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Information technology — Font information interchange —

Part 1: Architecture

Technologies de l'information — Échange d'informations sur les fontes —

Partie 1: Architecture

Reference number
ISO/IEC 9541-1:1991(E)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 9541-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology.*

ISO/IEC 9541 consists of the following parts, under the general title *Information technology — Font information interchange*:

— *Part 1: Architecture*

— *Part 2: Interchange Format*

— *Part 3: Glyph shape representation*

— *Part 4: Application-specific requirements*

Part 1 of ISO/IEC 9541 specifies the architecture of a font resource, i.e., the font description, font metrics, glyph description and glyph metrics properties required for font references and the interchange of font resources.

Part 2 of ISO/IEC 9541 specifies the interchange formats for font information, and the minimum subsets of that information required for interchange.

Part 3 of ISO/IEC 9541 specifies the architecture and interchange formats for glyph shape representations.

Part 4 of ISO/IEC 9541 specifies the architecture and interchange format extensions for application specific (e.g. typesetting of mathematics) requirements.

Annex A forms an integral part of this part of ISO/IEC 9541. Annex B is for information only.

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Introduction

The use of open networks for the interchange of documents in both office and publishing environments has shown the need for a mechanism enabling the interchange of font information.

It is foreseen that publishing and office technologies will merge and that this development will be facilitated by definition of a standard font resource architecture and a limited number of standard font resource interchange formats.

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Information technology — Font information interchange —

Part 1: Architecture

1 Scope

ISO/IEC 9541 defines a method of naming glyphs and glyph collections, independent of any document encoding technique; it assumes that one or more methods of associating document encoding techniques with glyph identifiers used in font resources will be provided by text processing systems.

This part of ISO/IEC 9541 specifies the architecture of a font resource, i.e., the font description, font metrics, glyph description and glyph metrics properties required for font references and the interchange of font resources.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 9541. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 9541 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 646:1983, *Information processing — ISO 7-bit coded character set for information interchange.*

ISO 3166:1988, *Codes for the representation of names of countries.*

ISO 6523:1984, *Data interchange — Structures for the identification of organizations.*

ISO 8824:1990, *Information technology — Open Systems Interconnection — Specification of Abstract Syntax Notation One (ASN.1).*

ISO/IEC 9070:1991, *Information technology — SGML support facilities — Registration procedures for public text owner identifiers.*

ISO/IEC 9541-2:1991, *Information technology — Font information interchange — Part 2: Interchange Format.*

ISO/IEC 10036:—[1], *Information technology — Procedure for registration of glyph and glyph collection identifiers.*

1) To be published.

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3 Definitions

For the purposes of this part of ISO/IEC 9541, the following definitions apply.

3.1 alignment line: Imaginary line to which most glyph images of a font seem to align.

3.2 current position: A point on the presentation surface at which the next glyph representation is to be imaged.

3.3 design size: Absolute size at which a font is designed to be used.

3.4 escapement: Movement of the current position on the presentation surface after a glyph representation is imaged.

3.5 escapement point: A glyph metric; a point in the glyph coordinate system, to which the current position on the presentation surface is usually translated, after the glyph representation is imaged.

3.6 font: A collection of glyph images having the same basic design, e.g., *Courier Bold Oblique.*

3.7 font family: A collection of fonts of common design, e.g., *Courier, Courier Bold, Courier Bold Oblique.*

3.8 font metrics: The set of dimensions and positioning information in a font resource common to all glyph representations contained in that font resource.

3.9 font reference: The information about a font resource in an electronic document representation, and possible procedures and operations on that information, which identify or describe the desired font.

3.10 font resource: A collection of glyph representations together with descriptive and font metric information which are relevant to the collection of glyph representations as a whole.

3.11 font size: A scalar reference size relative to which most font metrics, glyph shapes and glyph metrics are specified.

3.12 glyph: A recognizable abstract graphic symbol which is independent of any specific design.

3.13 glyph collection: An identified set of glyphs.

3.14 glyph coordinate system: A two-dimensional Cartesian coordinate system within which glyph shapes, glyph metrics, and font metrics are defined.

3.15 glyph image: An image of a glyph, as obtained from a glyph representation displayed on a presentation surface.

3.16 glyph metrics: The set of information in a glyph representation used for defining the dimensions and positioning of the glyph shape.

3.17 glyph representation: The glyph shape and glyph metrics associated with a specific glyph in a font resource.

3.18 glyph shape: The set of information in a glyph representation used for defining the shape which represents the glyph.

3.19 kern: The extension of a glyph shape beyond its position point or escapement point.

3.20 position point: A glyph metric; a point in the glyph coordinate system, usually translated to the current position on the presentation surface before the glyph shape is imaged.

3.21 posture: The extent to which the shape of a glyph or set of glyphs appear to incline, including any consequent design or form change.

3.22 presentation surface: A virtual representation of a presentation medium (page, graphics display, etc.), maintained by the presentation process, on which all glyph shapes are to be imaged.

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3.23 proportionate width: The ratio of a glyph's or set of glyphs' escapement to font height.

3.24 stem: The major stroke of a glyph shape.

3.25 weight: The ratio of a glyph's or set of glyphs' stem width to font height.

3.26 writing mode: An identified mode for setting of text in a writing system, usually corresponding to a nominal escapement direction of the glyphs in that mode, i.e., left-to-right, right-to-left or top-to-bottom.

4 Notation

An extended version of Backus-Naur Form (BNF) notation is used to formally define the data types used throughout this part of ISO/IEC 9541 in a manner independent of the actual abstract data syntax used in the font interchange formats. By convention, basic data types are shown in uppercase.

The components of the extended BNF are:

aaa	rule syntactic element
::=	rule definition
|	element choice (or)
,	element separator
{ ... }	optional element(s)
(...)	group of elements
(...)*	0 to n repeat of element(s) in group
(...)+	1 to n repeat of element(s) in group
" ... "	literal element
–...	comment

EXAMPLES:

a) **a ::= b, c:** Element *a* is defined as/composed of the sequence of element *b* followed by element *c* (ordered list);

b) **a ::= b | c:** Element *a* is defined as either of the elements *b* or *c*;

c) **a ::= (b | c), [d]:** Element *a* is defined as the sequence of containing either of the elements *b* or *c*, optionally followed by the element *d*;

d) **a ::= (b | c)*:** Element *a* is defined as a sequence of 0 or more instances of either of the elements *b* or *c*;

e) **a ::= (b, c, "foo")+:** Element *a* is defined as a sequence of 1 or more instances of the sequence of the elements *b*, *c* and the literal *"foo"*.

The formal data type definitions given in clause 8 identify the set of information that must be represented by all font information interchange formats that conform to this part of ISO/IEC 9541. There is no requirement that an interchange format follow the exact organization of data or structures represented in clause 8 , as long as the general architectural principles of extensibility, backward and forward compatibility are not compromised. Each conforming interchange format is free to adopt the most efficient encoding mechanism available in its abstract syntax.

In particular, the actual names of properties and property-lists defined in ISO/IEC 9541 do not have to be encoded directly as data in an interchange format as long as the association between the names and values is maintained.

The fully qualified name of a property or property-list is given by the BNF definition of the structured property name for each property defined in clause 8 . It is up to the parsing processes to expand the encoding-specific names into these fully qualified names for use by encoding-independent interfaces.

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5 Data types

5.1 General

An elemental data type defines the basic unit of information represented in a font resource for which there is no further part 1 subdivision. A complex data type is a grouping of elemental data types which are used as basic building blocks.

This clause defines the elemental and complex data types used throughout this part of ISO/IEC 9541. The formal syntax and method of encoding these data types are defined in the font information interchange format specified in ISO/IEC 9541-2.

5.2 Properties and property-lists

The principal data type used to represent font resource information is a property. Conceptually, a property is defined to be a *name type value* tuple, where: *name* is the unambiguous property name; *type* is the data type of the property value; and *value* is the value of the property, the meaning and interpretation of which is specified by the property name and the context in which the property is used.

The font resource properties specified in clause 8 of ISO/IEC 9541 include precise definitions of data type. As a result, the property name is also a specification of the data type and meaning of the corresponding property value. The data type of non-ISO properties, however, shall be explicitly defined using the elemental and complex data types defined in this clause.

For example, a property for identifying the font family name used in a font resource might have a property name FONTFAMILY, whose value is defined to be of data type *name*, where a particular property value instance might be *Courier*.

Properties may be grouped together according to the class of object they are associated with into property-lists. A property-list is a set of zero or more properties of an object, all with property names of the same class. Often a class of property names is created specifically for the purpose of naming the objects in a particular type of property-list. For example, the property names WEIGHT and POSTURE might belong to the class of font resource property names created specifically to name descriptive font resource properties.

The value of a property may be itself a property-list (i.e., the data type is *property-list*) so that one property-list is effectively nested inside another. In general, this nesting may be repeated indefinitely, so as to permit creation of arbitrarily complex hierarchical data structures. In practice, however, the depth of nesting is usually restricted according to the context in which a particular property is defined.

Property-lists, ordered or unordered as appropriate, allow for the definition and general extensibility of both ISO and non-ISO font resource data. A non-ISO property is any font resource property not defined by ISO/IEC 9541.

5.3 Values and value-lists

Each property has an associated value. A value may be terminal, i.e., it represents a simple data type such as integer, it may be a list of values of such simple data types (a value-list), or it may be itself a property-list.

As opposed to property-lists, value-lists are used wherever the content of a property can be prescribed; ordered value-lists are used whenever the exact order of the property values can be prescribed.

