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Xerox System Integration Standard

# CHARACTER CODE STANDARD

XNSS 058605  
May 1986

XEROX

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## Notice

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This document is one of a family of publications that collectively describes the protocols underlying Xerox Systems—Printing Systems and Network Systems.

This character code standard is the Xerox corporate character code standard. It supersedes all previous Xerox character code standards, including *Character Code Standard, XSYS 058404*, *Character Encoding Standard, XSYS 058305*, and the *NS Character Set Specification*, October 1981.

The Character Code Standard specifies the character codes to be used for exchange of text information among Xerox System Elements, and the forms in which sequences of numerical codes can be represented. Fragments of text which are referred to as *strings*—and a *Xerox string* means a string consisting of character codes defined by this standard—are used for such purposes as communication protocols, electronic print files, and document interchange.

This document assigns codes to a set of graphic characters, rendering characters, and control characters; defines and explains the character sequence encoding; gives examples of its use; addresses a number of technical questions concerning the details of the Xerox character code assignments; and provides a cross reference of commonly used text characters and symbols. The primary purpose of this document, however, is to provide an accurate specification of character codes and the encoding of a string of these codes.

Additions to this standard will be made and the string "XC<sub>a</sub>-b-c-d" will identify the current version of the standard. "a" represents the present version number for the standard, and its numeric value would change only in the event of a radical revision of the standard. "b" refers to the graphic character codes, and will increase each time graphic characters are added to the graphic character code space. "c" refers to the rendering character codes, and will increase each time rendering characters are added to the rendering character code space. "d" refers to the control character codes, and will increase each time control characters are added to the control character code space. In the event of an increase in "a," the values for "b," "c," and "d" will be reset to zero. All numbers are integers (base 10) without leading zeros. This present version of this standard is XC1-2-2-0. When used as the character code mapping in an Interpress font name with universal identifier "Xerox," this standard has character code identifier "XC1-2-2;" the number for the control character codes is omitted from the Interpress identifier because control characters cannot be included in Interpress fonts.

Comments and suggestions on this document and its use are encouraged. Please address communications to:

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## 1.1 Purpose

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The purpose of this standard is to permit multilingual textual information to be stored and transmitted in the form of a sequence of numerical codes. The numerical codes are called *character codes*, and a sequence of them forms the body of what is called a *string*. When two information processing systems agree on a standard interpretation of character codes and a standard format for strings, they may communicate text without danger of degrading its information content.

The particular standard presented here is used throughout the Xerox Systems. It is a generalization of familiar ISO and ANSI standards for coded character sets for text communication, and includes numerical codes for rendering entities—non-graphic character codes which may be used in fragments of text.

In this standard, a character code is any code representing a graphic character, a rendering character, or a control character, usually unique within the set, most commonly represented as a non-negative integer. Xerox' generalization of current standards to create this two-byte character code standard is motivated by the desire to handle symbols beyond simple punctuation and text in languages other than English.

The range of numbers available for character codes is taken to be [0 .. 177777<sub>8</sub>], i.e., 16 bits. A general method for extending this to 24-bits and to 32-bits is outlined, but not required at this time. The allocation of code space is specified in chapter 2, and the assignment of numbers to graphic characters, rendering characters, and control characters is specified in chapters 3 through 5. All assignments are summarized in reference charts in appendix B.

Valid methods of representing a sequence of 16-bit character codes are described in Chapter 6: String encoding. This format for strings is one solution to the problem of compatibility with existing 8-bit character strings.

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## 1.2 Scope

---

This Xerox standard assigns codes to a set of graphic characters spanning at least the following:

- all ISO 646 IRV graphic characters [5]
- all ISO 5426 graphic characters [8]
- all ISO 5428 graphic characters [9]
- all ISO 6937 graphic characters [10]

- all ANSI 7-bit ASCII graphic characters [1]
- all CCITT 8-bit Teletex "G0" & "G2" graphic characters [2]
- all Xerox 860 graphic characters [16]
- all EBCDIC 8-bit graphic characters [4]
- all JIS C 6226 graphic characters  
(including all 6,349 most-frequent Japanese *kanji*) [11]
- all characters required to write the following languages:  
English, Russian, German, French, Spanish, Italian, Portuguese, Dutch, Swedish,  
Norwegian, Danish, Japanese, Malay/Indonesian, Greek, Ukrainian, Polish, and other  
languages
- all standard office typewriter keyboard characters for the European languages above
- the most commonly-used office, technical, and general symbols

A graphic is a symbol produced by a process such as handwriting, drawing, or printing. In this standard, a graphic character is defined as a character, other than a control character or rendering character, that is normally represented by a graphic.

In addition to assigning codes to graphic characters, the standard also assigns codes to rendering characters—a character other than a graphic character or control character, which can include any of the following:

- a non-conventional representation of a control code
- a sequence of graphic characters, i.e., ligature or accented character
- a contextually-dependent alternate representation for a graphic character, i.e., initial, medial, or final form for an alphabet such as Arabic
- a "variant" representation for a graphic character, e.g., the rendering character  $\bar{A}$  instead of the graphic character A

The need for alternate graphic representations arises from language constraints, aesthetics, typographic preferences of users, etc. Since any alternate form of a graphic character violates the semantic uniqueness requirement for graphic characters codes (see section 1.4), rendering character codes are "non-graphic character codes." To distinguish one type of character code from another, i.e., graphic character code from a rendering character code, a separate section of the code space is allocated for each type of character code.

In addition to assigning a section of the code space to sets of graphic characters and sets of rendering characters, this standard also makes provision for control characters whose occurrence in a particular context initiates, modifies, or stops a control operation. While selected areas of the code space are reserved for control characters, only a single code assignment is made at this time. This single control code assignment, having the identity *Character Select Code*, is pivotal and is given special treatment throughout this standard. Since it is the only control character code assignment at this time and is discussed throughout this document, the control code chapter (chapter 5) is a place holder only. Additions to this chapter, the assignment of control characters to the reserved control code spaces, will be made in the near future.

Other entities which may be associated with text characters (e.g., logos, signatures, etc.) are not addressed in this document, but a portion of the rendering code space is reserved for private use for this purpose. The intent is to allow for those code assignments that are unique for private use, to enable the incorporation of logos, signatures, and specialized

graphics within strings destined for printers. However, entities contained within this specific private use code space are the responsibility of the communicant—this includes administration and utilization of such a code space.

The assigned graphic character codes currently number 8,055 characters and symbols, of which 1,129 are European letters and symbols, and 6,739 are Japanese *kanji*. Assigned rendering character codes currently number 394 rendering entities, the majority being accented characters for the Latin alphabet. The current list should be sufficient for general use, and is complete in the domains covered.

Further Xerox characters, however, will certainly be *added* in the future to include new technical domains and the alphabets of more languages (in preparation: Arabic/Farsi, Hebrew, Hindi, Chinese, Korean). Xerox will periodically publish updates to this document to reflect such additions.

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### 1.3 How to use this standard

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This standard specifies the character codes to be used for exchange of text information among Xerox System Elements, for such purposes as communications protocols, electronic print files, and document interchange. Since the identified codes are to be used to represent text information that is transmitted between separate Xerox systems, sometimes spanning multilingual boundaries and code conversion interfaces, *a unique, unambiguous, and absolute numerical code is assigned to each semantically different character*. Such an assignment permits the efficient accomplishment of text-storage and text-manipulation processes, while also ensuring proper interpretation of information.

Sometimes transmitted information may contain commands, names, and other forms of information. If the information is translated to a different external code while actually being transmitted, it must be translated back to these standard numerical codes before being interpreted at the other end, to ensure correct semantic meaning. The codes in this standard are also used for text and structure information in generalized, editable documents. When content is important, the assigned codes are the Xerox standard graphic character codes.

When only shape or form is relevant, however, such as when printing on an external medium, a rendering character code can be used for entities such as ligatures that the printing (or display) systems will be prepared to interpret. In the rendering of ligatures such as ffi where a single numeric code for ffi violates the singular semantic meaning of a graphic character code, the optimum coded form for printing is a rendering character code. When a rendering character is not used, the correct printing form is established by referencing (or sending along) a complete copy of the appropriate character forms, indexed by the non-standard character codes. Thus, there is more flexibility when no semantic meaning is applied to these text strings.

## 1.4 Design goals

The assignment of Xerox character codes is predicated on specific design goals, as follows:

- to include all commonly-used graphic and rendering characters on a fully international basis (see above)
- to assign each distinct character a unique, unambiguous, *absolute* numerical code
- to allow for high-quality computer typography, including text-rendering devices capable of an indefinite variety of different *appearances* for each distinct character
- to permit text-storage and text-manipulation processes to be as efficient as possible
- to minimize code translations required to interface with existing information interchange standards, especially ISO, ASCII, and Teletex

## 1.5 Character code and text-manipulation processes

Character codes can be viewed as the static representatives of textual content. Operating upon them are many active processes that handle or manipulate text in some way, as illustrated in Figure 1.1.

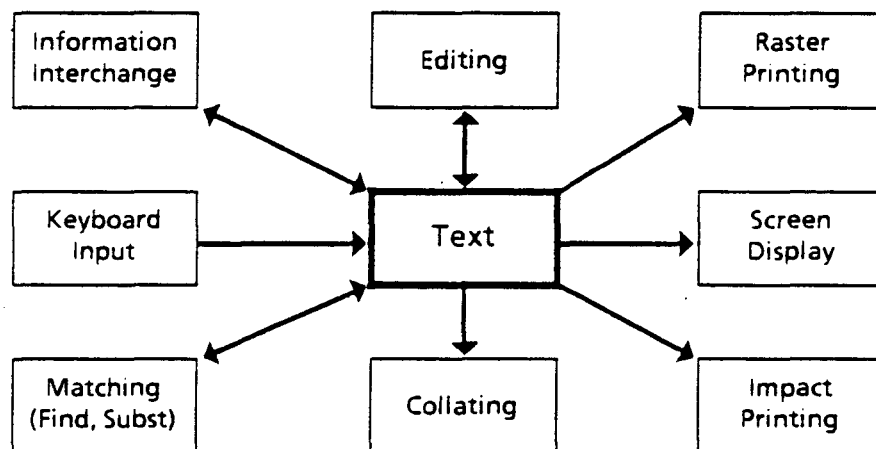


Figure 1.1 Text-manipulation processes

The assignment of character codes *affects but does not define* the text-manipulation processes.

In a simple regime such as 7-bit ASCII for English text, the relationship between graphic character codes and text-manipulation processes is very direct: there are invariant one-to-one mappings between input keyboard keystrokes, internal character codes, and output printer actions.

In the multilingual, multinational Xerox Systems environment, there are a multiplicity of input keyboards, a variety of output printers and displays, various information interchange encodings, different national collating sequences, and so on. It is impossible, for example, for graphic and rendering character code assignments to correspond optimally to all of these at once. The increased flexibility of a sophisticated information processing system must come

from more powerful text-manipulation processes, not from the assignment of the character codes themselves. In the environment of text-manipulation processes, illustrated in the figure above, the meaning and usage of numerical codes is aimed at the static representation of document text.

The present standard is concerned only with static text content as specified by assigned character codes. It does not define or describe any text-manipulation processes. (It does sometimes allude to their existence, particularly in the discussion of technical details in appendix C, and in the partitioning of the code space to allocate restricted areas for special purposes.) Figure 1.1 should serve as a reminder that this document tells only part of the story of text processing.

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## 1.6 Character codes and character appearance

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A character's numerical code expresses its *identity*, its *content*, its *semantic*, but this does not fully determine a printed or displayed character's visual *appearance*. Separate occurrences of the same graphic character may look quite different. For example, the character code for Latin "C" is always 103<sub>8</sub> in octal notation, but:

This C looks big.

This C looks small, perhaps small-caps style.

This C looks superscripted.

This C looks underlined.

This **C** looks bold.

This C looks serif-form.

This C looks sans-serif-form.

This C looks italic-style.

The character code models the "C-ness" common to all of the above letters, but there must be *something else* that models their difference in appearance. This appearance specification which can be applied to character codes may be called "*looks*" information. Thus, we can say:

character appearance = *function of*(character code, character looks)

In other words, textual information (i.e., *content*) is to be stored and transmitted in the form of a sequence of numerical codes, but textual *appearance* is to be stored and transmitted separately in the form of ancillary "*looks*" information.

The notion that character appearance is a function of two variables can be visualized in a 2-dimensional chart. A small fragment of such a chart is shown in Figure 1.2.

| <u>Code(s)</u>   | <u>looks #1</u> | <u>#2</u> | <u>#3</u> | <u>#4</u> | <u>#5</u> | <u>#6</u> | <u>#7</u> |
|------------------|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|
| 101 <sub>g</sub> | A               | A         | A         | <u>A</u>  | A         | A         | A         |
| 102 <sub>g</sub> | B               | B         | B         | <u>B</u>  | B         | B         | B         |
| 103 <sub>g</sub> | C               | C         | C         | <u>C</u>  | C         | C         | C         |

Figure 1.2 Character appearance as a function of character codes and character looks

Each row of the chart represents a character code and each column indicates some particular combination of "looks." The column labels ("#1," "#2," etc.) have no meaning except to distinguish one column from another and to indicate the number of character "looks" columns. To indicate an entry in the character appearance matrix—Figure 1.2 being only a fragment of such a matrix—we use the following row and column notation: <character code, character "looks"> pair.

## 1.7 Character codes and general "looks"

A graphic character appearance matrix may contain a million or more <graphic character code, graphic character "looks"> pair entries. Recall from section 1.2 that graphic character codes currently number 8,055 characters and symbols. In addition to the 8,055 rows, the number of character "looks" columns can be as numerous. For example, without standards the variations (the product of the number of sizes, character orientations, character postures, weight, etc.), can exceed a thousand. Other attributes such as setwidth or proportion, strike out, underline, and superscript, add to the number of "looks" columns required.

To minimize the number of "looks" columns within such a matrix (and the required storage facilities) to several hundred, standards for character "looks" have been created. The Xerox General Character Looks Standard [15] specifies the family of standardized character "looks." These are called general "looks," general "looks" being defined as that finite set of "looks" upon which agreement has been reached and *which can be broadly applied to all characters in a designated code space*.

While this standard is not concerned with general "looks" information as portrayed in Figure 1.2, nor with the text-rendering processes that convert such information into character appearance, it does identify those <rendering character code, rendering character> pairs having specific "looks" within a character appearance matrix. Old Style "looks" numerals are an example of specific "looks;" this look fails to meet the general look test. Only the numbers, zero through nine, can have this "named" traditional look.

## 1.8 Font matrices of <character code, character "looks"> pairs

There exists a third dimension to the visualization of character appearance, the 2-dimensional chart portrayed in Figure 1.2. Within this third dimension is the designated typeface which determines the design style of the "pictures" within an instance of a character appearance matrix, a multi-column appearance matrix existing for each named

face. A typeface is defined as the features by which you recognize a character's design, hence the word "face."

A partial visualization of this third dimension—a series of small fragments of charts like Figure 1.2, one for each face—illustrates that not all character appearance charts have identical contents. For example, the typeface named Lydian contains one picture of the uppercase character "A" with the general look weight attribute value = bold; however, in a non-general "*looks*" column, there appears a single, but similar entry—a picture of another uppercase "A," but having a different shape. To provide for these "variant" typographic objects which can occur within a typeface design, an identity is required for "variant" forms.

Recall from section 1.2 that there are four types of rendering characters, one of which is a "variant" representation for a graphic character. Also recall the example given, the rendering character A instead of A. To provide an identity for the second form of "A," a <rendering character code, "variant" rendering character> pair is required within the Lydian character appearance matrix.

To provide identities for "variant" character forms, a portion of the rendering character code space will be designated for this type of rendering character. However, since this type of rendering entity does not appear in every character appearance matrix, other standards which define the content of a named matrix and a font are also required. The word font or fount is derived from the word "foundry," which is where, originally, type was cast. It has come to mean the vehicle which holds the typeface character collection.

The Xerox Character Grouping Standard [14] provides for several types of character code collections, one very small in size and another of equal or greater size as that of an ISO character collection or a graphic arts font. The code collection similar in size to the ISO concept of character sets is comprised of selected rows from a general "*looks*" character appearance matrix. The result of this selection process is a collection of pairs—<character code, graphic character> pairs.

Another type of Xerox code collection is the small code collection which is used in creation of a character grouping, *a union of several collections having different sizes*—both large (a core collection) and small collections. Small collections having one <character code, character> pair, or several or more <character code, character> pairs, identifies the contents of a character "*looks*" column in a character appearance matrix, one having non-general character "*looks*."

Figure 1.2 serves as a reminder that this document tells only part of the story of text appearance and character design. It also serves as a reminder that additional standards are required, many of which are in preparation.

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## 1.9 Coding of <character code, character> pairs

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The question of coding for meaning or shape must be answered in any character code standard. One family of <character code, character> pairs is that comprised solely of <character code, character shape> pairs. An example of such a family is the set of pairs given in the ANSI X3.4-1977 standard [1]. In that standard, character code 47<sub>8</sub> has an identity given as "Apostrophe (Closing Single Quotation Mark; Acute Accent)." For these entities in the ANSI collection (character set), we can say that all of the identities have the

same "apostrophe shape." Since all "identities" have a common character code, there exists ambiguity.

Conversely, using a family of <character code, character semantic> pairs and the ISO 6937 standard [10], it is possible to resolve the semantic ambiguity within the ANSI standard. For example, ISO 6937 provides the following <character code, character> pairs: <47<sub>8</sub>, Apostrophe>, <271<sub>8</sub>, Single quotation mark right>, and <302<sub>8</sub>, Acute accent>. The ANSI standard can be derived from the ISO standard by removing (editing) two character codes and using the <47<sub>8</sub>, Apostrophe> pair when interpreting octal codes 271<sub>8</sub> and 302<sub>8</sub> at a coding interface.

A primary design objective in the construction of this standard is semantic separation. While the Xerox standard uses national and international standards and maintains compatibility with traditional practices in constructing the standard, the goal is to minimize or eliminate semantic ambiguity (i.e., separation of hyphen from minus in ISO 6937). Additions to this standard, after completion of construction from available standards, will consist primarily of <character code, character semantic> pairs.

While the Xerox standard is concerned with coding for meaning, its composition is such that it does not preclude the creation of a <character code, character> pairs collection based on coding for shape. The advantage in coding for meaning is that an all-graphic character code collection leads to document "text" suitable for subsequent processing or calculation. Such an optimized collection is preferred when it is required to have a processible form of text, a document description used in applications beyond printing. However, in the event that only a final form (not processible) of "text" is required (i.e., for printing originals), editing of a <character code, character semantic> pairs collection provides the necessary <character code, character shape> pairs collection.

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## 1.10 Document organization

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Chapter 2 describes the Xerox 16-bit code space and the Character Set allocations for the different text character code spaces.

Chapter 3 enumerates the one-to-one Xerox mapping between numerical codes and graphic characters in the graphic character code space.

Chapter 4 enumerates the one-to-one Xerox mapping between numerical codes and rendering characters in the rendering character code space.

Chapter 5 enumerates the one-to-one Xerox mapping between numerical codes and control characters in the control character code space.

Chapter 6 presents the 1-byte (or default) and 2-byte String Encoding.

Appendix A lists references, mainly information interchange standards.

Appendix B presents the same character codes as chapters 3, 4, and 5, in chart form. The user is urged to refer to chapters 3, 4, and 5 to make certain of character semantics.

Appendix C addresses a number of technical questions concerning the details of the Xerox character code assignments.

Appendix D contains differences between the Xerox Character Code Standard and the Japanese Industrial Standard JIS C 6226-1983.

Appendix E is a cross reference of commonly-used characters and symbols.

Appendix F is a glossary of common and unique text processing and printing terms.



This document presumes that textual information is to be stored and transmitted in the form of a sequence of numerical codes called *character codes*. Each character code thus represents a text entity called a *character*. The purpose of this chapter is to describe the Xerox 16-bit code space and the Character Set allocation for the different types of text characters.

---

## 2.1 Background

---

International Standards define the representation and mapping between numerical codes and text characters:

- (1) ISO 646 – 7-bit coded character set for information processing interchange [5].
- (2) ISO 2022 – Code extension techniques and use with the ISO 7-bit coded character set [6,7].

The following illustration of the 7-bit code table (Figure 2.1) is used throughout the standards documents of the International Standards Organization (ISO) and various national bodies, such as the American National Standards Institute Incorporated (ANSI).

The table includes a set of 32 control characters and a set of 94 graphic characters. Control characters are contained within the first two columns (0 and 1) of the matrix, and the graphic characters fill the remaining six columns (2 through 7). A complete character set in the 7-bit environment is shown in Figure 2.2, and is referred to as the Set G0.

The version illustrated in Figure 2.2 is the International Reference Version (IRV) and is used in international information processing interchange. Control information allocated to the first two columns is shaded to indicate a restricted area which is not a segment of the graphic character code space. The character "space" indicated in the column/row position 2/0 is also shaded and may be regarded as either a control character or a graphic character. The position 7/15 is also excluded from the graphic character set code space and accounts for the set designation as 94 characters (6 columns x 16 rows, minus 2/0 and 7/15).

The same character set code space structure is maintained within the Xerox standard to maintain ease of conversion between the Xerox standard and existing international standards. Assignment of graphic characters outside of the outlined structure is avoided to minimize the problems associated with interfacing at the terminal device level. The IRV set, designated in the absence of a working agreement between a sender and recipient of the data, is also used.

|                |                |                |                |   |                |   |   |    |   |   |   |   |   |
|----------------|----------------|----------------|----------------|---|----------------|---|---|----|---|---|---|---|---|
|                |                |                |                |   | b <sub>7</sub> | 0 | 0 | 0  | 0 | 1 | 1 | 1 | 1 |
|                |                |                |                |   | b <sub>6</sub> | 0 | 0 | 1  | 1 | 0 | 0 | 1 | 1 |
|                |                |                |                |   | b <sub>5</sub> | 0 | 1 | 0  | 1 | 0 | 1 | 0 | 1 |
|                |                |                |                |   |                | 0 | 1 | 2  | 3 | 4 | 5 | 6 | 7 |
| b <sub>4</sub> | b <sub>3</sub> | b <sub>2</sub> | b <sub>1</sub> |   | 0              | 0 | 0 | 0  | 0 |   |   |   |   |
|                |                |                |                | 0 | 0              | 0 | 1 | 1  |   |   |   |   |   |
|                |                |                |                | 0 | 0              | 1 | 0 | 2  |   |   |   |   |   |
|                |                |                |                | 0 | 0              | 1 | 1 | 3  |   |   |   |   |   |
|                |                |                |                | 0 | 1              | 0 | 0 | 4  |   |   |   |   |   |
|                |                |                |                | 0 | 1              | 0 | 1 | 5  |   |   |   |   |   |
|                |                |                |                | 0 | 1              | 1 | 0 | 6  |   |   |   |   |   |
|                |                |                |                | 0 | 1              | 1 | 1 | 7  |   |   |   |   |   |
|                |                |                |                | 1 | 0              | 0 | 0 | 8  |   |   |   |   |   |
|                |                |                |                | 1 | 0              | 0 | 1 | 9  |   |   |   |   |   |
|                |                |                |                | 1 | 0              | 1 | 0 | 10 |   |   |   |   |   |
|                |                |                |                | 1 | 0              | 1 | 1 | 11 |   |   |   |   |   |
|                |                |                |                | 1 | 1              | 0 | 0 | 12 |   |   |   |   |   |
|                |                |                |                | 1 | 1              | 0 | 1 | 13 |   |   |   |   |   |
|                |                |                |                | 1 | 1              | 1 | 0 | 14 |   |   |   |   |   |
|                |                |                |                | 1 | 1              | 1 | 1 | 15 |   |   |   |   |   |

Figure 2.1 7-bit code table

The structure of a family of 8-bit codes remains compatible with the 7-bit structure. Within ISO documents, a set is appended to the Set G0 to create columns 8 through 15. Various character sets which may be assigned to the "right" side are referred to as G1, G2, or G3. A member of the right set is obtained by the addition of 1 bit to each of the bit combinations of the 7-bit code. This produces a set of 256 8-bit combinations and results in a graphic character set representative of 188 (94 x 2) characters. These left and right 94 graphic character sets are also referred to as the primary and supplementary sets.

Within the Xerox Character Code Standard, both character sets and graphic character codes generally follow the ISO structure, i.e., assignment of graphic characters to 188 of the 256 possible locations. A character set is also said to be composed of two parts, each containing 94 characters. The left side is designated by the letter L following the character set identity, and the right side by the letter R.

|                |                |                |                |    |                |   |   |   |   |   |   |   |         |
|----------------|----------------|----------------|----------------|----|----------------|---|---|---|---|---|---|---|---------|
|                |                |                |                |    | b <sub>7</sub> | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1       |
|                |                |                |                |    | b <sub>6</sub> | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1       |
|                |                |                |                |    | b <sub>5</sub> | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1       |
|                |                |                |                |    |                | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7       |
| b <sub>4</sub> | b <sub>3</sub> | b <sub>2</sub> | b <sub>1</sub> |    |                | 0 | 0 | 0 | 0 | 0 | @ | P | .       |
| 0              | 0              | 0              | 0              | 0  |                |   |   |   |   |   | ! | 1 | A Q a q |
| 0              | 0              | 0              | 1              | 1  |                |   |   |   |   |   | " | 2 | B R b r |
| 0              | 0              | 1              | 0              | 2  |                |   |   |   |   |   | # | 3 | C S c s |
| 0              | 0              | 1              | 1              | 3  |                |   |   |   |   |   | □ | 4 | D T d t |
| 0              | 1              | 0              | 0              | 4  |                |   |   |   |   |   | % | 5 | E U e u |
| 0              | 1              | 0              | 1              | 5  |                |   |   |   |   |   | & | 6 | F V f v |
| 0              | 1              | 1              | 0              | 6  |                |   |   |   |   |   | ' | 7 | G W g w |
| 0              | 1              | 1              | 1              | 7  |                |   |   |   |   |   | ( | 8 | H X h x |
| 1              | 0              | 0              | 0              | 8  |                |   |   |   |   |   | ) | 9 | I Y i y |
| 1              | 0              | 0              | 1              | 9  |                |   |   |   |   |   | * | : | J Z j z |
| 1              | 0              | 1              | 0              | 10 |                |   |   |   |   |   | + | ; | K [ k { |
| 1              | 0              | 1              | 1              | 11 |                |   |   |   |   |   | , | < | L \ l   |
| 1              | 1              | 0              | 0              | 12 |                |   |   |   |   |   | - | = | M ] m } |
| 1              | 1              | 0              | 1              | 13 |                |   |   |   |   |   | . | > | N ^ n ~ |
| 1              | 1              | 1              | 0              | 14 |                |   |   |   |   |   | / | ? | O _ o   |
| 1              | 1              | 1              | 1              | 15 |                |   |   |   |   |   |   |   |         |

Figure 2.2 Character set G0

Specific numeric codes are assigned to every graphic contained within the Xerox Graphic Library [14]. This assignment of numeric codes to graphic characters is patterned after established standards and has a goal of achieving universality of global names, e.g., names for networks, files, or character fonts. This goal is accomplished by assigning a unique, unambiguous, and absolute numeric code to each graphic. The result is a correct machine interpretation of global names everywhere in the world.

## 2.2 The code space

### 2.2.1 Character sets

The total range of numbers available for character codes is taken to be  $[0 \dots 177777_8]$ , i.e., 16 bits, which would permit up to  $65,536_{10}$  distinct codes. Allowing for reserved control character space, this reduces to  $189 \times 188 = 35,532$ .

It is extremely convenient to partition this range into 256 blocks of 256 codes each. Each such block is called a *character set*.

Each 16-bit character code can be viewed as consisting of two 8-bit bytes, where the high-order byte is the character set code and the low-order byte is the character's code *within* the character set (ranging  $[0 \dots 377_8]$ ), as shown below. This point of view is often very useful, especially with regard to string encoding (chapter 6).

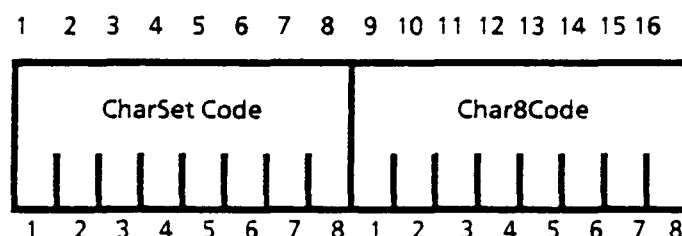


Figure 2.3 16-bit Xerox character code

### 2.2.2 Character set allocation

The Xerox character codes are assigned so that characters within a single character set tend to be related to each other by traditional usage. The principal goal of this arrangement is to minimize character-set switching in runs of text, but grouping related characters together also tends to clarify the meaning of the character sets themselves. Character sets are also arranged so that successive character sets bear some relationship to each other.

The character sets currently used for Xerox character codes and the standard from which they are derived are listed here for reference; a more detailed explanation of each is given in chapters 3, 4, and 5.

#### 2.2.2.1 Graphic character set allocations

The character sets currently used for graphic character codes and the standard from which they are derived are listed here for reference; a more detailed explanation of each is given in chapter 3:

ASCII/ISO/Teletex:

- Character Set 0<sub>g</sub> — Latin alphabet and punctuation
- Character Set 43<sub>g</sub>R — Extended Latin alphabet
- Character Set 46<sub>g</sub>L — Greek alphabet

JIS:

- Character Set 41<sub>g</sub>L — JIS Symbol 1-Punctuation and symbols not in Character Set 0
- Character Set 42<sub>g</sub>L — JIS Symbol 2-Punctuation and symbols not in Character Set 0
- Character Set 44<sub>g</sub>L — Japanese hiragana syllabary
- Character Set 45<sub>g</sub>L — Japanese katakana syllabary
- Character Set 47<sub>g</sub> — Cyrillic alphabet
- Character Set 50<sub>g</sub>L — JIS forms characters
- Character Sets 60<sub>g</sub>L through 117<sub>g</sub>L — JIS Level-I Japanese kanji
- Character Sets 120<sub>g</sub>L through 163<sub>g</sub>L — JIS Level-II Japanese kanji
- Character Set 165<sub>g</sub>L — JIS Level-II Japanese kanji

Other:

- Character Set 44<sub>g</sub>R — Chinese Bo-po-mo-fo
- Character Set 50<sub>g</sub>L — IBM forms characters
- Character Set 50<sub>g</sub>R — Mosaic characters
- Character Set 164<sub>g</sub>L — Symbol 3 - Miscellaneous Japanese symbols
- Character Set 166<sub>g</sub>L — Symbol 4 - Miscellaneous Japanese symbols
- Character Sets 167<sub>g</sub>L through 172<sub>g</sub>L — Gaiji kanji characters
- Character Set 340<sub>g</sub> — Extended Arabic alphabet
- Character Set 341<sub>g</sub> — Hebrew alphabet
- Character Set 343<sub>g</sub> — Korean Hangul alphabet
- Character Set 356<sub>g</sub> — General and technical symbols 2
- Character Set 357<sub>g</sub> — General and technical symbols 1

## 2.2.2.2 Rendering character set allocations

The character sets currently used for rendering character codes are listed here for reference; a more detailed explanation of each is given in chapter 4:

- Character Set 360<sub>g</sub> — Ligatures and format characters
- Character Set 361<sub>g</sub> — Accented Latin characters
- Character Set 365<sub>g</sub> — Initial, medial, and final Arabic characters
- Character Set 375<sub>g</sub> — Variant representations for graphic characters
- Character Set 376<sub>g</sub> — Reserved, private use

## 2.2.2.3 Control character set allocation

Two large blocks of character sets are excluded from availability for use as graphic characters or rendering character codes:

Character Sets  $1_8$  through  $40_8$  — Reserved

Character Sets  $177_8$  through  $240_8$  — Reserved

These blocks are reserved for control character code assignments.

### 2.2.3 Character set select code $377_8$

---

The 8-bit byte  $377_8$  is given unique treatment in the Xerox standard. It is pivotal to the String Encoding (chapter 6), where it is called the *character set select code*. Because of this application, the byte  $377_8$  is not permitted to occur as high- or low-order byte of any Xerox character codes.

### 2.2.4 Preponderance of kanji characters

---

It is worth noting that over 90% of the distinct Xerox text characters are kanji ideographs (kanji is a Japanese word meaning *Chinese characters*). Although the Xerox architecture treats kanji the same as non-kanji characters, there are still many cases where it is useful to distinguish the two classes of characters. For example, this document does not enumerate the names of the 6,349 kanji characters that currently have a Xerox character code assigned to them.

### 2.2.5 Expansion beyond 16 bits

---

This document specifies a 16-bit character code space. It does not preclude expansion to 24-bit, 32-bit, or greater, character codes. It is anticipated that future versions of this standard will define character code assignments of lengths greater than 16 bits.

The chart on the following page pictorially summarizes all of the above aspects of the division of the 16-bit code space into character sets and the allocation of the character set sub-spaces.

Each square represents one Character Set  
(HIGH - order character code byte)

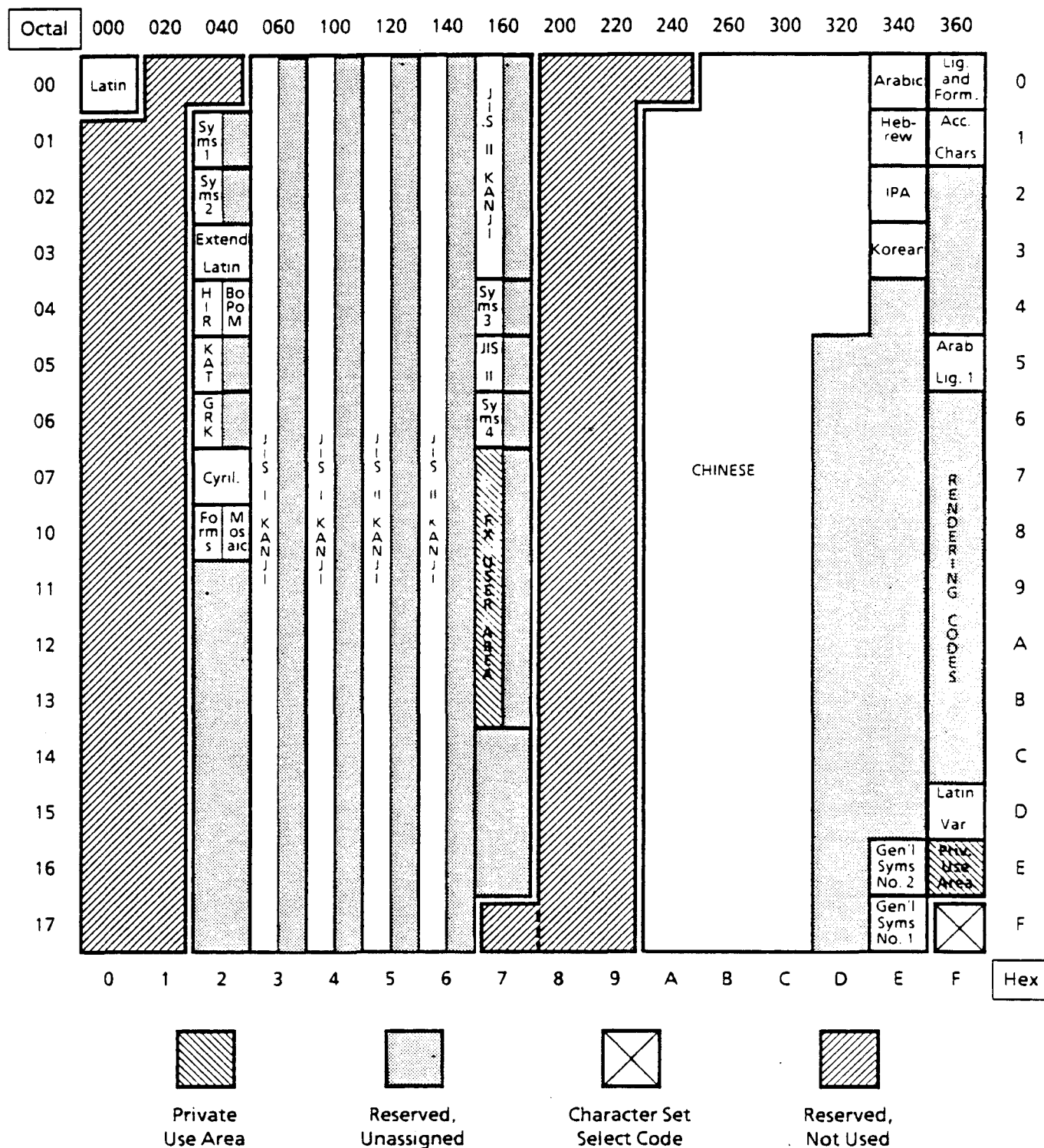


**Figure 2.4 Xerox character set allocation**



---

### 3.1 Graphic character codes

---

For us to talk about one character as distinct from another, we can refer to it by its traditional name(s), by its role(s) in a traditional alphabet or symbol system, or by the context(s) in which it is traditionally used. This collection of traditional usage information which identifies the character can be referred to in brief as its *semantic*.

To indicate a graphic character, it also helps to show a picture of it. In some cases, however, this can be misleading since different graphic characters can look very similar or even identical, e.g., "hyphen" and "minus sign." In the listing which follows, sometimes a picture of a graphic character is shown, but it is the *semantic* information which takes precedence in defining the identity of the character.

In some cases, we go so far as to specify what the graphic character is **NOT**, in order to distinguish it from other graphic characters which look similar or identical. In other cases, we use the "=" sign to indicate either synonymous names or alternative applications for the same Xerox character. We also use brackets "[ ]" to provide clarifying examples.

Several graphic character shapes traditionally imply the same semantic, i.e., the shapes associated with the semantic "approximately equal." In this case, we consider the possibility that the alternate forms are "looks" variants of each other and use a designation such as "approximately equal, type 1" and "approximately equal, type 2" to distinguish one variant from another. While we use this notation to provide information on traditional usage, we recommend using the semantic without the type designation when an "=" sign indicates a synonymous name.

We use a notation such as (41<sub>8</sub> | 124<sub>8</sub>) to depict the two-byte structure of a character code. For example, (41<sub>8</sub> | 124<sub>8</sub>) refers to the character in Character Set 41<sub>8</sub> which has the 8-bit code 124<sub>8</sub> *within* that character set.

---

### 3.2 The graphic character code sets

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---

#### 3.2.1 Character Set 0<sub>8</sub>: ASCII/ISO/CCITT Latin alphabet and punctuation

---

Character Set 0<sub>8</sub> serves as Xerox' "default" 8-bit character codespace (in the character sequence body format, see chapter 6). This fact makes Character Set 0 the most important Xerox character set, especially with regard to communicating with existing systems. Therefore, Character Set 0 is designed to be fully compatible with existing international standards. It is illustrated in Figure 3.1.

Character Set 0<sub>g</sub>L(Left) is identical to the graphics of the ISO International Reference Version (IRV). This version of ISO 646 is used when there is no requirement to use a national or an application-oriented version.

In some cases where ASCII/ISO/CCITT maps more than one distinct semantic into the same character code (e.g., "hyphen" and "minus sign"), the Xerox standard has two distinct characters, one of which is placed outside of Character Set 0. The result is still ASCII/ISO/CCITT compatible, but permits the distinction to be made when necessary.

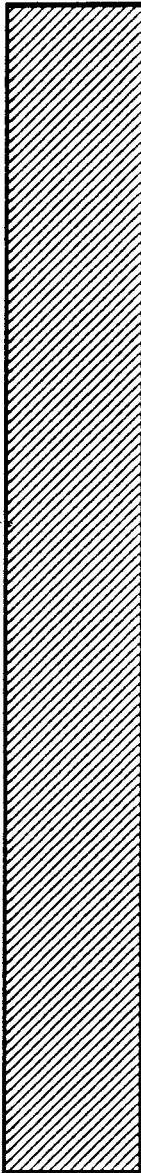
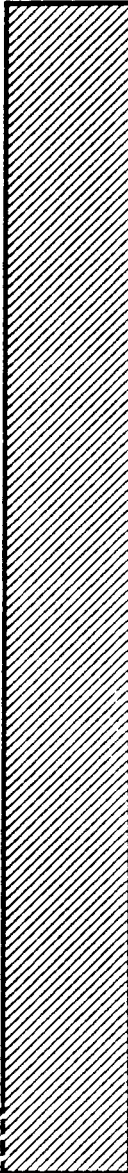
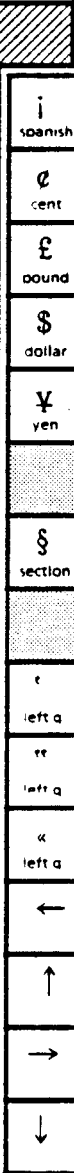
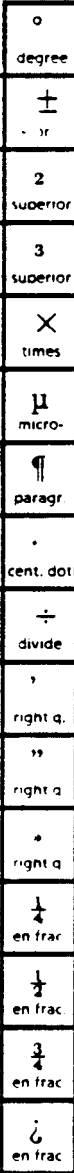
Character Set 0<sub>g</sub>R(Right) is identical to the supplementary graphic set for text communication from ISO 6937. This collection of graphics is also considered to be generic, in that it includes the graphics proposed in the International Text Communication Standard [10]. The composite left and right character sets are shown in the illustration of Character Set 0 in Figure 3.1. The structure follows the pattern established in section 2.1, and is presented using octal notation.

