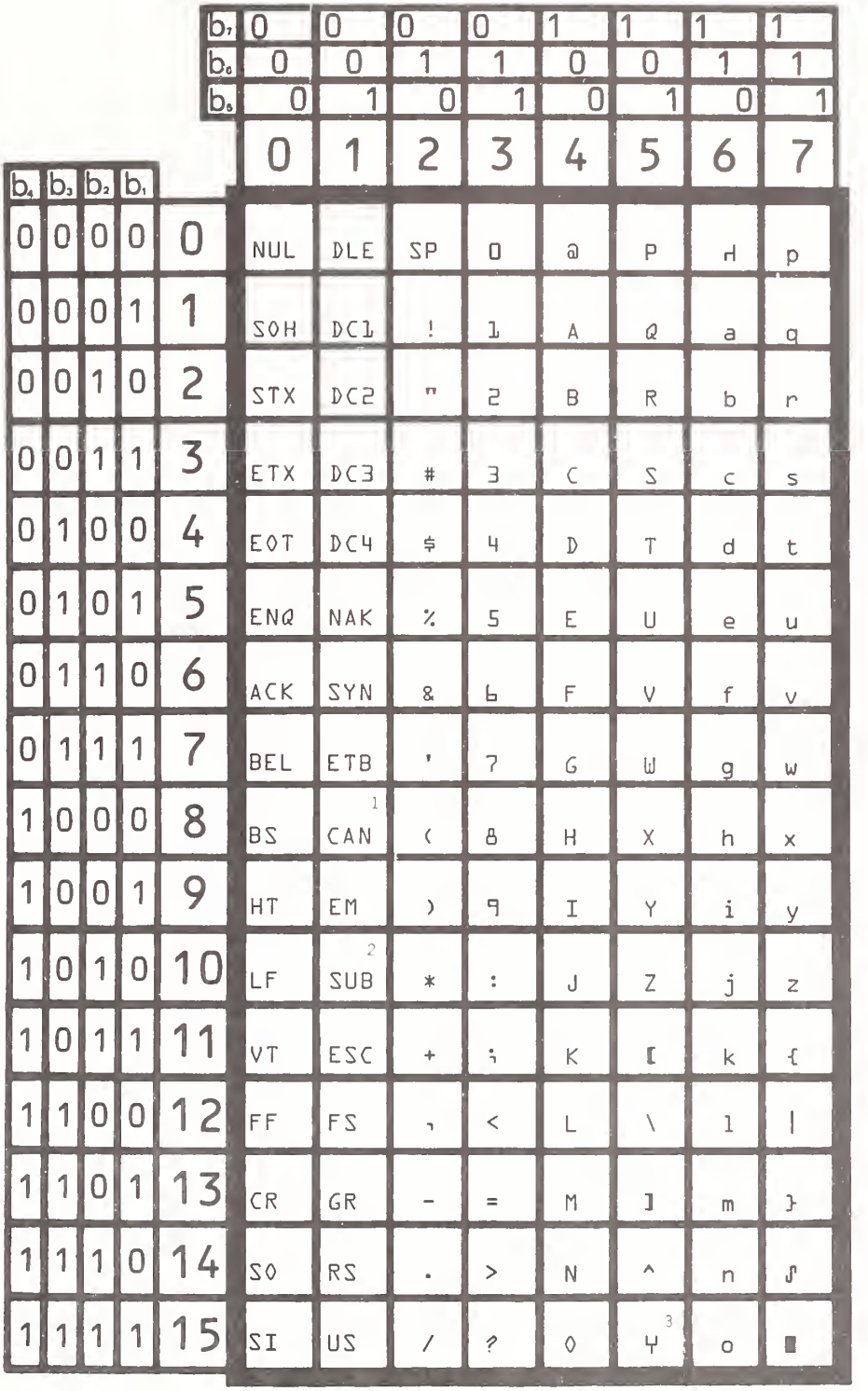
ANSI X3.93M-1981	Optical Character Recognition (OCR) Character Positioning
ANSI X3.62-1979	Paper Used in Optical Character Recognition (OCR) Systems
ANSI X3.86-1980	Optical Character Recognition (OCR) Inks
ANSI X3.45-1974	Character Set for Hand Printing
ANSI X3.49-1975	Character Set for Optical Character Recognition (OCR-B)
(Under Development)	Guideline for Optical Character Recognition (OCR) Print Quality

Appendix E

Correspondence to the ASCII Code Table

Fig. E1 is included to indicate a correspondence between the characters of this standard and those graphics used in Section 2 of the American National Standard Code for Information Interchange (ASCII), ANSI X3.4-1977. Note that the three symbols Hook, Fork, and Chair can be used as control symbols or to represent the characters Tilde, Underline, and Grave Accent, respectively. For forms interchange applications using these characters there must be agreement as to their use. If the abstract symbols are to be transmitted, they should be assigned to the code table positions as shown in Fig. E1.

Fig. E1 is given as an example for reference purposes only, and no specific correspondence is prescribed between the characters of this standard and those of ANSI X3.4-1977 other than that which is understood by the users.



b_4 b_3 b_2 b_1		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
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	"	2	B	R	b	r
0 0 1 1	3	ETX	DC3	#	3	C	S	c	s
0 1 0 0	4	EOT	DC4	$	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	'	7	G	W	g	w
1 0 0 0	8	BS	CAN[1]	(	8	H	X	h	x
1 0 0 1	9	HT	EM	)	9	I	Y	i	y
1 0 1 0	10	LF	SUB[2]	*	:	J	Z	j	z
1 0 1 1	11	VT	ESC	+	;	K	[	k	{
1 1 0 0	12	FF	FS	,	<	L	\	l	|
1 1 0 1	13	CR	GR	-	=	M	]	m	}
1 1 1 0	14	SO	RS	.	>	N	^	n	~
1 1 1 1	15	SI	US	/	?	O	_[3]	o	DEL

NOTE: b_1 is the low-order bit.

[1] The cancel function (CAN) results from the use of the Group Erase (—) symbol.

[2] This code is used to represent an OCR reject and has no associated symbol.

[3] This code position normally contains a non-OCR character, the Underline. Its assignment to the _ is not intended to preclude use of the Underline, except where _ is required for specific OCR applications.

Fig. E1
Correspondence Between OCR-A 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 Interchan ıe
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 bpmm [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 bpmm), Phase Encoded
X3.56-1977 Recorded Magnetic Tape Cartridge for Information Interchange, 4 Track, 0.250 Inch (6.30 mm), 1600 bpi (63 bpmm), 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 bpmm), 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/TR1-77 Dictionary for Information Processing (Technical Report)

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