The data types of each property value defined in a conforming font resource shall be specified to be one of the following:

5.3.1 property: A *name type value* tuple data structure;

5.3.2 property-list: A list of zero or more related properties, possibly the value of some other higher-level property, which may be specified to be ordered in a particular sequence;

5.3.3 value-list: A list of zero or more property *type value* pairs, each usually of the same data type, which may be specified to be ordered in a particular sequence;

5.3.4 proprietary-data: A data structure containing binary information that is not representable by data types defined in this part of ISO/IEC 9541. Such information is usually proprietary in nature, and is often protected by

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legal contract. It may be exchanged but will not be necessarily understood by all users of the font resource. Proprietary data contains:

— optional message (usually giving a data copyright notice);

— optional encryption key;

— *n* bytes of arbitrary binary data, optionally encrypted according to the encryption key.

5.3.5 match-string: An ordered sequence of graphic character and possible character set control codes, of an identified character string universal class, as specified by ISO 8824, such string intended for matching;

5.3.6 message: An ordered sequence of graphic character and possible character set control codes, of an identified character string universal class, as specified by ISO 8824, which constitute a human understandable message suitable for presentation to a user;

5.3.7 octet-string: An ordered sequence of octets;

5.3.8 octet: An 8-bit byte;

5.3.9 integer: A signed integer number within the range -2^{31} to $2^{31} - 1$ inclusive;

5.3.10 cardinal: An unsigned integer number within the range 0 to $2^{32} - 1$ inclusive;

5.3.11 code: A cardinal within the range 0 to $2^8 - 1$ inclusive;

5.3.12 rational: A signed rational number expressed as the ratio of two integers, i.e., a *numerator*/*denominator*. The denominator is within the range 1 to $2^{31} - 1$ inclusive;

5.3.13 rel-rational: A rational number expressed relative to the glyph coordinate system unit divisor;

5.3.14 angle: A rational number in degrees, within the range 0 inclusive to ± 360 exclusive, rotated counterclockwise around the origin of the the glyph coordinate system, as measured from the positive *x* axis;

5.3.15 structured-name: A structured-name, see 5.4;

5.3.16 boolean: A boolean value, one of TRUE or FALSE.

5.4 Structured-names

The main vehicle for naming used in ISO/IEC 9541 is a structured-name, as defined in ISO/IEC 9541-2, Annex B. A structured-name is an unambiguous identifier for some object suitable for representing that object within a decentralized, distributed computer system, invariant over space and time.

The remainder of this clause defines the application of ISO/IEC 9541-2, Annex B, to structured-names as used in ISO/IEC 9541. For notational convenience in ISO/IEC 9541, a structured-name is notated in the canonical form defined in ISO/IEC 9070:1991.

5.4.1 ISO/IEC 9541 and ISO/IEC 10036 names

ISO/IEC 9541 names are those structured-names with naming authority in the canonical form of *"ISO/IEC 9541-1"* . All ISO/IEC 9541 names are reserved for definition by this part of ISO/IEC 9541. Examples include the font resource properties defined in clause 8 of this part. Portions of the structured-name may be omitted from ISO/IEC 9541 names where context establishes the fully qualified name, thereby leaving only the property name to be interchanged.

NOTE 1 The ASN.1 form of this naming authority is {1 0 9541 1}.

ISO/IEC 10036 names are those structured-names with naming authority in canonical form *"ISO/IEC 10036/RA"* . All ISO/IEC 10036 names are reserved for definition by registries specifically authorized by ISO/IEC 10036. Examples include the glyph names and registry thereof defined in clause 6 of this part of ISO/IEC 9541. Portions of

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the structured-name may be omitted from structured ISO/IEC 10036 names where context establishes the fully qualified name, thereby leaving only the glyph or glyph collection name(s) to be interchanged.

NOTE 2 The ASN.1 form of this naming authority is {1 1 10036}.

The textual content of ISO/IEC 9541 names and ISO/IEC 10036 names contained in conforming font resources shall be encoded according to the ISO 646 IRV coded character set.

NOTES

3 The character repertoire of ISO/IEC 9541 names and ISO/IEC 10036 names is defined in ISO/IEC 9541-2, Annex B.

4 ISO/IEC 9541 names and ISO/IEC 10036 names are so reserved as to provide a set of structured-names which are most widely recognized and supported, while still allowing a distributed naming capability to those who wish to use it. Particular classes of font-related objects and names are defined in the appropriate clauses of this part of ISO/IEC 9541 and in accordance with ISO registration procedures.

5 While structured property names, structured glyph collection names and structured glyph names other than those registered as ISO/IEC 9541 or ISO/IEC 10036 names, respectively, are generally supported by the architecture defined here, their meaning is not defined by ISO/IEC 9541.

5.4.2 ICD0010 names

ICD0010 names are those structured-names created by organizations registered with naming authority *"ICD0010"*, whose organizational codes shall consist solely of numbers. All ICD0010 names are reserved for definition by registries specifically authorized by a type industry professional organization naming authority operating under ISO 6523 and having ICD value 0010 in its SIO.

NOTE 6 The ASN.1 form of this naming authority is {1 3 10}.

It is recommended, although not required, that the ICD0010 naming authority be used to register organizations wishing to create registries of font resource information for the purposes of font information interchange. For example, for organization XYZ to create the font resource name *"ICD0010/1234//FontNames::Garamond-Bold-Italic-Condensed"*, the object name naming authority *1234* must be issued by naming authority ICD0010 to organization XYZ.

5.5 Formal notation

The formal definition for ISO/IEC 9541 data types is given by the following BNF notation:

```
property  ::= property-name, [property-type,] property-value

property-name ::= STRUCTURED-NAME

property-type ::= -- coded ISO/IEC 9541 data type identifier, one of:
                  property-list, ordered-property-list,
                  value-list, ordered-value-list, BOOLEAN,
                  STRUCTURED-NAME, MATCH-STRING, MESSAGE,
                  OCTET-STRING, OCTET, INTEGER, CARDINAL, CODE,
                  RATIONAL, REL-RATIONAL, ANGLE, PROPRIETARY-DATA

property-value ::= value | complex-value

complex-value ::= value-list | ordered-value-list |
                  property-list | ordered-property-list

value-list ::= (value)* -- unordered

ordered-value-list ::= (value)* -- ordered

property-list ::= (property)*  -- unordered
```

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```
ordered-property-list ::= (property)* -- ordered

value ::= BOOLEAN | STRUCTURED-NAME |
          MATCH-STRING | MESSAGE | OCTET-STRING |
          OCTET | INTEGER | CARDINAL | CODE | RATIONAL |
          REL-RATIONAL | ANGLE | PROPRIETARY-DATA

BOOLEAN ::= -- a boolean value, one of TRUE or FALSE

STRUCTURED-NAME ::= -- see 5.4

MATCH-STRING ::= -- An ordered sequence of graphic character and
                 possible character set control codes, of an identified
                 character string universal class, as specified by
                 ISO 8824, intended for matching

MESSAGE ::= -- An ordered sequence of graphic character and
               possible character set control codes, of an identified
               character string universal class, as specified by
               ISO 8824, intended for presentation to a user

OCTET-STRING ::= (OCTET)*

OCTET ::= -- 8-bit byte

INTEGER ::= -- a signed integer number, -2^31 to 2^31 - 1 inclusive

CARDINAL ::= -- an unsigned integer number, 0 to 2^32 - 1 inclusive

CODE ::= -- a coded, unsigned integer number, 0 to 2^8 - 1 inclusive

RATIONAL ::= numerator, [denominator] -- denominator defaults to 1

REL-RATIONAL ::= numerator, [denominator] -- denominator defaults to value of glyp
                 coordinate system unit divisor or 1 if that divisor is not defin

ANGLE ::= numerator, [denominator] -- an angle, in degrees,
          0 to ±360 exclusive, rotated counter-clockwise around
          the origin of the the glyph coordinate system, as measured
          from the positive x axis

PROPRIETARY-DATA ::= [proprietary-data-message,]
                     [proprietary-data-key,]
                     proprietary-data-blackbox