The character codes (low-order byte) *within* Character Set 0<sub>g</sub>:

|                  |                                                               |
|------------------|---------------------------------------------------------------|
| 40 <sub>g</sub>  | Space (normally nonprinting)                                  |
| 41 <sub>g</sub>  | Exclamation point                                             |
| 42 <sub>g</sub>  | Neutral (vertical) double quote                               |
| 43 <sub>g</sub>  | Number sign                                                   |
| 44 <sub>g</sub>  | General currency symbol                                       |
| 45 <sub>g</sub>  | Percent sign                                                  |
| 46 <sub>g</sub>  | Ampersand                                                     |
| 47 <sub>g</sub>  | Apostrophe                                                    |
| 50 <sub>g</sub>  | Opening parenthesis                                           |
| 51 <sub>g</sub>  | Closing parenthesis                                           |
| 52 <sub>g</sub>  | Asterisk                                                      |
| 53 <sub>g</sub>  | Plus sign                                                     |
| 54 <sub>g</sub>  | Comma                                                         |
| 55 <sub>g</sub>  | Neutral dash; Also: hyphen/minus sign                         |
| 56 <sub>g</sub>  | Period = full stop                                            |
| 57 <sub>g</sub>  | Slant = solidus = virgule = slash                             |
| 60 <sub>g</sub>  | Digit 0                                                       |
| ...              | ...                                                           |
| 71 <sub>g</sub>  | Digit 9                                                       |
| 72 <sub>g</sub>  | Colon                                                         |
| 73 <sub>g</sub>  | Semicolon                                                     |
| 74 <sub>g</sub>  | Less than                                                     |
| 75 <sub>g</sub>  | Equals                                                        |
| 76 <sub>g</sub>  | Greater than                                                  |
| 77 <sub>g</sub>  | Question mark                                                 |
| 100 <sub>g</sub> | Commercial at                                                 |
| 101 <sub>g</sub> | Uppercase Latin (Roman) letter A                              |
| ...              | ...                                                           |
| 132 <sub>g</sub> | Uppercase Latin (Roman) letter Z                              |
| 133 <sub>g</sub> | Opening bracket                                               |
| 134 <sub>g</sub> | Reverse slant = backslash = reverse solidus = reverse virgule |
| 135 <sub>g</sub> | Closing bracket                                               |
| 136 <sub>g</sub> | Circumflex accent (spacing character)                         |
| 137 <sub>g</sub> | Low bar (spacing character)                                   |
| 140 <sub>g</sub> | Grave accent (spacing character)                              |
| 141 <sub>g</sub> | Lowercase Latin (Roman) letter a                              |

# XEROX Character Set 000<sub>8</sub>

ASCII/ISO/CCITT Roman Alphabet and Punctuation

| Octal | 000                                                                                | 020           | 040 | 060 | 100          | 120          | 140                                                                                 | 160                                                                                 | 200                                                                                  | 220                                                                                  | 240                                                                                  | 260                                                                                   | 300           | 320            | 340                                                                                   | 360                                                                                   |                                                                                       |              |   |   |   |
|-------|------------------------------------------------------------------------------------|---------------|-----|-----|--------------|--------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------|----------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--------------|---|---|---|
| 00    |  | word<br>space | 0   | @   | P            | `<br>spacing | p                                                                                   |  |  |  |  | °<br>degree                                                                           | —<br>hor. bar | Ω<br>ohms      | κ<br>grind                                                                            | 0                                                                                     |                                                                                       |              |   |   |   |
| 01    |                                                                                    | !             | 1   | A   | Q            | a            | q                                                                                   |                                                                                     |                                                                                      |                                                                                      |                                                                                      | ¡<br>spanish                                                                          | ±<br>+ or -   | ˘<br>grave     | ˆ<br>superior                                                                         | Æ<br>diphth                                                                           | æ<br>diphth                                                                           | 1            |   |   |   |
| 02    |                                                                                    | "<br>neutral  | 2   | B   | R            | b            | r                                                                                   |                                                                                     |                                                                                      |                                                                                      |                                                                                      | ¢<br>cent                                                                             | ²<br>superior | ´<br>acute     | ®<br>register                                                                         | Đ<br>croatian                                                                         | đ<br>croatian                                                                         | 2            |   |   |   |
| 03    |                                                                                    | #             | 3   | C   | S            | c            | s                                                                                   |                                                                                     |                                                                                      |                                                                                      |                                                                                      | £<br>pound                                                                            | ³<br>superior | ˆ<br>circum.   | ©<br>copyright                                                                        | à<br>spanish                                                                          | ð<br>iceland                                                                          | 3            |   |   |   |
| 04    |                                                                                    | ¤<br>currency | 4   | D   | T            | d            | t                                                                                   |                                                                                     |                                                                                      |                                                                                      |                                                                                      | \$<br>dollar                                                                          | ×<br>times    | ˘<br>tilde     | ™<br>tr. mark                                                                         | Ĥ<br>maltese                                                                          | ħ<br>maltese                                                                          | 4            |   |   |   |
| 05    |                                                                                    | %             | 5   | E   | U            | e            | u                                                                                   |                                                                                     |                                                                                      |                                                                                      |                                                                                      | ¥<br>yen                                                                              | μ<br>micro-   | ˘<br>macron    | ♪<br>1/8 note                                                                         | ˆ<br>dotless j                                                                        | ˆ<br>dotless i                                                                        | 5            |   |   |   |
| 06    |                                                                                    | &             | 6   | F   | V            | f            | v                                                                                   |                                                                                     |                                                                                      |                                                                                      |                                                                                      |    | ¶<br>paragr.  | ˘<br>breve     |    | Ĳ<br>dutch                                                                            | ĳ<br>dutch                                                                            | 6            |   |   |   |
| 07    |                                                                                    | '<br>apostr.  | 7   | G   | W            | g            | w                                                                                   |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                       | §<br>section  | ˘<br>cent. dot |                                                                                       | ˘<br>dot                                                                              | Ł<br>catalan                                                                          | ł<br>catalan | 7 |   |   |
| 10    |                                                                                    | (             | 8   | H   | X            | h            | x                                                                                   |                                                                                     |                                                                                      |                                                                                      |                                                                                      |  | ÷<br>divide   | ¨<br>diaresis  |  | Ł<br>polish                                                                           | ł<br>polish                                                                           | 8            |   |   |   |
| 11    |                                                                                    | )             | 9   | I   | Y            | i            | y                                                                                   |                                                                                     |                                                                                      |                                                                                      |                                                                                      |                                                                                       | ‘<br>left q.  | ’<br>right q.  |                                                                                       |  | Ø<br>norweg.                                                                          | ø<br>norweg. | 9 |   |   |
| 12    |                                                                                    | *             | :   | J   | Z            | j            | z                                                                                   |                                                                                     |                                                                                      |                                                                                      |                                                                                      | “<br>left q.                                                                          | ”<br>right q. | ˘<br>ring      |  |                                                                                       | Œ<br>diphth                                                                           | œ<br>diphth  | A |   |   |
| 13    |                                                                                    | +             | ;   | K   | [            | k            | {                                                                                   |                                                                                     |                                                                                      |                                                                                      |                                                                                      | «<br>left q.                                                                          | »<br>right q. | ˘<br>cedilla   |                                                                                       | o<br>spanish                                                                          | ß<br>german                                                                           | B            |   |   |   |
| 14    |                                                                                    | ,             | <   | L   | \            | l            |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      | ←<br>en frac                                                                          | ¼<br>en frac  | —<br>underline | ⅓<br>en frac                                                                          | Þ<br>iceland                                                                          | þ<br>iceland                                                                          | C            |   |   |   |
| 15    |                                                                                    | -<br>neutral  | =   | M   | ]            | m            | }                                                                                   |                                                                                     |                                                                                      |                                                                                      |                                                                                      | ↑<br>en frac                                                                          | ½<br>en frac  | ˘<br>db acute  | ⅔<br>en frac                                                                          | Ƨ<br>lapp                                                                             | Ƨ<br>lapp                                                                             | D            |   |   |   |
| 16    |                                                                                    | .             | >   | N   | ˘<br>spacing | n            | ˘<br>spacing                                                                        |                                                                                     |                                                                                      |                                                                                      |                                                                                      | →<br>en frac                                                                          | ¾<br>en frac  | ˘<br>ogonek    | ⅝<br>en frac                                                                          | Ŋ<br>lapp                                                                             | ŋ<br>lapp                                                                             | E            |   |   |   |
| 17    |                                                                                    | /             | ?   | O   | —<br>low bar | o            |  |                                                                                     |                                                                                      |                                                                                      |                                                                                      | ↓<br>en frac                                                                          | ˘<br>en frac  | ˘<br>hachek    | ⅞<br>en frac                                                                          | h<br>s. africa                                                                        |  | F            |   |   |   |
|       |                                                                                    | 0             | 1   | 2   | 3            | 4            |                                                                                     |                                                                                     |                                                                                      |                                                                                      |                                                                                      | 5                                                                                     | 6             | 7              | 8                                                                                     | 9                                                                                     |                                                                                       | A            | B | C | D |







Reserved,  
Unassigned

Character Set  
Select Code

Reserved,  
not used

Figure 3.1 Xerox character set 0

|                    |                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------|
| ...                | ...                                                                                                           |
| 172 <sub>8</sub>   | Lowercase Latin (Roman) letter z                                                                              |
| 173 <sub>8</sub>   | Opening brace                                                                                                 |
| 174 <sub>8</sub>   | Vertical bar                                                                                                  |
| 175 <sub>8</sub>   | Closing brace                                                                                                 |
| 176 <sub>8</sub>   | Tilde (spacing character)                                                                                     |
| 241 <sub>8</sub>   | Inverted exclamation point (Spanish)                                                                          |
| 242 <sub>8</sub>   | Cent sign                                                                                                     |
| 243 <sub>8</sub>   | Pound-Sterling sign                                                                                           |
| 244 <sub>8</sub>   | Dollar sign                                                                                                   |
| 245 <sub>8</sub>   | Yen sign (Japanese)                                                                                           |
| 247 <sub>8</sub>   | Section sign                                                                                                  |
| 251 <sub>8</sub>   | Left single Quote = single quote open                                                                         |
| 252 <sub>8</sub>   | Left double Quote                                                                                             |
| 253 <sub>8</sub>   | Left double guillemet (European quotation mark)—NOT much-less-than (357 <sub>8</sub>   102 <sub>8</sub> )     |
| 254 <sub>8</sub>   | West arrow = leftward arrow                                                                                   |
| 255 <sub>8</sub>   | North arrow = upward arrow                                                                                    |
| 256 <sub>8</sub>   | East arrow = rightward arrow                                                                                  |
| 257 <sub>8</sub>   | South arrow = downward arrow                                                                                  |
| 260 <sub>8</sub>   | Degree sign (spacing character)—NOT over-ring accent (0 <sub>8</sub>   312 <sub>8</sub> )                     |
| 261 <sub>8</sub>   | Plus/minus sign                                                                                               |
| 262 <sub>8</sub>   | Superscript 2 as independent character from 2                                                                 |
|                    | Also: Squared                                                                                                 |
| 263 <sub>8</sub>   | Superscript 3 as independent character from 3                                                                 |
|                    | Also: Cubed                                                                                                   |
| 264 <sub>8</sub>   | Multiply sign                                                                                                 |
| 265 <sub>8</sub>   | Micro sign—NOT Greek "mu" (46 <sub>8</sub>   157 <sub>8</sub> )                                               |
| 266 <sub>8</sub>   | Paragraph sign = pilcrow                                                                                      |
| 267 <sub>8</sub>   | Centered dot                                                                                                  |
| 270 <sub>8</sub>   | Divide sign                                                                                                   |
| 271 <sub>8</sub>   | Right single quote = single quote closed                                                                      |
| 272 <sub>8</sub>   | Right double quote                                                                                            |
| 273 <sub>8</sub>   | Right double guillemet (European quotation mark)—NOT much-greater-than (357 <sub>8</sub>   103 <sub>8</sub> ) |
| 274 <sub>8</sub>   | Fraction one quarter as independent character                                                                 |
| 275 <sub>8</sub>   | Fraction one half as independent character                                                                    |
| 276 <sub>8</sub>   | Fraction three quarters as independent character                                                              |
| 277 <sub>8</sub>   | Inverted question mark (Spanish)                                                                              |
| 301 <sub>8</sub> * | Grave accent                                                                                                  |
| 302 <sub>8</sub> * | Acute accent = phonetic stress mark (non-spacing)                                                             |
| 303 <sub>8</sub> * | Circumflex accent = hat                                                                                       |
| 304 <sub>8</sub> * | Tilde accent                                                                                                  |
| 305 <sub>8</sub> * | Macron accent = long vowel mark                                                                               |
| 306 <sub>8</sub> * | Breve accent                                                                                                  |
| 307 <sub>8</sub> * | Over-dot accent                                                                                               |
| 310 <sub>8</sub> * | Diaeresis accent = umlaut accent                                                                              |
| 312 <sub>8</sub> * | Over-ring accent—NOT degree sign (0 <sub>8</sub>   260 <sub>8</sub> )                                         |
| 313 <sub>8</sub> * | Cedilla undermark                                                                                             |
| 314 <sub>8</sub> * | Underline (non-spacing undermark)                                                                             |
| 315 <sub>8</sub> * | Double acute accent                                                                                           |
| 316 <sub>8</sub> * | Ogonek undermark = Polish hook                                                                                |

\* These diacritics are non-spacing.

|                    |                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------|
| 317 <sub>8</sub> * | Hachek accent = caron                                                                          |
| 320 <sub>8</sub>   | Horizontal bar                                                                                 |
| 321 <sub>8</sub>   | Superscript 1 as independent character from 1<br>Also: Reference 1                             |
| 322 <sub>8</sub>   | Registered sign                                                                                |
| 323 <sub>8</sub>   | Copyright sign                                                                                 |
| 324 <sub>8</sub>   | Trademark sign (TM)                                                                            |
| 325 <sub>8</sub>   | Music Note = eighth note                                                                       |
| 334 <sub>8</sub>   | Fraction one eighth as independent character                                                   |
| 335 <sub>8</sub>   | Fraction three eighths as independent character                                                |
| 336 <sub>8</sub>   | Fraction five eighths as independent character                                                 |
| 337 <sub>8</sub>   | Fraction seven eighths as independent character                                                |
| 340 <sub>8</sub>   | Ohm sign—NOT uppercase Greek "omega" (46 <sub>8</sub>   135 <sub>8</sub> )                     |
| 341 <sub>8</sub>   | Uppercase AE digraph                                                                           |
| 342 <sub>8</sub>   | Uppercase D with stroke (Croatian)                                                             |
| 343 <sub>8</sub>   | Feminine Spanish ordinal indicator as independent character from a                             |
| 344 <sub>8</sub>   | Uppercase H with stroke (Maltese)                                                              |
| 345 <sub>8</sub>   | Lowercase dotless j                                                                            |
| 346 <sub>8</sub>   | Uppercase IJ digraph (Dutch)                                                                   |
| 347 <sub>8</sub>   | Uppercase L with middle dot (Catalan)                                                          |
| 350 <sub>8</sub>   | Uppercase L with stroke (Polish)                                                               |
| 351 <sub>8</sub>   | Uppercase O with slash (Norwegian, Danish)                                                     |
| 352 <sub>8</sub>   | Uppercase OE digraph                                                                           |
| 353 <sub>8</sub>   | Masculine Spanish ordinal indicator as independent character from o                            |
| 354 <sub>8</sub>   | Uppercase "Thorn" (Icelandic)                                                                  |
| 355 <sub>8</sub>   | Uppercase T with stroke (Lapp)                                                                 |
| 356 <sub>8</sub>   | Uppercase "Eng" (Lapp)                                                                         |
| 357 <sub>8</sub>   | Lowercase n with apostrophe (South African)                                                    |
| 360 <sub>8</sub>   | Lowercase k (Greenlandic)                                                                      |
| 361 <sub>8</sub>   | Lowercase ae digraph                                                                           |
| 362 <sub>8</sub>   | Lowercase d with stroke (Croatian)                                                             |
| 363 <sub>8</sub>   | Lowercase "Eth" (Icelandic)                                                                    |
| 364 <sub>8</sub>   | Lowercase h with stroke (Maltese)—NOT Planck's constant (357 <sub>8</sub>   150 <sub>8</sub> ) |
| 365 <sub>8</sub>   | Lowercase dotless i (Turkish)                                                                  |
| 366 <sub>8</sub>   | Lowercase ij digraph (Dutch)                                                                   |
| 367 <sub>8</sub>   | Lowercase l with middle dot (Catalan)                                                          |
| 370 <sub>8</sub>   | Lowercase l with stroke (Polish)                                                               |
| 371 <sub>8</sub>   | Lowercase o with slash (Norwegian, Danish)                                                     |
| 372 <sub>8</sub>   | Lowercase oe digraph                                                                           |
| 373 <sub>8</sub>   | Double s = Ess-zed = sharp s (German)                                                          |
| 374 <sub>8</sub>   | Lowercase "Thorn" (Icelandic)                                                                  |
| 375 <sub>8</sub>   | Lowercase t with stroke (Lapp)                                                                 |
| 376 <sub>8</sub>   | Lowercase "Eng" (Lapp)                                                                         |

\* These diacritics are non-spacing.

### 3.2.2 Character Set 41<sub>8</sub>: JIS symbols 1 – punctuation and symbols not in CS 0

The character codes (low-order byte) *within* Character Set 41<sub>8</sub> (see reference chart in appendix B):

|                 |                                                |
|-----------------|------------------------------------------------|
| 41 <sub>8</sub> | Fixed pitch kanji space (normally nonprinting) |
| 42 <sub>8</sub> | Japanese comma = Chinese comma                 |

|                  |                                                                                                                                        |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| 43 <sub>g</sub>  | Japanese period = Chinese period                                                                                                       |
| 44 <sub>g</sub>  | Square comma                                                                                                                           |
| 45 <sub>g</sub>  | Square period                                                                                                                          |
| 53 <sub>g</sub>  | "daku-on" mark                                                                                                                         |
| 54 <sub>g</sub>  | "han-daku-on" mark                                                                                                                     |
| 63 <sub>g</sub>  | Repeat katakana                                                                                                                        |
| 64 <sub>g</sub>  | Repeat katakana with daku-on                                                                                                           |
| 65 <sub>g</sub>  | Repeat hiragana                                                                                                                        |
| 66 <sub>g</sub>  | Repeat hiragana with daku-on                                                                                                           |
| 67 <sub>g</sub>  | "reduplicate"                                                                                                                          |
| 70 <sub>g</sub>  | "reduplicate above item"                                                                                                               |
| 71 <sub>g</sub>  | Repeat kanji                                                                                                                           |
| 72 <sub>g</sub>  | "shime"                                                                                                                                |
| 73 <sub>g</sub>  | "Kanji zero"                                                                                                                           |
| 74 <sub>g</sub>  | Long vowel bar (spacing character)                                                                                                     |
| 76 <sub>g</sub>  | Hyphen—NOT minus (0 <sub>g</sub>   55 <sub>g</sub> )                                                                                   |
| 102 <sub>g</sub> | Parallel sign, type 1 = double vertical bar                                                                                            |
| 104 <sub>g</sub> | Three-dot leader on an em body                                                                                                         |
| 105 <sub>g</sub> | Two-dot leader on an em body                                                                                                           |
| 114 <sub>g</sub> | Left broken bracket                                                                                                                    |
| 115 <sub>g</sub> | Right broken bracket                                                                                                                   |
| 126 <sub>g</sub> | Left Japanese quote = left Chinese quote                                                                                               |
| 127 <sub>g</sub> | Right Japanese quote = right Chinese quote                                                                                             |
| 130 <sub>g</sub> | Left Japanese double quote = left Chinese double quote                                                                                 |
| 131 <sub>g</sub> | Right Japanese double quote = right Chinese double quote                                                                               |
| 132 <sub>g</sub> | Left black lenticular bracket                                                                                                          |
| 133 <sub>g</sub> | Right black lenticular bracket                                                                                                         |
| 142 <sub>g</sub> | Does not equal                                                                                                                         |
| 145 <sub>g</sub> | "Less than or equal to"                                                                                                                |
| 146 <sub>g</sub> | "Greater than or equal to"                                                                                                             |
| 147 <sub>g</sub> | Infinity                                                                                                                               |
| 150 <sub>g</sub> | Therefore                                                                                                                              |
| 151 <sub>g</sub> | male = Mars                                                                                                                            |
| 152 <sub>g</sub> | female = Venus                                                                                                                         |
| 154 <sub>g</sub> | Minutes sign = feet sign = prime sign = phonetic stress sign (spacing character)—NOT acute accent (0 <sub>g</sub>   302 <sub>g</sub> ) |
| 155 <sub>g</sub> | Seconds sign = double prime = inches sign (spacing character)—NOT double acute accent (0 <sub>g</sub>   315 <sub>g</sub> )             |
| 156 <sub>g</sub> | Degrees-Celsius symbol                                                                                                                 |
| 171 <sub>g</sub> | White star                                                                                                                             |
| 172 <sub>g</sub> | Black star                                                                                                                             |
| 173 <sub>g</sub> | White circle                                                                                                                           |
| 174 <sub>g</sub> | Black circle                                                                                                                           |
| 175 <sub>g</sub> | Two concentric white circles = bull's eye<br>Also: Concentricity (ANSI Y14.5)                                                          |
| 176 <sub>g</sub> | White diamond                                                                                                                          |

### 3.2.3 Character Set 42<sub>g</sub>: JIS symbols 2 – punctuation and symbols not in CS 0

The character codes (low-order byte) *within* Character Set 42<sub>g</sub> (see reference chart in appendix B):

|                  |                                                                                           |
|------------------|-------------------------------------------------------------------------------------------|
| 41 <sub>8</sub>  | Black diamond                                                                             |
| 42 <sub>8</sub>  | Ballot box = wave operator = white square                                                 |
| 43 <sub>8</sub>  | Black square                                                                              |
| 44 <sub>8</sub>  | White point-up triangle—NOT uppercase Greek "delta" (46 <sub>8</sub>   105 <sub>8</sub> ) |
| 45 <sub>8</sub>  | Black point-up triangle                                                                   |
| 46 <sub>8</sub>  | White point-down triangle—NOT nabla (357 <sub>8</sub>   271 <sub>8</sub> )                |
| 47 <sub>8</sub>  | Black point-down triangle                                                                 |
| 50 <sub>8</sub>  | "kome" symbol                                                                             |
| 51 <sub>8</sub>  | "post office" symbol                                                                      |
| 56 <sub>8</sub>  | Japanese "geta"                                                                           |
| 142 <sub>8</sub> | Is the image of                                                                           |
|                  | Also: Approximately equal to, Type 3 (uncommon usage)                                     |
| 152 <sub>8</sub> | Double integral                                                                           |
| 176 <sub>8</sub> | Large circle                                                                              |
|                  | Also: Roundness (ANSI Y14.5)                                                              |

### 3.2.4 Character Set 43<sub>8</sub>: extended Latin alphabet

Character Set 43<sub>8</sub> contains characters defined in ISO 5426, "Extension of the Latin alphabet coded character set for bibliographic information interchange" [8]. They constitute a character set for the interchange of bibliographic citations, including their annotations, in the Latin alphabet. *The characters selected are retained in ISO order and are assigned to code positions on the "right" side of the ISO 8-bit code table.*

The character codes (low-order byte) *within* Character Set 43<sub>8</sub> (see reference chart in appendix B):

|                    |                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 254 <sub>8</sub>   | Musical flat                                                                                                                                                                                                |
| 256 <sub>8</sub>   | Sound recording copyright statement                                                                                                                                                                         |
| 260 <sub>8</sub>   | Ayn—NOT single open quote (0 <sub>8</sub>   251 <sub>8</sub> )                                                                                                                                              |
| 261 <sub>8</sub>   | Alif/Hamzah—NOT single open quote (0 <sub>8</sub>   251 <sub>8</sub> )                                                                                                                                      |
| 262 <sub>8</sub>   | Lowered left single quote—NOT single open quote (0   251 <sub>8</sub> ), prints low on line. Used in German, etc.                                                                                           |
| 274 <sub>8</sub>   | Musical sharp                                                                                                                                                                                               |
| 275 <sub>8</sub>   | Mjagkij znak (transliterated Cyrillic alphabet languages)                                                                                                                                                   |
| 276 <sub>8</sub>   | Tverdyj znak (transliterated Cyrillic alphabet languages)                                                                                                                                                   |
| 300 <sub>8</sub> * | Low rising tone mark (Vietnamese)                                                                                                                                                                           |
| 303 <sub>8</sub> * | Overline                                                                                                                                                                                                    |
| 311 <sub>8</sub> * | Umlaut (German, etc.)—Diaeresis (0 <sub>8</sub>   310 <sub>8</sub> ) is preferred in a single language application and umlaut should only be used where text operations are performed on several languages. |
| 313 <sub>8</sub> * | High comma off center (Czech, Slovak, etc.)                                                                                                                                                                 |
| 314 <sub>8</sub> * | High inverted comma centered (Latvian)                                                                                                                                                                      |
| 316 <sub>8</sub> * | Horn (Vietnamese and transliterated Thai)                                                                                                                                                                   |
| 321 <sub>8</sub> * | Rude (transliterated Thai)                                                                                                                                                                                  |
| 322 <sub>8</sub> * | Hook to the left (Latvian, Romanian)                                                                                                                                                                        |
| 324 <sub>8</sub> * | Circle below (transliterated Bengali, Hindi, etc.)                                                                                                                                                          |
| 325 <sub>8</sub> * | Half circle below (transliterated Semitic languages, Sanskrit)                                                                                                                                              |
| 326 <sub>8</sub> * | Dot below (transliterated Bengali, Hindi, etc.)                                                                                                                                                             |
| 327 <sub>8</sub> * | Double dot below (transliterated Urdu)                                                                                                                                                                      |

\* These diacritics are non-spacing.

|                    |                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 331 <sub>8</sub> * | Double underline (transliterated Hindi, Sindhi)                                                                                                                                |
| 332 <sub>8</sub> * | Vertical bar (African languages)                                                                                                                                               |
| 333 <sub>8</sub> * | Circumflex undermark (African languages)                                                                                                                                       |
| 335 <sub>8</sub> * | Left half of ligature sign and of double tilde (Both ligature and double tilde are divided into two parts, the first parts of each being identical. Used in transliterations.) |
| 336 <sub>8</sub> * | Right half of ligature sign—see 335 <sub>8</sub> above                                                                                                                         |
| 337 <sub>8</sub> * | Right half of double tilde (Tagalog)—see 335 <sub>8</sub> above                                                                                                                |

\* These diacritics are non-spacing.

### 3.2.5 Character Set 44<sub>8</sub>L: Japanese hiragana syllabary

Character Set 44L contains hiragana characters used to write about 60% of typical Japanese text.

The character codes (low-order byte) *within* Character Set 44<sub>8</sub>L (see reference chart in appendix B):

|                  |                     |
|------------------|---------------------|
| 41 <sub>8</sub>  | Hiragana small "ah" |
| ...              | ...                 |
| 163 <sub>8</sub> | Hiragana "n"        |

### 3.2.6 Character Set 44<sub>8</sub>R: Chinese Bo-po-mo-fo

Character Set 44R contains 37 Chinese phonetic-annotated letters and 5 tone marks; the 37 symbols are in the same order as shown in documents submitted by the Library Association of China (at Taipei) [17] and "The People's Republic of China National Standard GB 2312-80" [18].

The character codes (low-order byte) *within* Character Set 44<sub>8</sub>R (see reference chart in appendix B):

|                  |                                      |
|------------------|--------------------------------------|
| 241 <sub>8</sub> | Chinese phonetic-annotated letter B  |
| 242 <sub>8</sub> | Chinese phonetic-annotated letter P  |
| 243 <sub>8</sub> | Chinese phonetic-annotated letter M  |
| 244 <sub>8</sub> | Chinese phonetic-annotated letter F  |
| 245 <sub>8</sub> | Chinese phonetic-annotated letter D  |
| 246 <sub>8</sub> | Chinese phonetic-annotated letter T  |
| 247 <sub>8</sub> | Chinese phonetic-annotated letter N  |
| 250 <sub>8</sub> | Chinese phonetic-annotated letter L  |
| 251 <sub>8</sub> | Chinese phonetic-annotated letter G  |
| 252 <sub>8</sub> | Chinese phonetic-annotated letter K  |
| 253 <sub>8</sub> | Chinese phonetic-annotated letter H  |
| 254 <sub>8</sub> | Chinese phonetic-annotated letter J  |
| 255 <sub>8</sub> | Chinese phonetic-annotated letter Q  |
| 256 <sub>8</sub> | Chinese phonetic-annotated letter X  |
| 257 <sub>8</sub> | Chinese phonetic-annotated letter ZH |
| 260 <sub>8</sub> | Chinese phonetic-annotated letter CH |
| 261 <sub>8</sub> | Chinese phonetic-annotated letter SH |
| 262 <sub>8</sub> | Chinese phonetic-annotated letter R  |
| 263 <sub>8</sub> | Chinese phonetic-annotated letter Z  |

|                  |                                       |
|------------------|---------------------------------------|
| 264 <sub>g</sub> | Chinese phonetic-annotated letter C   |
| 265 <sub>g</sub> | Chinese phonetic-annotated letter S   |
| 266 <sub>g</sub> | Chinese phonetic-annotated letter A   |
| 267 <sub>g</sub> | Chinese phonetic-annotated letter O   |
| 270 <sub>g</sub> | Chinese phonetic-annotated letter E   |
| 271 <sub>g</sub> | Chinese phonetic-annotated letter EH  |
| 272 <sub>g</sub> | Chinese phonetic-annotated letter AI  |
| 273 <sub>g</sub> | Chinese phonetic-annotated letter EI  |
| 274 <sub>g</sub> | Chinese phonetic-annotated letter AU  |
| 275 <sub>g</sub> | Chinese phonetic-annotated letter OU  |
| 276 <sub>g</sub> | Chinese phonetic-annotated letter AN  |
| 277 <sub>g</sub> | Chinese phonetic-annotated letter EN  |
| 300 <sub>g</sub> | Chinese phonetic-annotated letter ANG |
| 301 <sub>g</sub> | Chinese phonetic-annotated letter ENG |
| 302 <sub>g</sub> | Chinese phonetic-annotated letter ER  |
| 303 <sub>g</sub> | Chinese phonetic-annotated letter I   |
| 304 <sub>g</sub> | Chinese phonetic-annotated letter U   |
| 305 <sub>g</sub> | Chinese phonetic-annotated letter IU  |
| 306 <sub>g</sub> | Chinese Tone 2                        |
| 307 <sub>g</sub> | Chinese Tone 3                        |
| 310 <sub>g</sub> | Chinese Tone 4                        |
| 311 <sub>g</sub> | Chinese Tone 5                        |
| 312 <sub>g</sub> | Chinese Tone 1                        |
| 313 <sub>g</sub> | Chinese phonetic-annotated letter NG  |

### 3.2.7 Character Set 45<sub>g</sub>: Japanese katakana syllabary

Character Set 45<sub>g</sub> contains katakana characters used to write about 10% of typical Japanese text.

The character codes (low-order byte) *within* Character Set 45<sub>g</sub> (see reference chart in appendix B):

|                  |                     |
|------------------|---------------------|
| 41 <sub>g</sub>  | Katakana small "ah" |
| ...              | ...                 |
| 163 <sub>g</sub> | Katakana "n"        |
| 164 <sub>g</sub> | Katakana "vu"       |
| 165 <sub>g</sub> | Katakana small "ka" |
| 166 <sub>g</sub> | Katakana small "ke" |

### 3.2.8 Character Set 46<sub>g</sub>: Greek alphabet

Character Set 46<sub>g</sub> contains characters defined in ISO 5428, "Greek alphabet coded character set for bibliographic information interchange" [9]. *The characters selected are retained in ISO order and in ISO code positions.*

The character codes (low-order byte) *within* Character Set 46<sub>g</sub> (see reference chart in appendix B):

|                 |                                                                                    |
|-----------------|------------------------------------------------------------------------------------|
| 45 <sub>g</sub> | Smooth breathing (non-spacing)—Prints over a small letter, before a capital letter |
|-----------------|------------------------------------------------------------------------------------|

|                  |                                                                                   |
|------------------|-----------------------------------------------------------------------------------|
| 46 <sub>g</sub>  | Rough breathing (non-spacing)—Prints over a small letter, before a capital letter |
| 47 <sub>g</sub>  | Iota subscript (non-spacing)—Prints under small letter                            |
| 64 <sub>g</sub>  | Upper prime—Follow letters used as numbers under 1000                             |
| 65 <sub>g</sub>  | Lower prime—Follow letters used as numbers from 1000                              |
| 73 <sub>g</sub>  | Raised full stop (period)                                                         |
| 101 <sub>g</sub> | Capital letter Alpha                                                              |
| 102 <sub>g</sub> | Capital letter Beta                                                               |
| 104 <sub>g</sub> | Capital letter Gamma                                                              |
| 105 <sub>g</sub> | Capital letter Delta                                                              |
| 106 <sub>g</sub> | Capital letter Epsilon                                                            |
| 107 <sub>g</sub> | Capital letter Stigma—Obsolete letter used as 6                                   |
| 110 <sub>g</sub> | Capital letter Digamma—Obsolete letter used as 6                                  |
| 111 <sub>g</sub> | Capital letter Zeta                                                               |
| 112 <sub>g</sub> | Capital letter Eta                                                                |
| 113 <sub>g</sub> | Capital letter Theta                                                              |
| 114 <sub>g</sub> | Capital letter Iota                                                               |
| 115 <sub>g</sub> | Capital letter Kappa                                                              |
| 116 <sub>g</sub> | Capital letter Lambda                                                             |
| 117 <sub>g</sub> | Capital letter Mu                                                                 |
| 120 <sub>g</sub> | Capital letter Nu                                                                 |
| 121 <sub>g</sub> | Capital letter Xi                                                                 |
| 122 <sub>g</sub> | Capital letter Omicron                                                            |
| 123 <sub>g</sub> | Capital letter Pi                                                                 |
| 124 <sub>g</sub> | Capital letter Koppa—Obsolete letter used as 90 (also written K')                 |
| 125 <sub>g</sub> | Capital letter Rho                                                                |
| 126 <sub>g</sub> | Capital letter Sigma                                                              |
| 130 <sub>g</sub> | Capital letter Tau                                                                |
| 131 <sub>g</sub> | Capital letter Upsilon                                                            |
| 132 <sub>g</sub> | Capital letter Phi                                                                |
| 133 <sub>g</sub> | Capital letter Chi                                                                |
| 134 <sub>g</sub> | Capital letter Psi                                                                |
| 135 <sub>g</sub> | Capital letter Omega                                                              |
| 136 <sub>g</sub> | Capital letter Sampi—Obsolete letter used as 900                                  |
| 141 <sub>g</sub> | Small letter Alpha                                                                |
| 142 <sub>g</sub> | Small letter Beta beginning the word                                              |
| 143 <sub>g</sub> | Small letter Beta found at middle of the word                                     |
| 144 <sub>g</sub> | Small letter Gamma                                                                |
| 145 <sub>g</sub> | Small letter Delta                                                                |
| 146 <sub>g</sub> | Small letter Epsilon                                                              |
| 147 <sub>g</sub> | Small letter Stigma—Obsolete letter used as 6                                     |
| 150 <sub>g</sub> | Small letter Digamma—Obsolete letter used as 6                                    |
| 151 <sub>g</sub> | Small letter Zeta                                                                 |
| 152 <sub>g</sub> | Small letter Eta                                                                  |
| 153 <sub>g</sub> | Small letter Theta                                                                |
| 154 <sub>g</sub> | Small letter Iota                                                                 |
| 155 <sub>g</sub> | Small letter Kappa                                                                |
| 156 <sub>g</sub> | Small letter Lambda                                                               |
| 157 <sub>g</sub> | Small letter Mu                                                                   |
| 160 <sub>g</sub> | Small letter Nu                                                                   |
| 161 <sub>g</sub> | Small letter Xi                                                                   |
| 162 <sub>g</sub> | Small letter Omicron                                                              |
| 163 <sub>g</sub> | Small letter Pi                                                                   |
| 164 <sub>g</sub> | Small letter Koppa—Obsolete letter used as 90                                     |
| 165 <sub>g</sub> | Small letter Rho                                                                  |
| 166 <sub>g</sub> | Small letter Sigma form found at beginning or middle of words                     |
| 167 <sub>g</sub> | Small letter Sigma form found at end of words                                     |
| 170 <sub>g</sub> | Small letter Tau                                                                  |

|                  |                                                |
|------------------|------------------------------------------------|
| 171 <sub>8</sub> | Small letter Upsilon                           |
| 172 <sub>8</sub> | Small letter Phi                               |
| 173 <sub>8</sub> | Small letter Chi                               |
| 174 <sub>8</sub> | Small letter Psi                               |
| 175 <sub>8</sub> | Small letter Omega                             |
| 176 <sub>8</sub> | Small letter Sampi—Obsolete letter used as 900 |

### 3.2.9 Character Set 47<sub>8</sub>: Cyrillic alphabet

Character Set 47<sub>8</sub> contains the Russian alphabet [19][20].

The character codes (low-order byte) *within* Character Set 47<sub>8</sub> (see reference chart in appendix B):

|                  |                                                           |
|------------------|-----------------------------------------------------------|
| 41 <sub>8</sub>  | Russian capital letter "A"                                |
| 42 <sub>8</sub>  | Russian capital letter BE                                 |
| 43 <sub>8</sub>  | Russian capital letter VE                                 |
| 44 <sub>8</sub>  | Russian capital letter GHE                                |
| 45 <sub>8</sub>  | Russian capital letter DE                                 |
| 46 <sub>8</sub>  | Russian capital letter E                                  |
| 47 <sub>8</sub>  | Russian capital letter YO                                 |
| 50 <sub>8</sub>  | Russian capital letter ZHE                                |
| 51 <sub>8</sub>  | Russian capital letter ZE                                 |
| 52 <sub>8</sub>  | Russian capital letter I                                  |
| 53 <sub>8</sub>  | Russian capital letter SHORT I                            |
| 54 <sub>8</sub>  | Russian capital letter KA                                 |
| 55 <sub>8</sub>  | Russian capital letter EL                                 |
| 56 <sub>8</sub>  | Russian capital letter EM                                 |
| 57 <sub>8</sub>  | Russian capital letter EN                                 |
| 60 <sub>8</sub>  | Russian capital letter O                                  |
| 61 <sub>8</sub>  | Russian capital letter PE                                 |
| 62 <sub>8</sub>  | Russian capital letter ER                                 |
| 63 <sub>8</sub>  | Russian capital letter ES                                 |
| 64 <sub>8</sub>  | Russian capital letter TE                                 |
| 65 <sub>8</sub>  | Russian capital letter U                                  |
| 66 <sub>8</sub>  | Russian capital letter EF                                 |
| 67 <sub>8</sub>  | Russian capital letter HA                                 |
| 70 <sub>8</sub>  | Russian capital letter TSE                                |
| 71 <sub>8</sub>  | Russian capital letter CHE                                |
| 72 <sub>8</sub>  | Russian capital letter SHA                                |
| 73 <sub>8</sub>  | Russian capital letter SHCHA                              |
| 74 <sub>8</sub>  | Russian capital letter ER (also hard sign)                |
| 75 <sub>8</sub>  | Russian capital letter ERY                                |
| 76 <sub>8</sub>  | Russian capital letter SOFT SIGN                          |
| 77 <sub>8</sub>  | Russian capital letter REVERSE E                          |
| 100 <sub>8</sub> | Russian capital letter YU                                 |
| 101 <sub>8</sub> | Russian capital letter YA                                 |
| 102 <sub>8</sub> | Ukrainian and Byelorussian capital letter HARD G          |
| 103 <sub>8</sub> | Serbian capital letter SOFT DJ                            |
| 104 <sub>8</sub> | Macedonian capital letter SOFT DJ                         |
| 105 <sub>8</sub> | Ukrainian capital letter YE                               |
| 106 <sub>8</sub> | Macedonian capital letter ZELO                            |
| 107 <sub>8</sub> | Old Russian, Ukrainian, and Byelorussian capital letter I |

|                  |                                                              |
|------------------|--------------------------------------------------------------|
| 110 <sub>g</sub> | Ukrainian capital letter I with two dots                     |
| 111 <sub>g</sub> | Serbian and Macedonian capital letter JE                     |
| 112 <sub>g</sub> | Serbian and Macedonian capital letter SOFT L                 |
| 113 <sub>g</sub> | Serbian and Macedonian capital letter SOFT N                 |
| 114 <sub>g</sub> | Serbian capital letter SOFT T                                |
| 115 <sub>g</sub> | Macedonian capital letter SOFT K                             |
| 116 <sub>g</sub> | Byelorussian capital letter SHORT U                          |
| 121 <sub>g</sub> | Russian small letter a                                       |
| ...              | ...                                                          |
| 161 <sub>g</sub> | Russian small letter ya                                      |
| ...              | ...                                                          |
| 176 <sub>g</sub> | Byelorussian small letter SHORT u                            |
| 241 <sub>g</sub> | Serbian and Macedonian capital letter HARD DJ                |
| 242 <sub>g</sub> | Old Russian, Byelorussian, and Bulgarian capital letter YAT' |
| 243 <sub>g</sub> | Old Russian capital letter FITA                              |
| 244 <sub>g</sub> | Old Russian capital letter IZHITSA                           |
| 245 <sub>g</sub> | Old Bulgarian capital letter YUS                             |
| 321 <sub>g</sub> | Serbian and Macedonian small letter HARD dj                  |
| ...              | ...                                                          |
| 325 <sub>g</sub> | Old Bulgarian small letter YUS                               |

### 3.2.10 Character Set 50<sub>g</sub>L: JIS & IBM forms characters

JIS forms characters are located at Char8Codes 43<sub>g</sub> through 100<sub>g</sub> and have two line weights, thin and thick. The description of the line weight and the direction of any form line is given in coordinates x and y, lowercase indicating a thin line. Capital letters X and Y indicate thick form lines and their directions.

IBM forms characters are located at Char8Codes 120<sub>g</sub> through 154<sub>g</sub> and are comprised of single and double lines. The description of line shape is given as single and/or double lines, and location is as it relates to an element of a larger forms box, e.g., "lower left box corner."

When a "thin line" forms character has a shape common to both JIS and IBM, only one can be coded. Since the JIS standard precedes the IBM standard, in time the IBM elements in common with JIS are found in the JIS forms code space. These are easily identified since the common shape description uses both venacular's. For example, (50<sub>g</sub> | 46<sub>g</sub>) has the names "y + x" and "lower left box corner." A single line is implied in the IBM description. Had the shape been "lower left box corner double," indicating a double thin line, (50<sub>g</sub> | 134<sub>g</sub>) would be used. Note that for double thin lines, no equivalent shape exists within JIS.

The character codes (low-order byte) *within* Character Set 50<sub>g</sub>L:

|                 |                                                               |
|-----------------|---------------------------------------------------------------|
| 43 <sub>g</sub> | x - y (direction of form lines) = upper left box corner (IBM) |
| 44 <sub>g</sub> | -x - y = upper right box corner                               |
| 45 <sub>g</sub> | -x + y = lower right box corner                               |
| 46 <sub>g</sub> | y + x = lower left box corner                                 |
| 47 <sub>g</sub> | y + x - y = left middle box side                              |
| 50 <sub>g</sub> | -x - y + x = middle box top                                   |
| 51 <sub>g</sub> | y - x - y = right middle box side                             |
| 52 <sub>g</sub> | x + y - x = middle box bottom                                 |
| 56 <sub>g</sub> | X - Y (Uppercase denotes thick line)                          |
| 57 <sub>g</sub> | -X - Y                                                        |
| 60 <sub>g</sub> | -X + Y                                                        |

|                  |                                         |
|------------------|-----------------------------------------|
| 61 <sub>8</sub>  | Y + X                                   |
| 62 <sub>8</sub>  | X + Y - Y                               |
| 63 <sub>8</sub>  | X - X - Y                               |
| 64 <sub>8</sub>  | Y - X - Y                               |
| 65 <sub>8</sub>  | X + Y - X                               |
| 67 <sub>8</sub>  | x + Y - Y                               |
| 70 <sub>8</sub>  | X - X - y                               |
| 71 <sub>8</sub>  | Y - x - Y                               |
| 72 <sub>8</sub>  | X + y - X                               |
| 73 <sub>8</sub>  | X + y - X - y                           |
| 74 <sub>8</sub>  | X + y - y                               |
| 75 <sub>8</sub>  | x - x - Y                               |
| 76 <sub>8</sub>  | y - X - y                               |
| 77 <sub>8</sub>  | x + Y - x                               |
| 100 <sub>8</sub> | x + Y - x - Y                           |
|                  |                                         |
| 120 <sub>8</sub> | Right box side double to single         |
| 121 <sub>8</sub> | Right box side single to double         |
| 122 <sub>8</sub> | Upper right box corner single to double |
| 123 <sub>8</sub> | Upper right box corner double to single |
| 124 <sub>8</sub> | Right box side double                   |
| 125 <sub>8</sub> | Center box bar vertical double          |
| 126 <sub>8</sub> | Upper right box corner double           |
| 127 <sub>8</sub> | Lower right box corner double           |
| 130 <sub>8</sub> | Lower right box corner single to double |
| 131 <sub>8</sub> | Lower right box corner double to single |
| 132 <sub>8</sub> | Left box side single to double          |
| 133 <sub>8</sub> | Left box side double to single          |
| 134 <sub>8</sub> | Lower left box corner double            |
| 135 <sub>8</sub> | Upper left box corner double            |
| 136 <sub>8</sub> | Middle box bottom double                |
| 137 <sub>8</sub> | Middle box top double                   |
| 140 <sub>8</sub> | Left box side double                    |
| 141 <sub>8</sub> | Center box bar horizontal double        |
| 142 <sub>8</sub> | Box intersection double                 |
| 143 <sub>8</sub> | Middle box bottom single to double      |
| 144 <sub>8</sub> | Middle box bottom double to single      |
| 145 <sub>8</sub> | Middle box top double to single         |
| 146 <sub>8</sub> | Middle box top single to double         |
| 147 <sub>8</sub> | Lower left box corner double to single  |
| 150 <sub>8</sub> | Lower left box corner single to double  |
| 151 <sub>8</sub> | Upper left box corner single to double  |
| 152 <sub>8</sub> | Upper left box corner double to single  |
| 153 <sub>8</sub> | Box intersection single to double       |
| 154 <sub>8</sub> | Box intersection double to single       |

### 3.2.11 Character Sets 50<sub>8</sub>R: mosaic characters

Character Set 50<sub>8</sub>R contains mosaic characters defined in ANSI X3.110, Videotex/Teletext Presentation Level Protocol Syntax (North American PLPL). They are used to form pictures

or patterns. The rectangle surrounding each 2 X 3 inlay in the code chart in appendix B is for illustrative purposes only and is not part of the graphic symbol.

### 3.2.12 Character Sets 60<sub>g</sub> through 117<sub>g</sub>: JIS Level-I Japanese kanji

---

Japanese kanji are Chinese-style characters used to write about 35% of average Japanese text. Character Sets 60<sub>g</sub> through 117<sub>g</sub> contain the characters defined as JIS Level-I kanji by the Japanese Industrial Standard. They contain 2,965 Japanese kanji characters. *The characters are retained in JIS order and in JIS code positions.*

### 3.2.13 Character Sets 120<sub>g</sub> through 163<sub>g</sub>: JIS Level-II Japanese kanji

---

Character Sets 120<sub>g</sub> through 163<sub>g</sub> and 165<sub>g</sub> contain the characters defined as JIS Level-II kanji by the Japanese Industrial Standard [11] [12]. In 1983, the original standard (JIS C 6226-1978) was modified and the typographical shapes of 286 kanji characters were changed [21]. Four of the 286 old style characters were retained and placed in an adjacent character set in the JIS Level-II area. The assignment of these characters to the adjacent Character Set 164<sub>g</sub> cannot be allowed in the Xerox standard; Character Set 165<sub>g</sub> is used for this purpose. The assignment of Character Set 164<sub>g</sub> to Miscellaneous Japanese symbols was made prior to the 1983 JIS Level-II kanji modification.

The character sets in JIS Level-II contain 3,388 (previously 3,384) Japanese *kanji* characters. *All characters are retained in JIS order and in JIS code positions, except for the single character set discussed previously.*

### 3.2.14 Character Set 164<sub>g</sub>: symbols 3 - miscellaneous Japanese symbols

---

Character Set 164<sub>g</sub> contains miscellaneous Japanese symbols.

The character codes (low-order byte) *within* Character Set 164<sub>g</sub> (see reference chart in appendix B):

|                 |                                       |
|-----------------|---------------------------------------|
| 41 <sub>g</sub> | Japanese "kabu"                       |
| 42 <sub>g</sub> | Circled katakana "ah"                 |
| ...             | ...                                   |
| 57 <sub>g</sub> | Circled katakana "nu"                 |
| 60 <sub>g</sub> | Circled kanji "teki" financial symbol |
| 61 <sub>g</sub> | Circled kanji "hyou" financial symbol |
| 62 <sub>g</sub> | Circled kanji "kou" financial symbol  |
| 63 <sub>g</sub> | Circled kanji "toku" financial symbol |
| 64 <sub>g</sub> | Circled kanji "zou" financial symbol  |
| 65 <sub>g</sub> | Circled kanji "gen" financial symbol  |
| 66 <sub>g</sub> | Circled kanji "ki" financial symbol   |
| 67 <sub>g</sub> | Circled kanji "tyou" financial symbol |
| 70 <sub>g</sub> | Circled kanji "yuu" financial symbol  |
| 71 <sub>g</sub> | Circled kanji "zai" financial symbol  |
| 72 <sub>g</sub> | Circled kanji "hi" financial symbol   |
| 73 <sub>g</sub> | Circled kanji "in" financial symbol   |

### 3.2.15 Character Set 166<sub>8</sub>: symbols - miscellaneous Japanese symbols

Character Set 166<sub>8</sub> contains miscellaneous Japanese symbols.

The character codes (low-order byte) within Character Set 166<sub>8</sub> (see reference charts in appendix B):

|                  |                                                                                   |
|------------------|-----------------------------------------------------------------------------------|
| 60 <sub>8</sub>  | Diamond enclosed digit 0                                                          |
| ...              | ...                                                                               |
| 77 <sub>8</sub>  | Diamond enclosed digit 15                                                         |
| 101 <sub>8</sub> | Circled uppercase Latin letter A                                                  |
| ...              | ...                                                                               |
| 114 <sub>8</sub> | Circled uppercase Latin letter L<br>Also: Least material condition (ANSI Y14.5)   |
| 115 <sub>8</sub> | Circled uppercase Latin letter M<br>Also: Maximum material condition (ANSI Y14.5) |
| 116 <sub>8</sub> | Circled uppercase Latin letter N                                                  |
| 117 <sub>8</sub> | Circled uppercase Latin letter O                                                  |
| 120 <sub>8</sub> | Circled uppercase Latin letter P<br>Also: Projected tolerance zone (ANSI Y14.5)   |
| 121 <sub>8</sub> | Circled uppercase Latin letter Q                                                  |
| 122 <sub>8</sub> | Circled uppercase Latin letter R                                                  |
| 123 <sub>8</sub> | Circled uppercase Latin letter S<br>Also: Projected tolerance zone (ANSI Y14.5)   |
| 124 <sub>8</sub> | Circled uppercase Latin letter T                                                  |
| ...              | ...                                                                               |
| 132 <sub>8</sub> | Circled uppercase Latin letter Z                                                  |
| 141 <sub>8</sub> | Circled lowercase Latin letter a                                                  |
| ...              | ...                                                                               |
| 172 <sub>8</sub> | Circled lowercase Latin letter z                                                  |

### 3.2.16 Character Sets 167<sub>8</sub> through 172<sub>8</sub>: gaiji kanji characters

Character Sets 167<sub>8</sub> through 172<sub>8</sub> contain the characters defined by Fuji Xerox. They contain 374 Japanese gaiji kanji characters, which are often used in Japan. They come from user requests and are selected by Fuji Xerox.

### 3.2.17 Character Set 340<sub>8</sub>: extended Arabic alphabet

Character Set 340<sub>8</sub> contains characters defined in European Computer Manufacturers Association (ECMA) registration number 89, dated March 30, 1984 [23]. ECMA is the registration authority for ISO 2375 and the origin (user) of the 7-bit Coded Arabic Character Set for Information Interchange is Arab Standard 449 [22] [24]. The Arab Organization for Standardization and Metrology (ASMO) and Arab Telecommunication Union are sponsors of the registration. Also, the registration character set has been extended to include characters required for the Farsi language.

Three characters: "Indian decimal point," "Indian thousands delimiter," and the "zero-width joiner" have also been added to this character set. The first two characters are included because of the inconsistencies in the use of decimal signs and the thousands delimiter in printed Arabic literature. For example, the equivalent of the Arabic letter "RA" has been

used as a decimal point, and the equivalent of the "Arabic comma" has also been used as a decimal point. Assignment of a numeric with the semantic "Indian decimal point" provides for unambiguous machine interpretation during text processing operations.

The character "zero-width joiner" is useful in instances where it is desired to type one of the contextual-shape variants of an Arabic letter alone. For example, to show the joining form of the letter -b-, one cannot type <space>b<space> because that will automatically give the independent shape of "b," not the joined shape "-b-." Introducing the "joiner" enables the typing of <space><joiner>b<joiner><space>, and since the joiner has zero width, it is invisible when the string is displayed or printed.

The character codes (low-order byte) *within* Character Set 340<sub>8</sub> (see reference charts in appendix B):

|                  |                              |
|------------------|------------------------------|
| 45 <sub>8</sub>  | Arabic percent sign          |
| 54 <sub>8</sub>  | Arabic comma                 |
| 60 <sub>8</sub>  | Indian numeral zero          |
| ...              | ...                          |
| 71 <sub>8</sub>  | Indian numeral nine          |
| 73 <sub>8</sub>  | Arabic semi-colon            |
| 77 <sub>8</sub>  | Arabic question mark         |
| 101 <sub>8</sub> | Hamzah = glottal stop        |
| 102 <sub>8</sub> | Maddah on Alef               |
| 103 <sub>8</sub> | Hamzah on Alef               |
| 104 <sub>8</sub> | Hamzah on Waw                |
| 105 <sub>8</sub> | Hamzah under Alef            |
| 106 <sub>8</sub> | Hamzah on YA'                |
| 107 <sub>8</sub> | Isolated Arabic letter Alef  |
| 110 <sub>8</sub> | Isolated Arabic letter BA'   |
| 111 <sub>8</sub> | TA'A Marbuta                 |
| 112 <sub>8</sub> | Isolated Arabic letter TA'   |
| 113 <sub>8</sub> | Isolated Arabic letter THA'  |
| 114 <sub>8</sub> | Isolated Arabic letter JEEM  |
| 115 <sub>8</sub> | Isolated Arabic letter HA'   |
| 116 <sub>8</sub> | Isolated Arabic letter KHA'  |
| 117 <sub>8</sub> | Isolated Arabic letter DAL   |
| 120 <sub>8</sub> | Isolated Arabic letter THAL  |
| 121 <sub>8</sub> | Isolated Arabic letter RA    |
| 122 <sub>8</sub> | Isolated Arabic letter ZAIN  |
| 123 <sub>8</sub> | Isolated Arabic letter SEEN  |
| 124 <sub>8</sub> | Isolated Arabic letter SHEEN |
| 125 <sub>8</sub> | Isolated Arabic letter SAD   |
| 126 <sub>8</sub> | Isolated Arabic letter DAD   |
| 127 <sub>8</sub> | Isolated Arabic letter TAH   |
| 130 <sub>8</sub> | Isolated Arabic letter DHAH  |
| 131 <sub>8</sub> | Isolated Arabic letter AIN   |
| 132 <sub>8</sub> | Isolated Arabic letter GHAIN |
| 140 <sub>8</sub> | Tatweel = Kashida            |
| 141 <sub>8</sub> | Isolated Arabic letter FA'   |
| 142 <sub>8</sub> | Isolated Arabic letter QAF   |
| 143 <sub>8</sub> | Isolated Arabic letter CAF   |
| 144 <sub>8</sub> | Isolated Arabic letter LAM   |
| 145 <sub>8</sub> | Isolated Arabic letter MEEM  |
| 146 <sub>8</sub> | Isolated Arabic letter NOON  |

|                    |                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------|
| 147 <sub>8</sub>   | Isolated Arabic letter HA                                                                 |
| 150 <sub>8</sub>   | Isolated Arabic letter WAW                                                                |
| 151 <sub>8</sub>   | Alef-maqsurah                                                                             |
| 152 <sub>8</sub>   | Isolated Arabic letter YA                                                                 |
| 153 <sub>8</sub> * | Fathatan                                                                                  |
| 154 <sub>8</sub> * | Dammatan                                                                                  |
| 155 <sub>8</sub> * | Kasratan                                                                                  |
| 156 <sub>8</sub> * | Fatha                                                                                     |
| 157 <sub>8</sub> * | Dammah                                                                                    |
| 160 <sub>8</sub> * | Kasrah                                                                                    |
| 161 <sub>8</sub> * | Shaddah                                                                                   |
| 162 <sub>8</sub> * | Sukun                                                                                     |
| 163 <sub>8</sub> * | Dagger Alef                                                                               |
| 164 <sub>8</sub>   | Wasla on Alef                                                                             |
| 165 <sub>8</sub>   | Indian decimal point = radix point—NOT Arabic "RA" (340 <sub>8</sub>   121 <sub>8</sub> ) |
| 166 <sub>8</sub>   | Indian thousands delimiter—NOT Arabic "comma" (340 <sub>8</sub>   54 <sub>8</sub> )       |
| 241 <sub>8</sub>   | Arabic V—used in transliterating foreign words                                            |
| 242 <sub>8</sub>   | Farsi P                                                                                   |
| 243 <sub>8</sub>   | Farsi CH                                                                                  |
| 244 <sub>8</sub>   | Farsi ZH                                                                                  |
| 245 <sub>8</sub>   | Farsi G                                                                                   |
| 376 <sub>8</sub>   | Zero-width joiner                                                                         |

\* These vowels are non-spacing.

### 3.2.18 Character Set 341<sub>8</sub>: Hebrew alphabet

Character Set 341<sub>8</sub> contains characters of the Hebrew alphabet. Like all Semitic alphabets, Hebrew consists solely of consonants, twenty two in number. Code assignments within the character set for consonants, 100<sub>8</sub> through 132<sub>8</sub>, are identical to those of Table 3 in the 7-bit Coded Character Set for Information Processing Interchange, SI 960, of The Standards Institution of Israel, dated November, 1976 [25].

In Hebrew, any word spelled can be described as divisible into two distinct elements: the skeletal signs, and diacritical markings which are written above, below, or within the letters. In everyday text or manuscripts, however, these diacriticals are not used, and the reader identifies the letter intended from context.

When consonantal modification is used, it is indicated in manuscripts by a dot. Examination of the skeletal list of consonants, 100<sub>8</sub> through 132<sub>8</sub>, indicates where the inventory of alphabetic graphemes is increased by consonantal modification. For example, code 131<sub>8</sub> is identified as "Hebrew letter Shin/Sin in skeletal form," and a comment in parenthesis indicates dot placement to obtain the unambiguous form.

Not all comments made in parenthesis identify unambiguous letter forms, e.g., ("Shin" when modified by a dot written above and to the right and "Sin" when modified by a dot written above and to the left). All other commentary, e.g., outside of Shin/Sin, refers to how the ambiguous letter form is obtained.

A *dagesh forte*, a dot in the consonant, can be written within almost any letter of the alphabet, e.g., in the graphemes of Tiberian Hebrew [26], a dot can be written within any one of the letters with the exception of Cheth and Ayin. In Modern Hebrew, however,

consonantal modification using *dagesh forte* occurs only in the places noted, e.g., 101<sub>g</sub>, 113<sub>g</sub>, and 124<sub>g</sub>. The graphic forms appear respectively at 133<sub>g</sub>, 134<sub>g</sub>, and 135<sub>g</sub>.

In Hebrew, there are also nine basic vowel signs and three vowel digraphs; all of them are non-spacing and located at Char8Codes 301<sub>g</sub> through 317<sub>g</sub>. Seven of the vowel signs and all three digraph vowels are subscripts; a comment as "superscript" in parenthesis identifies those which are not.

Infrequent consonants written using a letter and an "acute accent" to the left of the letter are used for writing non-Hebrew names or words. They include the letters Gimel, Zayin, and Tsadi.

The character codes (low-order byte) *within* Character Set 341<sub>g</sub> (see reference charts in appendix B):

|                    |                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 54 <sub>g</sub>    | Hebrew comma                                                                                                                                                       |
| 100 <sub>g</sub>   | Hebrew letter Aleph                                                                                                                                                |
| 101 <sub>g</sub>   | Hebrew letter Veth                                                                                                                                                 |
|                    | Also: Hebrew letter Beth in skeletal form ("Beth" without middle dot)                                                                                              |
| 102 <sub>g</sub>   | Hebrew letter Gimel                                                                                                                                                |
| 103 <sub>g</sub>   | Hebrew letter Daleth                                                                                                                                               |
| 104 <sub>g</sub>   | Hebrew letter Heh                                                                                                                                                  |
| 105 <sub>g</sub>   | Hebrew letter Vav                                                                                                                                                  |
| 106 <sub>g</sub>   | Hebrew letter Zayin                                                                                                                                                |
| 107 <sub>g</sub>   | Hebrew letter Cheth                                                                                                                                                |
| 110 <sub>g</sub>   | Hebrew letter Teth                                                                                                                                                 |
| 111 <sub>g</sub>   | Hebrew letter Yod                                                                                                                                                  |
| 112 <sub>g</sub>   | Hebrew letter Chaph form found at the end of words                                                                                                                 |
| 113 <sub>g</sub>   | Hebrew letter Chaph                                                                                                                                                |
|                    | Also: Hebrew letter Kaph in skeletal form ("Kaph" without middle dot)                                                                                              |
| 114 <sub>g</sub>   | Hebrew letter Lamed                                                                                                                                                |
| 115 <sub>g</sub>   | Hebrew letter Mem form found at the end of words                                                                                                                   |
| 116 <sub>g</sub>   | Hebrew letter Mem                                                                                                                                                  |
| 117 <sub>g</sub>   | Hebrew letter Nun form found at the end of words                                                                                                                   |
| 120 <sub>g</sub>   | Hebrew letter Nun                                                                                                                                                  |
| 121 <sub>g</sub>   | Hebrew letter Samekh                                                                                                                                               |
| 122 <sub>g</sub>   | Hebrew letter Ayin                                                                                                                                                 |
| 123 <sub>g</sub>   | Hebrew letter Feh form found at the end of words                                                                                                                   |
| 124 <sub>g</sub>   | Hebrew letter Feh                                                                                                                                                  |
|                    | Also: Hebrew letter Peh in skeletal form ("Peh" without middle dot)                                                                                                |
| 125 <sub>g</sub>   | Hebrew letter Tsadi form found at the end of words                                                                                                                 |
| 126 <sub>g</sub>   | Hebrew letter Tsadi                                                                                                                                                |
| 127 <sub>g</sub>   | Hebrew letter Koph                                                                                                                                                 |
| 130 <sub>g</sub>   | Hebrew letter Resh                                                                                                                                                 |
| 131 <sub>g</sub>   | Hebrew letter Shin/Sin in skeletal form ("Shin" when modified by a dot written above and to the right, "Sin" when modified by a dot written above and to the left) |
| 132 <sub>g</sub>   | Hebrew letter Thav                                                                                                                                                 |
| 133 <sub>g</sub>   | Hebrew letter Beth                                                                                                                                                 |
| 134 <sub>g</sub>   | Hebrew letter Kaph                                                                                                                                                 |
| 135 <sub>g</sub>   | Hebrew letter Peh                                                                                                                                                  |
| 301 <sub>g</sub> * | Hebrew vowel sign Hireq                                                                                                                                            |

\* These vowels are non-spacing

|                    |                                    |
|--------------------|------------------------------------|
| 302 <sub>8</sub> * | Hebrew vowel sign Sereh            |
| 303 <sub>8</sub> * | Hebrew vowel sign Segol            |
| 304 <sub>8</sub> * | Hebrew vowel sign Qubbus           |
| 305 <sub>8</sub> * | Hebrew vowel sign Qamas            |
| 306 <sub>8</sub> * | Hebrew vowel sign Pathah           |
| 307 <sub>8</sub> * | Hebrew vowel sign Shewa            |
| 310 <sub>8</sub> * | Hebrew vowel digraph Hataph Pathah |
| 311 <sub>8</sub> * | Hebrew vowel digraph Hataph Segol  |
| 312 <sub>8</sub> * | Hebrew vowel digraph Hataph Qamas  |
| 316 <sub>8</sub> * | Hebrew vowel Holem (superscript)   |
| 317 <sub>8</sub> * | Hebrew vowel Shureq (middle)       |

\* These vowels are non-spacing

### 3.2.19 Character Set 343<sub>8</sub>: Korean Hangul

Character Set 343<sub>8</sub> contains characters defined in the Korean Standard KS C 5601 - 1982, 8-bit Roman and Korean Character Codes [27]. The characters selected from the Korean Hangul alphabet are retained in the same order and code positions as in the national standard.

The character codes (low-order byte) *within* Character Set 343<sub>8</sub> (see reference charts in appendix B):

|                  |                   |
|------------------|-------------------|
| 301 <sub>8</sub> | Korean letter K   |
| 302 <sub>8</sub> | Korean letter KK  |
| 304 <sub>8</sub> | Korean letter N   |
| 307 <sub>8</sub> | Korean letter T   |
| 310 <sub>8</sub> | Korean letter TT  |
| 311 <sub>8</sub> | Korean letter L   |
| 321 <sub>8</sub> | Korean letter M   |
| 322 <sub>8</sub> | Korean letter P   |
| 323 <sub>8</sub> | Korean letter PP  |
| 325 <sub>8</sub> | Korean letter S   |
| 326 <sub>8</sub> | Korean letter SS  |
| 327 <sub>8</sub> | Korean letter NG  |
| 330 <sub>8</sub> | Korean letter C   |
| 331 <sub>8</sub> | Korean letter CC  |
| 332 <sub>8</sub> | Korean letter CH  |
| 333 <sub>8</sub> | Korean letter KH  |
| 334 <sub>8</sub> | Korean letter TH  |
| 335 <sub>8</sub> | Korean letter PH  |
| 336 <sub>8</sub> | Korean letter H   |
| 342 <sub>8</sub> | Korean letter A   |
| 343 <sub>8</sub> | Korean letter AI  |
| 344 <sub>8</sub> | Korean letter YA  |
| 345 <sub>8</sub> | Korean letter YAI |
| 346 <sub>8</sub> | Korean letter E   |
| 347 <sub>8</sub> | Korean letter EI  |
| 352 <sub>8</sub> | Korean letter YE  |
| 353 <sub>8</sub> | Korean letter YEI |
| 354 <sub>8</sub> | Korean letter O   |
| 355 <sub>8</sub> | Korean letter WA  |

|                  |                   |
|------------------|-------------------|
| 356 <sub>8</sub> | Korean letter WAI |
| 357 <sub>8</sub> | Korean letter OI  |
| 362 <sub>8</sub> | Korean letter YO  |
| 363 <sub>8</sub> | Korean letter WU  |
| 364 <sub>8</sub> | Korean letter WE  |
| 365 <sub>8</sub> | Korean letter WEI |
| 366 <sub>8</sub> | Korean letter WI  |
| 367 <sub>8</sub> | Korean letter YU  |
| 372 <sub>8</sub> | Korean letter U   |
| 373 <sub>8</sub> | Korean letter UI  |
| 374 <sub>8</sub> | Korean letter I   |

### 3.2.20 Character Set 356<sub>8</sub>: general and technical symbols 2

Character Set 356 ends a series of consecutive character sets (currently two of them) which contain "symbols" that are not traditionally considered part of linguistic punctuation.

The character codes (low-order byte) *within* Character Set 356<sub>8</sub> (see reference charts in appendix B):

|                  |                                                                       |
|------------------|-----------------------------------------------------------------------|
| 41 <sub>8</sub>  | Thick space = 3-em space (normally nonprinting)                       |
| 42 <sub>8</sub>  | 4-em space (normally nonprinting)                                     |
| 43 <sub>8</sub>  | Hair space (fixed and normally nonprinting)                           |
| 44 <sub>8</sub>  | Punctuation space (fixed, device dependent, and normally nonprinting) |
| 45 <sub>8</sub>  | Hyphenation point— (not normally imaged)                              |
| 46 <sub>8</sub>  | Crop top right                                                        |
| 47 <sub>8</sub>  | Crop top left                                                         |
| 50 <sub>8</sub>  | Crop bottom right                                                     |
| 51 <sub>8</sub>  | Crop bottom left                                                      |
| 52 <sub>8</sub>  | Histogram sign                                                        |
| 53 <sub>8</sub>  | Direct sum                                                            |
| 54 <sub>8</sub>  | Arabic thousands separating delimiter                                 |
| 55 <sub>8</sub>  | Minus sign                                                            |
| 56 <sub>8</sub>  | Arabic decimal point                                                  |
| 65 <sub>8</sub>  | Factorial sign                                                        |
| 66 <sub>8</sub>  | Assertion sign (math logic)                                           |
|                  | Also: Reduced to                                                      |
| 67 <sub>8</sub>  | Symmetry sign (ANSI TC10)                                             |
| 70 <sub>8</sub>  | Total runout (ANSI Y14.5)                                             |
| 71 <sub>8</sub>  | Impedance                                                             |
| 72 <sub>8</sub>  | Small house                                                           |
| 100 <sub>8</sub> | Cada una (Spanish) -- means each one                                  |
| 101 <sub>8</sub> | Inverse (357 <sub>8</sub>   146 <sub>8</sub> ) centered bullet        |
| 105 <sub>8</sub> | Increment; Also: Laplace operator                                     |
| 106 <sub>8</sub> | Lozenge                                                               |
| 107 <sub>8</sub> | Caret                                                                 |
| 110 <sub>8</sub> | Centerline                                                            |
| 111 <sub>8</sub> | Straightness (ANSI Y14.5)                                             |
| 112 <sub>8</sub> | Flatness (ANSI Y14.5)                                                 |
| 113 <sub>8</sub> | Cylindricity (ANSI Y14.5)                                             |
| 114 <sub>8</sub> | Profile of a line (ANSI Y14.5)                                        |
| 115 <sub>8</sub> | Profile of a surface (ANSI Y14.5)                                     |
| 116 <sub>8</sub> | All-around profile (ANSI Y14.5)                                       |

|                  |                                                                                                                                      |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 117 <sub>8</sub> | Position (ANSI Y14.5)                                                                                                                |
| 120 <sub>8</sub> | Right arrow over left arrow                                                                                                          |
| 121 <sub>8</sub> | Double arrow, up and down                                                                                                            |
| 125 <sub>8</sub> | Inverse (42 <sub>8</sub>   176 <sub>8</sub> ) large circle                                                                           |
| 126 <sub>8</sub> | Intersection of classes (Intersection of a collection of sets $A_1, \dots, A_n$ )<br>Also: Product of classes or sets between limits |
| 127 <sub>8</sub> | Union of classes or sets (Union of a collection of sets $A_1, \dots, A_n$ )<br>Also: Sum of classes or sets between limits           |
| 130 <sub>8</sub> | "Square" checkplot sign                                                                                                              |
| 131 <sub>8</sub> | "Diamond" checkplot sign                                                                                                             |
| 132 <sub>8</sub> | "Triangle" checkplot sign                                                                                                            |
| 133 <sub>8</sub> | "Circle" checkplot sign                                                                                                              |
| 134 <sub>8</sub> | "Hexagon" checkplot sign                                                                                                             |
| 135 <sub>8</sub> | "Hourglass" checkplot sign                                                                                                           |
| 136 <sub>8</sub> | "Tree" checkplot sign                                                                                                                |
| 137 <sub>8</sub> | "Picnic table" checkplot sign                                                                                                        |
| 140 <sub>8</sub> | Light shade                                                                                                                          |
| 141 <sub>8</sub> | Dark shade                                                                                                                           |
| 145 <sub>8</sub> | Neither less than nor equal to                                                                                                       |
| 146 <sub>8</sub> | Neither greater than nor equal to                                                                                                    |
| 152 <sub>8</sub> | Start of line symbol                                                                                                                 |
| 160 <sub>8</sub> | Upside down perpendicular                                                                                                            |
| 162 <sub>8</sub> | Not identical with                                                                                                                   |
| 163 <sub>8</sub> | Top portion of left bracket                                                                                                          |
| 164 <sub>8</sub> | Bottom portion of left bracket                                                                                                       |
| 165 <sub>8</sub> | Center portion of left and right bracket                                                                                             |
| 166 <sub>8</sub> | Top portion of right bracket                                                                                                         |
| 167 <sub>8</sub> | Bottom portion of right bracket                                                                                                      |
| 170 <sub>8</sub> | Asymptotic or equal to                                                                                                               |
| 171 <sub>8</sub> | Approximately equal to—NOT Libra (357 <sub>8</sub>   370 <sub>8</sub> )                                                              |
| 172 <sub>8</sub> | Double exclamation mark                                                                                                              |
| 174 <sub>8</sub> | Absolute value = such that, type 2                                                                                                   |
| 176 <sub>8</sub> | Similar to (geometry) = equivalent to                                                                                                |
| 242 <sub>8</sub> | One-dot leader on an en body                                                                                                         |
| 243 <sub>8</sub> | Two-dot leader on an en body                                                                                                         |
| 244 <sub>8</sub> | Large rightward arrow, closed                                                                                                        |
| 245 <sub>8</sub> | Large leftward arrow, closed                                                                                                         |
| 246 <sub>8</sub> | Large upward arrow, closed                                                                                                           |
| 247 <sub>8</sub> | Large downward arrow, closed                                                                                                         |
| 250 <sub>8</sub> | Large rightward arrow, open                                                                                                          |
| 251 <sub>8</sub> | Large leftward arrow, open                                                                                                           |
| 252 <sub>8</sub> | Large upward arrow, open                                                                                                             |
| 253 <sub>8</sub> | Large downward arrow, open                                                                                                           |
| 254 <sub>8</sub> | Relata of a relation—NOT West arrow (0 <sub>8</sub>   254 <sub>8</sub> )                                                             |
| 255 <sub>8</sub> | Increases; exponent—NOT North arrow (0 <sub>8</sub>   255 <sub>8</sub> )                                                             |
| 256 <sub>8</sub> | Approaches—NOT East arrow (0 <sub>8</sub>   256 <sub>8</sub> )                                                                       |
| 257 <sub>8</sub> | Decreases—NOT South arrow (0 <sub>8</sub>   257 <sub>8</sub> )                                                                       |
| 260 <sub>8</sub> | Black point-right triangle                                                                                                           |
| 261 <sub>8</sub> | Black point-left triangle                                                                                                            |
| 262 <sub>8</sub> | White point-right triangle                                                                                                           |
| 263 <sub>8</sub> | White point-left triangle                                                                                                            |
| 264 <sub>8</sub> | Scalar product                                                                                                                       |
| 265 <sub>8</sub> | North-South arrow                                                                                                                    |
| 266 <sub>8</sub> | North-South arrow perpendicular                                                                                                      |

|                  |                                                                                                            |
|------------------|------------------------------------------------------------------------------------------------------------|
| 271 <sub>8</sub> | Solid fill character                                                                                       |
| 272 <sub>8</sub> | Solid fill character, bottom half                                                                          |
| 273 <sub>8</sub> | Solid fill character, right half                                                                           |
| 274 <sub>8</sub> | Solid fill character, left half                                                                            |
| 275 <sub>8</sub> | Solid fill character, top half                                                                             |
| 276 <sub>8</sub> | Backward indicator arrow                                                                                   |
| 277 <sub>8</sub> | Forward indicator arrow                                                                                    |
| 313 <sub>8</sub> | Open (357 <sub>8</sub>   313 <sub>8</sub> ) spades                                                         |
| 314 <sub>8</sub> | Solid (357 <sub>8</sub>   314 <sub>8</sub> ) hearts                                                        |
| 316 <sub>8</sub> | Open (357 <sub>8</sub>   316 <sub>8</sub> ) clubs                                                          |
| 317 <sub>8</sub> | Compass symbol—NOT sun (357 <sub>8</sub>   347 <sub>8</sub> )                                              |
| 325 <sub>8</sub> | Double sixteenth note                                                                                      |
| 334 <sub>8</sub> | Vertical rectangle                                                                                         |
| 335 <sub>8</sub> | Right angle symbol                                                                                         |
| 336 <sub>8</sub> | Solid horizontal rectangle                                                                                 |
| 337 <sub>8</sub> | Dark (357 <sub>8</sub>   337 <sub>8</sub> ) smile face                                                     |
| 340 <sub>8</sub> | Top portion of right brace                                                                                 |
| 341 <sub>8</sub> | Vertical portion of a multiline brace                                                                      |
| 342 <sub>8</sub> | Center portion of right brace                                                                              |
| 343 <sub>8</sub> | Bottom portion of right brace                                                                              |
| 344 <sub>8</sub> | Top portion of left brace                                                                                  |
| 345 <sub>8</sub> | Bottom portion of left brace                                                                               |
| 346 <sub>8</sub> | Center portion of left brace                                                                               |
| 347 <sub>8</sub> | First part of a two line brace (upper portion of the left brace and the lower portion of the right brace)  |
| 350 <sub>8</sub> | Second part of a two line brace (lower portion of the left brace and the upper portion of the right brace) |
| 355 <sub>8</sub> | Top portion of integral sign (356 <sub>8</sub>   165 <sub>8</sub> )                                        |
| 356 <sub>8</sub> | Bottom portion of integral sign (356 <sub>8</sub>   165 <sub>8</sub> )                                     |
| 357 <sub>8</sub> | Center portion of integral sign (356 <sub>8</sub>   165 <sub>8</sub> )                                     |
| 376 <sub>8</sub> | Not equivalent to                                                                                          |

### 3.2.21 Character Set 357<sub>8</sub>: general and technical symbols 1

Character Set 357<sub>8</sub> begins a series of consecutive character sets (currently two of them) which contain "symbols" that are not traditionally considered part of linguistic punctuation.

Some of these symbols, for instance the circle, have a large number of different applications or interpretations (see guides such as *Shepherd's Glossary of Graphic Signs and Symbols* [13]). Only the most common applications are mentioned below.

The character codes (low-order byte) *within* Character Set 357<sub>8</sub> (see reference chart in appendix B):

|                 |                                            |
|-----------------|--------------------------------------------|
| 41 <sub>8</sub> | Non-breaking space (normally nonprinting)  |
| 42 <sub>8</sub> | Non-breaking hyphen                        |
| 43 <sub>8</sub> | Discretionary hyphen                       |
| 44 <sub>8</sub> | En dash                                    |
| 45 <sub>8</sub> | Em dash                                    |
| 46 <sub>8</sub> | Figure dash                                |
| 47 <sub>8</sub> | Neutral single quote                       |
| 50 <sub>8</sub> | Lowered left double quote (European usage) |
| 51 <sub>8</sub> | German right double quote                  |

|                  |                                                                                                                                                |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 52 <sub>8</sub>  | Single "guillemet" left quote—NOT "less than" (0 <sub>8</sub>   74 <sub>8</sub> )                                                              |
| 53 <sub>8</sub>  | Single "guillemet" right quote—NOT "greater than" (0 <sub>8</sub>   76 <sub>8</sub> )                                                          |
| 54 <sub>8</sub>  | En quad                                                                                                                                        |
| 55 <sub>8</sub>  | Em quad                                                                                                                                        |
| 56 <sub>8</sub>  | Figure space = numeric space (normally nonprinting)                                                                                            |
| 57 <sub>8</sub>  | Thin space = 5-em space (normally nonprinting)                                                                                                 |
| 60 <sub>8</sub>  | Dagger                                                                                                                                         |
| 61 <sub>8</sub>  | Double dagger                                                                                                                                  |
| 62 <sub>8</sub>  | Bra                                                                                                                                            |
| 63 <sub>8</sub>  | Ket                                                                                                                                            |
| 64 <sub>8</sub>  | Right-pointing index                                                                                                                           |
| 65 <sub>8</sub>  | Left-pointing index                                                                                                                            |
| 66 <sub>8</sub>  | Left perpendicular (perp)                                                                                                                      |
| 67 <sub>8</sub>  | Right perpendicular (perp)                                                                                                                     |
| 70 <sub>8</sub>  | Left 2 perpendicular (perp)                                                                                                                    |
| 71 <sub>8</sub>  | Right 2 perpendicular (perp)                                                                                                                   |
| 72 <sub>8</sub>  | Left white lenticular bracket (Chinese)                                                                                                        |
| 73 <sub>8</sub>  | Right white lenticular bracket (Chinese)                                                                                                       |
| 74 <sub>8</sub>  | NorthWest arrow                                                                                                                                |
| 75 <sub>8</sub>  | SouthEast arrow                                                                                                                                |
| 76 <sub>8</sub>  | NorthEast arrow                                                                                                                                |
| 77 <sub>8</sub>  | SouthWest arrow                                                                                                                                |
| 100 <sub>8</sub> | Care of                                                                                                                                        |
| 101 <sub>8</sub> | Per thousand = per mil                                                                                                                         |
| 102 <sub>8</sub> | Much less than—NOT left guillemet (0 <sub>8</sub>   253 <sub>8</sub> )                                                                         |
| 103 <sub>8</sub> | Much greater than—NOT right guillemet (0 <sub>8</sub>   273 <sub>8</sub> )                                                                     |
| 104 <sub>8</sub> | Not less than                                                                                                                                  |
| 105 <sub>8</sub> | Not greater than                                                                                                                               |
| 106 <sub>8</sub> | Divides—NOT vertical bar (0 <sub>8</sub>   174 <sub>8</sub> )                                                                                  |
| 107 <sub>8</sub> | Does not divide                                                                                                                                |
| 110 <sub>8</sub> | Double slash = parallel sign, type 2                                                                                                           |
| 111 <sub>8</sub> | Not parallel                                                                                                                                   |
| 112 <sub>8</sub> | Is a member of—NOT Greek "epsilon" (46 <sub>8</sub>   146 <sub>8</sub> )                                                                       |
| 113 <sub>8</sub> | Is not a member of                                                                                                                             |
| 114 <sub>8</sub> | Such that, type 1 = contains as a member                                                                                                       |
| 115 <sub>8</sub> | Double back arrow = is implied by                                                                                                              |
| 116 <sub>8</sub> | Double double arrow = iff                                                                                                                      |
| 117 <sub>8</sub> | Double right arrow = implies                                                                                                                   |
| 120 <sub>8</sub> | Reversible reaction, type 2                                                                                                                    |
| 121 <sub>8</sub> | Reversible reaction, type 1 = electric current                                                                                                 |
| 122 <sub>8</sub> | Double arrow                                                                                                                                   |
| 123 <sub>8</sub> | Curly arrow                                                                                                                                    |
| 124 <sub>8</sub> | Contains, type 1 [A contains every element of B, but A does not equal B]                                                                       |
| 125 <sub>8</sub> | Contained in, type 1 [Every element of B belongs to A, but B is not equal to A]                                                                |
| 126 <sub>8</sub> | Intersection [The set of all elements which belong to both A and B]<br>Also: Product of intersection of classes (math logic) or sets (algebra) |
| 127 <sub>8</sub> | Union [The set of all elements which belong to A or to B or to A and B]<br>= sum or union of classes (math logic) or sets (algebra)            |
| 130 <sub>8</sub> | "Contains or equals" [A contains every element of B]                                                                                           |
| 131 <sub>8</sub> | "Contained in or equals" [Every element of B belongs to A]<br>Also: Identity or inclusion in the set                                           |

|                  |                                                                                                                                                                                                                                                                                   |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 132 <sub>g</sub> | Properly includes in set [A contains every element of B, but A does not equal B] = contains, type 2 (This meaning is (357 <sub>g</sub>   130 <sub>g</sub> ) and requires use of (357 <sub>g</sub>   124 <sub>g</sub> ) to indicate A does not equal B, per ISO 31/X1-1978.)       |
| 133 <sub>g</sub> | Proper inclusion in set [Every element of B belongs to A, but B is not equal to A] = Contained in, type 2 (This meaning is (357 <sub>g</sub>   131 <sub>g</sub> ) and requires use of (357 <sub>g</sub>   125 <sub>g</sub> ) to indicate B does not equal A, per ISO 31/X1-1978.) |
| 134 <sub>g</sub> | Neither contains nor is equal to (A does not include C as a subset)<br>Also: (Does not contain as a subset)                                                                                                                                                                       |
| 135 <sub>g</sub> | Neither contained in nor is equal to                                                                                                                                                                                                                                              |
| 136 <sub>g</sub> | Does not contain = does not properly include in set                                                                                                                                                                                                                               |
| 137 <sub>g</sub> | Is not contained in = non-proper inclusion in set                                                                                                                                                                                                                                 |
| 140 <sub>g</sub> | Checked ballot box                                                                                                                                                                                                                                                                |
| 141 <sub>g</sub> | Null set—NOT Norwegian/Danish o with slash (0 <sub>g</sub>   371 <sub>g</sub> )<br>Also: Diameter (ANSI Y14.5)                                                                                                                                                                    |
| 142 <sub>g</sub> | Abstract + = Earth = Sign of composition                                                                                                                                                                                                                                          |
| 143 <sub>g</sub> | Abstract -                                                                                                                                                                                                                                                                        |
| 144 <sub>g</sub> | Abstract x                                                                                                                                                                                                                                                                        |
| 145 <sub>g</sub> | Abstract /                                                                                                                                                                                                                                                                        |
| 146 <sub>g</sub> | Centered bullet—NOT black circle (41 <sub>g</sub>   174 <sub>g</sub> )                                                                                                                                                                                                            |
| 147 <sub>g</sub> | Centered ring—NOT white circle (41 <sub>g</sub>   173 <sub>g</sub> )                                                                                                                                                                                                              |
| 150 <sub>g</sub> | Planck's constant                                                                                                                                                                                                                                                                 |
| 151 <sub>g</sub> | Liter                                                                                                                                                                                                                                                                             |
| 152 <sub>g</sub> | Logical Not = End of line symbol                                                                                                                                                                                                                                                  |
| 153 <sub>g</sub> | Broken vertical bar                                                                                                                                                                                                                                                               |
| 154 <sub>g</sub> | Angle—NOT "less than" (0 <sub>g</sub>   74 <sub>g</sub> )<br>Also: Angularity (ANSI Y14.5)                                                                                                                                                                                        |
| 155 <sub>g</sub> | Spherical angle                                                                                                                                                                                                                                                                   |
| 156 <sub>g</sub> | "Identical"                                                                                                                                                                                                                                                                       |
| 157 <sub>g</sub> | Because                                                                                                                                                                                                                                                                           |
| 160 <sub>g</sub> | Perpendicular<br>Also: Perpendicularity (ANSI Y14.5)                                                                                                                                                                                                                              |
| 161 <sub>g</sub> | Is proportional to                                                                                                                                                                                                                                                                |
| 162 <sub>g</sub> | Identically equal = equivalent                                                                                                                                                                                                                                                    |
| 163 <sub>g</sub> | Equal by definition                                                                                                                                                                                                                                                               |
| 164 <sub>g</sub> | Questioned equality                                                                                                                                                                                                                                                               |
| 165 <sub>g</sub> | Integral                                                                                                                                                                                                                                                                          |
| 166 <sub>g</sub> | Contour integral                                                                                                                                                                                                                                                                  |
| 167 <sub>g</sub> | Asymptotically equal to = Approximately equal, type 1                                                                                                                                                                                                                             |
| 170 <sub>g</sub> | Isomorphic = congruent                                                                                                                                                                                                                                                            |
| 171 <sub>g</sub> | Asymptotic to = approximately equal, type 2                                                                                                                                                                                                                                       |
| 172 <sub>g</sub> | Summation—NOT uppercase Greek "sigma" (46 <sub>g</sub>   126 <sub>g</sub> )                                                                                                                                                                                                       |
| 173 <sub>g</sub> | Product—NOT uppercase Greek "pi" (46 <sub>g</sub>   123 <sub>g</sub> )                                                                                                                                                                                                            |
| 174 <sub>g</sub> | Radical = root                                                                                                                                                                                                                                                                    |
| 175 <sub>g</sub> | "Minus or plus"                                                                                                                                                                                                                                                                   |
| 176 <sub>g</sub> | Shade                                                                                                                                                                                                                                                                             |
| 241 <sub>g</sub> | Cruzeiro (Brazilian)                                                                                                                                                                                                                                                              |
| 242 <sub>g</sub> | Florin = Guilder (Dutch)                                                                                                                                                                                                                                                          |
| 243 <sub>g</sub> | Francs                                                                                                                                                                                                                                                                            |
| 244 <sub>g</sub> | Pesetas (Spanish)                                                                                                                                                                                                                                                                 |
| 245 <sub>g</sub> | European currency symbol                                                                                                                                                                                                                                                          |
| 246 <sub>g</sub> | Milreis = Escudo (Portuguese)                                                                                                                                                                                                                                                     |
| 247 <sub>g</sub> | Generic Infinity Sign—NOT Hebrew aleph                                                                                                                                                                                                                                            |
| 250 <sub>g</sub> | Number                                                                                                                                                                                                                                                                            |
| 251 <sub>g</sub> | Take                                                                                                                                                                                                                                                                              |

|                  |                                                          |
|------------------|----------------------------------------------------------|
| 252 <sub>8</sub> | TEL (telephone)                                          |
| 253 <sub>8</sub> | Yogh (Old English) = dram = IPA "zh" sound               |
| 254 <sub>8</sub> | Complex number                                           |
| 255 <sub>8</sub> | Natural number                                           |
| 256 <sub>8</sub> | Real number = reluctance                                 |
| 257 <sub>8</sub> | Integer                                                  |
| 260 <sub>8</sub> | Left ceiling                                             |
| 261 <sub>8</sub> | Right ceiling                                            |
| 262 <sub>8</sub> | Left floor                                               |
| 263 <sub>8</sub> | Right floor                                              |
| 264 <sub>8</sub> | There exists                                             |
| 265 <sub>8</sub> | For all                                                  |
| 266 <sub>8</sub> | And                                                      |
| 267 <sub>8</sub> | Or                                                       |
| 270 <sub>8</sub> | QED                                                      |
| 271 <sub>8</sub> | Nabla = del = differential operator                      |
| 272 <sub>8</sub> | Partial derivative                                       |
| 273 <sub>8</sub> | OCR hook                                                 |
| 274 <sub>8</sub> | OCR fork                                                 |
| 275 <sub>8</sub> | OCR chair                                                |
| 276 <sub>8</sub> | Alternating current                                      |
| 277 <sub>8</sub> | Double low bar (spacing character)                       |
| 300 <sub>8</sub> | Arc                                                      |
| 301 <sub>8</sub> | Fixed-pitch Roman numeral I as independent from letter I |
| ...              | ...                                                      |
| 312 <sub>8</sub> | Fixed-pitch Roman numeral X as independent from letter X |
| 313 <sub>8</sub> | Solid or black spades                                    |
| 314 <sub>8</sub> | Open hearts                                              |
| 315 <sub>8</sub> | Open or white diamonds                                   |
| 316 <sub>8</sub> | Solid or black clubs                                     |
| 317 <sub>8</sub> | Check mark = yes                                         |
| 320 <sub>8</sub> | X mark = no                                              |
| 321 <sub>8</sub> | Circled number 1                                         |
| ...              | ...                                                      |
| 332 <sub>8</sub> | Circled number 10                                        |
| 333 <sub>8</sub> | Circled East (right) arrow                               |
| 334 <sub>8</sub> | Circled East-then-South (right-then-down) arrow          |
| 335 <sub>8</sub> | Circled South-then-West (down-then-left) arrow           |
| 336 <sub>8</sub> | Peace symbol                                             |
| 337 <sub>8</sub> | Smile face = "have a nice day!"                          |
| 340 <sub>8</sub> | Skull & crossbones                                       |
| 341 <sub>8</sub> | Thick vertical line                                      |
| 342 <sub>8</sub> | Thick horizontal line                                    |
| 343 <sub>8</sub> | Thick intersecting lines                                 |
| 344 <sub>8</sub> | Thin vertical line = Center box bar verticle             |
| 345 <sub>8</sub> | Thin horizontal line = Center box bar horizontal         |
| 346 <sub>8</sub> | Thin intersecting lines = Box intersection               |
| 347 <sub>8</sub> | Sun = abstract multiplication                            |
| 350 <sub>8</sub> | First quarter moon                                       |
| 351 <sub>8</sub> | Third quarter moon                                       |
| 352 <sub>8</sub> | Mercury                                                  |
| 353 <sub>8</sub> | Jupiter                                                  |
| 354 <sub>8</sub> | Saturn                                                   |
| 355 <sub>8</sub> | Uranus                                                   |

|                  |                                              |
|------------------|----------------------------------------------|
| 356 <sub>8</sub> | Neptune                                      |
| 357 <sub>8</sub> | Pluto                                        |
| 360 <sub>8</sub> | Aquarius                                     |
| 361 <sub>8</sub> | Pisces                                       |
| 362 <sub>8</sub> | Aries                                        |
| 363 <sub>8</sub> | Taurus                                       |
| 364 <sub>8</sub> | Gemini                                       |
| 365 <sub>8</sub> | Cancer                                       |
| 366 <sub>8</sub> | Leo                                          |
| 367 <sub>8</sub> | Virgo                                        |
| 370 <sub>8</sub> | Libra                                        |
| 371 <sub>8</sub> | Scorpius = minim                             |
| 372 <sub>8</sub> | Sagittarius                                  |
| 373 <sub>8</sub> | Capricorn                                    |
| 374 <sub>8</sub> | Telephone symbol                             |
| 375 <sub>8</sub> | Fraction one third as independent character  |
| 376 <sub>8</sub> | Fraction two thirds as independent character |

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### 4.1 Rendering character codes

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Recall from section 1.2 that the standard assigns codes to rendering characters, a character other than a graphic character or control character, which can include any of the following:

- a non-conventional representation of a control code
- a sequence of graphic characters, i.e., ligature or accented character
- a contextually-dependent alternate representation for a graphic character, i.e., initial, medial, or final form for an alphabet such as Arabic
- a "variant" representation for a graphic character, e.g., the rendering character  $\bar{A}$  instead of the graphic character A

Recall further that rendering entities which may be associated with text characters (e.g., logos, signatures, etc.) are not addressed in this document, but that a portion of the rendering code space is reserved for private use for this purpose. The intent is to enable the incorporation of logos, signatures, and specialized graphics within strings destined for printers.