numerator ::= -- a signed integer number, -2^31 to 2^31 - 1 inclusive

denominator ::= -- a signed integer number, 1 to 2^31 - 1 inclusive

proprietary-data-message ::= MESSAGE

proprietary-data-key ::= OCTET-STRING

proprietary-data-blackbox ::= OCTET-STRING
```

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6 Glyph identification

6.1 General

Glyphs are distinguished by their design-independent shape and their description (e.g., "||" – double bracket, open, piece extender; "||" – center box bar, double vertical). In the general case, glyphs are identified by a structured glyph name, according to the definition of structured-names in clause 5. For example, *"ICD0010/1234//A"* or *"ICD0010/1234//789"* might be a name for the capital Latin *"A"* glyph, at the discretion of naming authority XYZ.

This method of naming is not intended to establish any particular encoding for strings of glyph names, particularly not an encoding where the complete structured glyph name including the registered naming authority object identifier must be encoded for every glyph.

When referencing glyphs with intersecting descriptions, users are generally advised to use the the most specific appropriate glyph available in order to maintain unique glyph identification. For example, use *hyphen* rather than *hyphen-minus* if hyphen is intended.

6.2 ISO/IEC 10036 glyph names

ISO/IEC 10036 glyphs are those glyphs named by structured-names for which the owner name identifies the registration authority authorized by ISO/IEC 10036. ISO/IEC 10036 glyph identification has the objective of generating a unique, unambiguous glyph identifier for each glyph defined and used in the world. These glyph identifiers are to be distinct for each combination of glyph shape and description, but will not be different for each design variation. This establishes a structure and registry for identification of ISO/IEC 10036 glyphs.

ISO/IEC 10036 glyphs are identified by structured-names for which the equivalent canonical character string form is *"ISO/IEC 10036/RA//Glyphs::nnnn"* ; where *"nnnn"* is a sequence of decimal digits beginning with a non-zero digit, which represents an integer in the range of 1 to $2^{32} - 1$.

6.3 ISO/IEC 10036 glyph registration authority

For the purposes of ISO/IEC 9541 and according to the rules for the designation and operation of registration authorities in the ISO/IEC JTC1 Directives, the ISO and IEC Councils shall designate an organization to act as the ISO/IEC 10036 glyph registration authority. The name and address of the registration authority and the registration procedures are to be found in ISO/IEC 10036.

7 Glyph collection identification

7.1 General

A glyph collection is an identified set of glyphs, defined by enumeration of the structured-names of the glyphs in the collection. In the general case, glyph collections are identified by a structured glyph collection name, according to the definition of structured-names in 5.4 . For example, *"ICD0010/1234//WesternEuropean"* or *"ICD0010/1234//6789"* might be a name for the Western European glyph collection, at the discretion of naming authority XYZ.

Some or all of the glyphs of a collection might or might not be ISO/IEC 10036 glyphs. However, wherever practical, users are advised to use ISO/IEC 10036 glyphs in defining collections. Further, the structured glyph collection name might or might not be an ISO-registered name. However, wherever practical, users are advised to use ISO/IEC 10036 glyph collections, and composite collections based on ISO/IEC 10036 glyph collections and ISO/IEC 10036 glyphs.

7.2 ISO/IEC 10036 glyph collection names

ISO/IEC 10036 glyph collections are those glyph collections named by structured-names for which the owner name identifies the registration authority authorized by ISO/IEC 10036. ISO/IEC 10036 glyph collections shall consist solely of ISO/IEC 10036 glyphs. Definition of ISO/IEC 10036 glyph collections has the objective of establishing a

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relatively few widely recognized collections which serve as the basis for efficient generation and use of fonts. The remainder of this clause establishes a structure and registry for identification of ISO/IEC 10036 glyph collections.

ISO/IEC 10036 glyph collections are identified by structured-names for which the equivalent canonical character string form is *"ISO/IEC 10036/RA//Collections::nnnn"* ; where *"nnnn"* is a squence of decimal digits, beginning with a non-zero digit, which represents an integer in the range 1 to $2^{32} - 1$.

7.3 ISO/IEC 10036 glyph collection registration authority

For the purposes of ISO/IEC 9541 and according to the rules for the designation and operation of registration authorities in the ISO/IEC JTC1 Directives, the ISO and IEC Councils shall designate an organization to act as the ISO/IEC 10036 glyph collection registration authority. The name and address of the registration authority and the registration procedures are to be found in ISO/IEC 10036.

8 Font resource

8.1 General

A font resource is composed of an arbitrary number of ISO and non-ISO font properties and is unambiguously identified by its device-independent font resource name. The properties of a font resource are defined by a property-list whose property names are structured font resource property names. For example, CAPHEIGHT might be a font resource property name whose corresponding value is a distance in the glyph coordinate system.

The font resource data structure groups writing-mode-dependent properties into sets of values on a per-writing-mode basis, referred to as *modal properties*. Most glyph and font metrics are specified as modal properties. A font resource may also contain a set of descriptive properties, referred to as *description properties*, that describe the glyph representations of the resource globally, independent of a particular writing mode. Glyph shape-specific information is grouped into a set of shape properties, referred to as *glyph shape representation properties* (see ISO/IEC 9541-3).

The structure of a font resource is as follows (where indentation denotes structure nesting):

Font resource name property

Description property-list

Modal property-list

Writing mode property-list(s)

Glyph metrics property-list(s)

Glyph shape representations property-list(s)

While a particular instance of a font resource may contain all the property-lists described above, it is not required to do so. Font suppliers, processing systems or applications may require that a font resource be partitioned into subsets for practical or contractual reasons. For the purposes of ISO/IEC 9541, however, a font resource is viewed conceptually as containing all the property-lists described above.

ISO/IEC 9541 font resource properties are those font resource properties with structured font resource property names having naming authority *"ISO/IEC 9541-1"* .

Within a font resource, a font resource definer should generally supply as many font resource properties as is practical, so that users can make fullest use of the resource.

The remainder of this clause defines the font resource description and modal properties, giving the type and meaning of the corresponding property values. Unless otherwise specified, all dimensions and locations are given in the glyph coordinate system independent of imaging device or shape representation technology.

NOTE 7 It is possible, although not advised, for an otherwise valid font resource to contain font resource property values which are inconsistent with other font resource property values. For example, it is possible for a font resource to contain a POSTURE property with a value of *italic* even though some or all of the glyphs in the font resource are in fact not of italic design.

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8.1.1 Font resource name

The font resource name property specifies an unambiguous identifier to refer to all information contained in a particular font resource.

The font resource name property is specified in 8.5 .

8.1.2 Font resource description properties

The description property-list contains those font resource properties that characterize the font resource as a whole, independent of writing mode, including such properties as font family, weight, posture, glyph complement, etc.

The description property-list is specified in 8.6 , and is of general interest to font selection, substitution and document composition processes.

8.1.3 Font resource modal properties

The font resource architecture described here supports multiple writing modes, but has only one set of values for description properties and glyph shapes. Much of the font metric information is dependent upon writing mode. Therefore the structure of a font resource distinguishes which properties are writing-mode-dependent from those that are not, and provides for the identification of which property values are associated with which writing mode.

Font resource description and modal property-lists taken together are commonly referred to as the *metrics* of a font resource, and are of general interest to document composition processes. The modal properties are also used by presentation processes to position the glyph shape representations on the presentation surface.

8.1.3.1 Writing mode properties

The writing mode properties describe the limits and measures for the font resource according to a given writing mode.

The writing mode properties are specified in 8.7 .

8.1.3.2 Glyph metrics properties

The glyph metrics property-list contains the glyph description and metrics information that give the extents, escapement and other measures for individual glyphs on a per-writing-mode basis.

The glyph metrics property-list is specified in 8.8 .

8.1.4 Glyph shape representation properties

The glyph shape representation property-list contains the set of glyph shape representation and technology-specific information of the font resource, independent of writing mode.

The glyph shape representation property-list is specified in ISO/IEC 9541-3 and is of general interest to presentation processes.

8.1.5 Formal data type definition of a font resource

The formal data type definition of a font resource in BNF notation is given below:

```
fontresource ::= [fontname-property,]
                 [fontdescription-property-list,]
                 [wrmodes-property-list,]
                 [shapes-property-list,]
                 [property-list]
```

It is recommended, although not required, that non-ISO properties and property-lists be nested in one of the property-lists defined in ISO/IEC 9541 wherever possible.

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Throughout the remainder of clause 8, the formal data type definition in BNF notation is given with each property and property-list defined in the clause.

8.2 Glyph coordinate system

Glyph shapes and metrics are defined with respect to a single two-dimensional Cartesian coordinate system, called the glyph coordinate system, with positive *x* axis pointing to the right and positive *y* axis pointing up. All directions, e.g., horizontal or vertical, are given here with respect to the glyph coordinate system, not the presentation surface or document coordinate system. Technology-specific shape descriptions may be defined with respect to a technology-specific shape coordinate system; such descriptions refer to the glyph coordinate system by appropriate specification of the relationship between the technology-specific shape coordinate system and the reference glyph coordinate system.

Font resource definers are strongly encouraged to follow the convention that, in the glyph coordinate system, glyphs are upright, i.e., what is usually the top of the glyph is oriented in the positive *y* direction.

Within the glyph coordinate system, dimensions are specified as a ratio to the body size of the glyph. Body size is a scalar reference size, often expressed as an integral number of unit sub-divisions equivalent to the *x,y* grid employed to digitize the font resource, relative to which most metric information of that font resource and its glyph shapes are specified. The glyph coordinate system, therefore, may be continuous or discrete, as indicated by the relative rational units divisor property, which specifies the number of relative rational units equal to the body size (see the RELUNITS) property, 8.6.7 .

Distances are specified as unsigned ratios to the body size. Locations are specified as signed *x* and *y* coordinates, each coordinate a ratio to the body size, generally specified relative to the origin of the glyph coordinate system. See figure 1.

NOTE 8 The sizes of typographic fonts are traditionally specified in terms of body size, by height measured in printing points or millimeters, so that dimensions may naturally be specified relative to their body size. For fonts whose sizes are not normally specified in terms of body size, e.g., office fonts whose size is usually given in terms of horizontal pitch, the font resource definer must assign some reasonable body size relative to which dimensions may then be specified in the glyph coordinate system; for example, the font Courier 10 pitch, being usually printed 6 lines to the inch, might be assigned a body size equivalent to 1/6 inch for this purpose.

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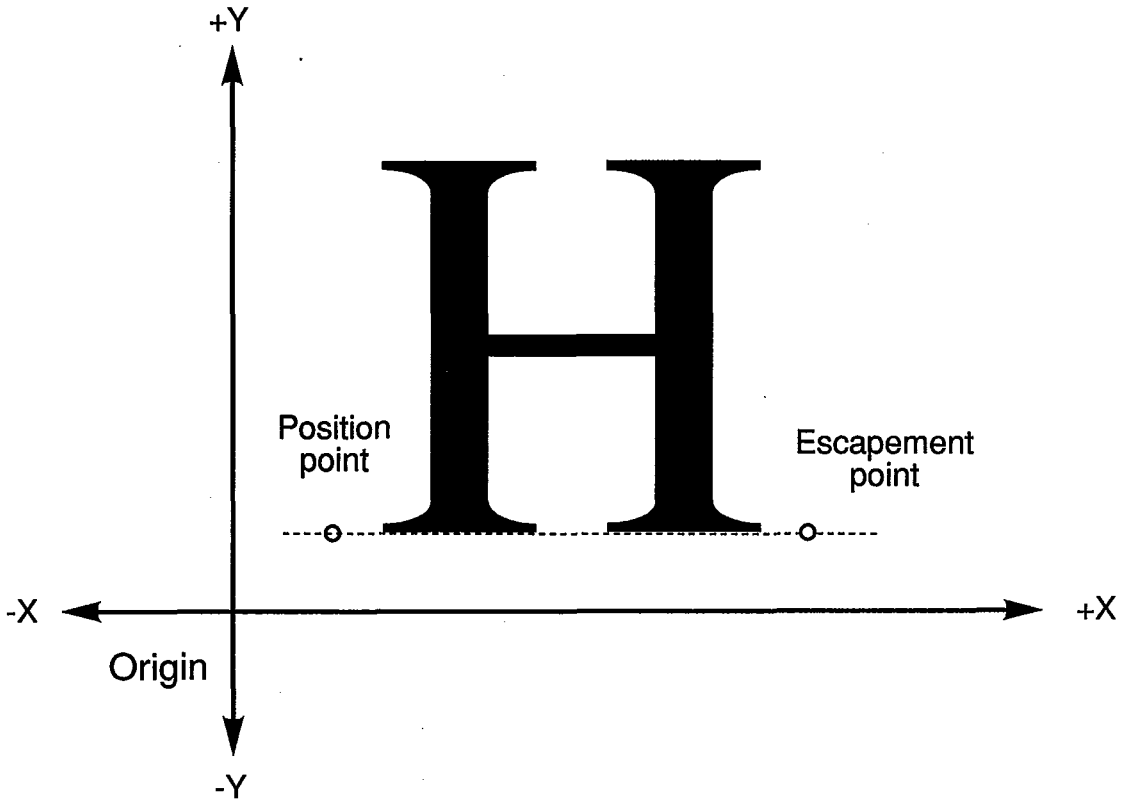


Figure 1 — Glyph coordinate system showing a typical Latin glyph in the LEFT-TO-RIGHT writing mode

8.3 Linear scaling model

A fundamental aspect of the the font model described in ISO/IEC 9541 is the ability to apply linear geometric transformations to metric and shape representation information contained in a font resource.

Positions and distances in the glyph coordinate system (e.g., glyph position and escapement points, average escapement, etc.) scale uniformly in proportion to the body size of the font resource. For example, a distance that is defined as one-half the body size will be 5 mm at a font size of 10 mm and 50 mm at a font size of 100 mm. All scaling is performed with respect to the origin of the glyph coordinate system.

Anamorphic scaling, i.e., non-uniform scale factors in *x* and *y*, may be applied to a font resource according to the limits imposed by the minimum and maximum anamorphic scale factor modal properties (see MINANASCALE and MAXANASCALE, 8.7.1.15). In this case, the *x* and *y* components of positions and distances are scaled by their independent *x,y* scale factors, respectively. Let $S_{x,y}$ be the *x* and *y* components of the scale factor, $P_{x,y}$ and $D_{x,y}$ be the *x* and *y* components of a point and a distance in the glyph coordinate system, respectively; then the scaled point and distance can be represented by:

$$P'_{x,y} = S_{x,y} \times P_{x,y}$$

$$D'_{x,y} = S_{x,y} \times D_{x,y}$$

Where warranted, multiple font resource *masters* of a font design may be defined by a font supplier in order to more faithfully reproduce the size-dependent shape and possible metric variations inherent in certain typeface designs, through the appropriate application of the minimum, design and maximum font size description properties (see DSNSIZE, MINSIZE and MAXSIZE, 8.6.17). Each such font resource continues to follow the linear scaling model presented here over the continuous range of body sizes defined from MINSIZE, inclusive, to MAXSIZE, inclusive.

In general, non-linear scaling artifacts will be introduced from one font resource master to another. Creators of such font resources are strongly encouraged to incorporate some indication of the intended usage of a master in

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its font resource name, e.g., *Notes*, *Book*, *Display*, etc., to maintain an unambiguous font resource name space (see FONTNAME property, 8.5). Composition processes using such font resources are advised to treat each master as a logically distinct font resource, which although of the same font family, has independent metric and shape representation information.

8.4 Extensibility

As font resource interchange and processing evolves, new features will require new representations in ISO/IEC 9541. As ISO/IEC 9541 will be supported by current and future versions of multiple standards and products developed in conformance with those standards, the font resource architecture defined here is designed to support the reasonable extension of both ISO and non-ISO font resource information. Such extensions shall be made as amendments according to established ISO procedures.

Extensions to ISO/IEC 9541 shall be made in a way that is both forward and backward compatible with the current version of ISO/IEC 9541. An extension is backward compatible if and only if it can be shown that *robust* implementations conforming to an older version of ISO/IEC 9541 may process without modification font resources that conform to newer versions of ISO/IEC 9541. An extension is forward compatible if and only if it can be shown that any future *robust* implementation conforming to some future version of ISO/IEC 9541 will be able to process without modification font resources that conform to the existing version of ISO/IEC 9541.

In order to assure backward compatibility, future amendments to ISO/IEC 9541 shall be restricted to the addition of new or partially redundant properties rather than the semantic modification of existing properties. In such cases, the standard version information description property value shall be updated to reflect the amendment (see the standard version information property (STANDARDVERSION), 8.6.2). Forward compatibility is assured by the property-list architecture described herein.

Consumers of font resources are advised to ignore non-ISO properties whose property name or data type is unknown or not locally supported, but are strongly encouraged to make such unaltered data available to third parties during general font resource interchange.

8.5 Specification of font resource name (FONTNAME)

FONTNAME is a structured-name, the device-independent name of the font resource, as assigned by the data source (DATASOURCE).

```
fontname-property ::= fontname-name, fontname-value
fontname-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//FONTNAME
fontname-value ::= STRUCTURED-NAME
```

NOTE 9 The FONTNAME property provides an unambiguous method for identifying a given font resource across space and time, within a potentially large decentralized database of the world's font resources.

8.6 Description of font resource description properties (FONTDESCRIPTION)

FONTDESCRIPTION is a property-list, specifying all the properties that globally describe the font resource, independent of a particular writing mode or how the glyph shapes may be represented.

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```
fontdescription-property-list ::= fontdescription-name,
                                  fontdescription-value-property-list
fontdescription-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//FONTDESCRIPTION
fontdescription-value-property-list :: =
                     (dataversion-property | standardversion-property |
                      datasource-property | datacopyright-property |
                      dsnsource-property | dsncopyright-property |
                      relunits-property | typeface-property |
                      fontfamily-property | posture-property |
                      postureangle-property | weight-property |
                      propwidth-property | structure-property |
                      dsngroup-property | glyphcomp-property-list |
                      dsnsize-property | minsize-property |
                      maxsize-property | capheight-property |
                      lcheight-property | minfeatsz-property |
                      nomcapstemwidth-property | nomlcstemwidth-property |
                      nomwrmode-property | property-list)*
```

The remainder of this clause defines the ISO/IEC 9541 font resource description properties. The order of the description properties as shown here is for convenience only; no order is assumed.

8.6.1 Data Version (DATAVERSION)

DATAVERSION is an ordered-value-list of three values giving the version information for the font resource data. It is composed of two *cardinals*: the major and minor version number of the data, respectively, and an ISO 8824 Universal Time String, the timestamp of the last update to the data.

```
dataversion-property ::= dataversion-name, dataversion-value-value-list
dataversion-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//DATAVERSION
dataversion-value-value-list ::= dataversion-major,
                                 dataversion-minor,
                                 dataversion-timestamp
dataversion-major ::= CARDINAL
dataversion-minor ::= CARDINAL
dataversion-timestamp ::= -- ISO 8824 Universal Time String
```

8.6.2 Standard Version (STANDARDVERSION)

STANDARDVERSION is a cardinal giving the version information of ISO/IEC 9541 that the font resource structure conforms to, as assigned by ISO/IEC 9541-2. Typically, this value is defined to be the year that the standard or an amendment to the standard is published, e.g., 1991.

```
standardversion-property ::= standardversion-name, standardversion-value
standardversion-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//STANDARDVERSION
standardversion-value ::= CARDINAL
```

8.6.3 Data Source (DATASOURCE)

DATASOURCE is a structured-name, the name of the supplier of the font resource data, or if different, the name of the organization that last modified the information contained in the font resource.

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```
datasource-property ::= datasource-name, datasource-value
datasource-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//DATASOURCE
datasource-value ::= STRUCTURED-NAME
```

8.6.4 Data Copyright (DATACOPYRIGHT)

DATACOPYRIGHT is a message, the copyright information of the legal owner of the digital font data as represented in the font resource.

```
datacopyright-property ::= datacopyright-name, datacopyright-value
datacopyright-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//DATACOPYRIGHT
datacopyright-value ::= MESSAGE
```

NOTE 10 Data copyright information may be a required component of a font resource by law or contract, independent of the particular encoding or possible storage format used to represent that information.

8.6.5 Design Source (DSNSOURCE)

DSNSOURCE is a structured-name, the organizational name of the typeface design source.

```
dsnsource-property ::= dsnsource-name, dsnsource-value
dsnsource-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//DSNSOURCE
dsnsource-value ::= STRUCTURED-NAME
```

8.6.6 Design Copyright (DSNCOPYRIGHT)

DSNCOPYRIGHT is a message, the copyright information of the legal owner of the typeface design as represented in the font resource.

```
dsncopyright-property ::= dsncopyright-name, dsncopyright-value
dsncopyright-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//DSNCOPYRIGHT
dsncopyright-value ::= MESSAGE
```

NOTE 11 Typeface design and trademark protection laws vary from country to country. As with the data copyright (DATACOPYRIGHT), design copyright information may be a required component of a font resource by law or contract, independent of the particular encoding or possible storage format used to represent that information.

8.6.7 Relative Rational Units (RELUNITS)

RELUNITS is a cardinal, the number of relative units equal to the body size of the font resource, as measured along the *y* axis of the glyph coordinate system.

```
relunits-property ::= relunits-name, relunits-value
relunits-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//RELUNITS
relunits-value ::= CARDINAL
```

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NOTE 12 If supplied in a font resource, the RELUNITS property gives the number of discrete glyph coordinate system units equal to the body size, which constitutes the denominator of those properties of the font resource with data type rel-rational. If not supplied, this implies a continuous unit coordinate space where all measurements are expressed as rational numbers; in this case most properties that use the rel-rational data type will supply both a numerator and denominator.

8.6.8 Typeface Name (TYPEFACE)

TYPEFACE is a message, the full name of the typeface design of the font resource.