Given that there are several classes of rendering characters, it is important that rendering entities be defined as precisely as possible. Most important are those rendering character codes which can be algorithmically substituted for graphic character codes. In this standard, rendering characters and their numerical codes are defined to be *A single character or collection of characters which can be algorithmically substituted for a graphic character, or characters, to alter the displayed or printed appearance of the normal graphic character, or graphic characters, in conformance with predetermined typographic, linguistic, or formatting rules.*

The definition of rendering character includes "variant" representations for a graphic character; however, some "variant" representations for a graphic character are excluded by the formal definition of a rendering character. An example of a "variant" that fails to qualify as a rendering character is the *non-general "look"* known as Swash. There is no consistency among typeface suppliers as to what graphic characters may have the Swash appearance. As a consequence, automatic substitution cannot be successfully accomplished.

In the case of the non-general "look" known as Old Style, selected entities qualify as rendering character candidates. Old Style includes certain numerals which, when used within text, improves readability; however, they are not recommended when figures appear in tables. Since there is universal agreement on which numerals may have the Old Style "look," these numerals qualify as rendering characters—the key phrase in the definition of a rendering character is *algorithmically substituted*.

The goal of formal definition is to allow for automatic substitution where necessary and specification by formatters when desired.

## 4.2 Rendering entity code space

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### 4.2.1 Rendering characters

---

Rendering character codes can always be distinguished from graphic character codes, as the high order byte is always larger than the higher order byte for graphic character codes. Rendering Code Sets 360<sub>8</sub> through 375<sub>8</sub> are reserved for rendering characters as defined in section 4.1. Using this definition, the codespace allocation is primarily for ligatures and accented characters. A reasonable estimate of future assignments is as follows: Arabic - 450, Devanagari - 300, Korean - 400, Roman - 350, and other languages - approximately 500. For other classes of renderings, requirements are less than 200 for each category.

### 4.2.2 Private use rendering entities

---

The Rendering Code Set 376<sub>8</sub> is unique in that entities assigned to this set do not satisfy the definition of a rendering code. The assignment within this character set of logos, signatures, and certain "variant" representations, those having non-general "looks," is for local use. As such, the communicant is responsible for administration and utilization of this code space.

There is no reason to assume that entities in this character set on a given printer or display will match, in any way, with entities on another printer or display for identical codes. The intent is to allow for code assignments that are unique to a device. This permits clients to conveniently incorporate specialized or non-standard entities within their systems or printers.

Entities assigned within the private use codespace cannot be used in some forms of communication interchange. See Section 1.3, Utilization, for communication of non-rendering character codes.

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## 4.3 The rendering character code sets

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For us to talk about one rendering character as distinct from another, we can refer to it by its traditional name(s), by its role(s) in a traditional alphabet or symbol system, or by the context(s) in which it is traditionally used. This collection of traditional usage information which identifies the rendering character can be referred to in brief as its *semantic*.

To indicate a rendering, it also helps to show a picture of it. In some cases, however, this can be misleading, since different renderings can look very similar or even identical. In the listing which follows, sometimes a picture is shown; but, it is the *semantic* information which takes precedence in defining the identity of the rendering character.

In some cases, we go so far as to specify what the rendering character is **NOT**, in order to distinguish it from other rendering characters which look similar or identical. In other cases, we use an "=" sign to indicate either synonymous names or alternative applications for the same Xerox character.

We use a notation such as (360<sub>8</sub> | 45<sub>8</sub>) to depict the two-byte structure of a rendering character code. For example, (360<sub>8</sub> | 45<sub>8</sub>) refers to the rendering character in Character Set 360<sub>8</sub>, which has the 8-bit code 45<sub>8</sub> within that character set.

### 4.3.1 Character Set 360<sub>8</sub>: ligatures and field format symbols

The rendering codes (low-order byte) *within* Character Set 360<sub>8</sub> (see reference chart in appendix B):

|                  |                                                                                                                                                                                         |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 41 <sub>8</sub>  | Ligature ff                                                                                                                                                                             |
| 42 <sub>8</sub>  | Ligature ffi                                                                                                                                                                            |
| 43 <sub>8</sub>  | Ligature ffl                                                                                                                                                                            |
| 44 <sub>8</sub>  | Ligature fi                                                                                                                                                                             |
| 45 <sub>8</sub>  | Ligature fl                                                                                                                                                                             |
| 46 <sub>8</sub>  | Ligature st (Quaint character)                                                                                                                                                          |
| 160 <sub>8</sub> | Fraction one quarter = Alternate rendition of sequence:<br>$\frac{1}{4}$ (0 <sub>8</sub>   61 <sub>8</sub> ) (0 <sub>8</sub>   57 <sub>8</sub> ) (0 <sub>8</sub>   64 <sub>8</sub> )    |
| 161 <sub>8</sub> | Fraction one half = Alternate rendition of sequence:<br>$\frac{1}{2}$ (0 <sub>8</sub>   61 <sub>8</sub> ) (0 <sub>8</sub>   57 <sub>8</sub> ) (0 <sub>8</sub>   62 <sub>8</sub> )       |
| 162 <sub>8</sub> | Fraction three quarters = Alternate rendition of sequence:<br>$\frac{3}{4}$ (0 <sub>8</sub>   63 <sub>8</sub> ) (0 <sub>8</sub>   57 <sub>8</sub> ) (0 <sub>8</sub>   64 <sub>8</sub> ) |
| 163 <sub>8</sub> | Fraction one third = Alternate rendition of sequence:<br>$\frac{1}{3}$ (0 <sub>8</sub>   61 <sub>8</sub> ) (0 <sub>8</sub>   57 <sub>8</sub> ) (0 <sub>8</sub>   63 <sub>8</sub> )      |
| 164 <sub>8</sub> | Fraction two thirds = Alternate rendition of sequence:<br>$\frac{2}{3}$ (0 <sub>8</sub>   62 <sub>8</sub> ) (0 <sub>8</sub>   57 <sub>8</sub> ) (0 <sub>8</sub>   63 <sub>8</sub> )     |
| 165 <sub>8</sub> | Fraction one eighth = Alternate rendition of sequence:<br>$\frac{1}{8}$ (0 <sub>8</sub>   61 <sub>8</sub> ) (0 <sub>8</sub>   57 <sub>8</sub> ) (0 <sub>8</sub>   70 <sub>8</sub> )     |
| 166 <sub>8</sub> | Fraction three eighths = Alternate rendition of sequence:<br>$\frac{3}{8}$ (0 <sub>8</sub>   63 <sub>8</sub> ) (0 <sub>8</sub>   57 <sub>8</sub> ) (0 <sub>8</sub>   70 <sub>8</sub> )  |
| 167 <sub>8</sub> | Fraction five eighths = Alternate rendition of sequence:<br>$\frac{5}{8}$ (0 <sub>8</sub>   65 <sub>8</sub> ) (0 <sub>8</sub>   57 <sub>8</sub> ) (0 <sub>8</sub>   70 <sub>8</sub> )   |
| 170 <sub>8</sub> | Fraction seven eighths = Alternate rendition of sequence:<br>$\frac{7}{8}$ (0 <sub>8</sub>   67 <sub>8</sub> ) (0 <sub>8</sub>   57 <sub>8</sub> ) (0 <sub>8</sub>   70 <sub>8</sub> )  |
| 260 <sub>8</sub> | Graphic entity representative of IBM NULL CHARACTER (NUL)                                                                                                                               |
| 261 <sub>8</sub> | Graphic Entity representative of thick space or 3-em space (356 <sub>8</sub>   41 <sub>8</sub> )                                                                                        |
| 262 <sub>8</sub> | Graphic Entity representative of 4-em space (356 <sub>8</sub>   42 <sub>8</sub> )                                                                                                       |
| 263 <sub>8</sub> | Graphic Entity representative of thin space or 5-em space (357 <sub>8</sub>   57 <sub>8</sub> )                                                                                         |
| 264 <sub>8</sub> | Graphic Entity representative of En quad (357 <sub>8</sub>   54 <sub>8</sub> )                                                                                                          |
| 265 <sub>8</sub> | Graphic Entity representative of Em quad (357 <sub>8</sub>   55 <sub>8</sub> )                                                                                                          |
| 266 <sub>8</sub> | Graphic Entity representative of punctuation space (356 <sub>8</sub>   44 <sub>8</sub> )                                                                                                |
| 267 <sub>8</sub> | Graphic Entity representative of figure or numeric space (357 <sub>8</sub>   56 <sub>8</sub> )                                                                                          |
| 270 <sub>8</sub> | Graphic entity representative of VERTICAL TABULATION                                                                                                                                    |
| 271 <sub>8</sub> | Graphic entity representative of HORIZONTAL TABULATION                                                                                                                                  |

|                  |                                                                                   |
|------------------|-----------------------------------------------------------------------------------|
| 272 <sub>8</sub> | Graphic entity representative of LINE FEED (LF), Type 1                           |
| 273 <sub>8</sub> | Graphic entity representative of FORM FEED                                        |
| 274 <sub>8</sub> | Graphic entity representative of CARRIAGE RETURN, Type 1                          |
| 275 <sub>8</sub> | Graphic entity representative of NEW LINE (NL)                                    |
| 276 <sub>8</sub> | Graphic entity representative of CARRIAGE RETURN, Type 2                          |
| 277 <sub>8</sub> | Graphic entity representative of LINE FEED, Type 2                                |
| 300 <sub>8</sub> | Graphic Entity representative of hair space (356 <sub>8</sub>   43 <sub>8</sub> ) |
| 301 <sub>8</sub> | Graphic Entity representative of TIMING CHARACTER                                 |
| 302 <sub>8</sub> | Graphic entity representative of PAGE FORMAT CHARACTER (PFC)                      |
| 303 <sub>8</sub> | Graphic entity representative of START OF DOCUMENT (SOD)                          |
| 304 <sub>8</sub> | Graphic entity representative of STOP CHARACTER                                   |
| 305 <sub>8</sub> | Graphic entity representative of GROUP ERASE (OCR-A & B)                          |
| 306 <sub>8</sub> | Graphic entity representative of CHARACTER ERASE (OCR-A & B)                      |
| 312 <sub>8</sub> | Graphic entity representative of "SUBSTITUTE" character                           |
| 313 <sub>8</sub> | Graphic entity representative of ERROR                                            |
| 314 <sub>8</sub> | Graphic entity representative of IBM DUPLICATE (DUP)                              |
| 316 <sub>8</sub> | Graphic entity representative of IBM FORMAT (FM)                                  |
| 331 <sub>8</sub> | Graphic entity representative of PARAGRAPH-TAB                                    |
| 335 <sub>8</sub> | Graphic entity representative of NEW PARAGRAPH (NP)                               |
| 341 <sub>8</sub> | Graphic for Field Format: Match special character                                 |
| ...              | ...                                                                               |
| 357 <sub>8</sub> | Graphic for Field Format: Match special character                                 |
| 366 <sub>8</sub> | Graphic for Field Format: Any Greek Letter                                        |
| 367 <sub>8</sub> | Graphic for Field Format: Any Russian Letter                                      |
| 370 <sub>8</sub> | Graphic for Field Format: Any Hiragana character                                  |
| 371 <sub>8</sub> | Graphic for Field Format: Any Katakana character                                  |
| 372 <sub>8</sub> | Graphic for Field Format: Any Kanji character                                     |
| 373 <sub>8</sub> | Graphic for Field Format: Any Japanese character                                  |
| 374 <sub>8</sub> | Graphic entity representative of Space, Type 1                                    |
| 375 <sub>8</sub> | Graphic entity representative of Space, Type 2                                    |
| 376 <sub>8</sub> | Graphical Entity representative of Space, Type 3                                  |

#### 4.3.2 Character Set 361<sub>8</sub>: accented Latin characters

The character codes (low-order byte) *within* Character Set 361<sub>8</sub> (see reference chart in appendix B):

|                 |                        |
|-----------------|------------------------|
| 41 <sub>8</sub> | Grave A                |
| 42 <sub>8</sub> | Acute A                |
| 43 <sub>8</sub> | Circumflex A           |
| 44 <sub>8</sub> | Tilde A                |
| 45 <sub>8</sub> | Macron A               |
| 46 <sub>8</sub> | Breve A                |
| 47 <sub>8</sub> | Diaeresis A = umlaut A |
| 50 <sub>8</sub> | Ring A = angstrom A    |
| 51 <sub>8</sub> | Ogonek A               |
| 52 <sub>8</sub> | Acute C                |
| 53 <sub>8</sub> | Circumflex C           |
| 54 <sub>8</sub> | High dot C             |
| 55 <sub>8</sub> | Cedilla C              |
| 56 <sub>8</sub> | Hachek C = caron C     |
| 57 <sub>8</sub> | Hachek D = caron D     |

|                  |                        |
|------------------|------------------------|
| 60 <sub>8</sub>  | Grave E                |
| 61 <sub>8</sub>  | Acute E                |
| 62 <sub>8</sub>  | Circumflex E           |
| 63 <sub>8</sub>  | Macron E               |
| 64 <sub>8</sub>  | High dot E             |
| 65 <sub>8</sub>  | Diaeresis E = umlaut E |
| 66 <sub>8</sub>  | Ogonek E               |
| 67 <sub>8</sub>  | Hachek E = caron E     |
| 70 <sub>8</sub>  | Acute G                |
| 71 <sub>8</sub>  | Circumflex G           |
| 72 <sub>8</sub>  | Breve G                |
| 73 <sub>8</sub>  | High dot G             |
| 74 <sub>8</sub>  | Cedilla G              |
| 75 <sub>8</sub>  | Circumflex H           |
| 76 <sub>8</sub>  | Grave I                |
| 77 <sub>8</sub>  | Acute I                |
| 100 <sub>8</sub> | Circumflex I           |
| 101 <sub>8</sub> | Tilde I                |
| 102 <sub>8</sub> | Macron I               |
| 103 <sub>8</sub> | High dot I             |
| 104 <sub>8</sub> | Diaeresis I = umlaut I |
| 105 <sub>8</sub> | Ogonek I               |
| 106 <sub>8</sub> | Circumflex J           |
| 107 <sub>8</sub> | Cedilla K              |
| 110 <sub>8</sub> | Acute L                |
| 111 <sub>8</sub> | Cedilla L              |
| 112 <sub>8</sub> | Hachek L = caron L     |
| 113 <sub>8</sub> | Acute N                |
| 114 <sub>8</sub> | Tilde N                |
| 115 <sub>8</sub> | Cedilla N              |
| 116 <sub>8</sub> | Hachek N = caron N     |
| 117 <sub>8</sub> | Grave O                |
| 120 <sub>8</sub> | Acute O                |
| 121 <sub>8</sub> | Circumflex O           |
| 122 <sub>8</sub> | Tilde O                |
| 123 <sub>8</sub> | Macron O               |
| 124 <sub>8</sub> | Diaeresis O = umlaut O |
| 125 <sub>8</sub> | Double acute O         |
| 126 <sub>8</sub> | Acute R                |
| 127 <sub>8</sub> | Cedilla R              |
| 130 <sub>8</sub> | Hachek R = caron R     |
| 131 <sub>8</sub> | Acute S                |
| 132 <sub>8</sub> | Circumflex S           |
| 133 <sub>8</sub> | Cedilla S              |
| 134 <sub>8</sub> | Hachek S = caron S     |
| 135 <sub>8</sub> | Cedilla T              |
| 136 <sub>8</sub> | Hachek T = caron T     |
| 137 <sub>8</sub> | Grave U                |
| 140 <sub>8</sub> | Acute U                |
| 141 <sub>8</sub> | Circumflex U           |
| 142 <sub>8</sub> | Tilde U                |
| 143 <sub>8</sub> | Macron U               |
| 144 <sub>8</sub> | Breve U                |
| 145 <sub>8</sub> | Diaeresis U = umlaut U |

|                  |                                                                 |
|------------------|-----------------------------------------------------------------|
| 146 <sub>8</sub> | Ring U                                                          |
| 147 <sub>8</sub> | Double acute U                                                  |
| 150 <sub>8</sub> | Ogonek U                                                        |
| 151 <sub>8</sub> | Circumflex W                                                    |
| 152 <sub>8</sub> | Grave Y                                                         |
| 153 <sub>8</sub> | Acute Y                                                         |
| 154 <sub>8</sub> | Circumflex Y                                                    |
| 155 <sub>8</sub> | Diaeresis Y = umlaut Y                                          |
| 156 <sub>8</sub> | Acute Z                                                         |
| 157 <sub>8</sub> | High dot Z                                                      |
| 160 <sub>8</sub> | Hachek Z = caron Z                                              |
| 161 <sub>8</sub> | Alternate rendition of Char8Code 112B in this charset, Hachek L |
| 241 <sub>8</sub> | Grave a                                                         |
| 242 <sub>8</sub> | Acute a                                                         |
| 243 <sub>8</sub> | Circumflex a                                                    |
| 244 <sub>8</sub> | Tilde a                                                         |
| 245 <sub>8</sub> | Macron a                                                        |
| 246 <sub>8</sub> | Breve a                                                         |
| 247 <sub>8</sub> | Diaeresis a = umlaut a                                          |
| 250 <sub>8</sub> | Ring a                                                          |
| 251 <sub>8</sub> | Ogonek a                                                        |
| 252 <sub>8</sub> | Acute c                                                         |
| 253 <sub>8</sub> | Circumflex c                                                    |
| 254 <sub>8</sub> | High dot c                                                      |
| 255 <sub>8</sub> | Cedilla c                                                       |
| 256 <sub>8</sub> | Hachek c = caron c                                              |
| 257 <sub>8</sub> | Hachek d = caron d                                              |
| 260 <sub>8</sub> | Grave e                                                         |
| 261 <sub>8</sub> | Acute e                                                         |
| 262 <sub>8</sub> | Circumflex e                                                    |
| 263 <sub>8</sub> | Macron e                                                        |
| 264 <sub>8</sub> | High dot e                                                      |
| 265 <sub>8</sub> | Diaeresis e = umlaut e                                          |
| 266 <sub>8</sub> | Ogonek e                                                        |
| 267 <sub>8</sub> | Hachek e = caron e                                              |
| 270 <sub>8</sub> | Acute g                                                         |
| 271 <sub>8</sub> | Circumflex g                                                    |
| 272 <sub>8</sub> | Breve g                                                         |
| 273 <sub>8</sub> | High dot g                                                      |
| 274 <sub>8</sub> | Cedilla g                                                       |
| 275 <sub>8</sub> | Circumflex h                                                    |
| 276 <sub>8</sub> | Grave i                                                         |
| 277 <sub>8</sub> | Acute i                                                         |
| 300 <sub>8</sub> | Circumflex i                                                    |
| 301 <sub>8</sub> | Tilde i                                                         |
| 302 <sub>8</sub> | Macron i                                                        |
| 304 <sub>8</sub> | Diaeresis i = umlaut i                                          |
| 305 <sub>8</sub> | Ogonek i                                                        |
| 306 <sub>8</sub> | Circumflex j                                                    |
| 307 <sub>8</sub> | Cedilla k                                                       |
| 310 <sub>8</sub> | Acute l                                                         |
| 311 <sub>8</sub> | Cedilla l                                                       |
| 312 <sub>8</sub> | Hachek l = caron l                                              |
| 313 <sub>8</sub> | Acute n                                                         |

|                  |                                                                 |
|------------------|-----------------------------------------------------------------|
| 314 <sub>8</sub> | Tilde n                                                         |
| 315 <sub>8</sub> | Cedilla n                                                       |
| 316 <sub>8</sub> | Hachek n = caron n                                              |
| 317 <sub>8</sub> | Grave o                                                         |
| 320 <sub>8</sub> | Acute o                                                         |
| 321 <sub>8</sub> | Circumflex o                                                    |
| 322 <sub>8</sub> | Tilde o                                                         |
| 323 <sub>8</sub> | Macron o                                                        |
| 324 <sub>8</sub> | Diaeresis o = umlaut o                                          |
| 325 <sub>8</sub> | Double acute o                                                  |
| 326 <sub>8</sub> | Acute r                                                         |
| 327 <sub>8</sub> | Cedilla r                                                       |
| 330 <sub>8</sub> | Hachek r = caron r                                              |
| 331 <sub>8</sub> | Acute s                                                         |
| 332 <sub>8</sub> | Circumflex s                                                    |
| 333 <sub>8</sub> | Cedilla s                                                       |
| 334 <sub>8</sub> | Hachek s = caron s                                              |
| 335 <sub>8</sub> | Cedilla t                                                       |
| 336 <sub>8</sub> | Hachek t = caron t                                              |
| 337 <sub>8</sub> | Grave u                                                         |
| 340 <sub>8</sub> | Acute u                                                         |
| 341 <sub>8</sub> | Circumflex u                                                    |
| 342 <sub>8</sub> | Tilde u                                                         |
| 343 <sub>8</sub> | Macron u                                                        |
| 344 <sub>8</sub> | Breve u                                                         |
| 345 <sub>8</sub> | Diaeresis u = umlaut u                                          |
| 346 <sub>8</sub> | Ring u                                                          |
| 347 <sub>8</sub> | Double acute u                                                  |
| 350 <sub>8</sub> | Ogonek u                                                        |
| 351 <sub>8</sub> | Circumflex w                                                    |
| 352 <sub>8</sub> | Grave y                                                         |
| 353 <sub>8</sub> | Acute y                                                         |
| 354 <sub>8</sub> | Circumflex y                                                    |
| 355 <sub>8</sub> | Diaeresis y = umlaut y                                          |
| 356 <sub>8</sub> | Acute z                                                         |
| 357 <sub>8</sub> | High dot z                                                      |
| 360 <sub>8</sub> | Hachek z = caron z                                              |
| 361 <sub>8</sub> | Alternate rendition of Char8Code 312B in this charset, Hachek l |
| 362 <sub>8</sub> | Alternate rendition of Char8Code 336B in this charset, Hachek t |
| 363 <sub>8</sub> | Alternate rendition of Char8Code 257B in this charset, Hachek d |

#### 4.3.3 Character Set 365<sub>8</sub>: initial, medial, and final Arabic characters

The character codes (low-order byte) within Character Set 365<sub>8</sub> (see reference chart in appendix B):

|                 |                            |
|-----------------|----------------------------|
| 41 <sub>8</sub> | Final Alef with Maddah     |
| 42 <sub>8</sub> | Final Alef with high Hamza |
| 43 <sub>8</sub> | Final Waw with Hamza       |
| 44 <sub>8</sub> | Final Alef with low Hamza  |
| 45 <sub>8</sub> | Initial seat with Hamza    |
| 46 <sub>8</sub> | Medial seat with Hamza     |

|                  |                       |
|------------------|-----------------------|
| 47 <sub>8</sub>  | Final seat with Hamza |
| 50 <sub>8</sub>  | Final Alef            |
| 51 <sub>8</sub>  | Initial BA'           |
| 52 <sub>8</sub>  | Medial BA'            |
| 53 <sub>8</sub>  | Final BA'             |
| 54 <sub>8</sub>  | Final Ta'a Marbuta    |
| 55 <sub>8</sub>  | Initial TA'           |
| 56 <sub>8</sub>  | Medial TA'            |
| 57 <sub>8</sub>  | Final TA'             |
| 60 <sub>8</sub>  | Initial THA'          |
| 61 <sub>8</sub>  | Medial THA'           |
| 62 <sub>8</sub>  | Final THA'            |
| 63 <sub>8</sub>  | Initial JEEM          |
| 64 <sub>8</sub>  | Medial JEEM           |
| 65 <sub>8</sub>  | Final JEEM            |
| 66 <sub>8</sub>  | Initial HA'           |
| 67 <sub>8</sub>  | Medial HA'            |
| 70 <sub>8</sub>  | Final HA'             |
| 71 <sub>8</sub>  | Initial KHA'          |
| 72 <sub>8</sub>  | Medial KHA'           |
| 73 <sub>8</sub>  | Final KHA'            |
| 74 <sub>8</sub>  | Final DAL             |
| 75 <sub>8</sub>  | Final THAL            |
| 76 <sub>8</sub>  | Final RA              |
| 77 <sub>8</sub>  | Final ZAIN            |
| 100 <sub>8</sub> | Initial SEEN          |
| 101 <sub>8</sub> | Medial SEEN           |
| 102 <sub>8</sub> | Final SEEN            |
| 103 <sub>8</sub> | Initial SHEEN         |
| 104 <sub>8</sub> | Medial SHEEN          |
| 105 <sub>8</sub> | Final SHEEN           |
| 106 <sub>8</sub> | Initial SAD           |
| 107 <sub>8</sub> | Medial SAD            |
| 110 <sub>8</sub> | Final SAD             |
| 111 <sub>8</sub> | Initial DAD           |
| 112 <sub>8</sub> | Medial DAD            |
| 113 <sub>8</sub> | Final DAD             |
| 114 <sub>8</sub> | Initial TAH           |
| 115 <sub>8</sub> | Medial TAH            |
| 116 <sub>8</sub> | Final TAH             |
| 117 <sub>8</sub> | Initial DHAH          |
| 120 <sub>8</sub> | Medial DHAH           |
| 121 <sub>8</sub> | Final DHAH            |
| 122 <sub>8</sub> | Initial AIN           |
| 123 <sub>8</sub> | Medial AIN            |
| 124 <sub>8</sub> | Final AIN             |
| 125 <sub>8</sub> | Initial GHAIN         |
| 126 <sub>8</sub> | Medial GHAIN          |
| 127 <sub>8</sub> | Final GHAIN           |
| 130 <sub>8</sub> | Initial FA'           |
| 131 <sub>8</sub> | Medial FA'            |
| 132 <sub>8</sub> | Final FA'             |
| 133 <sub>8</sub> | Initial QAF           |
| 134 <sub>8</sub> | Medial QAF            |

|                  |                                            |
|------------------|--------------------------------------------|
| 135 <sub>8</sub> | Final QAF                                  |
| 136 <sub>8</sub> | Initial CAF                                |
| 137 <sub>8</sub> | Medial CAF                                 |
| 140 <sub>8</sub> | Final CAF                                  |
| 141 <sub>8</sub> | Initial LAM                                |
| 142 <sub>8</sub> | Medial LAM                                 |
| 143 <sub>8</sub> | Final LAM                                  |
| 144 <sub>8</sub> | Initial MEEM                               |
| 145 <sub>8</sub> | Medial MEEM                                |
| 146 <sub>8</sub> | Final MEEM                                 |
| 147 <sub>8</sub> | Initial NOON                               |
| 150 <sub>8</sub> | Medial NOON                                |
| 151 <sub>8</sub> | Final NOON                                 |
| 152 <sub>8</sub> | Initial HA                                 |
| 153 <sub>8</sub> | Medial HA                                  |
| 154 <sub>8</sub> | Final HA                                   |
| 155 <sub>8</sub> | Final WAW                                  |
| 156 <sub>8</sub> | Final Alef-maqsura                         |
| 157 <sub>8</sub> | Initial YA                                 |
| 160 <sub>8</sub> | Medial YA                                  |
| 161 <sub>8</sub> | Final YA                                   |
| 162 <sub>8</sub> | Ligature Lam + Alef with Maddah            |
| 163 <sub>8</sub> | Final ligature Lam + Alef with Maddah      |
| 164 <sub>8</sub> | Ligature Lam + Alef with high Hamzah       |
| 165 <sub>8</sub> | Final ligature Lam + Alef with high Hamzah |
| 166 <sub>8</sub> | Ligature Lam + Alef with low Hamzah        |
| 167 <sub>8</sub> | Final ligature Lam + Alef with low Hamzah  |
| 170 <sub>8</sub> | Ligature Lam + Alef                        |
| 171 <sub>8</sub> | Final ligature Lam + Alef                  |
| 172 <sub>8</sub> | Variant form of numeral 4 (Urdu)           |
| 173 <sub>8</sub> | Variant form of numeral 4 (Farsi)          |
| 174 <sub>8</sub> | Variant form of numeral 5 (Farsi and Urdu) |
| 175 <sub>8</sub> | Variant form of numeral 6 (Farsi and Urdu) |
| 176 <sub>8</sub> | Variant form of numeral 7 (Urdu)           |

#### 4.3.4 Character Set 375<sub>8</sub>: variant representations for graphic characters

The character codes (low-order byte) within Character Set 375<sub>8</sub> (see reference chart in appendix B):

|                  |                                                                                             |
|------------------|---------------------------------------------------------------------------------------------|
| 54 <sub>8</sub>  | Alternate rendition of "thousandseparating delimiter" (356 <sub>8</sub>   54 <sub>8</sub> ) |
| 56 <sub>8</sub>  | Alternate rendition of "decimal point = radix point" (356 <sub>8</sub>   56 <sub>8</sub> )  |
| 174 <sub>8</sub> | Alternate rendition of "radical = root" (357 <sub>8</sub>   174 <sub>8</sub> )              |
| 175 <sub>8</sub> | Alternate rendition of Greek "small letter alpha" (46 <sub>8</sub>   141 <sub>8</sub> )     |
| 176 <sub>8</sub> | Alternate rendition of "similar to = equivalent to" (356 <sub>8</sub>   176 <sub>8</sub> )  |
| 241 <sub>8</sub> | Superscript a = Alternate rendition of "letter a" (0 <sub>8</sub>   141 <sub>8</sub> )      |
| 242 <sub>8</sub> | Superscript e = Alternate rendition of "letter e" (0 <sub>8</sub>   145 <sub>8</sub> )      |
| 243 <sub>8</sub> | Superscript l = Alternate rendition of "letter l" (0 <sub>8</sub>   154 <sub>8</sub> )      |
| 244 <sub>8</sub> | Superscript m = Alternate rendition of "letter m" (0 <sub>8</sub>   155 <sub>8</sub> )      |
| 245 <sub>8</sub> | Superscript o = Alternate rendition of "letter o" (0 <sub>8</sub>   157 <sub>8</sub> )      |
| 246 <sub>8</sub> | Superscript r = Alternate rendition of "letter r" (0 <sub>8</sub>   162 <sub>8</sub> )      |
| 247 <sub>8</sub> | Superscript s = Alternate rendition of "letter s" (0 <sub>8</sub>   163 <sub>8</sub> )      |

|                    |                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| 250 <sub>g</sub>   | Superscript n = Alternate rendition of "letter n" (0 <sub>g</sub>   156 <sub>g</sub> )                                                     |
| 251 <sub>g</sub>   | Alternate rendition of "left single quote" (0 <sub>g</sub>   251 <sub>g</sub> )                                                            |
| 252 <sub>g</sub>   | Alternate rendition of "left double quote" (0 <sub>g</sub>   252 <sub>g</sub> )                                                            |
| 257 <sub>g</sub>   | Fraction bar = Alternate rendition of "slant = slash" (0 <sub>g</sub>   57 <sub>g</sub> )                                                  |
| 260 <sub>g</sub>   | Superscript 0 = Alternate rendition of "digit 0" (0 <sub>g</sub>   60 <sub>g</sub> )                                                       |
| ...                | ...                                                                                                                                        |
| 271 <sub>g</sub>   | Superscript 9 = Alternate rendition of "digit 9" (0 <sub>g</sub>   71 <sub>g</sub> )                                                       |
| 272 <sub>g</sub>   | Superscript decimal point = Alternate rendition of "decimal point" (356 <sub>g</sub>   56 <sub>g</sub> )                                   |
| 273 <sub>g</sub>   | Superscript thousands separating delimiter = Alternate rendition of "thousands separating delimiter" (356 <sub>g</sub>   54 <sub>g</sub> ) |
| 274 <sub>g</sub>   | Superscript opening parenthesis = Alternate rendition of "opening parenthesis" (0 <sub>g</sub>   50 <sub>g</sub> )                         |
| 275 <sub>g</sub>   | Superscript closing parenthesis = Alternate rendition of "closing parenthesis" (0 <sub>g</sub>   51 <sub>g</sub> )                         |
| 276 <sub>g</sub>   | Superscript plus sign = Alternate rendition of "plus sign" (0 <sub>g</sub>   53 <sub>g</sub> )                                             |
| 277 <sub>g</sub>   | Superscript minus sign = Alternate rendition of "minus sign" (356 <sub>g</sub>   55 <sub>g</sub> )                                         |
| 301 <sub>g</sub> * | Alternate rendition of "grave accent" (0 <sub>g</sub>   301 <sub>g</sub> )                                                                 |
| 302 <sub>g</sub> * | Alternate rendition of "acute accent" (0 <sub>g</sub>   302 <sub>g</sub> )                                                                 |
| 303 <sub>g</sub> * | Alternate rendition of "circumflex accent" (0 <sub>g</sub>   303 <sub>g</sub> )                                                            |
| 304 <sub>g</sub> * | Alternate rendition of "tilde accent" (0 <sub>g</sub>   304 <sub>g</sub> )                                                                 |
| 305 <sub>g</sub> * | Alternate rendition of "macron accent" (0 <sub>g</sub>   305 <sub>g</sub> )                                                                |
| 306 <sub>g</sub> * | Alternate rendition of "breve accent" (0 <sub>g</sub>   306 <sub>g</sub> )                                                                 |
| 307 <sub>g</sub> * | Alternate rendition of "over-dot accent" (0 <sub>g</sub>   307 <sub>g</sub> )                                                              |
| 310 <sub>g</sub> * | Alternate rendition of "dieresis accent" (0 <sub>g</sub>   310 <sub>g</sub> )                                                              |
| 312 <sub>g</sub> * | Alternate rendition of "over-ring accent" (0 <sub>g</sub>   312 <sub>g</sub> )                                                             |
| 313 <sub>g</sub> * | Alternate rendition of "cedilla undermark" (0 <sub>g</sub>   313 <sub>g</sub> )                                                            |
| 315 <sub>g</sub> * | Alternate rendition of "double acute accent" (0 <sub>g</sub>   315 <sub>g</sub> )                                                          |
| 316 <sub>g</sub> * | Alternate rendition of "ogonek undermark" (0 <sub>g</sub>   316 <sub>g</sub> )                                                             |
| 317 <sub>g</sub> * | Alternate rendition of "hachek accent" (0 <sub>g</sub>   317 <sub>g</sub> )                                                                |
|                    | * These diacritics are non-spacing                                                                                                         |
| 320 <sub>g</sub>   | Thin horizontal line (top) = Alternate rendition of "thin horizontal line" (357 <sub>g</sub>   345 <sub>g</sub> )                          |
| 321 <sub>g</sub>   | Thin horizontal line (upper middle) = Alternate rendition of "thin horizontal line" (357 <sub>g</sub>   345 <sub>g</sub> )                 |
| 322 <sub>g</sub>   | Thin horizontal line (lower middle) = Alternate rendition of "thin horizontal line" (357 <sub>g</sub>   345 <sub>g</sub> )                 |
| 323 <sub>g</sub>   | Thin horizontal line (bottom) = Alternate rendition of "thin horizontal line" (357 <sub>g</sub>   345 <sub>g</sub> )                       |
| 324 <sub>g</sub>   | Thin vertical line (left) = Alternate rendition of "thin vertical line" (357 <sub>g</sub>   344 <sub>g</sub> )                             |
| 325 <sub>g</sub>   | Thin vertical line (right) = Alternate rendition of "thin vertical line" (357 <sub>g</sub>   344 <sub>g</sub> )                            |
| 340 <sub>g</sub>   | Subscript 0 = Alternate rendition of "digit 0" (0 <sub>g</sub>   60 <sub>g</sub> )                                                         |
| ...                | ...                                                                                                                                        |
| 351 <sub>g</sub>   | Subscript 9 = Alternate rendition of "digit 9" (0 <sub>g</sub>   71 <sub>g</sub> )                                                         |
| 352 <sub>g</sub>   | Subscript minus sign = Alternate rendition of "minus sign" (356 <sub>g</sub>   55 <sub>g</sub> )                                           |

At present, there are no control character code assignments. Additions to this section, the assignment of control characters to the reserved control code spaces, will be made in the near future.



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## 6.1 Purpose

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This document presumes that textual information is to be stored and transmitted in the form of a sequence of numerical codes. This section specifies the forms in which these sequences of numerical codes can be represented and how they are typically used to transmit fragments of text such as names and messages. These fragments are referred to as *strings*, and a *Xerox string* means a string consisting of character codes defined by this standard.

There are many situations in which more complex and sophisticated models of text are required which might serve functions greater than the simple transmission of a sequence of characters. To distinguish between these more complex situations and the simple view of text here, we refer to the format given here as plain text. This standard makes no attempt to define formats for any other types of text.

Character codes are normally numerical codes in the range 0 to 65,535. Not all values in this range are valid, and the use of higher numbers is not precluded from later versions of this standard. It is useful to regard these numbers as 16-bit entities. The Character Sequence Encoding defines a string as a sequence of *stringlets*, each stringlet consisting of a declaration followed by a body.

There are two types of stringlets: 1-byte, which uses one byte per character, and 2-byte, which uses two bytes per character. The two types of stringlets can be mixed in any combination, except that there is an implicit 1-byte stringlet declaration at the beginning of every string. This means that every string *starts* with a 1-byte stringlet body, which may be null. In order to conform to this standard, a device must support both types of stringlets.

The 1-byte stringlet body is defined in such a manner that:

- 1) a sequence of characters is compressed into strings of 8-bit bytes on a one-for-one basis, i.e., one 8-bit byte for each 16-bit entity;
- 2) all sequences of 8-bit ISO 646 characters of high frequency usage constitute valid Xerox strings.

The 2-byte stringlet body consists of a sequence of 16-bit codes.

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## 6.2 Review of definitions

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Recall from section 2.2 that the total range of numbers available for character codes, namely  $[0 \dots 177777_8]$ , is partitioned into 256 blocks of 256 codes each, called *character sets*. Each 16-bit character code can be viewed as consisting of two 8-bit bytes, where the high-order byte is the character set code and the low-order byte is the character's code *within* the character set,

as shown in Figure 6.1. We shall designate these bytes by the terminology **CharSet** and **Char8Code**, respectively.

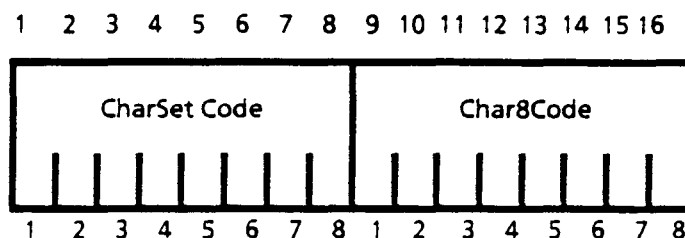


Figure 6.1 16-bit Xerox character code

Recall further that the character codes are assigned so that characters within a single character set tend to be related to each other by traditional usage. In normal text, successive characters tend to come from the same character set, usually letters of the same alphabet.

Recall finally that the 8-bit byte  $377_8$ , called the *character set select code*, is forbidden to occur as the high- or low-order byte of any character codes.

Given this structure on the character codes, the character sequence coding is a simple run-encoding of the **CharSet** bytes.

The same character set code space structure is maintained within the Xerox standard to maintain ease of conversion between the Xerox standard and existing international standards. Assignment of graphic characters outside of the outlined structure is avoided to minimize the problems associated with interfacing at the terminal device level. The IRV set, designated in the absence of a working agreement between a sender and recipient of the data, is also used.

### 6.3 Simple encoding examples

Below are a few simple examples of sequences of characters that have been encoded using character sequence encoding. These should be helpful in understanding the formal definitions that follow. The numbers are the successive bytes of the encoded sequence given in octal. The "**377**" is the character set select, with the character set number following it in italics.

#### Examples:

##### ASCII based

|     |     |     |     |     |      |     |     |     |     |     |
|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|
| A   | S   | C   | I   | I   | <sp> | b   | a   | s   | e   | d   |
| 101 | 123 | 103 | 111 | 111 | 040  | 142 | 141 | 163 | 145 | 144 |

##### †footnote

|     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|     |     | †   |     |     | f   | o   | o   | t   | n   | o   | t   | e   |
| 377 | 357 | 060 | 377 | 000 | 146 | 157 | 157 | 164 | 156 | 157 | 164 | 145 |

##### a ≠ a — as a 2-byte stringlet

|     |     |     |     |      |     |     |      |     |     |     |     |     |
|-----|-----|-----|-----|------|-----|-----|------|-----|-----|-----|-----|-----|
|     |     |     | a   | <sp> |     | ≠   | <sp> |     | a   |     |     |     |
| 377 | 377 | 000 | 000 | 141  | 000 | 040 | 041  | 142 | 000 | 040 | 046 | 141 |

## 6.4 Syntax

The Xerox String Encoding provides a method for encoding any 16-bit (two-byte) number that does not contain the value  $377_8$  (decimal value 255) in either its left-hand or right-hand bytes. Thus, with this encoding it is possible to encode any number in the range  $[0 \dots 65278]$  that does not leave a remainder of 255 when divided by 256. All legitimate Xerox Character Codes lie within this range. This encoding provides the ability to encode many numbers that cannot be legitimate Xerox Character Codes; hence this encoding system encompasses a broader class of 16-bit codes than is required for the encoding of Xerox Character Codes.

The following provides a definition of the encoding expressed in a Backus-Naur format.

**CSselect**::=  $377_8$

As above.