```
typeface-property ::= typeface-name, typeface-value
typeface-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//TYPEFACE
typeface-value ::= MESSAGE
```

NOTE 13 The value for the TYPEFACE property is generally the industrial name of the typeface, as normally used in the type industry, and usually implies particular values for the font family name, weight, posture, proportionate width, etc. This name may or may not be unambiguous, but should be suitable for presentation to a human user to identify the typeface used in the font resource.

8.6.9 Font Family Name (FONTFAMILY)

FONTFAMILY is a match-string, the name of the font family of the font resource.

```
fontfamily-property ::= fontfamily-name, fontfamily-value
fontfamily-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//FONTFAMILY
fontfamily-value ::= MATCH-STRING
```

8.6.10 Posture (POSTURE)

POSTURE is a code, indicating the coded posture of the typeface of the font resource; one of

0 ⇒ not applicable;

1 ⇒ upright (e.g., Roman);

2 ⇒ oblique; upright design slanted in the direction of the nominal escapement with no design or form change;

3 ⇒ back slanted oblique; upright design slanted in the direction opposite of the nominal escapement with no design or form change;

4 ⇒ italic; slanted in the direction of the nominal escapement with change in design or form;

5 ⇒ back slanted italic; italic design slanted in the direction opposite to the nominal escapement;

6 ⇒ other.

All other posture codes are reserved for future standardization.

```
posture-property ::= posture-name, posture-value
posture-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//POSTURE
posture-value ::= CODE
```

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8.6.11 Posture Angle (POSTUREANGLE)

POSTUREANGLE is an angle, the nominal angle of the posture of the typeface design.

```
postureangle-property ::= postureangle-name, postureangle-value
postureangle-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//POSTUREANGLE
postureangle-value ::= ANGLE
```

NOTE 14 The value for the POSTUREANGLE property will normally be defined in the first and second quadrants of the glyph coordinate system, in the range 75 to 105 °. For Latin fonts, the italic and oblique postures usually will be less than 90 °.

8.6.12 Weight (WEIGHT)

WEIGHT is a code, indicating the coded weight of the typeface of the font resource relative to all font resources of the same font family (FONTFAMILY) and data source (DATASOURCE), according to the judgment of the data source; one of

0 ⇒ not applicable

1 ⇒ ultra light (lowest ratio of glyph stem width to font height);

2 ⇒ extra light;

3 ⇒ light;

4 ⇒ semilight;

5 ⇒ medium;

6 ⇒ semi bold;

7 ⇒ bold;

8 ⇒ extra bold;

9 ⇒ ultra bold (highest ratio of glyph stem width to font height).

WEIGHT codes are ordered according to increasing weight. All other weight codes are reserved for future standardization.

```
weight-property ::= weight-name, weight-value
weight-name ::= STRUCTURED-NAME
                -- ISO/IEC 9541-1//WEIGHT
weight-value ::= CODE
```

NOTE 15 A font family-independent approximation of absolute weight adequate for matching operations across all font resources and all font suppliers can be derived using the nominal capital stem width (NOMCAPSTEMWIDTH) and capital height (CAPHEIGHT) properties:

AbsoluteWeight = NOMCAPSTEMWIDTH / CAPHEIGHT

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8.6.13 Proportionate Width (PROPWIDTH)

PROPWIDTH is a code, indicating the coded proportionate width of the typeface of the font resource relative to all font resources of the same font family (FONTFAMILY) and data source (DATASOURCE), according to the judgment of the data source; one of

0 ⇒ not applicable;

1 ⇒ ultra condensed (lowest ratio of glyph width to font height);

2 ⇒ extra condensed;

3 ⇒ condensed;

4 ⇒ semi condensed;

5 ⇒ medium;

6 ⇒ semi expanded;

7 ⇒ expanded;

8 ⇒ extra expanded;

9 ⇒ ultra expanded (highest ratio of glyph width to font height).

PROPWIDTH codes are ordered according to increasing width. All other proportionate width codes are reserved for future standardization.

```
propwidth-property ::= propwidth-name, propwidth-value
propwidth-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//PROPWIDTH
propwidth-value ::= CODE
```

NOTE 16 A font family-independent approximation of absolute proportionate width adequate for matching operations across all font resources and all font suppliers can be derived using the average capital escapement (AVGCAPESCX or AVGCAPESCY) and capital height (CAPHEIGHT) properties:

AbsolutePropwidth = AVGCAPESC[X or Y] / CAPHEIGHT

8.6.14 Structure (STRUCTURE)

STRUCTURE is a code, indicating the structure of the strokes of the glyph shapes of the font resource, one of

0 ⇒ undefined or not applicable;

1 ⇒ solid, the shape containing no voids or patterns within the strokes;

2 ⇒ outline, the shape including only the outer edges of the strokes.

All other structure codes are reserved for future standardization.

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```
structure-property ::= structure-name, structure-value
structure-name ::= STRUCTURED-NAME
                   -- ISO/IEC 9541-1//STRUCTURE
structure-value ::= CODE
```

NOTE 17 Structure codes are not intended to supplant the design grouping provided by the design group property (DSNGROUP).

8.6.15 Design Group (DSNGROUP)

DSNGROUP is an ordered-value-list of three codes, indicating the design grouping of the typeface of the font resource, according to one or more levels of the grouping scheme defined in ISO/IEC 9541-1, Annex A, in order by level, beginning with the highest, most general level.

All other design group codes are reserved for future standardization.

```
dsngroup-property ::= dsngroup-name, dsngroup-value-value-list
dsngroup-name ::= STRUCTURED-NAME
                  -- ISO/IEC 9541-1//DSNGROUP
dsngroup-value-value-list ::= dsngroup-class, dsngroup-subclass,
                              dsngroup-specific-group
dsngroup-class ::= CODE
dsngroup-subclass ::= CODE
dsngroup-specific-group ::= CODE
```

NOTE 18 The WEIGHT, PROPWIDTH, POSTURE and STRUCTURE properties specify further typographic design variations on elements of the design group, e.g., *Baskerville Roman, Baskerville Bold Italic, Baskerville Expanded Outline,* etc.

8.6.16 Glyph Complement (GLYPHCOMP)

GLYPHCOMP is an ordered-property-list, a list of properties that together define the union of distinct glyph identifiers contained in each writing mode of the font resource.

The properties include any or all of the properties defined in this clause, at most once each, and applied in the order here defined so as to construct a specification of the glyph complement.

```
glyphcomp-property-list ::= glyphcomp-name,
                            glyphcomp-value-property-list
glyphcomp-name ::= STRUCTURED-NAME
                   -- ISO/IEC 9541-1//GLYPHCOMP
glyphcomp-value-property-list ::=
                        [numglyphs-property,]
                        [incglyphcols-property,]
                        [excglyphcols-property,]
                        [incglyphs-property,]
                        [excglyphs-property,]
                        [property-list]
```

NOTE 19 Individual writing modes may contain glyph metrics for fewer glyphs than prescribed by the full glyph complement.

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8.6.16.1 Number of Glyphs (NUMGLYPHS)

NUMGLYPHS is a cardinal, the number of distinct glyph identifiers in the glyph complement of the font resource.

```
numglyphs-property ::= numglyphs-name, numglyphs-value
numglyphs-name ::= STRUCTURED-NAME
                   -- ISO/IEC 9541-1//NUMGLYPHS
numglyphs-value ::= CARDINAL
```

8.6.16.2 Included Glyph Collections (INCGLYPHCOLS)

INCGLYPHCOLS is a value-list of structured glyph collection names, the glyphs in the collections thereby indicated to be included in the glyph complement, subject to modification by the presence of other glyph complement properties (see clause 7 for a description of glyph collections).

```
incglyphcols-property ::= incglyphcols-name, incglyphcols-value-value-list
incglyphcols-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//INCGLYPHCOLS
incglyphcols-value-value-list ::= (glyph-collection-name)+
glyph-collection-name ::= STRUCTURED-NAME
```

8.6.16.3 Excluded Glyph Collections (EXCGLYPHCOLS)

EXCGLYPHCOLS is a value-list of structured glyph collection names, the glyphs in the collections thereby indicated to be excluded from the glyph complement.

```
excglyphcols-property ::= excglyphcols-name, excglyphcols-value-value-list
excglyphcols-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//EXCGLYPHCOLS
excglyphcols-value-value-list ::= (glyph-collection-name)+
```

8.6.16.4 Included Glyphs (INCGLYPHS)

INCGLYPHS is a value-list of structured glyph names, thereby indicated to be included in the glyph complement, subject to modification by the presence of other glyph complement properties.

```
incglyphs-property ::= incglyphs-name, incglyphs-value-value-list
incglyphs-name ::= STRUCTURED-NAME
                   -- ISO/IEC 9541-1//INCGLYPHS
incglyphs-value-value-list ::= (glyph-name)+
glyph-name ::= STRUCTURED-NAME
```

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8.6.16.5 Excluded Glyphs (EXCGLYPHS)

EXCGLYPHS is a value-list of structured glyph names, thereby indicated to be excluded from the glyph complement.

```
excglyphs-property ::= excglyphs-name, excglyphs-value-value-list
excglyphs-name ::= STRUCTURED-NAME
                        -- ISO/IEC 9541-1//EXCGLYPHS
excglyphs-value-value-list ::= (glyph-name)+
```

8.6.17 Design Size, Recommended Minimum and Maximum Size (DSNSIZE, MINSIZE, MAXSIZE)

DSNSIZE is a rational, the recommended body size at which the font resource is designed to be used, in units of millimeters, according to the judgment of the design source (DSNSOURCE). The value of this property also establishes a default body size at which the font resource is to be used if no other size is specified in a font reference.