**CharSet8**::=  $[0 \dots 376_8]$

Any 8-bit number other than  $377_8$  (CSselect). **CharSet8** designates a legal character set (as listed in section 2.2). Note that any legal character set designator must be in this range, but that not all numbers in this range may be legitimate values for **CharSet8** in the Xerox Character Code Standard. Legal values for **CharSet8** in the Xerox Character Code Standard are in the set  $[0, 41_8 \dots 176_8, 241_8 \dots 376_8]$ . Note also that not all legitimate **CharSet8** values in the Xerox Character Code Standard in this range have yet been designated as legal values for **CharSet8**. Note also that this range includes the value 0.

**CharSet16**::=  $[0 \dots 376_8]$

An 8-bit number designating a legal 16-bit character set. In this version of the standard, only 0 is valid. Allowing non-zero values of **CharSet16** would allow addressing of 24-bit characters—in this version only 0 is legal.

**CS8Declaration**::= CSselect **CharSet8**

A 2-byte sequence to declare a new 188-character code set. If this occurs within a 2-byte encoded sequence, then the encoding is changed to 1-byte. If this occurs within a 1-byte encoded sequence, then it causes the character set to be changed as defined in section 6.4. Note that there are 189 possible character sets, of 188 characters each, designated by the numbers in the set  $[0, 41_8 \dots 176_8, 241_8 \dots 376_8]$ .

**CS16Declaration**::= CSselect CSselect **CharSet16**

A 3-byte sequence preceding a sequence of 2-byte encoded characters. In this version of the standard, the only legal value of **CharSet16** is 0. Therefore, **CS16Declaration** is always (in octal) "377 377 000."

[Allowing non-zero values of **CharSet16** would allow addressing of 24-bit characters—in this version only 0 is legal.]

**Char8Code**::=  $[0 \dots 376_8]$

Any 8-bit number other than  $377_8$  (CSselect). **Char8Code** is a character's code within its character set (as listed in section 2.2). Note that any legal character code within its character set must be in this range, but that not all numbers in this range are necessarily legal values for **Char8Code**. Legal values for **Char8Code** are in the set  $[40_8 \dots 176_8, 241_8 \dots 376_8]$ . Further, legal values for **Char8Code** are a function of the value for the associated **CharSet** byte. Note that the above range does not include the value 0, but does include  $40_8$ .

**Char16Code**::= **CharSet8 Char8Code**

A two-byte 16-bit character code. Note that not all values of **Char8Code** are necessarily

legal. Legal values for **Char8Code** are a function of the value for the associated **CharSet8** byte.

**Stringlet8** ::=  $\emptyset$  | **Stringlet8 Char8Code**

By default, a **Stringlet8** is interpreted as character codes lying within Character Set 0. This is the 1-byte stringlet body which occurs at the beginning of a **String**.

**DeclaredStringlet8** ::= **CS8declaration Char8Code** |  
**DeclaredStringlet8 Char8Code**

A 1-byte stringlet complete with a specific codespace declaration at its head and a body consisting of a sequence of **Char8Codes**.

**DeclaredStringlet16** ::= **CS16declaration Char16Code** |  
**DeclaredStringlet16 Char16Code**

A 2-byte stringlet with an explicit **CS16declaration** at its head and a body consisting of a sequence of **Char16Codes**.

**String** ::= **Stringlet8** |  
**DeclaredStringlet8** |  
**DeclaredStringlet16** |  
**String DeclaredStringlet8** |  
**String DeclaredStringlet16**

A sequence of **DeclaredStringlets**, except that the first one may be undeclared (but this may be null; if it is not null then it must be a **Stringlet8**). **DeclaredStringlets** may be mixed in any combination (apart from the first **Stringlet8**).

---

## 6.5 Interpretation of the encoding

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The syntax above defines both the 1-byte and 2-byte stringlets, but some comments on the process of interpreting the 1-byte stringlet body to get **Char8Code** bytes back into logical 16-bit character codes are in order.

- In interpreting a 1-byte stringlet body, the high-order byte (**CharSet**) for each character code can be considered to come from an 8-bit finite-state machine which tracks the sequence byte-by-byte. The **CharSet** state is initialized to 0 at the beginning of the interpretation. During interpretation, the finite-state machine is alerted by a **CS8Declaration** to switch state to the indicated **CharSet**.
- The 1-byte stringlet implies that the number of logical characters in a sequence cannot be assumed to be equal to the number of bytes. Likewise, any process which wants to step through a sequence of characters encoded by means of the 1-byte stringlet in a character-at-a-time fashion cannot assume that each byte corresponds to a single character.

As stated before, the default state is initialized to 1-byte stringlet body within character set 0 Character Code Standard at the beginning of the interpretation process.

This definition has impact on any processes which read a sequence of characters "backwards," from tail-to-head. Processes which read a sequence of characters encoded by means of the character sequence encoding "backwards," from tail-to-head, must locate the beginnings of **DeclaredStringlet8** or **DeclaredStringlet16** segments in order to know how to interpret each character. This is facilitated by the fact that the **CSselect** byte 377<sub>8</sub> is

forbidden as the high- or low-order byte of character codes, so the beginnings of **DeclaredStringlet8** or **DeclaredStringlet16** segments may be found simply by scanning for 377<sub>8</sub> bytes—i.e., an isolated sequence of the form 377<sub>8</sub> or 377<sub>8</sub> 377<sub>8</sub>. Since Character Set 377<sub>8</sub> is forbidden, a sequence of more than two 377<sub>8</sub> bytes in succession within a sequence of characters is impossible.

Since a **CS8Declaration** requires 2 bytes, a 1-byte stringlet does not result in a compression of a string if the average run-length (the number of characters between **CharSet** changes) is less than 2.0 characters. For ordinary European-language text, this is not the case and 1-byte stringlet is an economic representation. However, for the Japanese and Chinese languages, with their thousands of kanji characters, the situation is different. Here the use of a 2-byte stringlet is more economical. This is the main rationale for allowing 2-byte stringlets: so that Kanji-based text can be represented and stored with reasonable efficiency.

In order to use a 2-byte stringlet, because the default is a 1-byte stringlet body, it must be prefixed by a **CS16Declaration**, which functions as an annunciator for the 2-byte stringlet body.

Return from a 2-byte stringlet body is effected by a single "377<sub>8</sub>" character, followed by a single byte that designates the high-order byte (**CharSet**) of the subsequent characters. Therefore, no 16-bit 2-byte encoded character code can contain the value 377<sub>8</sub> in any of its byte positions.

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## 6.6 Relationship to existing 8-bit encodings

---

The character sequence encoding specifies the default convention that the bytes are interpreted as **Char8Codes**, i.e., a 1-byte stringlet body, within Character Set 0 until a **CS8Declaration** or **CS16Declaration** is encountered. This means that if the entire Xerox string content consists solely of characters from Character Set 0 as a 1-byte stringlet body, then the Xerox string is nothing more than a sequence of 8-bit **Char8Code** bytes taken from Character Set 0. (See the first example in 6.3.)

Since Character Set 0 is directly taken from the ASCII/Teletex ISO-based standards, it follows that *the overwhelming majority of ASCII, Teletex, and ISO strings are bit-for-bit identical to the Xerox Character Sequence Encoding with 1-byte stringlet body*. (The only qualifications relate to "\$" in ASCII and "#" and "general currency sign" in CCITT recommendations S.61 and S.100 when compared to ISO 6937.)

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## 6.7 Encoding of diacritical marks in strings

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There are several types of phonetically-marked characters, diacritical markings which are written above, below, within, or next to letters. These may be grouped into three general classes:

- (a) those that mark certain consonantal and vowel modifications
- (b) those used in vowelization

(c) those that mark the significant features of stress, juncture, and pitch

When phonetic characters are marked or composed of two or more components, of which one component is a qualifying mark, they are encoded as follows:

(1) Characters in which the qualifying mark is superimposed upon the basic character are encoded as a single character (for example, uppercase D with stroke, 342<sub>8</sub> in Character Set 0).

(2) Characters in which the qualifying mark is separated from, or only touches, the basic character are usually encoded as two or more characters (for example, "ç" = "cedilla " and c or "ç" = 313<sub>8</sub> + 143<sub>8</sub> of Character Set 0).

For case (2), components encoded as two or more characters, the encoding sequence for general classes (a) and (b) above is as follows:

**Consonantal modification.** Consonantal modification is commonly used in Latin-based languages, Cyrillic-based languages, etc. and is a small mark that never appears alone by itself in ordinary text. It is traditionally thought of as being applied to some other character. Such marks are assigned their own separate character codes. Examples include the "accent" characters in French and other European languages.

In a string body, consonantal and vowel modification characters always precede the character which they modify. Multiple diacritics are entered in the order in which they appear, reading left to right and top to bottom.

**Vowel signs.** The string sequence rule for vowel signs, the second class, is different from the rule used for consonantal diacritics. When vowelized text is written, the chain of characters in a string is alphabetic character followed by the vowel sign—**does not precede it**. In addition, when two or more vowel signs are applied to the base character, a general sequence rule pertaining to all languages does not exist--**a general rule such as that used in consonantal modification does not exist**.

In this version of the standard, the sequence rules for consonantal modification and vowelization are identified. For the third class, those that mark the significant features of stress, juncture, and pitch, the sequence remains unspecified.

Examples: (not a part of the standard)

**ARABIC, CharSet8 = 343<sub>8</sub>**

There are five common vowels in CharSet8 = 343<sub>8</sub>:

| <u>Name</u> | <u>Code</u> |
|-------------|-------------|
| Fatha       | 156B        |
| Dammah      | 157B        |
| Kasrah      | 160B        |
| Shaddah     | 161B        |
| Sukun       | 162B        |

In addition, there are three vowels that are not so common:

|           |      |
|-----------|------|
| Fat'hatan | 153B |
| Dammatan  | 154B |
| Kashratan | 155B |

These vowels are non-spacing, and when vowelized text is created, the chain of characters are in the following sequence, reading right to left:

<...> <vowel sign> <character> <vowel sign> <character>.

And, when the Shadda (343<sub>g</sub> | 161<sub>g</sub>) is used, the sequence rule, reading right to left, is:

<...> <vowel sign> <shadda> <character>.

The vowel Shaddah follows the base character and precedes other vowels. Note that Arabic text is written from right to left and that the sequence has been written in the Arabic order, e.g., vowels following the base character.

To provide an example that a general positioning rule cannot specify vowel character order, note that both the Fatha and Kasrah, when used, follow the Shaddah, but the "picture" is as follows:

Fatha appears directly above the Shaddah  
Kasrah appears directly below the Shaddah.

**HEBREW, CharSet8 = 341<sub>g</sub>**

In Hebrew, there are nine basic vowel signs and three vowel digraphs; seven of the nine vowel signs and all three digraphs are subscripts. The seven subscript signs are:

hireq, sereh, segol, qubbus, qamas, pathah, and shewa

and the three subscript digraphs are:

hataph pathah, hataph segol, and hataph qamas.

All seven subscript signs and three subscript digraphs follow the base character in a string. The remaining two vowels, holem and shuruq, also follow the base character in a string, holem appearing in the upper left corner of any character and shuruq appearing in the middle of the character Vav. All these entities are non-spacing characters.

In rendering, only one vowel is applied to a character. Multiple vowel sequences in Hebrew do not exist.

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## 6.8 General encoding example

---

Below are a few examples of sequences that have been encoded using the full capability of the Xerox Character Encoding. The declarations are shown in *italics*. For ease of reference, the examples of section 6.3 are repeated here.

Examples:

ASCII based (1-byte stringlet body only)

|     |     |     |     |     |      |     |     |     |     |     |
|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|
| A   | S   | C   | I   | I   | <sp> | b   | a   | s   | e   | d   |
| 101 | 123 | 103 | 111 | 111 | 040  | 142 | 141 | 163 | 145 | 144 |

†footnote (1-byte stringlets only)

|     |     |     |     |     |     |     |     |     |     |     |     |     |   |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
|     |     |     | †   |     |     | f   | o   | o   | t   | n   | o   | t   | e |
| 377 | 357 | 060 | 377 | 000 | 146 | 157 | 157 | 164 | 156 | 157 | 164 | 145 |   |

a ≠ a

|     |      |     |     |     |     |      |     |     |     |     |
|-----|------|-----|-----|-----|-----|------|-----|-----|-----|-----|
| a   | <sp> |     |     | ≠   |     | <sp> |     | a   |     |     |
| 141 | 040  | 377 | 041 | 142 | 377 | 000  | 040 | 377 | 046 | 141 |

†footnote (2-byte stringlet only)

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|     |     |     |     | †   |     | f   | o   | o   | t   | n   | o   | t   | e   |     |     |     |     |     |     |     |
| 377 | 377 | 000 | 357 | 060 | 000 | 146 | 000 | 157 | 000 | 157 | 000 | 164 | 000 | 156 | 000 | 157 | 000 | 164 | 000 | 145 |

a ≠ a

|     |     |     |  |     |      |     |     |      |     |     |     |     |     |
|-----|-----|-----|--|-----|------|-----|-----|------|-----|-----|-----|-----|-----|
|     |     |     |  | a   | <sp> |     | ≠   | <sp> |     | a   |     |     |     |
| 377 | 377 | 000 |  | 000 | 141  | 000 | 040 | 041  | 142 | 000 | 040 | 046 | 141 |

cat (1-byte stringlet followed by 2-byte)

|     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|
| c   |     |     |     | a   |     | t   |     |
| 103 | 377 | 377 | 000 | 000 | 101 | 000 | 124 |

cat (2-byte stringlet followed by 1-byte)

|     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|     |     |     |     | c   |     | a   | t   |     |
| 377 | 377 | 000 | 000 | 103 | 377 | 000 | 101 | 124 |

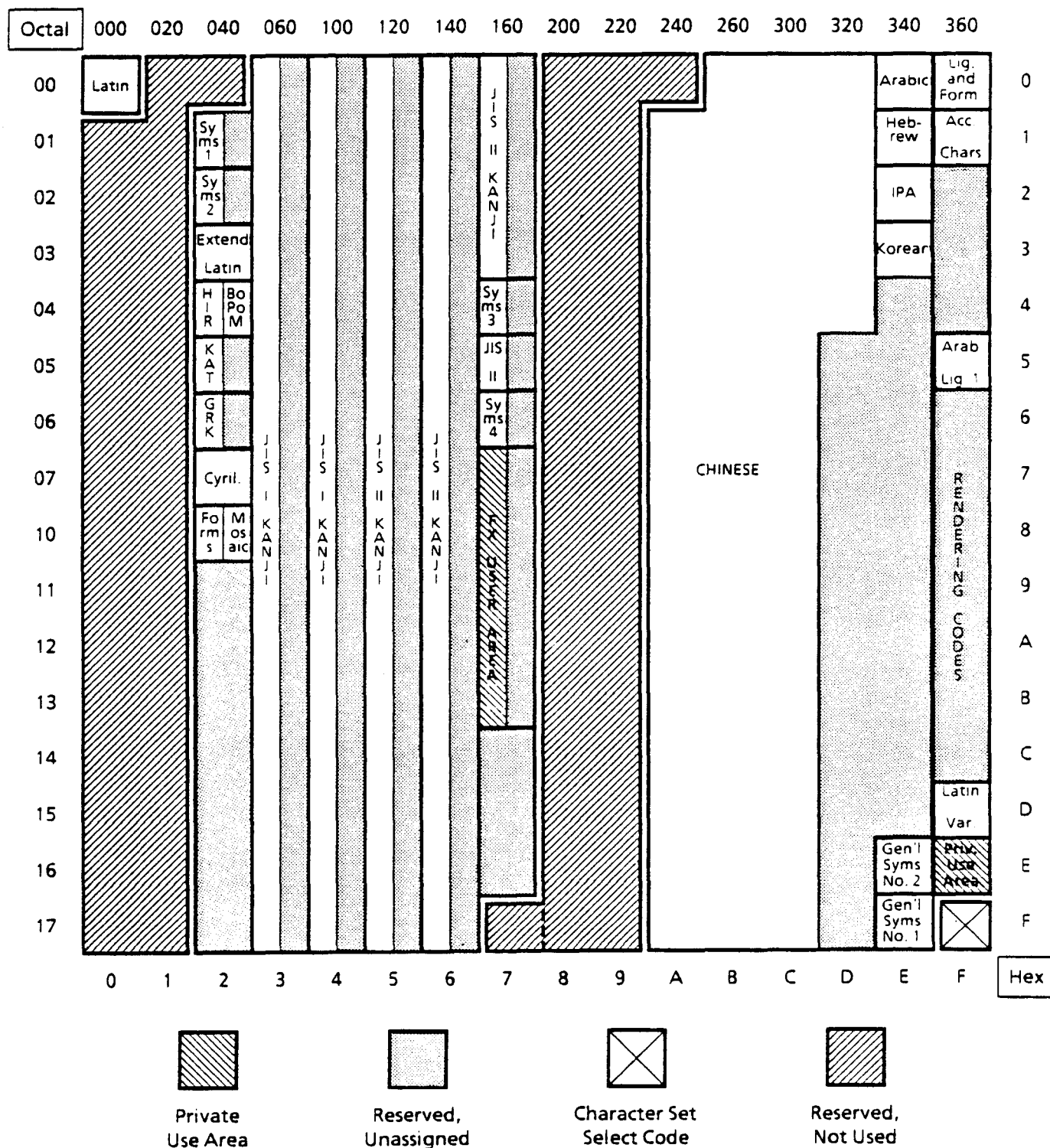
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This appendix contains the reference charts of the symbols for the non-kanji graphic character codes described in chapter 3 and the rendering character codes described in chapter 4.

# XEROX Character Set Allocation

Each square represents one Character Set  
(HIGH - order character code byte)



# XEROX Character Set 000<sub>8</sub>

ASCII/ISO/CCITT Roman Alphabet and Punctuation

| Octal | 000 | 020 | 040           | 060 | 100 | 120     | 140 | 160 | 200 | 220 | 240 | 260 | 300 | 320    | 340 | 360 |     |
|-------|-----|-----|---------------|-----|-----|---------|-----|-----|-----|-----|-----|-----|-----|--------|-----|-----|-----|
| 00    |     |     | word<br>space | 0   | @   | P       | `   | p   |     |     |     | °   |     | —      | Ω   | κ   | 0   |
| 01    |     |     | !             | 1   | A   | Q       | a   | q   |     |     |     | ¡   | ±   | · or · | Æ   | æ   | 1   |
| 02    |     |     | "             | 2   | B   | R       | b   | r   |     |     |     | ¢   | ²   | ´      | ®   | Đ   | 2   |
| 03    |     |     | #             | 3   | C   | S       | c   | s   |     |     |     | £   | ³   | ˆ      | ©   | ā   | 3   |
| 04    |     |     | □             | 4   | D   | T       | d   | t   |     |     |     | \$  | ×   | ˜      | ™   | Ĥ   | 4   |
| 05    |     |     | %             | 5   | E   | U       | e   | u   |     |     |     | ¥   | μ   | ˉ      | ♪   | ı   | 5   |
| 06    |     |     | &             | 6   | F   | V       | f   | v   |     |     |     |     | ¶   | ˘      |     | İ   | 6   |
| 07    |     |     | '             | 7   | G   | W       | g   | w   |     |     |     | §   | ·   | ·      |     | Ł   | 7   |
| 10    |     |     | (             | 8   | H   | X       | h   | x   |     |     |     |     | ÷   | ˆ      |     | ł   | 8   |
| 11    |     |     | )             | 9   | I   | Y       | i   | y   |     |     |     | ‘   | ’   |        |     | Ø   | 9   |
| 12    |     |     | *             | :   | J   | Z       | j   | z   |     |     |     | “   | ”   | °      |     | Œ   | A   |
| 13    |     |     | +             | ;   | K   | [       | k   | {   |     |     |     | «   | »   | ˆ      |     | ß   | B   |
| 14    |     |     | ,             | <   | L   | \       | l   |     |     |     |     | ←   | ¼   | —      | ⅛   | Þ   | C   |
| 15    |     |     | -             | =   | M   | ]       | m   | }   |     |     |     | ↑   | ½   | ˘      | ⅜   | ƒ   | D   |
| 16    |     |     | .             | >   | N   | ˆ       | n   | ˘   |     |     |     | →   | ¾   | ˘      | ⅝   | Ŋ   | E   |
| 17    |     |     | /             | ?   | O   | low bar | o   |     |     |     |     | ↓   | ¿   | ˘      | ⅞   | h   | F   |
|       | 0   | 1   | 2             | 3   | 4   | 5       | 6   | 7   | 8   | 9   | A   | B   | C   | D      | E   | F   | Hex |



Reserved,  
Unassigned



Character Set  
Select Code



Reserved,  
not used

# XEROX Character Set 041<sub>8</sub>

JIS Symbols 1 - Punctuation and Symbols not in CS 0

| Octal | 000 | 020 | 040 | 060 | 100 | 120 | 140 | 160 | 200 | 220 | 240 | 260 | 300 | 320 | 340 | 360 |                |           |           |           |           |          |            |   |   |   |   |   |   |   |   |   |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------------|-----------|-----------|-----------|-----------|----------|------------|---|---|---|---|---|---|---|---|---|-----|
| 00    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 0              |           |           |           |           |          |            |   |   |   |   |   |   |   |   |   |     |
| 01    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | Kanji<br>space |           |           |           |           |          |            |   |   |   |   |   |   |   |   | 1 |     |
| 02    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | comma          |           | parallel  |           |           | not =    |            |   |   |   |   |   |   |   |   | 2 |     |
| 03    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | period         | rpt kata. |           |           |           |          |            |   |   |   |   |   |   |   |   | 3 |     |
| 04    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | comma          | rpt kata. | em lead.  |           |           |          |            |   |   |   |   |   |   |   |   | 4 |     |
| 05    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | period         | rpt hira. | em lead.  |           |           | < or =   |            |   |   |   |   |   |   |   |   | 5 |     |
| 06    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |                | rpt hira. |           |           | l quote   | > or =   |            |   |   |   |   |   |   |   |   | 6 |     |
| 07    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |                | ditto     |           |           | r quote   | infinity |            |   |   |   |   |   |   |   |   | 7 |     |
| 10    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |                | reduplic. |           |           | l quote   | therefor |            |   |   |   |   |   |   |   |   | 8 |     |
| 11    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |                | rpt kanji |           |           | r quote   | male     | star       |   |   |   |   |   |   |   |   |   | 9   |
| 12    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |                | shime     |           |           | l. brack. | female   | star       |   |   |   |   |   |   |   |   |   | A   |
| 13    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | daku-on        | knji zero |           |           | r. brack. |          | circle     |   |   |   |   |   |   |   |   |   | B   |
| 14    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | handaku        | ing vow.  | l. brack. |           |           | minutes  | circle     |   |   |   |   |   |   |   |   |   | C   |
| 15    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |                |           |           | r. brack. |           | seconds  | bull's eye |   |   |   |   |   |   |   |   |   | D   |
| 16    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |                | hyphen    |           |           |           | celsius  | diamon.    |   |   |   |   |   |   |   |   |   | E   |
| 17    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |                |           |           |           |           |          |            |   |   |   |   |   |   |   |   |   | F   |
|       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 0              | 1         | 2         | 3         | 4         | 5        | 6          | 7 | 8 | 9 | A | B | C | D | E | F | Hex |

  
Reserved,  
Unassigned

  
Character Set  
Select Code

  
Reserved,  
not used

# XEROX Character Set 042g

JIS Symbols 2 - Punctuation and Symbols not in CS 0

| Octal | 000 | 020 | 040 | 060 | 100 | 120 | 140 | 160 | 200 | 220 | 240 | 260 | 300 | 320 | 340 | 360 |           |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------|------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-----|
| 00    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 0         |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   |     |
| 01    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | diamon.   |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 1   |
| 02    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | square    |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 2   |
| 03    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | square    |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 3   |
| 04    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | triangle  |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 4   |
| 05    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | triangle  |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 5   |
| 06    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | inv. tri. |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 6   |
| 07    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | inv. tri. |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 7   |
| 10    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | kome      |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 8   |
| 11    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | post off. |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 9   |
| 12    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |           |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   | A   |
| 13    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |           |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   | B   |
| 14    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |           |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   | C   |
| 15    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |           |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   | D   |
| 16    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |           | geta |   |   |   |   |   |   |   |   |   |   |   |   |   |   | E   |
| 17    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |           |      |   |   |   |   |   |   |   |   |   |   |   |   |   |   | F   |
|       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 0         | 1    | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F | Hex |

Reserved,  
Unassigned

Character Set  
Select Code

Reserved,  
not used

# XEROX Character Set 043<sub>8</sub>

## Extended Latin Alphabet

| Octal | 000                     | 020 | 040 | 060 | 100                          | 120 | 140 | 160 | 200                   | 220 | 240 | 260 | 300 | 320 | 340 | 360 |   |   |
|-------|-------------------------|-----|-----|-----|------------------------------|-----|-----|-----|-----------------------|-----|-----|-----|-----|-----|-----|-----|---|---|
| 00    | <div></div>             |     |     |     |                              |     |     |     |                       |     |     |     | ’   | ˆ   |     | 0   |   |   |
| 01    |                         |     |     |     |                              |     |     |     |                       |     |     |     | ‘   |     | ˆ   | 1   |   |   |
| 02    |                         |     |     |     |                              |     |     |     |                       |     |     |     | ’   |     | ˆ   | 2   |   |   |
| 03    |                         |     |     |     |                              |     |     |     |                       |     |     |     |     | —   |     | 3   |   |   |
| 04    |                         |     |     |     |                              |     |     |     |                       |     |     |     |     |     | ˆ   | 4   |   |   |
| 05    |                         |     |     |     |                              |     |     |     |                       |     |     |     |     |     | ˆ   | 5   |   |   |
| 06    |                         |     |     |     |                              |     |     |     |                       |     |     |     |     |     | ˆ   | 6   |   |   |
| 07    |                         |     |     |     |                              |     |     |     |                       |     |     |     |     |     | ˆ   | 7   |   |   |
| 10    |                         |     |     |     |                              |     |     |     |                       |     |     |     |     |     |     | 8   |   |   |
| 11    |                         |     |     |     |                              |     |     |     |                       |     |     |     |     |     | ˆ   | ˆ   | 9 |   |
| 12    |                         |     |     |     |                              |     |     |     |                       |     |     |     |     |     |     | ˆ   | A |   |
| 13    |                         |     |     |     |                              |     |     |     |                       |     |     |     |     |     | ˆ   | ˆ   | B |   |
| 14    |                         |     |     |     |                              |     |     |     |                       |     |     |     | ˆ   | #   | ˆ   |     | C |   |
| 15    |                         |     |     |     |                              |     |     |     |                       |     |     |     |     | ˆ   |     | ˆ   | D |   |
| 16    |                         |     |     |     |                              |     |     |     |                       |     |     |     | ˆ   | ˆ   | ˆ   | ˆ   | E |   |
| 17    |                         |     |     |     |                              |     |     |     |                       |     |     |     |     |     |     | ˆ   | ˆ | F |
|       |                         |     |     |     |                              |     |     |     |                       |     |     |     | 0   | 1   | 2   | 3   | 4 | 5 |
|       | <div></div>             |     |     |     | <div></div>                  |     |     |     | <div></div>           |     |     |     |     |     |     |     |   |   |
|       | Reserved,<br>Unassigned |     |     |     | Character Set<br>Select Code |     |     |     | Reserved,<br>not used |     |     |     |     |     |     |     |   |   |

# XEROX Character Set 044g

Japanese Hiragana Syllabary and Chinese Bo-po-mo-fo

| Octal | 000 | 020 | 040 | 060 | 100 | 120 | 140 | 160 | 200 | 220 | 240 | 260 | 300    | 320 | 340 | 360 |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|-----|-----|-----|-----|
| 00    |     |     | ぐ   | だ   | ば   | む   | る   |     |     |     |     | イ   | 九      |     |     |     | 0   |
|       |     |     | gu  | da  | ba  | mu  | wi  |     |     |     |     | ch  | ang    |     |     |     |     |
| 01    |     | あ   | け   | ち   | ぱ   | め   | ゑ   |     |     |     | フ   | 尸   | 厶      |     |     |     | 1   |
|       |     | a   | ke  | chi | pa  | me  | we  |     |     |     | b   | sh  | eng    |     |     |     |     |
| 02    |     | あ   | げ   | ち   | ひ   | も   | を   |     |     |     | タ   | 田   | 儿      |     |     |     | 2   |
|       |     | a   | ge  | ji  | hi  | mo  | wo  |     |     |     | p   | r   | er     |     |     |     |     |
| 03    |     | い   | こ   | っ   | び   | や   | ん   |     |     |     | 冂   | 尸   | 丨      |     |     |     | 3   |
|       |     | i   | ko  | tsu | bi  | ya  | n   |     |     |     | m   | z   | i      |     |     |     |     |
| 04    |     | い   | ご   | っ   | ぴ   | や   |     |     |     |     | 匚   | ち   | メ      |     |     |     | 4   |
|       |     | i   | go  | tsu | pi  | ya  |     |     |     |     | f   | c   | u      |     |     |     |     |
| 05    |     | う   | さ   | づ   | ふ   | ゆ   |     |     |     |     | 刀   | ム   | 凵      |     |     |     | 5   |
|       |     | u   | sa  | zu  | fu  | yu  |     |     |     |     | d   | s   | iu     |     |     |     |     |
| 06    |     | う   | ざ   | て   | ぶ   | ゆ   |     |     |     |     | 土   | 丫   | 丶      |     |     |     | 6   |
|       |     | u   | za  | te  | bu  | yu  |     |     |     |     | t   | i   | tone 2 |     |     |     |     |
| 07    |     | え   | し   | で   | ぶ   | よ   |     |     |     |     | ろ   | こ   | 丶      |     |     |     | 7   |
|       |     | e   | shi | de  | bu  | yo  |     |     |     |     | n   | o   | tone 3 |     |     |     |     |
| 10    |     | え   | じ   | と   | へ   | よ   |     |     |     |     | カ   | さ   | 丶      |     |     |     | 8   |
|       |     | e   | ji  | to  | he  | yo  |     |     |     |     | i   | e   | tone 4 |     |     |     |     |
| 11    |     | お   | す   | ど   | べ   | ら   |     |     |     |     | く   | せ   | 丶      |     |     |     | 9   |
|       |     | o   | su  | do  | be  | ra  |     |     |     |     | g   | eh  | tone 5 |     |     |     |     |
| 12    |     | お   | ず   | な   | べ   | り   |     |     |     |     | 子   | 所   | 丶      |     |     |     | A   |
|       |     | o   | zu  | na  | be  | ri  |     |     |     |     | i   | ai  | tone 1 |     |     |     |     |
| 13    |     | か   | せ   | に   | ほ   | る   |     |     |     |     | 厂   | し   | 兀      |     |     |     | B   |
|       |     | ka  | se  | ni  | ho  | ru  |     |     |     |     | h   | ei  | ng     |     |     |     |     |
| 14    |     | が   | ぜ   | ぬ   | ぼ   | れ   |     |     |     |     | 4   | 么   |        |     |     |     | C   |
|       |     | ga  | ze  | nu  | bo  | re  |     |     |     |     | i   | au  |        |     |     |     |     |
| 15    |     | き   | そ   | ね   | ぼ   | ろ   |     |     |     |     | く   | 又   |        |     |     |     | D   |
|       |     | ki  | so  | ne  | bo  | ro  |     |     |     |     | q   | ou  |        |     |     |     |     |
| 16    |     | ぎ   | ぞ   | の   | ま   | わ   |     |     |     |     | 丁   | 马   |        |     |     |     | E   |
|       |     | gi  | zo  | no  | ma  | wa  |     |     |     |     | x   | an  |        |     |     |     |     |
| 17    |     | く   | た   | は   | み   | わ   |     |     |     |     | 卣   | 乚   |        |     |     |     | F   |
|       |     | ku  | ta  | ha  | mi  | wa  |     |     |     |     | zh  | en  |        |     |     |     |     |
|       | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | A   | B   | C      | D   | E   | F   | Hex |



Reserved,  
Unassigned



Character Set  
Select Code



Reserved,  
not used

# XEROX Character Set 045g

## Japanese Katakana Syllabary

| Octal | 000 | 020 | 040 | 060 | 100 | 120 | 140 | 160 | 200 | 220 | 240 | 260 | 300 | 320 | 340 | 360 |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 00    |     |     | グ   | ダ   | バ   | ム   | キ   |     |     |     |     |     |     |     |     |     | 0   |
| 01    |     |     | ア   | ケ   | チ   | パ   | メ   | エ   |     |     |     |     |     |     |     |     | 1   |
| 02    |     |     | ア   | ゲ   | ヂ   | ヒ   | モ   | ヲ   |     |     |     |     |     |     |     |     | 2   |
| 03    |     |     | イ   | コ   | ツ   | ビ   | ヤ   | ン   |     |     |     |     |     |     |     |     | 3   |
| 04    |     |     | イ   | ゴ   | ツ   | ピ   | ヤ   | ヴ   |     |     |     |     |     |     |     |     | 4   |
| 05    |     |     | ウ   | サ   | ヅ   | フ   | ユ   | カ   |     |     |     |     |     |     |     |     | 5   |
| 06    |     |     | ウ   | ザ   | テ   | ブ   | ユ   | ケ   |     |     |     |     |     |     |     |     | 6   |
| 07    |     |     | エ   | シ   | デ   | ブ   | ヨ   |     |     |     |     |     |     |     |     |     | 7   |
| 10    |     |     | エ   | ジ   | ト   | ヘ   | ヨ   |     |     |     |     |     |     |     |     |     | 8   |
| 11    |     |     | オ   | ス   | ド   | ベ   | ラ   |     |     |     |     |     |     |     |     |     | 9   |
| 12    |     |     | オ   | ズ   | ナ   | ペ   | リ   |     |     |     |     |     |     |     |     |     | A   |
| 13    |     |     | カ   | セ   | ニ   | ホ   | ル   |     |     |     |     |     |     |     |     |     | B   |
| 14    |     |     | ガ   | ゼ   | ヌ   | ボ   | レ   |     |     |     |     |     |     |     |     |     | C   |
| 15    |     |     | キ   | ソ   | ネ   | ポ   | ロ   |     |     |     |     |     |     |     |     |     | D   |
| 16    |     |     | ギ   | ゾ   | ノ   | マ   | ワ   |     |     |     |     |     |     |     |     |     | E   |
| 17    |     |     | ク   | タ   | ハ   | ミ   | ワ   |     |     |     |     |     |     |     |     |     | F   |
|       | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   | Hex |



Reserved,  
Unassigned



Character Set  
Select Code



Reserved,  
not used

# XEROX Character Set 046<sub>8</sub>

## Greek Alphabet

| Octal | 000 | 020 | 040 | 060 | 100           | 120           | 140          | 160          | 200            | 220      | 240 | 260 | 300 | 320 | 340 | 360 |     |
|-------|-----|-----|-----|-----|---------------|---------------|--------------|--------------|----------------|----------|-----|-----|-----|-----|-----|-----|-----|
| 00    |     |     |     |     | N<br>nu       |               |              | v<br>nu      |                |          |     |     |     |     |     |     | 0   |
| 01    |     |     |     |     | A<br>alpha    | Ξ<br>xi       | α<br>alpha   | ξ<br>xi      |                |          |     |     |     |     |     |     | 1   |
| 02    |     |     |     |     | B<br>beta     | Ο<br>omicron  | β<br>beta    | ο<br>omicron |                |          |     |     |     |     |     |     | 2   |
| 03    |     |     |     |     |               | Π<br>pi       | ϑ<br>md beta | π<br>pi      |                |          |     |     |     |     |     |     | 3   |
| 04    |     |     |     |     | Γ<br>hi prime | Ϛ<br>gamma    | ϙ<br>gamma   | ς<br>koppa   |                |          |     |     |     |     |     |     | 4   |
| 05    |     |     |     |     | ι<br>lenis    | Δ<br>lo prime | Ρ<br>rho     | δ<br>delta   | ρ<br>rho       |          |     |     |     |     |     |     | 5   |
| 06    |     |     |     |     | asper         | Ε<br>epsilon  | Σ<br>sigma   | ε<br>epsilon | σ<br>sigma     |          |     |     |     |     |     |     | 6   |
| 07    |     |     |     |     | sub-iota      | Ϛ<br>stigma   |              | ς<br>stigma  | ς<br>fl. sigma |          |     |     |     |     |     |     | 7   |
| 10    |     |     |     |     |               | Ϝ<br>digam.   | Τ<br>tau     | ϝ<br>digam.  | τ<br>tau       |          |     |     |     |     |     |     | 8   |
| 11    |     |     |     |     |               | Ζ<br>zeta     | Υ<br>upsilon | ζ<br>zeta    | υ<br>upsilon   |          |     |     |     |     |     |     | 9   |
| 12    |     |     |     |     |               | Η<br>eta      | Φ<br>phi     | η<br>eta     | φ<br>phi       |          |     |     |     |     |     |     | A   |
| 13    |     |     |     |     |               | full stoo     | Θ<br>theta   | Χ<br>chi     | θ<br>theta     | χ<br>chi |     |     |     |     |     |     | B   |
| 14    |     |     |     |     |               | Ι<br>iota     | Ψ<br>psi     | ι<br>iota    | ψ<br>psi       |          |     |     |     |     |     |     | C   |
| 15    |     |     |     |     |               | Κ<br>kappa    | Ω<br>omega   | κ<br>kappa   | ω<br>omega     |          |     |     |     |     |     |     | D   |
| 16    |     |     |     |     |               | Λ<br>lambda   | Ϻ<br>sampi   | λ<br>lambda  | ς<br>sampi     |          |     |     |     |     |     |     | E   |
| 17    |     |     |     |     |               | Μ<br>mu       |              | μ<br>mu      |                |          |     |     |     |     |     |     | F   |
|       | 0   | 1   | 2   | 3   | 4             | 5             | 6            | 7            | 8              | 9        | A   | B   | C   | D   | E   | F   | Hex |

Reserved,  
Unassigned

Character Set  
Select Code

Reserved,  
not used

# XEROX Character Set 0478

## Cyrillic Alphabet

| Octal | 000 | 020 | 040 | 060 | 100 | 120 | 140 | 160 | 200 | 220 | 240 | 260 | 300 | 320 | 340 | 360 |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 00    |     |     | О   | Ю   |     | о   | ю   |     |     |     |     |     |     |     |     |     | 0   |
| 01    |     |     | А   | П   | Я   | а   | п   | я   |     |     | Ц   |     |     | Ц   |     |     | 1   |
| 02    |     |     | Б   | Р   | Г   | б   | р   | г   |     |     | Ђ   |     |     | Ђ   |     |     | 2   |
| 03    |     |     | В   | С   | Ђ   | в   | с   | ђ   |     |     | Ѓ   |     |     | Ѓ   |     |     | 3   |
| 04    |     |     | Г   | Т   | Ѓ   | г   | т   | ѓ   |     |     | Ѕ   |     |     | Ѕ   |     |     | 4   |
| 05    |     |     | Д   | У   | Ѕ   | д   | у   | ѕ   |     |     | Ж   |     |     | Ж   |     |     | 5   |
| 06    |     |     | Е   | Ф   | Ѕ   | е   | ф   | ѕ   |     |     |     |     |     |     |     |     | 6   |
| 07    |     |     | Ё   | Х   | Ї   | ё   | х   | ї   |     |     |     |     |     |     |     |     | 7   |
| 10    |     |     | Ж   | Ц   | Ї   | ж   | ц   | ї   |     |     |     |     |     |     |     |     | 8   |
| 11    |     |     | З   | Ч   | Ј   | з   | ч   | ј   |     |     |     |     |     |     |     |     | 9   |
| 12    |     |     | И   | Ш   | Љ   | и   | ш   | љ   |     |     |     |     |     |     |     |     | A   |
| 13    |     |     | Й   | Щ   | Њ   | й   | щ   | њ   |     |     |     |     |     |     |     |     | B   |
| 14    |     |     | К   | Ђ   | Ђ   | к   | ђ   | ђ   |     |     |     |     |     |     |     |     | C   |
| 15    |     |     | Л   | Ы   | Ќ   | л   | ы   | ќ   |     |     |     |     |     |     |     |     | D   |
| 16    |     |     | М   | Ь   | Ў   | м   | ь   | ў   |     |     |     |     |     |     |     |     | E   |
| 17    |     |     | Н   | Э   |     | н   | э   |     |     |     |     |     |     |     |     |     | F   |
|       | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   | Hex |



Reserved,  
Unassigned



Character Set  
Select Code



Reserved,  
not used

# XEROX Character Set 050<sub>8</sub>

## Forms & Mosaic Characters

| Octal | 000 | 020 | 040 | 060 | 100 | 120 | 140 | 160 | 200 | 220 | 240 | 260 | 300 | 320 | 340 | 360 |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 00    |     |     |     | ┐   | +   | ≡   | ≡   |     |     |     |     | •   |     |     | •   | •   | 0   |
| 01    |     |     |     | └   |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | 1   |
| 02    |     |     |     | ┌   |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | 2   |
| 03    |     |     | ┐   | ┐   |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | 3   |
| 04    |     |     | ┐   | ┐   |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | 4   |
| 05    |     |     | ┐   | ┐   |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | 5   |
| 06    |     |     | ┐   |     |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | 6   |
| 07    |     |     | ┐   | ┐   |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | 7   |
| 10    |     |     | ┐   | ┐   |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | 8   |
| 11    |     |     | ┐   | ┐   |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | 9   |
| 12    |     |     | ┐   | ┐   |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | A   |
| 13    |     |     |     | +   |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | B   |
| 14    |     |     |     | ┐   |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | C   |
| 15    |     |     |     | ┐   |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | D   |
| 16    |     |     | ┐   | ┐   |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | E   |
| 17    |     |     | ┐   | ┐   |     | ≡   | ≡   |     |     |     | •   | :   |     |     | :   | :   | F   |
|       | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   | Hex |

Reserved, Unassigned

Character Set Select Code

Reserved, not used

# XEROX Character Set 1648

## Symbols 3 - Miscellaneous Japanese symbols

| Octal | 000 | 020 | 040           | 060         | 100 | 120 | 140 | 160 | 200 | 220 | 240 | 260 | 300 | 320 | 340 | 360 |     |
|-------|-----|-----|---------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 00    |     |     |               | てき<br>teki  |     |     |     |     |     |     |     |     |     |     |     |     | 0   |
| 01    |     |     | かぶ<br>kabu    | ひょう<br>hyou |     |     |     |     |     |     |     |     |     |     |     |     | 1   |
| 02    |     |     | あ<br>cir. a   | こう<br>kou   |     |     |     |     |     |     |     |     |     |     |     |     | 2   |
| 03    |     |     | い<br>cir. i   | とく<br>toku  |     |     |     |     |     |     |     |     |     |     |     |     | 3   |
| 04    |     |     | う<br>cir. u   | ぞう<br>zou   |     |     |     |     |     |     |     |     |     |     |     |     | 4   |
| 05    |     |     | え<br>cir. e   | げん<br>gen   |     |     |     |     |     |     |     |     |     |     |     |     | 5   |
| 06    |     |     | お<br>cir. o   | き<br>ki     |     |     |     |     |     |     |     |     |     |     |     |     | 6   |
| 07    |     |     | ろ<br>cir. ro  | てい<br>tyou  |     |     |     |     |     |     |     |     |     |     |     |     | 7   |
| 10    |     |     | は<br>cir. ha  | ゆう<br>yuu   |     |     |     |     |     |     |     |     |     |     |     |     | 8   |
| 11    |     |     | に<br>cir. ni  | ざい<br>zai   |     |     |     |     |     |     |     |     |     |     |     |     | 9   |
| 12    |     |     | ほ<br>cir. ho  | ひ<br>hi     |     |     |     |     |     |     |     |     |     |     |     |     | A   |
| 13    |     |     | へ<br>cir. he  | いん<br>in    |     |     |     |     |     |     |     |     |     |     |     |     | B   |
| 14    |     |     | と<br>cir. to  |             |     |     |     |     |     |     |     |     |     |     |     |     | C   |
| 15    |     |     | ち<br>cir. chi |             |     |     |     |     |     |     |     |     |     |     |     |     | D   |
| 16    |     |     | り<br>cir. ri  |             |     |     |     |     |     |     |     |     |     |     |     |     | E   |
| 17    |     |     | ぬ<br>cir. nu  |             |     |     |     |     |     |     |     |     |     |     |     |     | F   |
|       | 0   | 1   | 2             | 3           | 4   | 5   | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   | Hex |