MINSIZE and MAXSIZE are *rationals*, the recommended minimum and maximum of the range of body sizes over which the font resource is designed to be linearly scaled, each size specified in units of millimeters, according to the judgment of the design source (DSNSOURCE). If both minimum and maximum sizes are the same as the design size, the font resource is designed to be used only at that one size.

In effect, the use of the DSNSIZE, MINSIZE, and MAXSIZE properties allow for the definition of multiple font masters for typeface designs that require this level of typographic specification.

```
dsnsize-property ::= dsnsize-name, dsnsize-value
dsnsize-name ::= STRUCTURED-NAME
                        -- ISO/IEC 9541-1//DSNSIZE
dsnsize-value ::= RATIONAL

minsize-property ::= minsize-name, minsize-value
minsize-name ::= STRUCTURED-NAME
                        -- ISO/IEC 9541-1//MINSIZE
minsize-value ::= RATIONAL

maxsize-property ::= maxsize-name, maxsize-value
maxsize-name ::= STRUCTURED-NAME
                        -- ISO/IEC 9541-1//MAXSIZE
maxsize-value ::= RATIONAL
```

NOTE 20 The size at which the font resource will actually be used and imaged is usually determined, not directly by the font resource, but by the presentation device imaging the font resource, acting under direct or indirect control of the end user, e.g., as specified via the content of a document.

8.6.18 Capital Height (CAPHEIGHT)

CAPHEIGHT is an unsigned rel-rational, the nominal height of the capital (major) glyphs contained in the font resource, as specified by the data source (DATASOURCE). Where applicable, defined to be the nominal height of the capital letter *"X"* (Latin, Greek, Cyrillic, etc.).

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```
capheight-property ::= capheight-name, capheight-value
capheight-name ::= STRUCTURED-NAME
                   -- ISO/IEC 9541-1//CAPHEIGHT
capheight-value ::= REL-RATIONAL -- unsigned
```

8.6.19 Lowercase Height (LCHEIGHT)

LCHEIGHT is an unsigned rel-rational, the nominal height of the lowercase (mean) glyphs contained in the font resource, as specified by the data source (DATASOURCE). Where applicable, defined to be the nominal height of the lowercase letter "x" (Latin, Cyrillic, etc.).

```
lcheight-property ::= lcheight-name, lcheight-value
lcheight-name ::= STRUCTURED-NAME
                  -- ISO/IEC 9541-1//LCHEIGHT
lcheight-value ::= REL-RATIONAL -- unsigned
```

NOTE 21 This property is defined to be equivalent to the capital height (CAPHEIGHT) for font resources which contain no lowercase glyphs (e.g., Ideographic, Hebrew, etc.).

8.6.20 Minimum Feature Size (MINFEATSZ)

MINFEATSZ is an unsigned rel-rational, the size of the smallest non-terminating feature in the glyph shapes of the font resource.

```
minfeatsz-property ::= minfeatsz-name, minfeatsz-value
minfeatsz-name ::= STRUCTURED-NAME
                   -- ISO/IEC 9541-1//MINFEATSZ
minfeatsz-value ::= REL-RATIONAL -- unsigned
```

NOTE 22 MINFEATSZ might be the thickness of a stroke, or of a serif if present.

8.6.21 Nominal Capital Stem Width (NOMCAPSTEMWIDTH)

NOMCAPSTEMWIDTH is an unsigned rel-rational, the nominal width of the main stems of the capital (major) glyphs contained in the font resource, measured perpendicular to the posture angle (POSTUREANGLE), as specified by the data source (DATASOURCE). Where applicable, defined to be the nominal stem width of the Latin capital letter "I".

```
nomcapstemwidth-property ::= nomcapstemwidth-name,
nomcapstemwidth-value
nomcapstemwidth-name ::= STRUCTURED-NAME
                         -- ISO/IEC 9541-1//NOMCAPSTEMWIDTH
nomcapstemwidth-value ::= REL-RATIONAL -- unsigned
```

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8.6.22 Nominal Lowercase Stem Width (NOMLCSTEMWIDTH)

NOMLCSTEMWIDTH is an unsigned rel-rational, the nominal width of the main stems of the lowercase (mean) glyphs contained in the font resource, measured perpendicular to the posture angle (POSTUREANGLE), as specified by the data source (DATASOURCE). Where applicable, defined to be the nominal stem width of the Latin lowercase letter *"i"*.

```
nomlcstemwidth-property ::= nomlcstemwidth-name,
nomlcstemwidth-value
nomlcstemwidth-name ::= STRUCTURED-NAME
                        -- ISO/IEC 9541-1//NOMLCSTEMWIDTH
nomlcstemwidth-value ::= REL-RATIONAL -- unsigned
```

NOTE 23 this property is defined to be equivalent to the nominal capital stem width (NOMCAPSTEMWIDTH) for font resources which contain no lowercase glyphs (e.g., Ideographic, Hebrew, etc.).

8.6.23 Nominal Writing Mode (NOMWRMODE)

NOMWRMODE is a structured-name, the name of the nominal writing mode, i.e., the mode in which the font resource is to be used if no other mode is specified in a font reference, one of those writing modes defined in the writing mode name property (WRMODENAME).

```
nomwrmode-property ::= nomwrmode-name, nomwrmode-value
nomwrmode-name ::= STRUCTURED-NAME
                   -- ISO/IEC 9541-1//NOMWRMODE
nomwrmode-value ::= STRUCTURED-NAME
```

8.7 Specification of font resource modal properties (WRMODES)

The values of certain font resource properties depend upon the writing mode in which they are nested; this dependence is established to allow the remainder of the font resource information, particularly the glyph shape representations, to be used in multiple modes.

Each writing mode is identified by a structured writing mode name; each mode is associated with the setting of text in a writing system, usually corresponding to a nominal escapement direction of the font in that mode, the direction specified within the glyph coordinate system. Examples of such modes might include left-to-right, top-to-bottom, right-to-left, etc. Refer to figure 1, figure 2, and figure 3.

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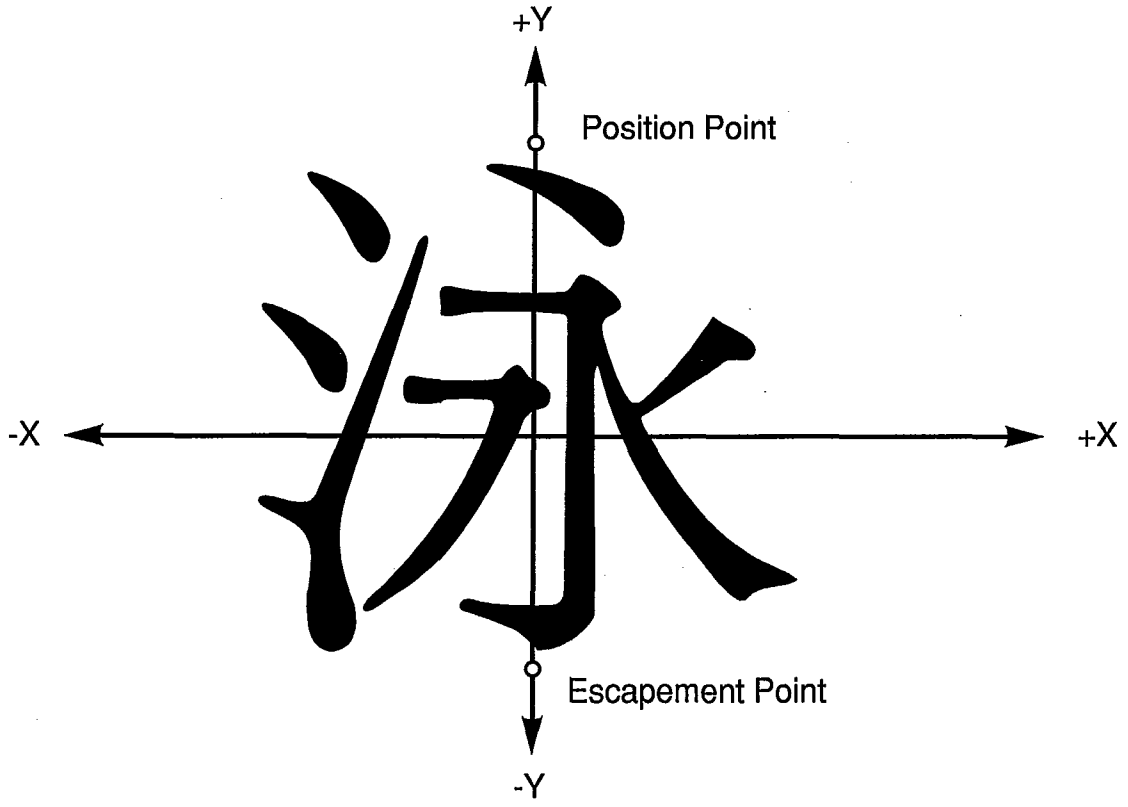


Figure 2 — A typical Ideographic glyph in the TOP-TO-BOTTOM writing mode

WRMODES is a property-list of writing mode *property-list*, defining all writing mode properties associated with this font resource.