 Reserved, Unassigned
  Character Set Select Code
  Reserved, not used

# XEROX Character Set 166g

## Symbols 4 - Miscellaneous Japanese Symbols

| Octal | 000 | 020 | 040 | 060 | 100 | 120 | 140 | 160 | 200 | 220 | 240 | 260 | 300 | 320 | 340 | 360 |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 00    |     |     |     | 0   |     | P   |     | P   |     |     |     |     |     |     |     |     | 0   |
| 01    |     |     |     | 1   | A   | Q   | a   | Q   |     |     |     |     |     |     |     |     | 1   |
| 02    |     |     |     | 2   | r   | b   | R   | B   |     |     |     |     |     |     |     |     | 2   |
| 03    |     |     |     | 3   | C   | S   | c   | s   |     |     |     |     |     |     |     |     | 3   |
| 04    |     |     |     | 4   | D   | T   | d   | t   |     |     |     |     |     |     |     |     | 4   |
| 05    |     |     |     | 5   | E   | U   | e   | u   |     |     |     |     |     |     |     |     | 5   |
| 06    |     |     |     | 6   | F   | V   | f   | v   |     |     |     |     |     |     |     |     | 6   |
| 07    |     |     |     | 7   | G   | W   | g   | w   |     |     |     |     |     |     |     |     | 7   |
| 10    |     |     |     | 8   | H   | X   | h   | x   |     |     |     |     |     |     |     |     | 8   |
| 11    |     |     |     | 9   | I   | Y   | i   | y   |     |     |     |     |     |     |     |     | 9   |
| 12    |     |     |     | 10  | J   | Z   | j   | z   |     |     |     |     |     |     |     |     | A   |
| 13    |     |     |     | 11  | K   |     | k   |     |     |     |     |     |     |     |     |     | B   |
| 14    |     |     |     | 12  | L   |     | l   |     |     |     |     |     |     |     |     |     | C   |
| 15    |     |     |     | 13  | M   |     | m   |     |     |     |     |     |     |     |     |     | D   |
| 16    |     |     |     | 14  | N   |     | n   |     |     |     |     |     |     |     |     |     | E   |
| 17    |     |     |     | 15  | O   |     | o   |     |     |     |     |     |     |     |     |     | F   |
|       | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   | Hex |

Reserved, Unassigned
Character Set Select Code
Reserved, not used

# XEROX Character Set 167<sub>8</sub>

Fuji Xerox Private Use

| Octal | 000 | 020 | 040 | 060 | 100 | 120 | 140 | 160 | 200 | 220 | 240 | 260 | 300 | 320 | 340 | 360 |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 00    |     |     | 𠂇   | 𠂈   | 𠂉   | 𠂊   | 𠂋   | 𠂌   |     |     |     |     |     |     |     |     | 0   |
| 01    |     |     | 𠂍   | 𠂎   | 𠂏   | 𠂐   | 𠂑   | 𠂒   |     |     |     |     |     |     |     |     | 1   |
| 02    |     |     | 𠂓   | 𠂔   | 𠂕   | 𠂖   | 𠂗   | 𠂘   |     |     |     |     |     |     |     |     | 2   |
| 03    |     |     | 𠂙   | 𠂚   | 𠂛   | 𠂜   | 𠂝   | 𠂞   |     |     |     |     |     |     |     |     | 3   |
| 04    |     |     | 𠂟   | 𠂠   | 𠂡   | 𠂢   | 𠂣   | 𠂤   |     |     |     |     |     |     |     |     | 4   |
| 05    |     |     | 𠂥   | 𠂦   | 𠂧   | 𠂨   | 𠂩   | 𠂪   |     |     |     |     |     |     |     |     | 5   |
| 06    |     |     | 𠂫   | 𠂬   | 𠂭   | 𠂮   | 𠂯   | 𠂰   |     |     |     |     |     |     |     |     | 6   |
| 07    |     |     | 𠂱   | 𠂲   | 𠂳   | 𠂴   | 𠂵   | 𠂶   |     |     |     |     |     |     |     |     | 7   |
| 10    |     |     | 𠂷   | 𠂸   | 𠂹   | 𠂺   | 𠂻   | 𠂼   |     |     |     |     |     |     |     |     | 8   |
| 11    |     |     | 𠂽   | 𠂾   | 𠂿   | 𠃀   | 𠃁   | 𠃂   |     |     |     |     |     |     |     |     | 9   |
| 12    |     |     | 𠃃   | 𠃄   | 𠃅   | 𠃆   | 𠃇   | 𠃈   |     |     |     |     |     |     |     |     | A   |
| 13    |     |     | 𠃉   | 𠃊   | 𠃋   | 𠃌   | 𠃍   | 𠃎   |     |     |     |     |     |     |     |     | B   |
| 14    |     |     | 𠃏   | 𠃐   | 𠃑   | 𠃒   | 𠃓   | 𠃔   |     |     |     |     |     |     |     |     | C   |
| 15    |     |     | 𠃕   | 𠃖   | 𠃗   | 𠃘   | 𠃙   | 𠃚   |     |     |     |     |     |     |     |     | D   |
| 16    |     |     | 𠃛   | 𠃜   | 𠃝   | 𠃞   | 𠃟   | 𠃠   |     |     |     |     |     |     |     |     | E   |
| 17    |     |     | 𠃡   | 𠃢   | 𠃣   | 𠃤   | 𠃥   | 𠃦   |     |     |     |     |     |     |     |     | F   |
|       | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   | Hex |



Reserved,  
Unassigned



Character Set  
Select Code



Reserved,  
not used

# XEROX Character Set 170g

Fuji Xerox Private Use

| Octal | 000 | 020 | 040 | 060 | 100 | 120 | 140 | 160 | 200 | 220 | 240 | 260 | 300 | 320 | 340 | 360 |   |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| 00    |     |     |     | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | 0 |
| 01    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | 1 |
| 02    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | 2 |
| 03    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | 3 |
| 04    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | 4 |
| 05    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | 5 |
| 06    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | 6 |
| 07    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | 7 |
| 10    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | 8 |
| 11    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | 9 |
| 12    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | A |
| 13    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | B |
| 14    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | C |
| 15    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | D |
| 16    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | E |
| 17    |     |     | 恣   | 摠   | 晡   | 榉   | 洄   | 濱   |     |     |     |     |     |     |     |     | F |

  
Reserved,  
Unassigned

  
Character Set  
Select Code

  
Reserved,  
not used

# XEROX Character Set 1718

Fuji Xerox Private Use

| Octal | 000 | 020 | 040 | 060 | 100 | 120 | 140 | 160 | 200 | 220 | 240 | 260 | 300 | 320 | 340 | 360 |   |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| 00    |     |     | 琿   | 碌   | 粹   | 董   | 譚   |     |     |     |     |     |     |     |     |     | 0 |
| 01    |     |     | 狢   | 璉   | 礪   | 綠   | 藹   | 賄   |     |     |     |     |     |     |     |     | 1 |
| 02    |     |     | 獫   | 璫   | 礼   | 緒   | 薰   | 賴   |     |     |     |     |     |     |     |     | 2 |
| 03    |     |     | 猪   | 瓶   | 神   | 繪   | 穉   | 賢   |     |     |     |     |     |     |     |     | 3 |
| 04    |     |     | 獷   | 峻   | 祥   | 罇   | 姓   | 赶   |     |     |     |     |     |     |     |     | 4 |
| 05    |     |     | 珣   | 皂   | 禔   | 羨   | 螭   | 赴   |     |     |     |     |     |     |     |     | 5 |
| 06    |     |     | 珉   | 皛   | 福   | 羽   | 褻   | 軌   |     |     |     |     |     |     |     |     | 6 |
| 07    |     |     | 珖   | 皞   | 禎   | 茁   | 訥   | 返   |     |     |     |     |     |     |     |     | 7 |
| 10    |     |     | 珣   | 晶   | 竝   | 芋   | 諄   | 逸   |     |     |     |     |     |     |     |     | 8 |
| 11    |     |     | 琿   | 皦   | 鳩   | 茂   | 詹   | 遼   |     |     |     |     |     |     |     |     | 9 |
| 12    |     |     | 琿   | 益   | 靖   | 菇   | 誦   | 郎   |     |     |     |     |     |     |     |     | A |
| 13    |     |     | 琿   | 琬   | 琿   | 摹   | 閭   | 都   |     |     |     |     |     |     |     |     | B |
| 14    |     |     | 琿   | 劭   | 箴   | 葉   | 諱   | 鄉   |     |     |     |     |     |     |     |     | C |
| 15    |     |     | 琪   | 砭   | 精   | 萌   | 諸   | 鄧   |     |     |     |     |     |     |     |     | D |
| 16    |     |     | 琿   | 砭   | 紉   | 藝   | 諶   | 鈞   |     |     |     |     |     |     |     |     | E |
| 17    |     |     | 琿   | 硤   | 絜   | 蕙   | 譚   |     |     |     |     |     |     |     |     |     | F |



Reserved,  
Unassigned



Character Set  
Select Code



Reserved,  
not used

XEROX Character Set 172<sub>8</sub>

Fuji Xerox Private Use

| Octal | 000 | 020 | 040 | 060 | 100 | 120 | 140 | 160 | 200 | 220 | 240 | 260 | 300 | 320 | 340 | 360 |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 00    |     |     | 鉹   | 鋅   | 鵠   | 𪛗   | 禮   |     |     |     |     |     |     |     |     |     | 0   |
| 01    |     |     | 釗   | 鋁   | 鋅   | 鵠   | 麟   | 餃   |     |     |     |     |     |     |     |     | 1   |
| 02    |     |     | 釒   | 銑   | 鋤   | 隲   | 高   | 寄   |     |     |     |     |     |     |     |     | 2   |
| 03    |     |     | 釕   | 銑   | 鋤   | 隲   | 高   | 寄   |     |     |     |     |     |     |     |     | 3   |
| 04    |     |     | 釕   | 銑   | 鋤   | 隲   | 高   | 寄   |     |     |     |     |     |     |     |     | 4   |
| 05    |     |     | 釕   | 銑   | 鋤   | 隲   | 高   | 寄   |     |     |     |     |     |     |     |     | 5   |
| 06    |     |     | 釕   | 銑   | 鋤   | 隲   | 高   | 寄   |     |     |     |     |     |     |     |     | 6   |
| 07    |     |     | 釕   | 銑   | 鋤   | 隲   | 高   | 寄   |     |     |     |     |     |     |     |     | 7   |
| 10    |     |     | 釕   | 銑   | 鋤   | 隲   | 高   | 寄   |     |     |     |     |     |     |     |     | 8   |
| 11    |     |     | 釕   | 銑   | 鋤   | 隲   | 高   | 寄   |     |     |     |     |     |     |     |     | 9   |
| 12    |     |     | 釕   | 銑   | 鋤   | 隲   | 高   | 寄   |     |     |     |     |     |     |     |     | A   |
| 13    |     |     | 釕   | 銑   | 鋤   | 隲   | 高   | 寄   |     |     |     |     |     |     |     |     | B   |
| 14    |     |     | 釕   | 銑   | 鋤   | 隲   | 高   | 寄   |     |     |     |     |     |     |     |     | C   |
| 15    |     |     | 釕   | 銑   | 鋤   | 隲   | 高   | 寄   |     |     |     |     |     |     |     |     | D   |
| 16    |     |     | 釕   | 銑   | 鋤   | 隲   | 高   | 寄   |     |     |     |     |     |     |     |     | E   |
| 17    |     |     | 釕   | 銑   | 鋤   | 隲   | 高   | 寄   |     |     |     |     |     |     |     |     | F   |
|       | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   | Hex |

Reserved,  
UnassignedCharacter Set  
Select CodeReserved,  
not used

# XEROX Character Set 340<sub>8</sub>

## Arabic Alphabet

| Octal | 000 | 020 | 040 | 060      | 100      | 120   | 140      | 160       | 200 | 220 | 240      | 260 | 300 | 320 | 340 | 360               |     |
|-------|-----|-----|-----|----------|----------|-------|----------|-----------|-----|-----|----------|-----|-----|-----|-----|-------------------|-----|
| 00    |     |     |     | Indian 0 |          | thal  | tatweel  | kasrah    |     |     |          |     |     |     |     |                   | 0   |
| 01    |     |     |     | Indian 1 | hamzah   | ra    | fa       | shaddah   |     |     | arab. v  |     |     |     |     |                   | 1   |
| 02    |     |     |     | Indian 2 | mad/alef | zain  | qaf      | sukun     |     |     | farsi p  |     |     |     |     |                   | 2   |
| 03    |     |     |     | Indian 3 | hm/alef  | seen  | caf      | dag. alef |     |     | farsi ch |     |     |     |     |                   | 3   |
| 04    |     |     |     | Indian 4 | hmwaw    | sheen | lam      | wsia/alef |     |     | farsi zh |     |     |     |     |                   | 4   |
| 05    |     |     | %   | Indian 5 | alef/hm  | sad   | meem     | dec. pnt  |     |     | farsi g  |     |     |     |     |                   | 5   |
| 06    |     |     |     | Indian 6 | hm/ya    | dad   | noon     | 1,000's   |     |     |          |     |     |     |     |                   | 6   |
| 07    |     |     |     | Indian 7 | alef     | tah   | ha       |           |     |     |          |     |     |     |     |                   | 7   |
| 10    |     |     |     | Indian 8 | ba       | dhah  | waw      |           |     |     |          |     |     |     |     |                   | 8   |
| 11    |     |     |     | Indian 9 | ta a mar | ain   | alf-maq. |           |     |     |          |     |     |     |     |                   | 9   |
| 12    |     |     |     |          | ta       | ghain | ya       |           |     |     |          |     |     |     |     |                   | A   |
| 13    |     |     |     |          | semi-col | tha   | fathatan |           |     |     |          |     |     |     |     |                   | B   |
| 14    |     |     |     |          | comma    | jeem  | damma.   |           |     |     |          |     |     |     |     |                   | C   |
| 15    |     |     |     |          |          | ha    | kasratan |           |     |     |          |     |     |     |     |                   | D   |
| 16    |     |     |     |          |          | kha   | fatha    |           |     |     |          |     |     |     |     |                   | E   |
| 17    |     |     |     |          | ques. mx | dal   | damma    |           |     |     |          |     |     |     |     | zero width joiner | F   |
|       | 0   | 1   | 2   | 3        | 4        | 5     | 6        | 7         | 8   | 9   | A        | B   | C   | D   | E   | F                 | Hex |



Reserved,  
Unassigned



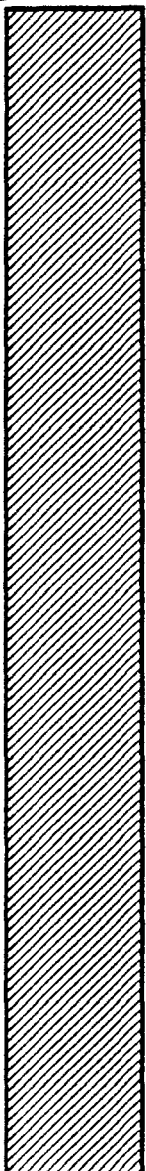
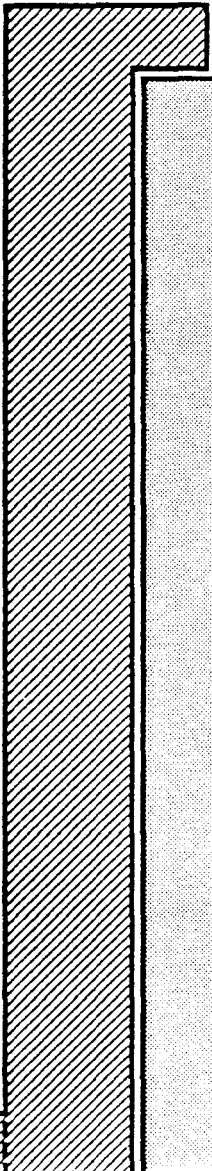
Character Set  
Select Code



Reserved,  
not used

# XEROX Character Set 3418

## Hebrew Alphabet

| Octal | 000                                                                                | 020 | 040        | 060 | 100           | 120           | 140                                                                                 | 160 | 200 | 220 | 240 | 260 | 300        | 320        | 340        | 360         |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 00    |  |     |            |     | א<br>aleph    | נ<br>nun      |  |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 01    |                                                                                    |     |            |     | כ<br>veth     | ס<br>samekh   |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 02    |                                                                                    |     |            |     | ג<br>gimel    | ע<br>ayin     |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 03    |                                                                                    |     |            |     | ד<br>daleth   | ף<br>fin. feh |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 04    |                                                                                    |     |            |     | ה<br>heh      | פ<br>feh      |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 05    |                                                                                    |     |            |     | ו<br>vav      | צ<br>f. tsadi |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 06    |                                                                                    |     |            |     | ז<br>zayin    | ץ<br>tsadi    |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 07    |                                                                                    |     |            |     | ח<br>cheth    | ק<br>koph     |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 10    |                                                                                    |     |            |     | ט<br>teth     | ר<br>resh     |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 11    |                                                                                    |     |            |     | י<br>yod      | ש<br>shin/sin |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 12    |                                                                                    |     |            |     | ך<br>f. chaph | ת<br>thav     |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 13    |                                                                                    |     |            |     | כ<br>chaph    | ב<br>beth     |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 14    |                                                                                    |     |            |     | ל<br>lamed    | כּ<br>kaph    |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 15    |                                                                                    |     |            |     | ם<br>fin mem  | פּ<br>peh     |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 16    |                                                                                    |     |            |     | מ<br>mem      |               |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 17    |                                                                                    |     |            |     | ן<br>fin nun  |               |                                                                                     |     |     |     |     |     |            |            |            |             |            |             |            |               |                |               |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|       |                                                                                    |     |            |     | 0             | 1             |                                                                                     |     |     |     |     |     |            |            |            |             | 2          | 3           | 4          | 5             | 6              | 7             | 8 | 9 | A | B | C | D | E | F | Hex |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|       |                                                                                    |     | ׃<br>comma |     |               |               |                                                                                     |     |     |     |     |     | ׀<br>hired | ׂ<br>sereh | ׃<br>segol | ׄ<br>qubbus | ׅ<br>qamas | ׆<br>pathah | ׇ<br>shewa | ׈<br>ht. path | ׉<br>ht. sefol | ׊<br>ht. qams |   |   |   |   |   |   |   |   |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

  
Reserved,  
Unassigned

  
Character Set  
Select Code

  
Reserved,  
not used

# XEROX Character Set 343g

Korean Hangul

| Octal | 000 | 020 | 040 | 060 | 100 | 120 | 140 | 160 | 200 | 220 | 240 | 260 | 300 | 320 | 340 | 360 |   |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| 00    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 0 |
| 01    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 1 |
| 02    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 2 |
| 03    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 3 |
| 04    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 4 |
| 05    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 5 |
| 06    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 6 |
| 07    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 7 |
| 10    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 8 |
| 11    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 9 |
| 12    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | A |
| 13    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | B |
| 14    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | C |
| 15    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | D |
| 16    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | E |
| 17    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | F |
|       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 0 |

|                         |                              |                       |
|-------------------------|------------------------------|-----------------------|
|                         |                              |                       |
| Reserved,<br>Unassigned | Character Set<br>Select Code | Reserved,<br>not used |

# XEROX Character Set 356g

## General and Technical Symbols 2

| Octal | 000 | 020          | 040       | 060       | 100       | 120        | 140       | 160       | 200 | 220 | 240 | 260 | 300       | 320     | 340      | 360       |     |
|-------|-----|--------------|-----------|-----------|-----------|------------|-----------|-----------|-----|-----|-----|-----|-----------|---------|----------|-----------|-----|
| 00    |     |              |           |           | c/u       | ↔          | lt. shade | T         |     |     |     | ▶   |           |         |          |           | 0   |
| 01    |     | 3 Em space   |           |           | l. bullet | up-down    | dk shade  |           |     |     |     | ◀   |           |         |          |           | 1   |
| 02    |     | 4 Em space   |           |           |           |            |           | ≠         |     |     |     | ◀   |           |         | }        |           | 2   |
| 03    |     | hair space   |           |           |           |            |           |           |     |     |     | ◀   |           |         |          |           | 3   |
| 04    |     | punct. space |           |           |           |            |           |           |     |     |     | →   |           |         |          |           | 4   |
| 05    |     | hyph. pt.    | !         | Δ         | ◻         | lg. cir    | n < nr =  |           |     |     |     | ←   | ↕         | notes   |          |           | 5   |
| 06    |     | crop t.r.    | assert    | lozenge   | lg. inter | n > nr =   |           |           |     |     |     | ↑   | ↕         |         | }        |           | 6   |
| 07    |     | crop t.l.    | symmet.   | caret     | lg. union |            |           |           |     |     |     | ↓   |           |         |          |           | 7   |
| 10    |     | crop b.r.    | t. runout | cntrline  | plotter   |            |           |           |     |     |     | ↔   |           |         |          |           | 8   |
| 11    |     | crop b.l.    | imped     | straight  | plotter   |            |           |           |     |     |     | ↔   | fill char |         |          |           | 9   |
| 12    |     | histogr.     | s. house  | flatness  | plotter   | start line | db excl.  | !!        |     |     |     | ↑   | fill char |         |          |           | A   |
| 13    |     | dir. sum     |           | cylindric | plotter   |            |           |           |     |     |     | ↓   | fill char | spades  |          |           | B   |
| 14    |     | ar. thou.    |           | line prof | plotter   |            |           | abs. val. |     |     |     | ←   | fill char | hearts  | rectang  |           | C   |
| 15    |     | minus        |           | sur. prof | plotter   |            |           |           |     |     |     | ↑   | fill char |         | r. angle | t. integ. | D   |
| 16    |     | ar. deci.    |           | all prof. | plotter   |            |           | ~ similar |     |     |     | →   | arr. hd   | clubs   | rectang. | b. integ. | E   |
| 17    |     |              |           | position  | plotter   |            |           |           |     |     |     | ↓   | arr. hd   | compass | dk smile | c. integ. | F   |
|       | 0   | 1            | 2         | 3         | 4         | 5          | 6         | 7         | 8   | 9   | A   | B   | C         | D       | E        | F         | Hex |

  
Reserved,  
Unassigned

  
Character Set  
Select Code

  
Reserved,  
not used

# XEROX Character Set 357<sub>8</sub>

## General and Technical Symbols 1

| Octal | 000 | 020 | 040              | 060            | 100            | 120             | 140             | 160             | 200 | 220 | 240            | 260             | 300             | 320        | 340          | 360           |     |
|-------|-----|-----|------------------|----------------|----------------|-----------------|-----------------|-----------------|-----|-----|----------------|-----------------|-----------------|------------|--------------|---------------|-----|
| 00    |     |     | †<br>dagger      | %<br>care of   | ≡<br>rev. res. | ⊠<br>ballot     | ⊥<br>perpind.   |                 |     |     |                | ⌈<br>l. ceiling | ⌒<br>arc        | ⊗<br>x-out | ☠<br>poison  | ♈<br>aquarius | 0   |
| 01    |     |     | non-brk<br>space | ‡<br>db dagg.  | ‰<br>per mil   | ↔<br>rev. res.  | ∅<br>null set   | ∝<br>proport.   |     |     | ₢<br>cruzeiro  | ⌈<br>r. ceiling | I<br>roman 1    | ①<br>form  | ∞<br>form    | ♏<br>pisces   | 1   |
| 02    |     |     | -<br>non-brk     | <<br>bra       | ≪<br>much <    | ↔<br>rev. res.  | ⊕<br>abs. +     | ≡<br>ident. =   |     |     | f<br>florin    | L<br>l. floor   | II<br>roman 2   | ②<br>form  | —<br>form    | ♈<br>aries    | 2   |
| 03    |     |     | -<br>discret.    | ><br>ket       | ≫<br>much >    | ↔<br>rev. res.  | ⊖<br>abs. -     | ≡<br>define =   |     |     | F<br>francs    | J<br>r. floor   | III<br>roman 3  | ③<br>form  | +<br>form    | ♉<br>taurus   | 3   |
| 04    |     |     | -<br>en dash     | ⌞<br>index     | ≠<br>not <     | ⊃<br>contains   | ⊗<br>abs. x     | ≡<br>? =        |     |     | P<br>pesetas   | E<br>th. exists | IV<br>roman 4   | ④<br>form  | —<br>form    | ♊<br>gemini   | 4   |
| 05    |     |     | -<br>em dash     | ⌞<br>index     | ≠<br>not >     | ⊃<br>cont. in   | ⊗<br>abs. +     | ∫<br>integral   |     |     | ₣<br>eur. cur. | ∇<br>for all    | V<br>roman 5    | ⑤<br>form  | —<br>form    | ♋<br>cancer   | 5   |
| 06    |     |     | -<br>fig. dash   | ⌞<br>perpin.   | ∩<br>divides   | ∩<br>intersec.  | •<br>bullet     | ¢<br>cont. int. |     |     | \$<br>milreis  | ∧<br>and        | VI<br>roman 6   | ⑥<br>form  | +<br>form    | ♌<br>leo      | 6   |
| 07    |     |     | '<br>neutral     | ⌞<br>perpin.   | ∩<br>not div.  | ∩<br>union      | °<br>cen. ring  | ≈<br>asym. =    |     |     | ⊗<br>gen. inf. | ∇<br>or         | VII<br>roman 7  | ⑦<br>form  | ☉<br>sun     | ♍<br>virgo    | 7   |
| 10    |     |     | ”<br>l. quote    | ≡<br>perpin.   | ∥<br>parallel  | ⊃<br>con. or =  | ℎ<br>Planck c.  | ≡<br>congru.    |     |     | No<br>number   | ▶<br>QED        | VIII<br>roman 8 | ⑧<br>form  | ☾<br>1q moon | ♎<br>libra    | 8   |
| 11    |     |     | “<br>r. quote    | ≡<br>perpin.   | ∥<br>no paral  | ⊃<br>cn. in =   | ℎ<br>liter      | ≈<br>asym. to   |     |     | R<br>take      | ∇<br>nabia      | IX<br>roman 9   | ⑨<br>form  | ☾<br>3q moon | ♏<br>scorpio  | 9   |
| 12    |     |     | ‘<br>l. quote    | ⌞<br>l. brack. | €<br>mem. of   | ⊃<br>p. incl.   | ⌞<br>log. not   | Σ<br>summat.    |     |     | TEL<br>teleph. | d<br>p. deriv.  | X<br>rom. 10    | ⑩<br>form  | ☿<br>mercury | ♐<br>sagittar | A   |
| 13    |     |     | ’<br>r. quote    | ⌞<br>r. brack. | ℳ<br>no mem.   | ⊃<br>p. inc. in | ⌞<br>br. v. bar | Π<br>product    |     |     | 3<br>dram      | ⌞<br>ocr hook   | ♠<br>spades     | ⊖<br>form  | ♃<br>jupiter | ♑<br>capric.  | B   |
| 14    |     |     | en quad          | ↖<br>such tht  | ≡<br>n.cn. =   | ∠<br>angle      | ✓<br>radical    |                 |     |     | C<br>comp. #   | Ψ<br>ocr fork   | ♥<br>hearts     | ⊕<br>form  | ♄<br>saturn  | ☎<br>teleph.  | C   |
| 15    |     |     | em quad          | ↘<br>imp. by   | ≡<br>n.c.in =  | ∠<br>sp. ang.   | ±<br>- or +     |                 |     |     | N<br>nat. #    | H<br>ocr chair  | ♦<br>diamon.    | ⊕<br>form  | ♅<br>uranus  | ½<br>en frac. | D   |
| 16    |     |     | figure space     | ↗<br>iff       | ↔<br>no cont.  | ∴<br>identical  | ⌞<br>m.shade    |                 |     |     | R<br>real #    | ∞<br>alt. curr. | ♣<br>clubs      | ☺<br>peace | ♆<br>neptune | ¾<br>en frac. | E   |
| 17    |     |     | thin space       | ↘<br>implies   | ↔<br>no cn. in | ∴<br>because    |                 |                 |     |     | Z<br>integer   | ≡<br>dbl bar    | ✓<br>check      | ☺<br>smile | ♇<br>pluto   | ⊗<br>form     | F   |
|       | 0   | 1   | 2                | 3              | 4              | 5               | 6               | 7               | 8   | 9   | A              | B               | C               | D          | E            | F             | Hex |



Reserved,  
Unassigned



Character Set  
Select Code



Reserved,  
not used

# XEROX Rendering Set 360<sub>8</sub>

## Ligatures and Field Format Symbols

| Octal | 000 | 020 | 040             | 060 | 100 | 120 | 140 | 160 | 200                       | 220                       | 240    | 260      | 300       | 320       | 340           | 360           |     |
|-------|-----|-----|-----------------|-----|-----|-----|-----|-----|---------------------------|---------------------------|--------|----------|-----------|-----------|---------------|---------------|-----|
| 00    |     |     |                 |     |     |     |     |     | $\frac{1}{4}$<br>em frac. |                           |        | NULL     | hair sp.  |           |               |               | 0   |
| 01    |     |     | ff<br>ligature  |     |     |     |     |     |                           | $\frac{1}{2}$<br>em frac. |        |          | 3 em sp.  | time mk   |               |               | 1   |
| 02    |     |     | ffi<br>ligature |     |     |     |     |     |                           | $\frac{3}{4}$<br>em frac. |        |          | 4 em sp.  | PFC       |               |               | 2   |
| 03    |     |     | ffl<br>ligature |     |     |     |     |     |                           | $\frac{1}{3}$<br>em frac. |        |          | 5 em sp.  | SOD       |               |               | 3   |
| 04    |     |     | fi<br>ligature  |     |     |     |     |     |                           | $\frac{2}{3}$<br>em frac. |        |          | en quad   | STOP      |               |               | 4   |
| 05    |     |     | fl<br>ligature  |     |     |     |     |     |                           | $\frac{1}{8}$<br>em frac. |        |          | em quad   | gp erase  |               |               | 5   |
| 06    |     |     | flt<br>ligature |     |     |     |     |     |                           | $\frac{3}{8}$<br>em frac. |        |          | punc. sp. | ch. erase | A             | Y<br>greek    | 6   |
| 07    |     |     |                 |     |     |     |     |     | $\frac{5}{8}$<br>em frac. |                           |        | fig. sp. |           |           | 9             | R<br>russian  | 7   |
| 10    |     |     |                 |     |     |     |     |     | $\frac{7}{8}$<br>em frac. |                           |        | v TAB    |           |           | Z             | U<br>hiragana | 8   |
| 11    |     |     |                 |     |     |     |     |     |                           |                           | H. TAB | Par TAB  |           | *         | カ<br>katakana |               | 9   |
| 12    |     |     |                 |     |     |     |     |     |                           |                           | LF (1) | SUB      |           |           | 漢<br>kanji    |               | A   |
| 13    |     |     |                 |     |     |     |     |     |                           |                           | FF     | ERROR    |           |           | 和<br>japanese |               | B   |
| 14    |     |     |                 |     |     |     |     |     |                           |                           | CR (1) | DUP      |           |           | +             | space (1)     | C   |
| 15    |     |     |                 |     |     |     |     |     |                           |                           | NL     |          | NP        |           | b             | space (2)     | D   |
| 16    |     |     |                 |     |     |     |     |     |                           |                           | CR (2) | FM       |           |           |               | space (3)     | E   |
| 17    |     |     |                 |     |     |     |     |     |                           |                           | LF (2) |          |           |           | X             |               | F   |
|       | 0   | 1   | 2               | 3   | 4   | 5   | 6   | 7   | 8                         | 9                         | A      | B        | C         | D         | E             | F             | Hex |

  
Reserved,  
Unassigned

  
Character Set  
Select Code

  
Reserved,  
not used

# XEROX Rendering Set 3618

## Accented Latin Characters

| Octal | 000 | 020 | 040            | 060            | 100            | 120            | 140           | 160          | 200 | 220 | 240 | 260            | 300            | 320            | 340            | 360           |               |   |
|-------|-----|-----|----------------|----------------|----------------|----------------|---------------|--------------|-----|-----|-----|----------------|----------------|----------------|----------------|---------------|---------------|---|
| 00    |     |     | È<br>grave E   | Î<br>circ. I   | Ó<br>acute O   | Ú<br>acute U   | Ž<br>hach. Z  |              |     |     |     | è<br>grave e   | î<br>circ. i   | ó<br>acute o   | ú<br>acute u   | ž<br>hach. z  | 0             |   |
| 01    |     |     | À<br>grave A   | É<br>acute E   | Ĩ<br>tilde I   | Ô<br>circ. O   | Û<br>circ. U  | Ł<br>hach. L |     |     |     | à<br>grave a   | é<br>acute e   | ĩ<br>tilde i   | ô<br>circ. o   | û<br>circ. u  | ł<br>hach. l  | 1 |
| 02    |     |     | Á<br>acute A   | Ê<br>circ. E   | Ī<br>macrn I   | Õ<br>tilde O   | Ū<br>tilde U  |              |     |     |     | á<br>acute a   | ê<br>circ. e   | ī<br>macrn i   | õ<br>tilde o   | ũ<br>tilde u  | ć<br>hach. t  | 2 |
| 03    |     |     | Ā<br>circ. A   | Ē<br>macrn E   | İ<br>dot I     | Ö<br>macrn O   | Ū<br>macrn U  |              |     |     |     | â<br>circ. a   | ē<br>macrn e   |                | ō<br>macrn o   | ū<br>macrn u  | d'<br>hach. d | 3 |
| 04    |     |     | Ȧ<br>tilde A   | Ė<br>dot E     | Į<br>diar. I   | Ȯ<br>diar. O   | Ū<br>breve U  |              |     |     |     | ȧ<br>tilde a   | ė<br>dot e     | į<br>diar. i   | ȯ<br>diar. o   | ū<br>breve u  |               | 4 |
| 05    |     |     | Ȧ<br>macrn A   | Ė<br>diar. E   | Į<br>ogon. I   | Ȯ<br>db ac. O  | Ū<br>diar. U  |              |     |     |     | ȧ<br>macrn a   | ė<br>diar. e   | į<br>ogon. i   | ȯ<br>db ac. o  | ū<br>diar. u  |               | 5 |
| 06    |     |     | Ǻ<br>breve A   | Ę<br>ogon. E   | Ĳ<br>circ. J   | Ŕ<br>acute R   | Ů<br>ring U   |              |     |     |     | ǻ<br>breve a   | ę<br>ogon. e   | ĳ<br>circ. j   | ŕ<br>acute r   | ů<br>ring u   |               | 6 |
| 07    |     |     | Ȧ<br>diar. A   | Ė<br>hach. E   | Į<br>cedilla K | Ȯ<br>cedilla R | Ū<br>db ac. U |              |     |     |     | ȧ<br>diar. a   | ė<br>hach. e   | į<br>cedilla k | ȯ<br>cedilla r | ū<br>db ac. u |               | 7 |
| 10    |     |     | Ȧ<br>ring A    | Ė<br>acute G   | Į<br>acute L   | Ȯ<br>hach. R   | Ū<br>ogon. U  |              |     |     |     | ȧ<br>ring a    | ė<br>acute g   | į<br>acute l   | ȯ<br>hach. r   | ū<br>ogon. u  |               | 8 |
| 11    |     |     | Ȧ<br>ogon. A   | Ė<br>circ. G   | Į<br>cedilla L | Ȯ<br>acute S   | Ū<br>circ. W  |              |     |     |     | ȧ<br>ogon. a   | ė<br>circ. g   | į<br>cedilla l | ȯ<br>acute s   | ū<br>circ. w  |               | 9 |
| 12    |     |     | Ȧ<br>acute C   | Ė<br>breve G   | Į<br>hach. L   | Ȯ<br>circ. S   | Ū<br>grave Y  |              |     |     |     | ȧ<br>acute c   | ė<br>breve g   | į<br>hach. l   | ȯ<br>circ. s   | ū<br>grave y  |               | A |
| 13    |     |     | Ȧ<br>circ. C   | Ė<br>dot G     | Į<br>acute N   | Ȯ<br>cedilla S | Ū<br>acute Y  |              |     |     |     | ȧ<br>circ. c   | ė<br>dot g     | į<br>acute n   | ȯ<br>cedilla s | ū<br>acute y  |               | B |
| 14    |     |     | Ȧ<br>dot C     | Ė<br>cedilla G | Į<br>tilde N   | Ȯ<br>hach. S   | Ū<br>circ. Y  |              |     |     |     | ȧ<br>dot c     | ė<br>cedilla g | į<br>tilde n   | ȯ<br>hach. s   | ū<br>circ. y  |               | C |
| 15    |     |     | Ȧ<br>cedilla C | Ė<br>circ. H   | Į<br>cedilla N | Ȯ<br>cedilla T | Ū<br>diar. Y  |              |     |     |     | ȧ<br>cedilla c | ė<br>circ. h   | į<br>cedilla n | ȯ<br>cedilla t | ū<br>diar. y  |               | D |
| 16    |     |     | Ȧ<br>hach. C   | Ė<br>grave I   | Į<br>hach. N   | Ȯ<br>hach. T   | Ū<br>acute Z  |              |     |     |     | ȧ<br>hach. c   | ė<br>grave i   | į<br>hach. n   | ȯ<br>hach. t   | ū<br>acute z  |               | E |
| 17    |     |     | Ȧ<br>hach. D   | Ė<br>acute I   | Į<br>grave O   | Ȯ<br>grave U   | Ū<br>dot Z    |              |     |     |     | ȧ<br>hach. d   | ė<br>acute i   | į<br>grave o   | ȯ<br>grave u   | ū<br>dot z    | <div></div>   | F |
|       | 0   | 1   | 2              | 3              | 4              | 5              | 6             | 7            | 8   | 9   | A   | B              | C              | D              | E              | F             | Hex           |   |



Reserved,  
Unassigned



Character Set  
Select Code



Reserved,  
not used

# XEROX Rendering Set 365<sub>8</sub>

Initial, Medial, and Final Arabic Characters

| Octal | 000 | 020 | 040 | 060 | 100 | 120 | 140 | 160 | 200 | 220 | 240 | 260 | 300 | 320 | 340 | 360 |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 00    |     |     | ث   | س   | ظ   | ك   | ي   |     |     |     |     |     |     |     |     |     | 0   |
| 01    |     |     | آ   | ث   | س   | ظ   | ل   | ي   |     |     |     |     |     |     |     |     | 1   |
| 02    |     |     | أ   | ث   | س   | ع   | ل   | ل   |     |     |     |     |     |     |     |     | 2   |
| 03    |     |     | و   | ج   | ش   | ع   | ل   | ل   |     |     |     |     |     |     |     |     | 3   |
| 04    |     |     | أ   | ج   | ش   | ع   | ل   | ل   |     |     |     |     |     |     |     |     | 4   |
| 05    |     |     | ز   | ج   | ش   | غ   | ح   | ل   |     |     |     |     |     |     |     |     | 5   |
| 06    |     |     | ز   | ح   | ص   | غ   | م   | ل   |     |     |     |     |     |     |     |     | 6   |
| 07    |     |     | ز   | ح   | ص   | غ   | ن   | ل   |     |     |     |     |     |     |     |     | 7   |
| 10    |     |     | أ   | ح   | ص   | ف   | ن   | ل   |     |     |     |     |     |     |     |     | 8   |
| 11    |     |     | ب   | خ   | ض   | ف   | ن   | ل   |     |     |     |     |     |     |     |     | 9   |
| 12    |     |     | م   | خ   | ض   | ف   | ه   | م   |     |     |     |     |     |     |     |     | A   |
| 13    |     |     | ب   | خ   | ض   | ق   | ه   | ف   |     |     |     |     |     |     |     |     | B   |
| 14    |     |     | ت   | د   | ط   | ق   | ه   | ف   |     |     |     |     |     |     |     |     | C   |
| 15    |     |     | ز   | د   | ط   | ق   | و   | ف   |     |     |     |     |     |     |     |     | D   |
| 16    |     |     | ت   | ر   | ط   | ك   | ي   | ك   |     |     |     |     |     |     |     |     | E   |
| 17    |     |     | ت   | ز   | ظ   | ك   | ي   | ك   |     |     |     |     |     |     |     |     | F   |
|       | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   | Hex |



Reserved,  
Unassigned



Character Set  
Select Code



Reserved,  
not used

## Variant Representations for Graphic Characters

92 CHARACTER CODE STANDARD

This appendix addresses a number of technical questions concerning the Xerox character codes listed in chapter 3. Since the topics below are not necessarily related to each other, there may not be continuity in reading from one section of this appendix to the next.

The discussions below rely heavily on the two distinctions made in sections 1.5 and 1.6:

- Static text *representation* is distinguished from active text-manipulation *processes*.
- The *content* of text (*identity* of a character) is distinguished from its *appearance*.

The impact of these distinctions is often that questions which are raised in the context of character codes turn out to be answered by mechanisms which lie *outside* the realm of character codes, namely either text-manipulation processes or "*looks*" information that specifies how text will appear when rendered visible. A full answer to such questions would require a detailed description of those mechanisms, which lies outside the scope of the present standard.

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## C.1 Basic *looks*

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Section 1.6 gave examples of different *looks* for the letter "C." Some of the appearance factors taken into account were: character size, character form (serif vs. sans-serif), character style (regular or roman vs. italic), character weight (light vs. bold), character baseline (normal vs. raised), and underlining. These are some of the most basic *looks*. Each can take on a number or *range* of values (e.g., there is a whole range of character weights, not merely light and bold).

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## C.2 Superscripts and subscripts

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Character baseline is a *looks* consideration. In the expression " $2x^2$ ," the two occurrences of the character "2" certainly represent the same numeral with different *looks* (size and baseline). This is especially obvious since computation might be performed involving these numbers. Therefore, superscripted numerals should not have independent character codes.

The graphic character codes do include independent superscript "2" and "3" characters, but only to maintain Teletex coverage for Character Set 0. These codes should not be used in a sophisticated text-processing system, and no graphic character codes are provided for the other digits. However, for printing on an external medium rendering character code assignments have been made for superscripts and subscript figures.

### C.3 Emphasis

Various *looks* are used to emphasize a phrase of text: *italicizing*, **boldening**, underlining, and (in some European languages) increased character spacing. These visual devices do not change the content of the emphasized text, only its appearance. The same could be said of emphasis via CAPITALIZATION as well (see the following).

### C.4 Case

Historically, the lowercase Latin letters such as "a," developed as mere stylistic variants of the standard Latin capitals, such as "A," in the same way that italic-style "A" did. Thus, "case" is merely a difference of visual style, so it *should* be handled the same as any other *looks*.

Specifically, the lowercase "a" *ought to* be assigned the same "101<sub>8</sub>" code as uppercase "A"—likewise for the even more troublesome "small-cap A." All are different appearances of the same character. In other words, a part of the code-vs.-*looks* chart *should* show:

| Code(s)          | <i>looks</i> #1 | #2 | #3 | #4 | #5 | #6 |
|------------------|-----------------|----|----|----|----|----|
| 101 <sub>8</sub> | A               | a  | A  | A  | a  | A  |
| 102 <sub>8</sub> | B               | b  | B  | B  | b  | B  |
| 103 <sub>8</sub> | C               | c  | C  | C  | c  | C  |
| ...              |                 |    |    |    |    |    |
| 141 <sub>8</sub> | <not used>      |    |    |    |    |    |
| 142 <sub>8</sub> | <not used>      |    |    |    |    |    |
| 143 <sub>8</sub> | <not used>      |    |    |    |    |    |

Treating case as a *looks* difference and not a code difference would yield more benefits than mere historical veracity. The word "cat" would have one unique internal representation instead of 8 case-dependent spellings. A single **Substitute** command that replaced the word "cat" with "dog" would also automatically replace "Cat" with "Dog." And the letter "a" would automatically sort together with "A" and before "Z," instead of requiring special treatment in the collating procedure.

Because of the untraditional nature of this analysis, the Xerox character codes do retain the ASCII standard assignment of 141<sub>8</sub> for "a," and a similar distinction for the Greek and Cyrillic alphabets. A sophisticated text-processing system would simply not use those codes internally, but would convert to the existing interchange standards at its communication interfaces.

If one chooses to remain with the traditional problems of representing lowercase "a" internally as code 141<sub>g</sub>, then small-cap "A" is best handled as a *looks* variant of "a." In other words, a part of the code-vs.-*looks* chart would show:

| <u>Code(s)</u>   | <u>looks #1</u> | <u>#2</u> | <u>#3</u> |
|------------------|-----------------|-----------|-----------|
| 141 <sub>g</sub> | a               | a         | A         |
| 142 <sub>g</sub> | b               | b         | B         |
| 143 <sub>g</sub> | c               | c         | C         |

A situation parallel to "case" occurs with the Japanese syllabaries *hiragana* and *katakana*, which ought to be represented as two different *looks* for a single set of *kana* symbols.

## C.5 Ligatures

In standard printing, it is common to express certain letter combinations by a single typographic object called a *ligature*, for example to render "f i" with "fi." This is modeled by designing the rendering process to detect the occurrence of the characters "f i" in sequence and render them visible with the "fi" ligature, if appropriate. In other words, the code-vs.-*looks* chart may allow multiple codes per line, such as:

| <u>Code(s)</u>                      | <u>looks #1</u> | <u>#2</u> | <u>#3</u> | <u>#4</u> | <u>#5</u> |
|-------------------------------------|-----------------|-----------|-----------|-----------|-----------|
| 146 <sub>g</sub>                    | f               | f         | f         | f         | f         |
| 146 <sub>g</sub> + 151 <sub>g</sub> | fi              | fi        | fi        | fi        | fi        |

What is important here is that the ligature itself, i.e., the typographic object "fi," is *not a text character and does not have a graphic character code*. This means that the text content of a string like "fish" does not vary; it remains four characters, whether it is *rendered* with a ligature or not.

Although the ligature entity "fi" is not a text character, in practice it is convenient to be able to refer to it by a numerical code. For this sort of use, the block of numbers assigned to alternate representations, Character Sets 360<sub>g</sub> through 376<sub>g</sub>, are excluded from use as graphic character codes. See chapter 4 for the definition of rendering characters and code assignments.

## C.6 European marked characters rendered via ligatures

The Xerox standard follows Teletex in representing European marked characters by *two* successive codes: the "mark" character followed by the "base" character. But good typography demands that the common European marked characters such as c-cedilla "ç" be *rendered* by a single specially-drawn typographic object.

This situation is handled in precisely the same way as ligatures. The rendering process detects the occurrence of the characters "cedilla c" in sequence and renders them visible with the graphic "ç." In other words, a part of the code-vs.-looks chart should show:

| <u>Code(s)</u>                      | <u>looks #1</u> |
|-------------------------------------|-----------------|
| 143 <sub>g</sub>                    | c               |
| 313 <sub>g</sub> + 143 <sub>g</sub> | ç               |

What is important here is that the European marked character itself, i.e., the typographic object "ç," *is not a text character and does not have a graphic character code*. It is, however, a rendering character (see chapter 4 of this standard). This permits adherence to the Teletex representation standard without loss of rendering quality.

This approach also solves the problem of whether the "marks" are visible or not when attached to uppercase letters. This is a matter of rendering style, not a difference of content. The marked uppercase letters can be rendered *either way*; but in any case, their *content* is represented as mark plus base. So, a part of the code-vs.-looks chart should show:

| <u>Code(s)</u>                      | <u>looks #1</u> | <u>#2</u> |
|-------------------------------------|-----------------|-----------|
| 141 <sub>g</sub>                    | a               | a         |
| 310 <sub>g</sub> + 141 <sub>g</sub> | ä               | ä         |
| 101 <sub>g</sub>                    | A               | A         |
| 310 <sub>g</sub> + 101 <sub>g</sub> | Ä               | A         |

## C.7 Generalized *n*-ary ligatures

The process which renders text visible may be designed to parse it into substrings of arbitrary length, and then emit a single visible graphic corresponding to each substring. Typographic objects representing *n* successive characters are a simple generalization of ligatures.

The English alphabet requires at most two simple ternary ligatures ("ffi" and "ffl"), but in other languages generalized ligatures can play an invaluable role:

- The Arabic-based scripts are modeled on cursive handwriting, and, as such, there are numerous combinations of letters which are better represented as nicely-drawn ligatures than by composition out of components. The more ligatures used, the more legible the printing. High-quality printing may use up to 900 ligatures for an alphabet containing only 29 distinct characters! One of the ligatures is obligatory.
- Devanagari-based scripts such as Hindi have dozens of ligatures, which are either obligatory or strongly preferred to the sequence of individual characters.
- Some scripts such as Hindi and Thai write certain vowels *before* the consonants that they phonetically *follow*. For example, the Hindi word pronounced "*hindu*," would in

effect be written "*ihndu*." This behavior is best handled by having a ligature for the pair of characters "h" + "i" which visually appears as the form "*ih*."

- Korean writes letters in small 2-dimensional syllabic clumps, although the underlying phonetic string is of course linear. The total number of possible syllables is on the order of 2,200, each of which could be either represented by its own generalized ligature or composed from an alphabet of about 400 small syllable fragments.

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## C.8 Context-dependent letterforms

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Closely related to *n*-ary ligatures are cases where the form of each letter depends on the identity of the letters surrounding it. These cases also require a parsing of the text by the rendering process, but, unlike ligatures, the text characters are singly mapped into visible forms.

The most noteworthy case of context-dependent letterforms is normal English text, where the first character of each sentence is rendered with uppercase *looks* (see section C.4). Another important application is Arabic-script languages, whose printing absolutely requires this capability. Other languages have a few context-dependent characters (Hindi, Greek, Hebrew).

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## C.9 Miscellaneous digraphs

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A *digraph* is a typographic object that appears to be composed out of two letters. Aside from ligatures, there are other digraphs whose treatment is quite different.

Certain languages have digraph letters: Spanish has "ch" and "ll," and Hungarian has several. These objects *collate* as though they were single characters, yet otherwise appear to be treated as pairs of separate characters. It seems best to represent such digraphs as pairs of separate characters and let the collating process parse the text to find them. The Xerox character codes do include independent Dutch "ij," "IJ," and South African "h" characters, primarily to maintain Teletex coverage for Character Set 0. The use of these codes is not necessarily recommended.

Other digraphs, notably "æ," "œ," and German "*ess-zed*," *do* differ graphically and otherwise from a pair of letters. The use of these individual codes in Character Set 0 is recommended.

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## C.10 Fractions

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Fractions must be handled as unitary objects of some sort, since the formatting of the fraction applies to the fraction as a whole and not only to the individual digits within it. But fractions cannot possibly be given individual character codes, since they are infinite in number.

Therefore, fractions must necessarily be handled as non-textual objects of some kind. The Xerox character codes do include independent "1/2," "1/3," "2/3," "1/4," and "3/4" characters,

but only to maintain coverage of Teletex and other code sets. These codes should not be used in a sophisticated text-processing system, and very few such codes are provided for other fractions.

## C.11 Logos, signatures, and other non-textual objects

There is no clear borderline between "text" and "graphics." The Xerox character codes arbitrarily include a few "pictorial" symbols, but policy is to exclude these in general. Pictorial entities which are not commonly used in running text should be handled by the machinery of graphics rather than the machinery of text. It is possible to construct an architecture where sequences of text may be interrupted by interceding non-textual objects such as "frames" for graphics.

The preference for not assigning character codes to arbitrary pictorial symbols applies to company logos and the signatures of individuals (see section 4.2.2). Moreover, such items should be accompanied by security information (password, etc.) which places them outside the pale of ordinary text. On the other hand, if a company name *can* be written in ordinary letters, such as

XEROX,

then there is certainly no harm in doing so.

## C.12 Rendering of "normally nonprinting" characters

The Xerox standard follows ISO in defining code (0 | 40<sub>8</sub>) as "Space, (normally nonprinting)." To render the character 40<sub>8</sub> visible, perhaps with one of several alternate graphical entities, is a different *look* of the Space character, not a change in its identity. So, a code-vs.-looks chart for the Space character could show:

| <u>Code(s)</u>                   | <u>looks #1</u> | <u>#2</u> | <u>#3</u> | <u>#4</u> |
|----------------------------------|-----------------|-----------|-----------|-----------|
| 0 <sub>8</sub>   40 <sub>8</sub> |                 | •         | ⌘         | ■         |

In the above visualization, either the Space character or another nonprinting character, the *picture* in each *looks* column is not itself a Space or even a graphic character at all. However, in practice it is convenient to be able to refer to each *picture* by a numerical code. Therefore, each *picture* is assigned a code in chapter 4.

To distinguish between a numeric code, which identifies a substitute *picture*, and a normal character code, the higher order byte of the substitute code is always larger than the higher order byte of the replaced character code. Substitute codes are defined as rendering character codes (section 4.1) when they can be algorithmically substituted for normal character codes. Rendering character codes use the block of numbers corresponding to Character Sets 360<sub>8</sub> through 375<sub>8</sub>.

In addition to rendering character codes always having a larger high-order byte, any given instance of a rendering type is assigned within a specified numeric code range. For rendering characters which are non-conventional representations of normally nonprinting

characters, Character Set 360<sub>8</sub> Right contains all of the *looks* for making control codes and graphic characters, such as Space, visible.

By definition from section 4.1, substitution is always in conformance with predetermined typographic, linguistic, or formatting rules. For rendering nonprinting characters visible, the set of <character code, character *looks*> pairs models these rules and always contains Character Set 360<sub>8</sub> as its high-order byte. A code-vs-*looks* chart of the set of pairs for rendering Space visible would show:

| <u>Code(s)</u>                      | <u>looks #1</u> | <u>#2</u> | <u>#3</u> | <u>#4</u> |
|-------------------------------------|-----------------|-----------|-----------|-----------|
| 0 <sub>8</sub>   40 <sub>8</sub>    |                 |           |           |           |
| 360 <sub>8</sub>   374 <sub>8</sub> |                 | •         |           |           |
| 360 <sub>8</sub>   375 <sub>8</sub> |                 |           | ⌘         |           |
| 360 <sub>8</sub>   312 <sub>8</sub> |                 |           |           | ■         |

The graphical picture "■" is defined in section 4.3.1 to be the graphic entity representative of "SUBSTITUTE" character, while the other pictures "•" and "⌘" are graphic entities representative of Space, type 1 and Space, type 2. Each picture in the chart provides an illustration of algorithmic substitution of a <character code, character *looks*> pair for the <0<sub>8</sub> | 40<sub>8</sub>, Space> pair, in accordance with a previously-assumed set of rules. The example only illustrates the rendering of nonprinting characters with substitute pairs from Character Set 360<sub>8</sub> Right and does not imply nor recommend any particular set of rules.

## C.13 Spaces

Space characters are conventionally included in text to provide spaces between words and, sometimes, to perform indentation, centering, tabulation, etc. In the printing trade, a variety of different width spaces are used when fine control of spacing is required. The Xerox standard follows both of these conventions by providing a variety of space characters.

For a given size of type, an "em" is a unit of width equal to the type font. For example, in a 12-point font, an em is 12 points high and 12 points wide. The space characters provided by the standard have widths expressed in units of ems; their width is, therefore, proportional to the size of the font used.

The following table describes the available space characters. All of the space characters are nonprinting.

| <u>Code(s)</u>                     | <u>Name</u>       | <u>Also called</u>      | <u>Width</u>                |             |
|------------------------------------|-------------------|-------------------------|-----------------------------|-------------|
| 357 <sub>8</sub>   55 <sub>8</sub> | em quad           | em space                | 1.0 em                      | fixed width |
| 357 <sub>8</sub>   54 <sub>8</sub> | en quad           | en space, nut quad      | 1/2 em                      | fixed width |
| 356 <sub>8</sub>   41 <sub>8</sub> | 3-to-the-em space | 3-em space, thick space | 1/3 em                      | fixed width |
| 356 <sub>8</sub>   42 <sub>8</sub> | 4-to-the-em space | 4-em space              | 1/4 em                      | fixed width |
| 357 <sub>8</sub>   57 <sub>8</sub> | 5-to-the-em space | 5-em space, thin space  | 1/5 em                      | fixed width |
| 356 <sub>8</sub>   43 <sub>8</sub> | hair space        |                         | 1/2 point to<br>6-to-the-em | fixed width |

|                                    |                    |               |                                 |                             |
|------------------------------------|--------------------|---------------|---------------------------------|-----------------------------|
| 357 <sub>8</sub>   56 <sub>8</sub> | figure space       | numeric space | same as numeral                 | fixed width                 |
| 356 <sub>8</sub>   44 <sub>8</sub> | punctuation space  |               | same as period, semicolon, etc. | fixed width                 |
| 0 <sub>8</sub>   40 <sub>8</sub>   | space              |               | 1/4 em (typ.)                   | stretches for justification |
| 357 <sub>8</sub>   41 <sub>8</sub> | non-breaking space |               | same as space                   | stretches for justification |

The non-breaking space is intended as a replacement for the plain space in situations where the space is not an acceptable place to break a line, e.g., the spaces in "May 15, 1928."

The widths given in the table are nominal widths. The font designer will choose the actual widths as appropriate for the font.

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## C.14 Printwheels

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Printwheel printing is somewhat at a loss to cope with the Xerox character world, with over 700 non-*kanji* characters, each of which can have an arbitrary number of *looks*. The key word here is *creative coping*: a division sign can be simulated as a colon overstruck with minus sign.

The process which maps text into printwheel spokes should, therefore, be able to map an arbitrary combination of characters plus *looks* into an arbitrary combination of printing actions. For example, a u-umlaut "ü" can be simulated as an umlaut mark overstruck with a "u." If the wheel does not have the mark character, then the "ü" can be alluded to via "ue" or even just plain "u." Again, a certain printwheel may have a large integral sign on one spoke and a small integral sign on another, and the mapping process must attend to the character *looks* information in order to pick the integral-sign spoke of the desired size.

Clearly there are no fixed rules to this game. What is important is that the mapping process have as much flexibility as possible—it cannot possibly be a simple one-to-one mapping between character codes and wheel spokes.

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## C.15 Kanji variations

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Chinese and Japanese kanji characters are subject to special *looks* variations, above and beyond the usual parameters of size and style:

- Vertical vs. horizontal text  
(a few characters change their appearance, such as parentheses)
- "Variant" character forms  
(affects a few hundred characters)
- Traditional vs. simplified character forms  
(affects thousands of characters)

These are all questions of *appearance* rather than *content*. Indeed, if we can say that one character is a "variant" or "simplified" form of another, then we have explicitly declared them to be *the same character*, and they should be given the same character code but different *looks*. Unfortunately, the information interchange code standards in Asia sometimes handle these distinctions by assigning separate character codes to the different forms.

In the Xerox character codes, there are thousands of Japanese kanji characters which have the same appearance as Chinese kanji. For example, the Japanese character "*ichi*" is identical semantically, graphically, and historically to the Chinese character "*yi*." These two kanji are considered to be different for the same reason that letters like "A" are repeated in the Latin, Greek, and Cyrillic alphabets: they are different by virtue of context. Furthermore, it would be chaos to attempt to manage a system in which Japanese and Chinese kanji codes were shared, not to mention the effect on run-length for text in both languages. Note that this version of the standard does not make any code assignments for Chinese kanji.

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## C.16 Find and Substitute

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Find and Substitute are not merely useful editing commands; they are also the most direct means by which a system user matches his understanding of text representation against the system's encoding. For example:

The English and Russian alphabets both contain letters which have the visual appearance of "ABC," but in the case of Russian, these letters correspond phonetically to "AVS." A user with a bilingual English-Russian document would hardly expect the English string "ABC" to Find the Russian string of the same appearance, since in the user's mind there is no relationship between the two.

In other words, when the user applies a **Find** command, his *expectation* of what is a reasonable match is a *de facto* definition of text identity.

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## C.17 Character identity

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Despite the helpfulness of the **Find** command in defining a notion of text identity, it still offers only a *gedankenexperiment*, not a definitive answer to questions of the sort: "Should these two symbols be two different character codes, or the same character code with different *looks*?"

In fact, there is no source of a definitive answer to such questions; there are only carefully considered judgments of appropriateness and expediency. The listing of Xerox character codes in section 3.2 is ultimately a record of such considered judgments. For example:

It is clear enough that "hyphen" and "minus sign" are *not* the same semantic, hence these are assigned to two different Xerox character codes. The ASCII and ISO 558 was given the identity "neutral dash" simply because that is more compatible with existing standards; "hyphen" is assigned the code (418 | 768) and "minus sign" is assigned the code (3568 | 558).

In cases where the Xerox character code listing does not distinguish separate characters, it is worth considering the possibility that they are *looks* variants of each other. For example:

It is clear enough that a "less-than-or-equal-to" sign that has one line on the bottom is just a *looks* variant of one that has two lines on the bottom. Hence, there is only one Xerox character code for the "less-than-or-equal-to" sign.

In cases where the Xerox character code listing does distinguish separate characters, a type designation is provided when the same semantic can be implied. For example:

It is clear that the approximate signs " $\approx$ " and " $\simeq$ " have similar meaning, but are assigned separate Xerox character codes. The code (357<sub>g</sub> | 167<sub>g</sub>) for " $\approx$ " has been given the identity "approximately equal, type 1" and the code (357<sub>g</sub> | 171<sub>g</sub>) has the identity "approximately equal, type 2."

The user of this standard must often apply his or her own judgment in finding the right combination of character identity and *looks* to meet the needs of a particular situation.

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## C.18 Keyboard input

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The method of keyboard input should have no particular relationship to the assignment of character codes, but in the past there has been a tendency to assume that any entity that appears on a standard typewriter keyboard must be represented as a single character (e.g., the Dutch "ij" digraph).

In fact, the mapping of keystrokes to characters may be many-to-one or one-to-many. A many-to-one mapping is found in phonetic-based typing methods for Japanese and Chinese. A one-to-many mapping is found in Swedish, whose standard keyboard contains several European marked characters, such as "ä," which are to be represented internally as two separate codes.

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## C.19 Collating

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The term "collating" here simply means "sorting into alphabetical order." The numerical Xerox character codes obviously constitute a *de facto* linear ordering on the characters, and the alphabetic Xerox characters are of course placed in standard dictionary order, insofar as possible.

The numerical Xerox code order, however, simply cannot serve as a universal standard collating order. Even among European Latin-alphabet languages, certain characters occupy different alphabetical places in different languages. For example, the character o-umlaut ("ö") has different standard positions:

- In German: mixed in with "o"
- In Hungarian: between "o" and "p"
- In Swedish: at the end after "z"

It also turns out that most alphabetical orderings are not based on simple numerical single-character comparisons. For example, in Spanish "ch" is a letter coming between "c" and "d."

in French the "œ" digraph is a single character but it sorts between "od" and "of," and in all European languages the uppercase and lowercase characters are sorted together.

Likewise, the phonetic ordering used in Japanese dictionaries is not a simple linear ordering of the *kana* characters, but instead involves sorting certain sets of *kana* together in a first pass and then discriminating them in a second pass (just as in collating English, if "A" and "a" are given separate codes, then they must first be sorted together and then later discriminated).

In the case of Japanese and Chinese *kanji*, there is no standard dictionary order at all.

The inescapable conclusion is:

- The *de facto* linear character ordering implied by the numerical Xerox character codes *cannot* be designed so as to carry the burden of the collating process. That being the case, there must exist a separate collating procedure for each language, which may in general be an arbitrarily complex algorithm.

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## C.20 Information interchange

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The present standard applies directly to textual information interchange only insofar as it defines character codes which constitute a representation of text content. It does not define or imply any transmission, error-correction, or other communications protocols.

The process of information interchange at an interface with an external system generally involves a format conversion of some sort, which often includes code-shuffling as one aspect of the conversion (for example, between ASCII and EBCDIC). The character codes obviously cannot be chosen so as to eliminate all such code shuffling, especially for a multinational system that must interface with various conflicting information interchange standards.

This situation is quite analogous to the conclusion with regard to collating (see above):

The numerical Xerox character codes *cannot* be designed so as to completely eliminate code shuffling as part of all format conversion processes. That being the case, there must exist a separate character conversion procedure for each information interchange standard, which may in general be an arbitrarily complex algorithm.

The goal, of course, is to *minimize* interface code shuffling, which is the reason that the Xerox character codes adhere to existing standards wherever possible, even at the cost of a very sparse utilization of the available code space.

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## C.21 Number of available codes

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The basic Xerox code space is 16 bits, i.e., [0 .. 177777g], which in theory allows for 65,536 different characters; however, this space is very considerably diluted by the ISO-based format which excludes "control codes" [1 .. 37g] and [177g .. 240g] from being used in any byte.

For Japanese characters, the Xerox codes follow the JIS standard, which adopts the ISO format and further prohibits use of the high-order bit in any byte (except that the Xerox codes impose the Character Set Escape code 377<sub>g</sub>). Thus, JIS limits itself to  $94 \times 94 = 8,836$  total characters. There appear to remain 1,033 code spaces available to JIS for additional Japanese kanji under the current self-imposed regime. The current JIS codes cover all but the most obscure Japanese text, and only a highly-trained scholar could recognize all of the currently-specified JIS kanji characters. However, there are many thousands of obscure characters used in the names of people and places or archaic text, that are not now covered by JIS.

The Xerox code design makes no attempt to resolve this problem on behalf of JIS. JIS will undoubtedly address it in the future, and the Xerox codes will attempt to remain as consistent as possible with JIS' future handling of kanji code assignments. Certainly the most attractive code-extension possibility is an escape to a multi-byte encoding (see section 6.4) for ultra-obscure kanji characters. In any case, the current limitations of the Xerox characters with regard to Japanese kanji are precisely those which are presently in force throughout Japan.

The situation for Chinese kanji characters is similar, but confused by the lack of a generally-accepted character set. The total number of Chinese kanji characters is in excess of 50,000; however, most of these are extremely rare. Between 6,000 and 12,000 kanji characters will suffice for all but the most obscure Chinese text.

As for non-kanji characters, all but the most technical European-language text is already covered by the current Xerox character codes, and there are only a few significant non-European alphabets remaining to be added. Most European-language typewriting and information processing has survived so far with no more than a *dozen* or so "symbol" characters.

A reference such as *Shepherd's Glossary of Graphic Signs and Symbols* [13] lists only 6,188 symbol *applications*, but this represents a very much smaller number of distinct character codes. Many of these "symbols" are actually letters, and there are often many different applications of the same symbol (e.g., a circle). Likewise, the number of different visual *appearances* of symbols is in no way constrained by the number of distinct symbol codes.

The Xerox code space range of character sets [241<sub>g</sub> .. 355<sub>g</sub>] currently allows for the addition of approximately 14,500 new symbols and/or characters. This provision should be adequate for the foreseeable future without going to a code-extension scheme such as described in section 6.4.

## D.

# DIFFERENCES BETWEEN XEROX CHARACTER ENCODING AND JIS 6226 STANDARDS

Deletions and additions have been made to the *Code of the Japanese Graphic Character Set for Information Interchange* standard, JIS C 6226-1983 (Japanese Industrial Standard) [11] [21], to create the Xerox Character Code Standard. The differences are listed below for reference:

## Deletions to the JIS Standard

(Roman alphabet and punctuation)

| Character | Xerox Code in<br>Character Set0 | JIS Code Set<br>Row(1st)-Col.(2nd) |
|-----------|---------------------------------|------------------------------------|
| !         | 41                              | 1-10                               |
| #         | 43                              | 1-84                               |
| %         | 45                              | 1-83                               |
| &         | 46                              | 1-85                               |
| ' (apos)  | 47                              | 1-39                               |
| (         | 50                              | 1-42                               |
| )         | 51                              | 1-43                               |
| *         | 52                              | 1-86                               |
| +         | 53                              | 1-60                               |
| - (minus) | 55                              | 1-61                               |
| /         | 57                              | 1-31                               |
| 0         | 60                              | 3-16                               |
| 1         | 61                              | 3-17                               |
| 2         | 62                              | 3-18                               |
| 3         | 63                              | 3-19                               |
| 4         | 64                              | 3-20                               |
| 5         | 65                              | 3-21                               |
| 6         | 66                              | 3-22                               |
| 7         | 67                              | 3-23                               |
| 8         | 70                              | 3-24                               |
| 9         | 71                              | 3-25                               |
| :         | 72                              | 1-7                                |
| ;         | 73                              | 1-8                                |
| <         | 74                              | 1-67                               |
| =         | 75                              | 1-65                               |
| >         | 76                              | 1-68                               |
| ?         | 77                              | 1-9                                |
| @         | 100                             | 1-87                               |
| A         | 101                             | 3-33                               |
| B         | 102                             | 3-34                               |
| C         | 103                             | 3-35                               |
| D         | 104                             | 3-36                               |
| E         | 105                             | 3-37                               |
| F         | 106                             | 3-38                               |

| Character | Xerox Code in<br>Character Set 0 | JIS Code Set<br>Row(1st)-Col.(2nd) |
|-----------|----------------------------------|------------------------------------|
| G         | 107                              | 3-39                               |
| H         | 110                              | 3-40                               |
| I         | 111                              | 3-41                               |
| J         | 112                              | 3-42                               |
| K         | 113                              | 3-43                               |
| L         | 114                              | 3-44                               |
| M         | 115                              | 3-45                               |
| N         | 116                              | 3-46                               |
| O         | 117                              | 3-47                               |
| P         | 120                              | 3-48                               |
| Q         | 121                              | 3-49                               |
| R         | 122                              | 3-50                               |
| S         | 123                              | 3-51                               |
| T         | 124                              | 3-52                               |
| U         | 125                              | 3-53                               |
| V         | 126                              | 3-54                               |
| W         | 127                              | 3-55                               |
| X         | 130                              | 3-56                               |
| Y         | 131                              | 3-57                               |
| Z         | 132                              | 3-58                               |
| [         | 133                              | 1-46                               |
| \         | 134                              | 1-32                               |
| ]         | 135                              | 1-47                               |
| a         | 141                              | 3-65                               |
| b         | 142                              | 3-66                               |
| c         | 143                              | 3-67                               |
| d         | 144                              | 3-68                               |
| e         | 145                              | 3-69                               |
| f         | 146                              | 3-70                               |
| g         | 147                              | 3-71                               |
| h         | 150                              | 3-72                               |
| i         | 151                              | 3-73                               |
| j         | 152                              | 3-74                               |
| k         | 153                              | 3-75                               |
| l         | 154                              | 3-76                               |
| m         | 155                              | 3-77                               |
| n         | 156                              | 3-78                               |
| o         | 157                              | 3-79                               |
| p         | 160                              | 3-80                               |
| q         | 161                              | 3-81                               |
| r         | 162                              | 3-82                               |
| s         | 163                              | 3-83                               |
| t         | 164                              | 3-84                               |
| u         | 165                              | 3-85                               |
| v         | 166                              | 3-86                               |
| w         | 167                              | 3-87                               |
| x         | 170                              | 3-88                               |
| y         | 171                              | 3-89                               |
| z         | 172                              | 3-90                               |
| {         | 173                              | 1-48                               |
| (bar)     | 174                              | 1-35                               |

| Character        | Xerox Code in<br>Character Set 0 | JIS Code Set<br>Row(1st)-Col.(2nd) |
|------------------|----------------------------------|------------------------------------|
| }                | 175                              | 1-49                               |
| ~ (tilde)        | 176                              | 1-33                               |
| ¢ (cents)        | 242                              | 1-81                               |
| £ (Pound)        | 243                              | 1-82                               |
| \$               | 244                              | 1-80                               |
| ¥ (yen)          | 245                              | 1-79                               |
| §                | 247                              | 1-88                               |
| ' (left)         | 251                              | 1-38                               |
| " (left)         | 252                              | 1-40                               |
| <                | 253                              | 1-52                               |
| ← (left arrow)   | 254                              | 2-11                               |
| ↑ (up arrow)     | 255                              | 2-12                               |
| → (right arrow)  | 256                              | 2-10                               |
| ↓ (down arrow)   | 257                              | 2-13                               |
| ° (degree)       | 260                              | 1-75                               |
| ± (plus minus)   | 261                              | 1-62                               |
| × (mult.)        | 264                              | 1-63                               |
| .                | 266                              | 2-89                               |
| • (centered dot) | 267                              | 1-6                                |
| ÷ (div)          | 270                              | 1-64                               |
| ' (right)        | 271                              | 1-39                               |
| " (right)        | 272                              | 1-41                               |
| >                | 273                              | 1-53                               |
| ` (grave)        | 301                              | 1-14                               |
| ´ (acute)        | 302                              | 1-13                               |
| ˆ (circumflex)   | 303                              | 1-16                               |
| ¯ (macron)       | 305                              | 1-28                               |
| ¨ (diaeresis)    | 310                              | 1-15                               |
| — (underline)    | 314                              | 1-18                               |
|                  | 325                              | 2-86                               |

## (General and technical symbols)

| Character | Xerox Code in<br>Character Set 43 | JIS Code Set<br>Row(1st)-Col.(2nd) |
|-----------|-----------------------------------|------------------------------------|
|           | 254                               | 2-85                               |
|           | 274                               | 2-84                               |
|           | 303                               | 1-17                               |

| Character | Xerox Code in<br>Character Set 357 | JIS Code Set<br>Row(1st)-Col.(2nd) |
|-----------|------------------------------------|------------------------------------|
|           | 44                                 | 1-29                               |
|           | 60                                 | 2-87                               |
|           | 61                                 | 2-88                               |
|           | 62                                 | 1-50                               |
|           | 63                                 | 1-51                               |
|           | 101                                | 2-83                               |
|           | 102                                | 2-67                               |
|           | 103                                | 2-68                               |

|     |      |
|-----|------|
| 112 | 2-26 |
| 114 | 2-27 |
| 116 | 2-46 |
| 117 | 2-45 |
| 126 | 2-33 |
| 127 | 2-32 |
| 130 | 2-29 |
| 131 | 2-28 |
| 132 | 2-31 |
| 133 | 2-30 |
| 152 | 2-44 |
| 154 | 2-60 |
| 157 | 2-72 |
| 160 | 2-61 |
| 161 | 2-71 |
| 162 | 2-65 |
| 165 | 2-73 |
| 174 | 2-69 |
| 264 | 2-48 |
| 265 | 2-47 |
| 266 | 2-42 |
| 267 | 2-43 |
| 271 | 2-64 |
| 272 | 2-63 |
| 300 | 2-62 |

| Character | Xerox Code in<br>Character Set 361 | JIS Code Set<br>Row(1st)-Col.(2nd) |
|-----------|------------------------------------|------------------------------------|
|           | 50                                 | 2-82                               |

(Forms characters)

| Character | Xerox Code in<br>Character Set 357 | JIS Code Set<br>Row(1st)-Col.(2nd) |
|-----------|------------------------------------|------------------------------------|
|           | 341                                | 2-13                               |
|           | 342                                | 2-12                               |
|           | 343                                | 2-22                               |
|           | 344                                | 2-2                                |
|           | 345                                | 2-1                                |
|           | 346                                | 2-11                               |

**Substitution within the JIS Standard**

(Greek)

ISO 5428-1980 (E), Greek alphabet coded character set for bibliographic information has been substituted for the JIS C 6226-1983 Greek character set.

(JIS Level-II)

The four old style characters which appear in row 84 of the 1983 JIS Level-II standard are moved to row 85 because the Xerox standard has CharSet8 = 164<sub>8</sub> (the equivalent of row 84) assigned to Symbols 3 (Japanese).

| Character | Xerox Code in<br>Character Set 165 | JIS Code Set<br>Row(1st)-Col.(2nd) |
|-----------|------------------------------------|------------------------------------|
|           | 41                                 | 84-1                               |
|           | 42                                 | 84-2                               |
|           | 43                                 | 84-3                               |
|           | 44                                 | 84-4                               |

These two characters which appear in row 2 of the 1983 JIS standard are alternate renderings of graphic characters and so are assigned to CharSet8 = 375<sub>8</sub>.

| Character | Xerox Code in<br>Character Set 375 | JIS Code Set<br>Row(1st)-Col.(2nd) |
|-----------|------------------------------------|------------------------------------|
|           | 174                                | 2-69                               |
|           | 176                                | 2-70                               |

#### Addition to the JIS Standard

(Miscellaneous Japanese Symbols)

| Character | Xerox Code in<br>Character Set 164 | JIS Code Set<br>Row(1st)-Col.(2nd) |
|-----------|------------------------------------|------------------------------------|
|           | 41                                 | 84-1                               |
|           | 42                                 | 84-2                               |
|           | 43                                 | 84-3                               |
|           | 44                                 | 84-4                               |
|           | 45                                 | 84-5                               |
|           | 46                                 | 84-6                               |
|           | 47                                 | 84-7                               |
|           | 50                                 | 84-8                               |
|           | 51                                 | 84-9                               |
|           | 52                                 | 84-10                              |
|           | 53                                 | 84-11                              |
|           | 54                                 | 84-12                              |
|           | 55                                 | 84-13                              |
|           | 56                                 | 84-14                              |
|           | 57                                 | 84-15                              |



|                         |                                     |
|-------------------------|-------------------------------------|
| 0 (Digit)               | See Zero                            |
| 1 (Digit)               | See One                             |
| 2 (Digit)               | See Two                             |
| 3 (Digit)               | See Three                           |
| 4 (Digit)               | See Four                            |
| 5 (Digit)               | See Five                            |
| 6 (Digit)               | See Six                             |
| 7 (Digit)               | See Seven                           |
| 8 (Digit)               | See Eight                           |
| 9 (Digit)               | See Nine                            |
| Absolute value          | 356 <sub>8</sub>   174 <sub>8</sub> |
| Abstract +              | 357 <sub>8</sub>   142 <sub>8</sub> |
| Abstract -              | 357 <sub>8</sub>   143 <sub>8</sub> |
| Abstract ×              | 357 <sub>8</sub>   144 <sub>8</sub> |
| Abstract ÷              | 357 <sub>8</sub>   145 <sub>8</sub> |
| Abstract multiplication | See Sun                             |
| Accent, Acute           | See Acute                           |
| Accent, Acute, Double   | See Acute, Double                   |
| Accent, Breve           | See Breve                           |
| Accent, Cedilla         | See Cedilla                         |
| Accent, Circumflex      | See Circumflex                      |
| Accent, Diaeresis       | See Diaeresis                       |
| Accent, Grave           | See Grave                           |
| Accent, Hachek          | See Hachek                          |
| Accent, Macron          | See Macron                          |
| Accent, Ogonek          | See Ogonek                          |
| Accent, Over-dot        | See Over-dot                        |
| Accent, Overline        | See Overline                        |
| Accent, Over-ring       | See Over-ring                       |
| Accent, Tilde           | See Tilde                           |
| Accent, Underline       | See Underline                       |
| Acute (accent)          | 0 <sub>8</sub>   302 <sub>8</sub>   |
| Acute, Double (accent)  | 0 <sub>8</sub>   315 <sub>8</sub>   |
| ae digraph, Lowercase   | 0 <sub>8</sub>   361 <sub>8</sub>   |
| AE digraph, Uppercase   | 0 <sub>8</sub>   341 <sub>8</sub>   |
| Alphabet, Arabic        | Character Set 340 <sub>8</sub>      |
| Alphabet, Cyrillic      | Character Set 47 <sub>8</sub>       |
| Alphabet, English       | See Alphabet, Roman                 |
| Alphabet, Greek         | Character Set 46 <sub>8</sub>       |
| Alphabet, Hebrew        | Character Set 341 <sub>8</sub>      |
| Alphabet, Korean        | Character Set 343 <sub>8</sub>      |
| Alphabet, Latin         | See Alphabet, Roman                 |
| Alphabet, Roman         | Character Set 0 <sub>8</sub>        |

|                                    |                                     |
|------------------------------------|-------------------------------------|
| Alternating current                | 357 <sub>8</sub>   276 <sub>8</sub> |
| Ampersand                          | 0 <sub>8</sub>   46 <sub>8</sub>    |
| And                                | 357 <sub>8</sub>   266 <sub>8</sub> |
| Angle                              | 357 <sub>8</sub>   154 <sub>8</sub> |
| Angle, Right                       | 356 <sub>8</sub>   335 <sub>8</sub> |
| Angle, Spherical                   | 357 <sub>8</sub>   155 <sub>8</sub> |
| Apostrophe                         | 0 <sub>8</sub>   47 <sub>8</sub>    |
| Approaches                         | 356 <sub>8</sub>   256 <sub>8</sub> |
| Approximately equal to             | 356 <sub>8</sub>   171 <sub>8</sub> |
| Approximately equal, Type 1        | 357 <sub>8</sub>   167 <sub>8</sub> |
| Approximately equal, Type 2        | 357 <sub>8</sub>   171 <sub>8</sub> |
| Aquarius                           | 357 <sub>8</sub>   360 <sub>8</sub> |
| Arabic                             | See Alphabet, Arabic                |
| Arc                                | 357 <sub>8</sub>   300 <sub>8</sub> |
| Aries                              | 357 <sub>8</sub>   362 <sub>8</sub> |
| Arrow, Curly                       | 357 <sub>8</sub>   123 <sub>8</sub> |
| Arrow, Backward indicator          | 356 <sub>8</sub>   276 <sub>8</sub> |
| Arrow, Double                      | 357 <sub>8</sub>   122 <sub>8</sub> |
| Arrow, Double, Back                | 357 <sub>8</sub>   115 <sub>8</sub> |
| Arrow, Double, Double              | 357 <sub>8</sub>   116 <sub>8</sub> |
| Arrow, Double, Left                | See Arrow, Double, Back             |
| Arrow, Double, Up and Down         | 356 <sub>8</sub>   121 <sub>8</sub> |
| Arrow, Double, Right               | 357 <sub>8</sub>   117 <sub>8</sub> |
| Arrow, East                        | 0 <sub>8</sub>   256 <sub>8</sub>   |
| Arrow, East, Circled               | 357 <sub>8</sub>   333 <sub>8</sub> |
| Arrow, East-then-South, Circled    | 357 <sub>8</sub>   334 <sub>8</sub> |
| Arrow, Forward indicator           | 356 <sub>8</sub>   277 <sub>8</sub> |
| Arrow, Large, Downward and Closed  | 356 <sub>8</sub>   247 <sub>8</sub> |
| Arrow, Large, Downward and Open    | 356 <sub>8</sub>   253 <sub>8</sub> |
| Arrow, Large, Leftward and Closed  | 356 <sub>8</sub>   245 <sub>8</sub> |
| Arrow, Large, Leftward and Open    | 356 <sub>8</sub>   251 <sub>8</sub> |
| Arrow, Large, Rightward and Closed | 356 <sub>8</sub>   244 <sub>8</sub> |
| Arrow, Large, Rightward and Open   | 356 <sub>8</sub>   250 <sub>8</sub> |
| Arrow, Large, Upward and Closed    | 356 <sub>8</sub>   246 <sub>8</sub> |
| Arrow, Large, Upward and Open      | 356 <sub>8</sub>   252 <sub>8</sub> |
| Arrow, North                       | 0 <sub>8</sub>   255 <sub>8</sub>   |
| Arrow, NorthEast                   | 357 <sub>8</sub>   76 <sub>8</sub>  |
| Arrow, North-South                 | 356 <sub>8</sub>   265 <sub>8</sub> |
| Arrow, North-South, perpendicular  | 356 <sub>8</sub>   266 <sub>8</sub> |
| Arrow, NorthWest                   | 357 <sub>8</sub>   74 <sub>8</sub>  |
| Arrow, Right over Left             | 356 <sub>8</sub>   120 <sub>8</sub> |
| Arrow, South                       | 0 <sub>8</sub>   257 <sub>8</sub>   |
| Arrow, South-then-West, Circled    | 357 <sub>8</sub>   335 <sub>8</sub> |
| Arrow, SouthEast                   | 357 <sub>8</sub>   75 <sub>8</sub>  |
| Arrow, SouthWest                   | 357 <sub>8</sub>   77 <sub>8</sub>  |
| Arrow, West                        | 0 <sub>8</sub>   254 <sub>8</sub>   |
| Assertion sign                     | 356 <sub>8</sub>   66 <sub>8</sub>  |
| Asterisk                           | 0 <sub>8</sub>   52 <sub>8</sub>    |
| Asymptotic or equal to             | 356 <sub>8</sub>   170 <sub>8</sub> |
| At sign (Commercial at sign)       | 0 <sub>8</sub>   100 <sub>8</sub>   |
| Backslash                          | See Slant, Reverse                  |
| Ballot box                         | 42 <sub>8</sub>   42 <sub>8</sub>   |
| Ballot box, Checked                | 357 <sub>8</sub>   140 <sub>8</sub> |

|                                              |                                       |
|----------------------------------------------|---------------------------------------|
| Bar, Low                                     | 0 <sub>8</sub>   137 <sub>8</sub>     |
| Bar, Low, Double                             | 357 <sub>8</sub>   277 <sub>8</sub>   |
| Bar, Vertical                                | 0 <sub>8</sub>   174 <sub>8</sub>     |
| Bar, Vertical, Broken                        | 357 <sub>8</sub>   153 <sub>8</sub>   |
| Bar, Vertical, Double                        | See Parallel sign                     |
| Because                                      | 357 <sub>8</sub>   157 <sub>8</sub>   |
| Bo-po-mo-fo (Chinese)                        | Character Set 44 <sub>8</sub> R       |
| Bra                                          | 357 <sub>8</sub>   62 <sub>8</sub>    |
| Brace, Closing (Right)                       | 0 <sub>8</sub>   175 <sub>8</sub>     |
| Brace, Opening (Left)                        | 0 <sub>8</sub>   173 <sub>8</sub>     |
| Bracket, Closing (Right)                     | 0 <sub>8</sub>   135 <sub>8</sub>     |
| Bracket, Lenticular, Left, Black (Japanese)  | 41 <sub>8</sub>   132 <sub>8</sub>    |
| Bracket, Lenticular, Left, White (Chinese)   | 357 <sub>8</sub>   72 <sub>8</sub>    |
| Bracket, Lenticular, Right, Black (Japanese) | 41 <sub>8</sub>   133 <sub>8</sub>    |
| Bracket, Lenticular, Right, White (Chinese)  | 357 <sub>8</sub>   73 <sub>8</sub>    |
| Bracket, Opening (Left)                      | 0 <sub>8</sub>   133 <sub>8</sub>     |
| Breve (accent)                               | 0 <sub>8</sub>   306 <sub>8</sub>     |
| Bullet, Centered                             | 357 <sub>8</sub>   146 <sub>8</sub>   |
| Bull's eye                                   | See Circle, White,<br>Two, Concentric |
|                                              |                                       |
| Cada una (Spanish)                           | 356 <sub>8</sub>   100 <sub>8</sub>   |
| Cancer                                       | 357 <sub>8</sub>   365 <sub>8</sub>   |
| Capricorn                                    | 357 <sub>8</sub>   373 <sub>8</sub>   |
| Caret                                        | 356 <sub>8</sub>   107 <sub>8</sub>   |
| Care of                                      | 357 <sub>8</sub>   100 <sub>8</sub>   |
| Caron                                        | See Hachek                            |
| Cedilla (Undermark)                          | 0 <sub>8</sub>   313 <sub>8</sub>     |
| Ceiling, Left                                | 357 <sub>8</sub>   260 <sub>8</sub>   |
| Ceiling, Right                               | 357 <sub>8</sub>   261 <sub>8</sub>   |
| Cent sign                                    | 0 <sub>8</sub>   242 <sub>8</sub>     |
| Centerline                                   | 356 <sub>8</sub>   110 <sub>8</sub>   |
| Check mark                                   | 357 <sub>8</sub>   337                |
| Circle, Black                                | 41 <sub>8</sub>   174 <sub>8</sub>    |
| Circle, Large                                | 42 <sub>8</sub>   176 <sub>8</sub>    |
| Circle, Large, Inverse                       | 356 <sub>8</sub>   125 <sub>8</sub>   |
| Circle, White                                | 41 <sub>8</sub>   173 <sub>8</sub>    |
| Circle, White, Two, Concentric               | 41 <sub>8</sub>   175 <sub>8</sub>    |
| Circled letter                               | See Letter, Circled                   |
| Circled number                               | See Number, Circled                   |
| Circumflex Accent (spacing)                  | 0 <sub>8</sub>   136 <sub>8</sub>     |
| Circumflex (accent)                          | 0 <sub>8</sub>   303 <sub>8</sub>     |
| Circumflex Undermark (African languages)     | 41 <sub>8</sub>   333 <sub>8</sub>    |
| Clubs, Open                                  | 356 <sub>8</sub>   316 <sub>8</sub>   |
| Clubs, Solid                                 | 357 <sub>8</sub>   316 <sub>8</sub>   |
| Colon                                        | 0 <sub>8</sub>   72 <sub>8</sub>      |
| Comma                                        | 0 <sub>8</sub>   54 <sub>8</sub>      |
| Comma, Square (Kanji)                        | 41 <sub>8</sub>   44 <sub>8</sub>     |
| Compass symbol                               | 356 <sub>8</sub>   317 <sub>8</sub>   |
| Complex number                               | See Number, Complex                   |
| Congruent                                    | See Isomorphic                        |
| Contain, Does not                            | See Does not contain                  |
| Contained in, Type 1                         | 337 <sub>8</sub>   125 <sub>8</sub>   |
| Contained in, Type 2                         | 357 <sub>8</sub>   133 <sub>8</sub>   |