```
wrmodes-property-list ::= wrmodes-name, wrmodes-value-property-list
wrmodes-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//WRMODES
wrmodes-value-property-list ::= (wrmode-property-list | property-list)*
```

8.7.1 Writing Mode (WRMODE)

WRMODE *is a property-list of writing mode properties, defining a writing mode and its modal properties.* This property-list is repeated for each writing mode supported by the font resource.

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```
wrmode-property-list ::= wrmode-name, wrmode-value-property-list
wrmode-name ::= structured-name
                    -- ISO/IEC 9541-1//WRMODE
wrmode-value-property-list :: = wrmodename-property,
                   (nomescdir-property | escclass-property |
                    avgescx-property | avgescy-property |
                    avglcescx-property | avglcescy-property |
                    avgcpescx-property | avgcpescy-property |
                    tabescx-property | tabescy-property |
                    maxfontext-property | sectors-property-list |
                    escadjs-property-list | minescadjsze-property |
                    maxescadjsze-property | scores-property-list |
                    vscripts-property-list | minlinesp-property |
                    minanascale-property | maxanascale-property |
                    nomalign-property | alignmodes-property-list |
                    copyfits-property-list | dsnwordadd-property |
                    minwordadd-property | maxwordadd-property |
                    dsnwordampl-property | minwordampl-property |
                    maxwordampl-property | dsnletteradd-property |
                    minletteradd-property | maxletteradd-property |
                    dsnletterampl-property | minletterampl-property |
                    maxletterampl-property | glyphmetrics-property-list |
                    property-list)*
```

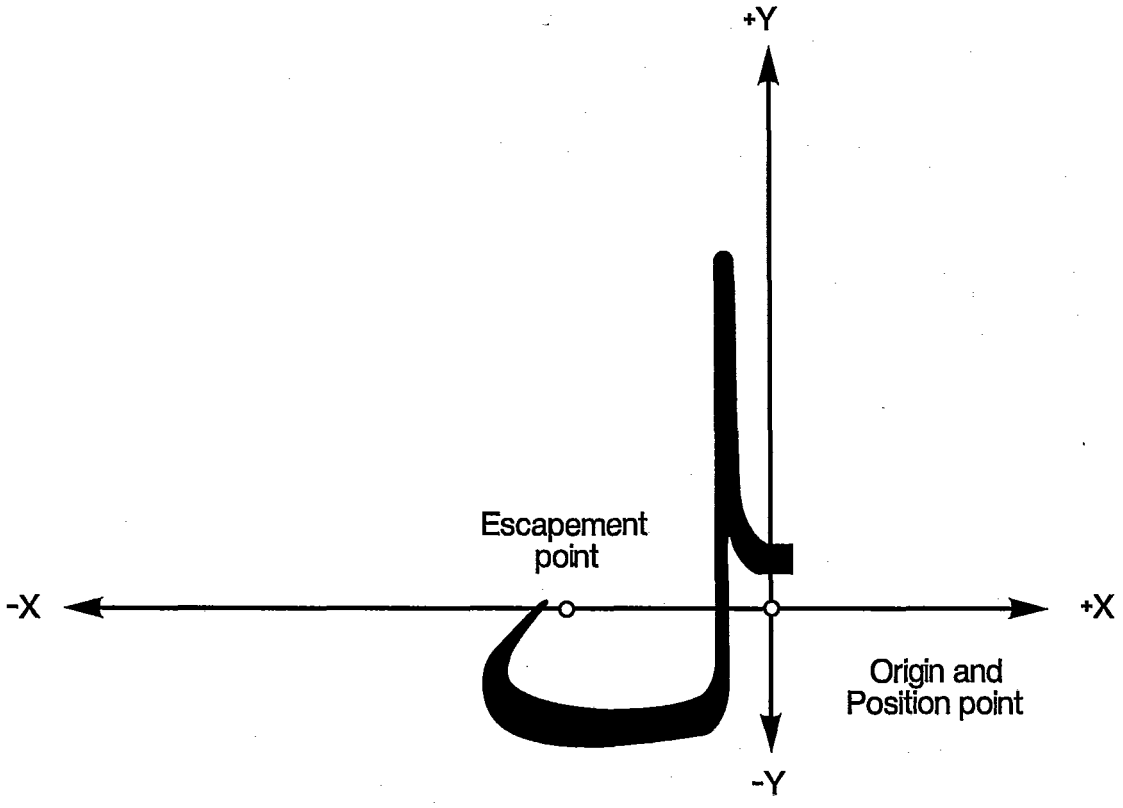


Figure 3 — A typical Arabic glyph in the RIGHT-TO-LEFT writing mode

The WRMODENAME property shall be unique within the context of the WRMODES property-list and shall be the first property in its associated property-list; all other properties can appear in any order.

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The remainder of this clause defines the ISO/IEC 9541 font properties which may appear within each writing mode property-list.

8.7.1.1 Writing Mode Name (WRMODENAME)

WRMODENAME is a structured-name, the name that identifies the writing mode.

The ISO/IEC 9541 writing mode object names are

LEFT-TO-RIGHT ⇒ A mode for normal setting of text in a writing system whose nominal escapement is in a left-to-right, horizontal direction, i.e., 0 ° (e.g., Latin, Cyrillic, Greek, horizontal Kanji/Kana);

RIGHT-TO-LEFT ⇒ A mode for normal setting of text in a writing system whose nominal escapement is in a right-to-left, horizontal direction, i.e., 180 ° (e.g., Hebrew, Arabic);

TOP-TO-BOTTOM ⇒ A mode for normal setting of text in a writing system whose nominal escapement is in a top-to-bottom, vertical direction, i.e., 270 ° (e.g., vertical Kanji/Kana).

```
wrmodename-property ::= wrmodename-name, wrmodename-value
wrmodename-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//WRMODENAME
wrmodename-value ::= STRUCTURED-NAME
```

NOTE 24 Other structured writing mode names are possible, but their significance is not defined within ISO/IEC 9541.

8.7.1.2 Nominal Escapement Direction (NOMESCDIR)

NOMESCDIR is an angle, the nominal angle of escapement direction of this writing mode of the font resource.

```
nomescdir-property ::= nomescdir-name, nomescdir-value
nomescdir-name ::= STRUCTURED-NAME
                   -- ISO/IEC 9541-1//NOMESCDIR
nomescdir-value ::= ANGLE
```

8.7.1.3 Escapement Class (ESCCLASS)

ESCCLASS is a code, indicating the coded escapement class of this writing mode of the font resource; one of

1 ⇒ monospaced, the net escapements of all glyphs in this mode of the font resource are the same;

2 ⇒ proportional, the net escapements are not all the same.

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```
escclass-property ::= escclass-name, escclass-value
escclass-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//ESCCLASS
escclass-value ::= CODE
```

NOTE 25 A character cell font is a special case of a monospaced font resource that conforms to the traditional typewriter character cell model, i.e., glyphs are modeled as rectangular boxes of the same width and height which can be imaged consecutively to form text strings and text lines. By definition, all glyphs have the same escapement and no glyph shapes extend outside the cell, i.e., the maximum font extents (MAXFONTEXT) do not exceed the box formed by the accumulated glyph position and escapement points (PX, PY, EX, and EY) and the left and right minimum line spacing values (MINLINESP).

8.7.1.4 Average Escapement (AVGESCX, AVGESCY)

AVGESCX and AVGESCY are *rel-rationals*, the *x* and *y* components, respectively, of the unweighted arithmetic average of the absolute value of the net escapement distances of all glyphs in this writing mode of the font resource. By convention, either of these properties defaults to zero if not specified in a font resource.

```
avgescx-property ::= avgescx-name, avgescx-value
avgescx-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//AVGESCX
avgescx-value ::= REL-RATIONAL

avgescy-property ::= avgescy-name, avgescy-value
avgescy-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//AVGESCY
avgescy-value ::= REL-RATIONAL
```

NOTE 26 If this mode of the font resource is monospaced, as indicated by the escapement class property (ESCCLASS), then this average escapement is also the escapement of every glyph in this mode of the font resource.

8.7.1.5 Average Lowercase Escapement (AVGLCESCX, AVGLCESCY)

AVGLCESCX and AVGLCESCY are *rel-rationals*, the *x* and *y* components, respectively, of the unweighted arithmetic average of the absolute value of the net escapement distances of the lowercase (mean) glyphs in this writing mode of the font resource. Where appropriate, lowercase glyphs are defined to be the Latin lowercase letters *"a - z"* inclusive, and their accented variants. By convention, either of these property values defaults to zero if not specified in a font resource.

```
avglcescx-property ::= avglcescx-name, avglcescx-value
avglcescx-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//AVGLCESCX
avglcescx-value ::= REL-RATIONAL

avglcescy-property ::= avglcescy-name, avglcescy-value
avglcescy-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//AVGLCESCY
avglcescy-value ::= REL-RATIONAL
```

NOTE 27 These property values are defined to be the average capital escapement (AVGCAPESCX, AVGCAPESCY) for font resource writing modes that contain no lowercase glyphs, e.g., Ideographic, Hebrew.

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8.7.1.6 Average Capital Escapement (AVGCAPESCX, AVGCAPESCY)

AVGCAPESCX and AVGCAPESCY are *rel-rationals*, the *x* and *y* components, respectively, of the unweighted arithmetic average of the absolute value of the net escapement distances of the capital (major) glyphs in this writing mode of the font resource. Where appropriate, capital glyphs are defined to be the Latin capital letters *"A - Z"* inclusive, and their accented variants. By convention, either of these property values defaults to zero if not specified in a font resource.

```
avgcpescx-property ::= avgcpescx-name, avgcpescx-value
avgcpescx-name ::= STRUCTURED-NAME
                       -- ISO/IEC 9541-1//AVGCAPESCX
avgcpescx-value ::= REL-RATIONAL

avgcpescy-property ::= avgcpescy-name, avgcpescy-value
avgcpescy-name ::= STRUCTURED-NAME
                       -- ISO/IEC 9541-1//AVGCAPESCY
avgcpescy-value ::= REL-RATIONAL
```

8.7.1.7 Tabular Escapement (TABESCX, TABESCY)

TABESCX and TABESCY are *rel-rationals*, the signed *x* and *y* components, respectively, of the net escapement of the tabular figure and possible currency glyphs, if suitable for tabular setting, for this writing mode of the font resource. For Latin fonts, tabular figures are defined to be the Arabic numerals *"0 - 9"* inclusive. By convention, property values of zero denote that the figures in this writing mode of the font resource are not suitable for tabular setting applications.