|                                          |                                                                       |
|------------------------------------------|-----------------------------------------------------------------------|
| Contained in or equals                   | 357 <sub>8</sub>   131 <sub>8</sub>                                   |
| Contained in, Not                        | See Is not contained in                                               |
| Contained in or equals, Not              | See Neither contained in nor is equal to                              |
| Contains or equals, Not                  | See Neither contains nor is equal to                                  |
| Contains, Type 1                         | 357 <sub>8</sub>   124 <sub>8</sub>                                   |
| Contains, Type 2                         | 357 <sub>8</sub>   132 <sub>8</sub>                                   |
| Contains as a member                     | See Such that, Type 1                                                 |
| Contains or equals                       | 357 <sub>8</sub>   130 <sub>8</sub>                                   |
| Copyright sign                           | 0 <sub>8</sub>   323 <sub>8</sub>                                     |
| Copyright statement, Sound recording     | 43 <sub>8</sub>   256 <sub>8</sub>                                    |
| Crop sign, Top right                     | 356 <sub>8</sub>   46 <sub>8</sub>                                    |
| Crop sign, Top left                      | 356 <sub>8</sub>   47 <sub>8</sub>                                    |
| Crop sign, Bottom right                  | 356 <sub>8</sub>   50 <sub>8</sub>                                    |
| Crop sign, Bottom left                   | 356 <sub>8</sub>   51 <sub>8</sub>                                    |
| Cruzeiro (Brazilian)                     | 357 <sub>8</sub>   241 <sub>8</sub>                                   |
| Cubed                                    | 0 <sub>8</sub>   263 <sub>8</sub>                                     |
| Currency sign, European                  | 357 <sub>8</sub>   245 <sub>8</sub>                                   |
| Currency symbol, Brazilian               | See Cruzeiro                                                          |
| Currency symbol, Dutch                   | See Florin                                                            |
| Currency symbol, General (International) | 0 <sub>8</sub>   44 <sub>8</sub>                                      |
| Currency symbol, Portugese               | See Escudo                                                            |
| Currency symbol, Spanish                 | See Pesetas                                                           |
| Currency symbol, Yen (Japanese)          | 0 <sub>8</sub>   245 <sub>8</sub>                                     |
| Cylindricity                             | 356 <sub>8</sub>   113 <sub>8</sub>                                   |
| Cyrillic                                 | See Alphabet, Cyrillic                                                |
| d with stroke, Lowercase (Croatian)      | 0 <sub>8</sub>   362 <sub>8</sub>                                     |
| D with stroke, Uppercase (Croatian)      | 0 <sub>8</sub>   342 <sub>8</sub>                                     |
| Dagger                                   | 357 <sub>8</sub>   60 <sub>8</sub>                                    |
| Dagger, Double                           | 357 <sub>8</sub>   61 <sub>8</sub>                                    |
| Dash, En                                 | 357 <sub>8</sub>   44 <sub>8</sub>                                    |
| Dash, Em                                 | 357 <sub>8</sub>   45 <sub>8</sub>                                    |
| Dash, Figure                             | 357 <sub>8</sub>   46 <sub>8</sub>                                    |
| Dash, Neutral                            | 0 <sub>8</sub>   55 <sub>8</sub>                                      |
| Decimal point                            | 356 <sub>8</sub>   56 <sub>8</sub>                                    |
| Decreases                                | 356 <sub>8</sub>   257 <sub>8</sub>                                   |
| Degree sign                              | 0 <sub>8</sub>   260 <sub>8</sub>                                     |
| Del                                      | See Nabla                                                             |
| Derivative, First                        | See Over-dot                                                          |
| Derivative, Partial                      | 357 <sub>8</sub>   272 <sub>8</sub>                                   |
| Diaeresis (accent)                       | 0 <sub>8</sub>   310 <sub>8</sub>                                     |
| Diamond, Black                           | 42 <sub>8</sub>   41 <sub>8</sub>                                     |
| Diamond, White                           | 41 <sub>8</sub>   176 <sub>8</sub>                                    |
| Diamonds                                 | 357 <sub>8</sub>   315 <sub>8</sub>                                   |
| Digits                                   | 0 <sub>8</sub>   60 <sub>8</sub> ... 0 <sub>8</sub>   71 <sub>8</sub> |
| Direct sum                               | 356 <sub>8</sub>   53 <sub>8</sub>                                    |
| Divides                                  | 357 <sub>8</sub>   106 <sub>8</sub>                                   |
| Divides, Not                             | See Does not divide                                                   |
| Divide sign                              | 0 <sub>8</sub>   270 <sub>8</sub>                                     |
| Does not contain                         | 357 <sub>8</sub>   136 <sub>8</sub>                                   |
| Does not contain as a subset             | See Neither contains nor is equal to                                  |
| Does not divide                          | 357 <sub>8</sub>   107 <sub>8</sub>                                   |
| Does not equal                           | 41 <sub>8</sub>   142 <sub>8</sub>                                    |

|                                       |                                     |
|---------------------------------------|-------------------------------------|
| Dollar sign                           | 0 <sub>8</sub>   244 <sub>8</sub>   |
| Dot, Centered                         | 0 <sub>8</sub>   267 <sub>8</sub>   |
| Double s                              | See s, Double                       |
| Dram                                  | See Yogh                            |
| Earth                                 | See Abstract +                      |
| Eight                                 | 0 <sub>8</sub>   70 <sub>8</sub>    |
| Electric current                      | See Reversible Reaction, Type 1     |
| En dash                               | See Dash, En                        |
| En quad                               | See Quad, En                        |
| Eng, Lowercase (Lapp)                 | 0 <sub>8</sub>   376 <sub>8</sub>   |
| Eng, Uppercase (Lapp)                 | 0 <sub>8</sub>   356 <sub>8</sub>   |
| English                               | See Alphabet, Roman                 |
| Em dash                               | See Dash, Em                        |
| Em quad                               | See Quad, Em                        |
| Equal                                 | See Equals                          |
| Equal, Approximately, Type 1          | 357 <sub>8</sub>   167 <sub>8</sub> |
| Equal, Approximately, Type 2          | 357 <sub>8</sub>   171 <sub>8</sub> |
| Equal by definition                   | 357 <sub>8</sub>   163 <sub>8</sub> |
| Equal, Not                            | See Does not equal                  |
| Equals                                | 0 <sub>8</sub>   75 <sub>8</sub>    |
| Equals, Does not                      | See Does not equal                  |
| Equivalent                            | See Identically equal               |
| Escudo (Portugese currency)           | 357 <sub>8</sub>   246 <sub>8</sub> |
| Ess-zed (German)                      | See s, Double                       |
| Eth , Lowercase (Icelandic)           | 0 <sub>8</sub>   363 <sub>8</sub>   |
| Exclamation mark, Double              | 356 <sub>8</sub>   172 <sub>8</sub> |
| Exclamation point                     | 0 <sub>8</sub>   41 <sub>8</sub>    |
| Exclamation point, Inverted (Spanish) | 0 <sub>8</sub>   241 <sub>8</sub>   |
| Face, Smile                           | See Smile Face                      |
| Factorial sign                        | 356 <sub>8</sub>   65 <sub>8</sub>  |
| Feet sign                             | See Minutes sign                    |
| Female                                | 41 <sub>8</sub>   152 <sub>8</sub>  |
| Figure dash                           | See Dash, Figure                    |
| Figure space                          | See Space, Figure                   |
| Five                                  | 0 <sub>8</sub>   65 <sub>8</sub>    |
| Flat, Musical                         | 43 <sub>8</sub>   254 <sub>8</sub>  |
| Flatness                              | 356 <sub>8</sub>   112 <sub>8</sub> |
| Floor, Left                           | 357 <sub>8</sub>   262 <sub>8</sub> |
| Floor, Right                          | 357 <sub>8</sub>   263 <sub>8</sub> |
| Florin                                | 357 <sub>8</sub>   242 <sub>8</sub> |
| For all                               | 357 <sub>8</sub>   265 <sub>8</sub> |
| Four                                  | 0 <sub>8</sub>   64 <sub>8</sub>    |
| Fraction, Five eighths                | 0 <sub>8</sub>   336 <sub>8</sub>   |
| Fraction, One eighth                  | 0 <sub>8</sub>   334 <sub>8</sub>   |
| Fraction, One half                    | 0 <sub>8</sub>   275 <sub>8</sub>   |
| Fraction, One third                   | 357 <sub>8</sub>   375 <sub>8</sub> |
| Fraction, One quarter                 | 0 <sub>8</sub>   274 <sub>8</sub>   |
| Fraction, Seven eighths               | 0 <sub>8</sub>   337 <sub>8</sub>   |
| Fraction, Three eighths               | 0 <sub>8</sub>   335 <sub>8</sub>   |
| Fraction, Three quarters              | 0 <sub>8</sub>   276 <sub>8</sub>   |
| Fraction, Two thirds                  | 357 <sub>8</sub>   376 <sub>8</sub> |

|                                            |                                               |
|--------------------------------------------|-----------------------------------------------|
| Francs                                     | 357 <sub>8</sub>   243 <sub>8</sub>           |
| Gemini                                     | 357 <sub>8</sub>   364 <sub>8</sub>           |
| General currency symbol                    | 0 <sub>8</sub>   44 <sub>8</sub>              |
| Grave Accent (spacing)                     | 0 <sub>8</sub>   140 <sub>8</sub>             |
| Grave (accent)                             | 0 <sub>8</sub>   301 <sub>8</sub>             |
| Greater than                               | 0 <sub>8</sub>   76 <sub>8</sub>              |
| Greater than, Much                         | 357 <sub>8</sub>   103 <sub>8</sub>           |
| Greater than, Not                          | 357 <sub>8</sub>   105 <sub>8</sub>           |
| Greater than or equal to                   | 41 <sub>8</sub>   146 <sub>8</sub>            |
| Greek                                      | See Alphabet, Greek                           |
| Guilder                                    | See Florin                                    |
| Guillemet, Left (European quotation mark)  | See Quote, Double, Left, European             |
| Guillemet, Right (European quotation mark) | See Quote, Double, Right, European            |
| Guillemet, Single...                       | See Quote, Single, ..., European              |
| h with stroke, Lowercase (Maltese)         | 0 <sub>8</sub>   364 <sub>8</sub>             |
| H with stroke, Uppercase (Maltese)         | 0 <sub>8</sub>   344 <sub>8</sub>             |
| Hachek (accent)                            | 0 <sub>8</sub>   317 <sub>8</sub>             |
| Happy Face                                 | See Smile face                                |
| Hat                                        | See Circumflex                                |
| Hearts, Open                               | 357 <sub>8</sub>   314 <sub>8</sub>           |
| Hearts, Solid                              | 356 <sub>8</sub>   314 <sub>8</sub>           |
| Hebrew                                     | Character Set 341 <sub>8</sub>                |
| Hiragana                                   | 44 <sub>8</sub>   starting at 41 <sub>8</sub> |
| Histogram sign                             | 356 <sub>8</sub>   52 <sub>8</sub>            |
| House, Small                               | 356 <sub>8</sub>   72 <sub>8</sub>            |
| Hyphen                                     | 41 <sub>8</sub>   76 <sub>8</sub>             |
| Hyphen, Discretionary                      | 357 <sub>8</sub>   43 <sub>8</sub>            |
| Hyphen, Non-breaking                       | 357 <sub>8</sub>   42 <sub>8</sub>            |
| Hyphenation point                          | 356 <sub>8</sub>   45 <sub>8</sub>            |
| i, dotless, Lowercase (Turkish)            | 0 <sub>8</sub>   365 <sub>8</sub>             |
| Identically equal                          | 357 <sub>8</sub>   162 <sub>8</sub>           |
| Identifier                                 | 357 <sub>8</sub>   156 <sub>8</sub>           |
| Iff                                        | See Arrow, Double, Double                     |
| ij digraph, Lowercase (Dutch)              | 0 <sub>8</sub>   366 <sub>8</sub>             |
| IJ digraph, Uppercase (Dutch)              | 0 <sub>8</sub>   346 <sub>8</sub>             |
| Impedance                                  | 356 <sub>8</sub>   71 <sub>8</sub>            |
| Implies                                    | See Arrow, Double, Right                      |
| Inches sign                                | See Seconds sign                              |
| Increases                                  | 356 <sub>8</sub>   255 <sub>8</sub>           |
| Index, Left-pointing                       | 357 <sub>8</sub>   65 <sub>8</sub>            |
| Index, Right-pointing                      | 357 <sub>8</sub>   64 <sub>8</sub>            |
| Infinity                                   | 41 <sub>8</sub>   147 <sub>8</sub>            |
| Infinity, Generic                          | 357 <sub>8</sub>   247 <sub>8</sub>           |
| Integer                                    | 357 <sub>8</sub>   257 <sub>8</sub>           |
| Integral                                   | 357 <sub>8</sub>   165 <sub>8</sub>           |
| Integral, Contour                          | 357 <sub>8</sub>   166 <sub>8</sub>           |
| Integral, Double                           | 42 <sub>8</sub>   152 <sub>8</sub>            |
| Intersection                               | 357 <sub>8</sub>   126 <sub>8</sub>           |
| Intersection of Classes                    | 356 <sub>8</sub>   126 <sub>8</sub>           |
| Is a member of                             | 357 <sub>8</sub>   112 <sub>8</sub>           |

|                                        |                                                 |
|----------------------------------------|-------------------------------------------------|
| Is implied by                          | See Arrow, Double, Back                         |
| Is not a member of                     | 357 <sub>8</sub>   112 <sub>8</sub>             |
| Is not contained in                    | 357 <sub>8</sub>   137 <sub>8</sub>             |
| Isomorphic                             | 357 <sub>8</sub>   170 <sub>8</sub>             |
| Is proportional to                     | 357 <sub>8</sub>   161 <sub>8</sub>             |
| j, dotless, Lowercase                  | 0 <sub>8</sub>   345 <sub>8</sub>               |
| Jupiter                                | 357 <sub>8</sub>   353 <sub>8</sub>             |
| k, Lowercase (Greenlandic)             | 0 <sub>8</sub>   360 <sub>8</sub>               |
| Katakana                               | Character Set 45 <sub>8</sub>                   |
| Ket                                    | 357 <sub>8</sub>   63 <sub>8</sub>              |
| Korean                                 | Character Set 343 <sub>8</sub>                  |
| l with middle dot, Lowercase (Catalan) | 0 <sub>8</sub>   367 <sub>8</sub>               |
| L with middle dot, Uppercase (Catalan) | 0 <sub>8</sub>   347 <sub>8</sub>               |
| l with stroke, Lowercase (Polish)      | 0 <sub>8</sub>   370 <sub>8</sub>               |
| L with stroke, Uppercase (Polish)      | 0 <sub>8</sub>   350 <sub>8</sub>               |
| Laplace operator                       | 356 <sub>8</sub>   105 <sub>8</sub>             |
| Latin                                  | See Alphabet, Roman                             |
| Leader, one-dot on an en body          | 356 <sub>8</sub>   242 <sub>8</sub>             |
| Leader, two-dot on an en body          | 356 <sub>8</sub>   243 <sub>8</sub>             |
| Leader, two-dot on an em body          | 41 <sub>8</sub>   105 <sub>8</sub>              |
| Leader, three-dot on an em body        | 41 <sub>8</sub>   104 <sub>8</sub>              |
| Leo                                    | 357 <sub>8</sub>   366 <sub>8</sub>             |
| Less than                              | 0 <sub>8</sub>   74 <sub>8</sub>                |
| Less than, Much                        | 357 <sub>8</sub>   102 <sub>8</sub>             |
| Less than, Not                         | 357 <sub>8</sub>   104 <sub>8</sub>             |
| Less than or equal to                  | 41 <sub>8</sub>   145 <sub>8</sub>              |
| Letters                                | See Alphabets                                   |
| Letters, Circled, Capital              | 166 <sub>8</sub>   starting at 101 <sub>8</sub> |
| Letters, Circled, Small                | 166 <sub>8</sub>   starting at 141 <sub>8</sub> |
| Libra                                  | 357 <sub>8</sub>   370 <sub>8</sub>             |
| Line, Horizontal, Thick                | 357 <sub>8</sub>   342 <sub>8</sub>             |
| Line, Horizontal, Thin                 | 357 <sub>8</sub>   345 <sub>8</sub>             |
| Line, Intersecting, Thick              | 357 <sub>8</sub>   343 <sub>8</sub>             |
| Line, Intersecting, Thin               | 357 <sub>8</sub>   346 <sub>8</sub>             |
| Line, Vertical, Thick                  | 357 <sub>8</sub>   341 <sub>8</sub>             |
| Line, Vertical, Thin                   | 357 <sub>8</sub>   344 <sub>8</sub>             |
| Liter                                  | 357 <sub>8</sub>   151 <sub>8</sub>             |
| Lozenge                                | 356 <sub>8</sub>   106 <sub>8</sub>             |
| Macron (accent)                        | 0 <sub>8</sub>   305 <sub>8</sub>               |
| Male                                   | 41 <sub>8</sub>   151 <sub>8</sub>              |
| Mars                                   | See Male                                        |
| Member                                 | See Is a member of                              |
| Member, contains as a                  | See Such that                                   |
| Member, Not                            | See Is not a member of                          |
| Micro sign                             | 0 <sub>8</sub>   265 <sub>8</sub>               |
| Milreis                                | See Currency sign                               |
| Minim                                  | See Scorpius                                    |
| Minus or plus                          | 357 <sub>8</sub>   175 <sub>8</sub>             |
| Minus sign                             | 356 <sub>8</sub>   55 <sub>8</sub>              |
| Minutes sign                           | 41 <sub>8</sub>   154 <sub>8</sub>              |

|                                              |                                                 |
|----------------------------------------------|-------------------------------------------------|
| Moon, First quarter                          | 357 <sub>g</sub>   350 <sub>g</sub>             |
| Moon, Third quarter                          | 357 <sub>g</sub>   351 <sub>g</sub>             |
| Mosaic                                       | Character Set 50 <sub>g</sub> R                 |
| Much greater than                            | See Greater than, Much                          |
| Much less than                               | See Less than, Much                             |
| Multiply sign                                | 0 <sub>g</sub>   264 <sub>g</sub>               |
| Musical Flat                                 | 43 <sub>g</sub>   254 <sub>g</sub>              |
| Musical Note                                 | See Note, Musical                               |
| Musical Sharp                                | 43 <sub>g</sub>   274 <sub>g</sub>              |
| Mercury                                      | 357 <sub>g</sub>   352 <sub>g</sub>             |
|                                              |                                                 |
| n with apostrophe, Lowercase (South African) | 0 <sub>g</sub>   357 <sub>g</sub>               |
| Nabla                                        | 357 <sub>g</sub>   271 <sub>g</sub>             |
| Natural Number                               | See Number, Natural                             |
| Neither contained in nor is equal to         | 357 <sub>g</sub>   135 <sub>g</sub>             |
| Neither contains nor is equal to             | 357 <sub>g</sub>   134 <sub>g</sub>             |
| Neither less than nor equal to               | 356 <sub>g</sub>   145 <sub>g</sub>             |
| Neither greater than nor equal to            | 356 <sub>g</sub>   146 <sub>g</sub>             |
| Neptune                                      | 357 <sub>g</sub>   356 <sub>g</sub>             |
| Nine                                         | 0 <sub>g</sub>   71 <sub>g</sub>                |
| Not                                          | 357 <sub>g</sub>   152 <sub>g</sub>             |
| Not equivalent to                            | 356 <sub>g</sub>   376 <sub>g</sub>             |
| Not sign                                     | See Approximately                               |
| Not greater than                             | See Greater than, Not                           |
| Not identical with                           | 356 <sub>g</sub>   162 <sub>g</sub>             |
| Not less than                                | See Less than, Not                              |
| Not parallel                                 | 357 <sub>g</sub>   111 <sub>g</sub>             |
| Note, Musical, eighth                        | 0 <sub>g</sub>   325 <sub>g</sub>               |
| Note, Musical, Double sixteenth              | 356 <sub>g</sub>   325 <sub>g</sub>             |
| Null set                                     | 357 <sub>g</sub>   141 <sub>g</sub>             |
| Number                                       | 357 <sub>g</sub>   250 <sub>g</sub>             |
| Number, Circled                              | 357 <sub>g</sub>   starting at 321 <sub>g</sub> |
| Number, Complex                              | 357 <sub>g</sub>   254 <sub>g</sub>             |
| Number, Diamond enclosed                     | 166 <sub>g</sub>   starting at 60 <sub>g</sub>  |
| Number, Natural                              | 357 <sub>g</sub>   255 <sub>g</sub>             |
| Number, Real                                 | 357 <sub>g</sub>   256 <sub>g</sub>             |
| Number sign                                  | 0 <sub>g</sub>   43 <sub>g</sub>                |
| Numeral, Roman, Fixed-pitch                  | 357 <sub>g</sub>   starting at 301 <sub>g</sub> |
|                                              |                                                 |
| o with slash, Lowercase (Norwegian, Danish)  | 0 <sub>g</sub>   371 <sub>g</sub>               |
| O with slash, Uppercase (Norwegian, Danish)  | 0 <sub>g</sub>   351 <sub>g</sub>               |
| OCR chair                                    | 357 <sub>g</sub>   275 <sub>g</sub>             |
| OCR fork                                     | 357 <sub>g</sub>   274 <sub>g</sub>             |
| OCR hook                                     | 357 <sub>g</sub>   273 <sub>g</sub>             |
| oe digraph, Lowercase                        | 0 <sub>g</sub>   372 <sub>g</sub>               |
| OE digraph, Uppercase                        | 0 <sub>g</sub>   352 <sub>g</sub>               |
| Ogonek undermark = Polish hook               | 0 <sub>g</sub>   316 <sub>g</sub>               |
| Ohm sign                                     | 0 <sub>g</sub>   340 <sub>g</sub>               |
| One                                          | 0 <sub>g</sub>   61 <sub>g</sub>                |
| Or                                           | 357 <sub>g</sub>   267 <sub>g</sub>             |
| Ordinal indicator, Feminine (Spanish)        | 0 <sub>g</sub>   343 <sub>g</sub>               |
| Ordinal indicator, Masculine (Spanish)       | 0 <sub>g</sub>   353 <sub>g</sub>               |
| Over-dot (accent)                            | 0 <sub>g</sub>   307 <sub>g</sub>               |
| Overline (accent)                            | 43 <sub>g</sub>   303 <sub>g</sub>              |

|                                   |                                       |
|-----------------------------------|---------------------------------------|
| Over-ring (accent)                | 0 <sub>8</sub>   312 <sub>8</sub>     |
| Paragraph sign                    | 0 <sub>8</sub>   266 <sub>8</sub>     |
| Parallel, Not                     | See Not parallel                      |
| Parallel sign, Type 1             | 41 <sub>8</sub>   102 <sub>8</sub>    |
| Parallel sign, Type 2             | See Slant, Double                     |
| Parenthesis, Closing              | 0 <sub>8</sub>   51 <sub>8</sub>      |
| Parenthesis, Opening              | 0 <sub>8</sub>   50 <sub>8</sub>      |
| Partial derivative                | See Derivative, Partial               |
| Peace symbol                      | 357 <sub>8</sub>   336 <sub>8</sub>   |
| Percent sign                      | 0 <sub>8</sub>   45 <sub>8</sub>      |
| Per mill sign                     | See Per thousand sign                 |
| Per thousand sign                 | 357 <sub>8</sub>   101 <sub>8</sub>   |
| Period                            | 0 <sub>8</sub>   56                   |
| Period, Square (Kanji)            | 41 <sub>8</sub>   45 <sub>8</sub>     |
| Perp, Left                        | See Perpendicular, Left               |
| Perp, Left, Type 2                | See Perpendicular, Left, Double       |
| Perp, Right                       | See Perpendicular, Right              |
| Perp, Right, Type 2               | See Perpendicular, Right, Double      |
| Perpendicular                     | 357 <sub>8</sub>   160 <sub>8</sub>   |
| Perpendicular, Left               | 357 <sub>8</sub>   66 <sub>8</sub>    |
| Perpendicular, Left, Double       | 357 <sub>8</sub>   70 <sub>8</sub>    |
| Perpendicular, Right              | 357 <sub>8</sub>   67 <sub>8</sub>    |
| Perpendicular, Right, Double      | 357 <sub>8</sub>   71 <sub>8</sub>    |
| Perpendicular, Upside down        | 356 <sub>8</sub>   160 <sub>8</sub>   |
| Pesetas (Spanish)                 | 357 <sub>8</sub>   244 <sub>8</sub>   |
| Pilcrow                           | See Paragraph                         |
| Pisces                            | 357 <sub>8</sub>   361 <sub>8</sub>   |
| Planck's constant                 | 357 <sub>8</sub>   150 <sub>8</sub>   |
| Plus sign                         | 0 <sub>8</sub>   53 <sub>8</sub>      |
| Plus or minus sign                | 0 <sub>8</sub>   261 <sub>8</sub>     |
| Product                           | 357 <sub>8</sub>   173 <sub>8</sub>   |
| Product of Classes or Sets        | See Intersection of Classes           |
| Product, Scaler                   | 356 <sub>8</sub>   264 <sub>8</sub>   |
| Position                          | 356 <sub>8</sub>   117 <sub>8</sub>   |
| Pound-Sterling sign               | 0 <sub>8</sub>   243 <sub>8</sub>     |
| Pluto                             | 357 <sub>8</sub>   357 <sub>8</sub>   |
| QED                               | 357 <sub>8</sub>   270 <sub>8</sub>   |
| Quad, Em                          | 357 <sub>8</sub>   55 <sub>8</sub>    |
| Quad, En                          | 357 <sub>8</sub>   54 <sub>8</sub>    |
| Questioned equality               | 357 <sub>8</sub>   164 <sub>8</sub>   |
| Question mark                     | 0 <sub>8</sub>   77 <sub>8</sub>      |
| Question mark, Inverted (Spanish) | 0 <sub>8</sub>   277 <sub>8</sub>     |
| Quote, Double, Neutral            | 0 <sub>8</sub>   42 <sub>8</sub>      |
| Quote, Double, Left, European     | 0 <sub>8</sub>   253 <sub>8</sub>     |
| Quote, Double, Left, Guillemet    | See Quote, Double, Left, European     |
| Quote, Double, Left, Lowered      | 357 <sub>8</sub>   50 <sub>8</sub>    |
| Quote, Double, Right, European    | 0 <sub>8</sub>   273 <sub>8</sub>     |
| Quote, Double, Right, Guillemet   | See Quote, Double, Right,<br>European |
| Quote, Double, Right, German      | 357 <sub>8</sub>   51 <sub>8</sub>    |
| Quote, Single, Left               | 0 <sub>8</sub>   251 <sub>8</sub>     |
| Quote, Single, Left, Guillemet    | 357 <sub>8</sub>   52 <sub>8</sub>    |

|                                            |                                                              |
|--------------------------------------------|--------------------------------------------------------------|
| Quote, Single, Left, Lowered               | 43 <sub>g</sub>   262 <sub>g</sub>                           |
| Quote, Single, Neutral                     | 357 <sub>g</sub>   47 <sub>g</sub>                           |
| Quote, Single, Right                       | 0 <sub>g</sub>   271 <sub>g</sub>                            |
| Quote, Single, Right, Guillemet            | 357 <sub>g</sub>   53 <sub>g</sub>                           |
| Radical                                    | 357 <sub>g</sub>   174 <sub>g</sub>                          |
| Real number                                | See Number, Real                                             |
| Rectangle, Horizontal, Solid               | 356 <sub>g</sub>   336 <sub>g</sub>                          |
| Rectangle, Vertical                        | 356 <sub>g</sub>   334 <sub>g</sub>                          |
| Reference 1                                | 0 <sub>g</sub>   321 <sub>g</sub>                            |
| Registered sign                            | 0 <sub>g</sub>   322 <sub>g</sub>                            |
| Relata of a relation                       | 356 <sub>g</sub>   254 <sub>g</sub>                          |
| Reluctance                                 | See Number, Real                                             |
| Reversible reaction, Type 1                | 357 <sub>g</sub>   121 <sub>g</sub>                          |
| Reversible reaction, Type 2                | 357 <sub>g</sub>   120 <sub>g</sub>                          |
| Ring, Centered                             | 357 <sub>g</sub>   147 <sub>g</sub>                          |
| Roman                                      | See Alphabet, Roman                                          |
| Root                                       | See Radical                                                  |
| s, Double                                  | 0 <sub>g</sub>   373 <sub>g</sub>                            |
| Sagittarius                                | 357 <sub>g</sub>   372 <sub>g</sub>                          |
| Saturn                                     | 357 <sub>g</sub>   354 <sub>g</sub>                          |
| Scaler product                             | See Product, Scaler                                          |
| Scorpius                                   | 357 <sub>g</sub>   371 <sub>g</sub>                          |
| Seconds sign                               | 41 <sub>g</sub>   155 <sub>g</sub>                           |
| Section sign                               | 0 <sub>g</sub>   247 <sub>g</sub>                            |
| Semicolon                                  | 0 <sub>g</sub>   73 <sub>g</sub>                             |
| Seven                                      | 0 <sub>g</sub>   67 <sub>g</sub>                             |
| Shade                                      | 357 <sub>g</sub>   176 <sub>g</sub>                          |
| Shade, Dark                                | 356 <sub>g</sub>   141 <sub>g</sub>                          |
| Shade, Light                               | 356 <sub>g</sub>   140 <sub>g</sub>                          |
| Sharp, Musical                             | 43 <sub>g</sub>   274 <sub>g</sub>                           |
| Sharp s                                    | See s, Double                                                |
| Similar to                                 | 356 <sub>g</sub>   176 <sub>g</sub>                          |
| Six                                        | 0 <sub>g</sub>   66 <sub>g</sub>                             |
| Skull & crossbones                         | 357 <sub>g</sub>   340 <sub>g</sub>                          |
| Slant                                      | 0 <sub>g</sub>   57 <sub>g</sub>                             |
| Slant, Double                              | 357 <sub>g</sub>   110 <sub>g</sub>                          |
| Slant, Reverse                             | 0 <sub>g</sub>   134 <sub>g</sub>                            |
| Slant, Reverse, High                       | 0 <sub>g</sub>   140 <sub>g</sub>                            |
| Slash, Double                              | See Slant, Double                                            |
| Smile face                                 | 357 <sub>g</sub>   337 <sub>g</sub>                          |
| Smile face, Dark                           | 356 <sub>g</sub>   337 <sub>g</sub>                          |
| Solidus                                    | See Slant                                                    |
| Space (Normally nonprinting)               | 0 <sub>g</sub>   40 <sub>g</sub>                             |
| Space, Figure (Normally nonprinting)       | 357 <sub>g</sub>   56 <sub>g</sub>                           |
| Space, Fixed Pitch (Kanji)                 | 41 <sub>g</sub>   41 <sub>g</sub>                            |
| Space, Hair (Normally nonprinting)         | 356 <sub>g</sub>   43 <sub>g</sub>                           |
| Space, Non-breaking (Normally nonprinting) | 357 <sub>g</sub>   41 <sub>g</sub>                           |
| Space, Numeric (Normally nonprinting)      | See Space, Figure                                            |
| Space, Punctuation (Normally nonprinting)  | 356 <sub>g</sub>   44 <sub>g</sub>                           |
| Space, Thick                               | (Normally nonprinting)<br>356 <sub>g</sub>   41 <sub>g</sub> |

|                                               |                                                 |
|-----------------------------------------------|-------------------------------------------------|
| Space, Thin (Normally nonprinting)            | 357 <sub>8</sub>   57 <sub>8</sub>              |
| Spades, Open                                  | 356 <sub>8</sub>   313 <sub>8</sub>             |
| Spades, Solid                                 | 357 <sub>8</sub>   313 <sub>8</sub>             |
| Square, Black                                 | 42 <sub>8</sub>   43 <sub>8</sub>               |
| Square, White                                 | See Ballot box                                  |
| Squared                                       | 0 <sub>8</sub>   262 <sub>8</sub>               |
| Star, Black                                   | 41 <sub>8</sub>   172 <sub>8</sub>              |
| Star, White                                   | 41 <sub>8</sub>   171 <sub>8</sub>              |
| Stop, Full (Period)                           | 0 <sub>8</sub>   56 <sub>8</sub>                |
| Stop, Full, Raised (Greek)                    | 46 <sub>8</sub>   73 <sub>8</sub>               |
| Stress mark, Phonetic (Non-spacing character) | See Acute                                       |
| Stress mark, Phonetic (Spacing character)     | See Minutes sign                                |
| Subscript numbers                             | 375 <sub>8</sub>   starting at 340 <sub>8</sub> |
| Subscript minus sign                          | 375 <sub>8</sub>   352 <sub>8</sub>             |
| Such that, Type 1                             | 357 <sub>8</sub>   114 <sub>8</sub>             |
| Such that, Type 2                             | 356 <sub>8</sub>   174 <sub>8</sub>             |
| Sum of Classes or Sets                        | See Union of Classes or Sets                    |
| Summation                                     | 357 <sub>8</sub>   172 <sub>8</sub>             |
| Sun                                           | 357 <sub>8</sub>   347 <sub>8</sub>             |
| Superscript numbers                           | 375 <sub>8</sub>   starting at 260 <sub>8</sub> |
| Superscript closing parenthesis               | 375 <sub>8</sub>   275 <sub>8</sub>             |
| Superscript decimal point                     | 375 <sub>8</sub>   272 <sub>8</sub>             |
| Superscript minus sign                        | 375 <sub>8</sub>   277 <sub>8</sub>             |
| Superscript opening parenthesis               | 375 <sub>8</sub>   274 <sub>8</sub>             |
| Superscript plus sign                         | 375 <sub>8</sub>   276 <sub>8</sub>             |
| Superscript thousands delimiter               | 375 <sub>8</sub>   273 <sub>8</sub>             |
| t with stroke, Lowercase (Lapp)               | 0 <sub>8</sub>   375 <sub>8</sub>               |
| T with stroke, Uppercase (Lapp)               | 0 <sub>8</sub>   355 <sub>8</sub>               |
| Take                                          | 357 <sub>8</sub>   251 <sub>8</sub>             |
| Taurus                                        | 357 <sub>8</sub>   363 <sub>8</sub>             |
| TEL (Telephone)                               | 357 <sub>8</sub>   252 <sub>8</sub>             |
| Telephone symbol                              | 357 <sub>8</sub>   374 <sub>8</sub>             |
| There exists                                  | 357 <sub>8</sub>   264 <sub>8</sub>             |
| Therefore                                     | 41 <sub>8</sub>   150 <sub>8</sub>              |
| Thin space                                    | See Space, Thin                                 |
| Thorn, Lowercase (Icelandic)                  | 0 <sub>8</sub>   374 <sub>8</sub>               |
| Thorn, Uppercase (Icelandic)                  | 0 <sub>8</sub>   354 <sub>8</sub>               |
| Three-dot leader                              | 41 <sub>8</sub>   104 <sub>8</sub>              |
| Three, Superscript                            | See Superscript 3                               |
| Tilde (spacing)                               | 0 <sub>8</sub>   176 <sub>8</sub>               |
| Tilde (accent)                                | 0 <sub>8</sub>   304 <sub>8</sub>               |
| Trademark sign                                | 0 <sub>8</sub>   324 <sub>8</sub>               |
| Triangle, Black, Point-down                   | 42 <sub>8</sub>   47 <sub>8</sub>               |
| Triangle, Black, Point-left                   | 356 <sub>8</sub>   261 <sub>8</sub>             |
| Triangle, Black, Point-right                  | 356 <sub>8</sub>   260 <sub>8</sub>             |
| Triangle, Black, Point-up                     | 42 <sub>8</sub>   45 <sub>8</sub>               |
| Triangle, White, Point-down                   | 42 <sub>8</sub>   46 <sub>8</sub>               |
| Triangle, White, Point-left                   | 356 <sub>8</sub>   263 <sub>8</sub>             |
| Triangle, White, Point-right                  | 356 <sub>8</sub>   262 <sub>8</sub>             |
| Triangle, White, Point-up                     | 42 <sub>8</sub>   44 <sub>8</sub>               |
| Two                                           | 0 <sub>8</sub>   62 <sub>8</sub>                |
| Two-dot leader                                | 41 <sub>8</sub>   105 <sub>8</sub>              |
| Two, Superscript                              | See Superscript 2                               |

|                                   |                                     |
|-----------------------------------|-------------------------------------|
| Three, Superscript                | See Superscript 3                   |
| Umlaut (accent)                   | See Diaeresis                       |
| Underline (Non-spacing undermark) | 0 <sub>8</sub>   314 <sub>8</sub>   |
| Undermark, Cedilla                | See Cedilla                         |
| Undermark, Ogonek                 | See Ogonek                          |
| Undermark, Underline              | See Underline                       |
| Union                             | 357 <sub>8</sub>   127 <sub>8</sub> |
| Union of Classes or Sets          | 356 <sub>8</sub>   127 <sub>8</sub> |
| Uranus                            | 357 <sub>8</sub>   355 <sub>8</sub> |
| Venus                             | See Female                          |
| Virgo                             | 357 <sub>8</sub>   367 <sub>8</sub> |
| Virgule                           | See Slant                           |
| Vowel mark, Long                  | See Macron                          |
| Vowel mark, Short                 | See Breve                           |
| Wave operator                     | See Ballot box                      |
| X mark                            | 357 <sub>8</sub>   320 <sub>8</sub> |
| Yen currency symbol (Japanese)    | 0 <sub>8</sub>   245 <sub>8</sub>   |
| Yogh (Old English)                | 357 <sub>8</sub>   253 <sub>8</sub> |
| Zero                              | 0 <sub>8</sub>   60 <sub>8</sub>    |

An underlined word in a definition is indexed and defined in this glossary. The parenthetical number at the end of each definition is the section in which the term is introduced.

**character:** A graphic shape that is used for representation of visual information or a syntactic entity which lacks a physical representation. In electronic printing, a character is represented in the form of a spatial arrangement of adjacent pixels.

**character appearance:** A function of two variables: character codes which express the identity of characters and character "looks" information which models the different appearances that a shape can assume.

**character code:** Any code representing a graphic character, rendering character, or control character, usually unique within the set, most commonly represented as a cardinal number. In a particular code collection, i.e., the Xerox Character Code Standard, a character code is represented as a 16-bit non-negative integer.

**character code collection:** A listing of specific cardinal numbers from a character code standard.

**character collection:** A particular selection of the individual characters appearing in a font. The instance of a character collection having a fixed number of characters is known as a character set in the graphic arts—a character collection has no such limit.

**character grouping:** One or more NAMED character collections in union with a core character collection (also NAMED, but a member of a nested set of character collections).

**character set:** An instance of a character collection having a fixed number of characters. For purposes of this document, a block of 256 contiguous numerical codes, of which 188 may be assigned to graphical characters.

**control character:** A character, other than a graphic character or rendering character, whose occurrence in a particular context initiates, modifies, or stops a control operation. A control character, while not a graphic character or rendering character, may have a non-conventional representation in some circumstances.

**core character collection:** One of a nested family of NAMED character collections. In the graphic arts industry, an instance of a core character collection is called a universal character set.

**Core Font Library:** A font library having the essential typefaces and character collections for a particular targeted market available on all products.

**display font:** A particular variation of a type face, or unique design, where type is set larger than that used in text to attract a readers attention and where distinctiveness of design may take precedence over readability factors.

**file:** A set of related records treated as a unit.

**file format:** The arrangement and structure of data or words in a file, including the order and size of the components of the file.

**font:** A particular collection of characters of a typeface with unique parameters in the Variation vector, i.e., a particular instance of values for orientation, size, posture, weight, etc., attributes.

(general definition): The word font or fount is derived from the word "foundry" which is where, originally, type was cast. It has come to mean the vehicle which holds the typeface character collection. A font can be metal, photographic film, or electronic media (cartridge, tape, disc).

**font family:** A particular collection of font progressions of a typeface where the Variation vector with given orientations and sizes can differ in posture attribute value and weight attribute values. By current practice, a font family can include font progressions in posture attribute values of roman and italic and weight attribute values of light, medium, and bold, i.e., 40 X 2 X 3 = 240 fonts.

**font file:** A set of font records including a digital representation of a set or collection of graphic symbols and/or characters and control information for some level(s) of processing.

**Font Library:** A repository for fonts and font metric information on any number of typefaces, e.g., the Times Roman Family, the Helvetica Family, etc.

**font progression:** A particular size sequence of font rotations of a typeface, i.e., the Variation vector with a given orientation value can differ only in size attribute value. A typical progression is ten sizes for the typical four orientations, resulting in 40 fonts for a typical font progression.

(general definition): Sequential sizes of one typeface. The number of fonts which comprise a progression can be influenced by needs of a typical market.

**font rotation:** A set of fonts of a typeface where only the parameter of the Variation vector affecting the rotational orientation of character placement differs between fonts. Typical orientation values are portrait, landscape, inverse portrait, and inverse landscape.

(general definition): A set of fonts of one typeface which print vertically or horizontally on a page or their inverse.

**general "looks":** The finite set of basic character "looks" (see Appendix C, C.1) upon which agreement has been reached and which can be broadly applied to all characters in a designated code space.

**graphic:** A symbol produced by a process such as handwriting, drawing, or printing.

**graphic character:** A character, other than a control character or rendering character, that is normally represented by a graphic.

**graphic shape:** The physical form of letters, accent marks, numeric figures, fractions, symbols, and constructions (forms characters, mosaics, etc.).

**kern:** (noun): That portion of a letter which extends beyond its width, i.e., the letter shapes that overhang—the projection of a character beyond its side bearings.

(verb): The function of adjusting the intercharacter spacing in character groups (words) to improve their appearance.

**library font file format:** The arrangement and structure of Font Library information in a Font Library font file. The internal format within the library and not a printer or display device specific format.

**logotype (or logo):** A symbol, image, or complex character, composed of multiple entities which, when assembled as a unit, provide for a given graphic shape, i.e., the name of a company or product in a special design used as an identity mark.

**NAMED character collection:** The identity given by a registration service, and recorded within a Name Registry, to a particular selection of the characters appearing in deliverable from a Font Library.

**Name Registry:** The official record book within the registry for recording unique identifiers. Within a Font Library, the record book to record typeface and character code identifiers for fonts, e.g., Font Name Registry.

#### **non-general "looks":**

First kind: The finite set of character "looks" upon which agreement has been reached and which cannot be broadly applied to all characters in the designated code space.

Second kind: The thousands of non-interesting sets of character "looks" which may or may not be broadly applied to all characters in the designated code space.

Non-general "looks" of the first kind, those upon which agreement has been reached, are also called specific "looks" and includes Old Style numerals, long descenders, small caps, etc.

**registry:** A dynamic (and sometimes complex) service whose purpose is to record information, assign and register unique identifiers, and respond to requests for information about identifiers.

**rendering:** A copy or version of a symbol produced by a process such as printing.

**rendering character:** A character, other than a control character or graphic character, that fits in one of four classes:

1<sup>st</sup> – a non-conventional representation of a control character.

2<sup>nd</sup> – a sequence of graphic characters (ligature or accented character).

3<sup>rd</sup> – contextually-dependent alternate representation for a graphic character (initial, medial, or final).

4<sup>th</sup> – a "variant" representation for a graphic character.

**screen display font:** A particular rendition of a typeface used exclusively to create character images on cathode ray tube screens, usually at low to very low resolution.

**typeface:** The features by which a character's design is recognized, hence the word "face." Within the Latin language group of graphic shapes are the following forms: Uncial, Blackletter, Serif, Sans Serif, Scripts, and Decorative. Each form characterizes one or more designs.

(Example: Serif form contains four designs called Old Style, Transitional, Modern, and Slab Serif designs. The typeface called Bodoni is a Modern design, while Times Roman is a Transitional design.)

**variation:** The extent to which a typographic object varies.

**Variation vector:** An ordered set of attributes and attribute values which models general character "looks" in the character "looks" information specification. An ordered set includes the following attributes: orientation, size, posture, weight, setwidth, stroke, measure, kerning, reading (right or wrong), and escapement (right to left playing and left to right playing).



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