```
tabescx-property ::= tabescx-name, tabescx-value
tabescx-name ::= STRUCTURED-NAME
                       -- ISO/IEC 9541-1//TABESCX
tabescx-value ::= REL-RATIONAL

tabescy-property ::= tabescy-name, tabescy-value
tabescy-name ::= STRUCTURED-NAME
                       -- ISO/IEC 9541-1//TABESCY
tabescy-value ::= REL-RATIONAL
```

8.7.1.8 Maximum Font Extents (MAXFONTEXT)

MAXFONTEXT is an ordered-value-list of four *rel-rationals*, the *x* and *y* coordinates of the minimum and maximum font extents, respectively. The minimum and maximum font extents are the signed minimum (most negative, least positive) and signed maximum (most positive, least negative), respectively, of the *x* and *y* components of the corresponding glyph extent of all of the glyphs in this writing mode of the font resource.

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```
maxfontext-property ::= maxfontext-name, maxfontext-value-value-list
maxfontext-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//MAXFONTEXT
maxfontext-value-value-list  ::= maxfontext-minx, maxfontext-miny,
                                 maxfontext-maxx, maxfontext-maxy
maxfontext-minx ::= REL-RATIONAL
maxfontext-miny ::= REL-RATIONAL
maxfontext-maxx ::= REL-RATIONAL
maxfontext-maxy ::= REL-RATIONAL
```

8.7.1.9 Sectors-Pairwise Escapement Adjustment Descriptions (SECTORS)

Certain font resources will accomplish most or all glyph pairwise escapement adjustment by defining forward and backward sector data for each glyph. The sectors are defined as bands in the nominal escapement direction, in this writing mode of the font resource. These bands often overlap, and span sections of the glyph shapes which when imaged successively, may visually interact resulting in apparent excessive or insufficient inter-glyph spacing.

SECTORS is an ordered-value-list of *sector* data structures, describing the number and extents of the sector-pairwise escapement adjustments for this writing mode of the font resource. Each sector is an ordered-value-list of two *rel-rationals*, the left and right extents defining the sector, respectively, as measured relative to the nominal escapement direction (NOMESCDIR) of this writing mode of the font resource.

SECTORS is ordered according to decreasing values of each sector's left extent; the number and order paralleling that of each glyph's forward and backward sector adjustment extents for this writing mode [see the per-glyph sector-pairwise escapement adjustment extents properties (SPEAFORWDX, SPEAFORWDY, SPEABACKWDX, and SPEABACKWDY), 8.8.1.5.1.3].

```
sectors-property ::= sectors-name, sectors-value-value-list
sectors-name ::= STRUCTURED-NAME
                 -- ISO/IEC 9541-1//SECTORS
sectors-value-value-list ::= (sector)+
                 -- ordered by decreasing sector-left-extent
sector ::= sector-left-extent, sector-right-extent
sector-left-extent ::= REL-RATIONAL
sector-right-extent ::= REL-RATIONAL
```

8.7.1.10 Escapement Adjustments (ESCADJS)

ESCADJS is a property-list of all class-pairwise and scale escapement adjustment property-lists, suggesting escapement adjustments between successively imaged glyphs in this writing mode of the font resource.

```
escadjs-property-list ::= escadjs-name, escadjs-value-property-list
escadjs-name ::= STRUCTURED-NAME
                 -- ISO/IEC 9541-1//ESCADJS
escadjs-value-property-list ::= (escadj-property-list | property-list)*
```

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8.7.1.10.1 Escapement Adjustment (ESCADJ)

ESCADJ is a property-list, defining the properties for a single escapement adjustment mode for this writing mode of the font resource. This property-list is repeated for each escapement adjustment mode supported by this writing mode of the font resource.

```
escadj-property-list ::= escadj-name, escadj-value-property-list
escadj-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//ESCADJ
escadj-value-property-list ::= escadjname-property,
                               (cpea-property-list |
                                sec-property-list |
                                property-list)*
```

The ESCADJNAME property shall be unique within the context of the ESCADJS property-list and shall be the first property in its associated property-list; all other properties can appear in any order.

8.7.1.10.1.1 Escapement Adjustment Mode Name (ESCADJNAME)

ESCADJNAME is a structured-name, the name that identifies the escapement adjustment mode.

The ISO/IEC 9541 escapement adjustment mode object names, are

LOOSE ⇒ An escapement adjustment mode for loose fit;

NORMAL ⇒ An escapement adjustment mode for normal fit;

KERN ⇒ An escapement adjustment mode for kerned fit;

TIGHT ⇒ An escapement adjustment mode for tight fit;

TOUCH ⇒ An escapement adjustment mode where glyph shapes touch.

```
escadjname-property ::= escadjname-name, escadjname-value
escadjname-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//ESCADJNAME
escadjname-value ::= STRUCTURED-NAME
```

NOTE 28 Other structured escapement adjustment mode names are possible, but their significance is not defined within ISO/IEC 9541.

8.7.1.10.1.2 Class-Pairwise Escapement Adjustments (CPEA)

Certain font resources will accomplish most or all glyph pairwise escapement adjustment by clustering similar forward and backward shape profiles into arbitrary numeric pairwise escapement adjustment classes, and by defining two-dimensional arrays of *x* or *y* escapement adjustments that correspond to these classes for each named escapement adjustment mode associated with this writing mode of the font resource. Each glyph property-list then includes an indication of the glyph's forward and backward class-pairwise escapement adjustment class, which can be used to retrieve the appropriate escapement adjustment for a given pair of glyphs.

CPEA is a property-list of the class-pairwise escapement adjustment properties for the named escapement adjustment mode associated with this writing mode of the font resource, suggesting the escapement adjustments for successive glyphs according to their respective forward and backward-direction class-pairwise escapement adjustment classes.

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```
cpea-property ::= cpea-name, cpea-value-property-list
cpea-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//CPEA
cpea-value-property-list ::= (ncpeaforwd-property |
                              ncpeabackwd-property |
                              cpeax-property |
                              cpeay-property |
                              property-list)*
```

The NCPEAFORWD and NCPEABACKWD properties are required.

8.7.10.1.2.1 Number of Class-Pairwise Escapement Adjustment Classes (NCPEAFORWD, NCPEABACKWD)

NCPEAFORWD and NCPEABACKWD are *cardinals*, the number of forward-direction and backward-direction escapement adjustment classes, respectively, defined for this class-pairwise escapement adjustment property-list.

```
ncpeaforwd-property ::= ncpeaforwd-name, ncpeaforwd-value
ncpeaforwd-name ::= STRUCTURED-NAME
                        -- ISO/IEC 9541-1//NCPEAFORWD
ncpeaforwd-value ::= CARDINAL

ncpeabackwd-property ::= ncpeabackwd-name, ncpeabackwd-value
ncpeabackwd-name ::= STRUCTURED-NAME
                        -- ISO/IEC 9541-1//NCPEABACKWD
ncpeabackwd-value ::= CARDINAL
```

8.7.1.10.1.2.2 Class-Pairwise Escapement Adjustment Arrays (CPEAX, CPEAY)

CPEAX and CPEAY are *ordered-value-lists* of the *x* and *y* components, respectively, of the suggested class-pairwise escapement adjustments between glyphs having the forward-direction and backward-direction escapement adjustment classes defined for this class-pairwise escapement adjustment property-list. [See the class-pairwise escapement adjustment indicator glyph property (CPEAI), 8.8.1.6].

Each CPEAX and CPEAY value-list effectively defines a fully populated NCPEAFORWD by NCPEABACKWD two-dimensional array of adjustment values, stored such that the second dimension varies most rapidly. The forward-direction escapement adjustment class is represented by the first dimension; the backward-direction escapement adjustment class is represented by the second dimension.

```
cpeax-property ::= cpeax-name, cpeax-value-value-list
cpeax-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//CPEAX
cpeax-value-value-list ::= (cpea-adj)+ -- n x m array, ordered m first
cpea-adj ::= REL-RATIONAL

cpeay-property ::= cpeay-name, cpeay-value-value-list
cpeay-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//CPEAY
cpeay-value-value-list ::= (cpea-adj)+ -- n x m array, ordered m first
```

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Let CPEAX and CPEAY be two-dimensional arrays giving the *x* and *y* components of the class-pairwise escapement adjustments, respectively, for the named escapement adjustment mode; let *i* and *j* be the forward and backward class-pairwise escapement adjustment class indicators for glyphs *a* and *b*, respectively. The class-pairwise escapement adjustment for glyph *a*, then, is given by

CPEAX [(i * NCPEABACKWD) + j]

CPEAY [(i * NCPEABACKWD) + j]

8.7.1.10.1.3 Scale Escapement Correction (SEC)

Scale escapement correction suggests the addition or subtraction of a uniform amount of space to or from the sides of most glyphs in a writing mode of a font resource to correct for linear scaling artifacts. Such correction is usually inversely proportional to the target font size, i.e., inter-glyph space is decreased as the target font size increases. Unless otherwise specified in a font reference, the target font size is the size at which the font resource is actually imaged. Multiple such linear functions may be defined, each commonly called a *track*.

SEC is a property-list, of the scale escapement correction properties for the named escapement adjustment mode associated with this writing mode of the font resource, suggesting a number of inter-glyph escapement adjustments as a function of font size. Only scale-adjusting glyphs may be so adjusted [see the escapement adjustment indicator glyph property (EAI), 8.8.1.7].

```
sec-property-list ::= sec-name, sec-value-property-list
sec-name ::= STRUCTURED-NAME
                  -- ISO/IEC 9541-1//SEC
sec-value-property-list ::=  (secx-property |
                              secy-property |
                              property-list)*
```

8.7.1.10.1.3.1 Scale Escapement Correction Adjustments (SECX, SECY)

SECX and SECY are *ordered-value-lists*, of *secrange* data structures, describing the *x* and *y* components, respectively, of the scale escapement corrections for this scale escapement correction property-list. Each secrange defines an ordered-value-list of *secsze* and *secadj* values giving the *x* or *y* scale escapement correction for a specific font size.

Secsze is a rational, the recommended font size, in units of millimeters, for which the associated scale escapement correction value is designed to be applied. Secadj is a rel-rational, the *x* or *y* component of the suggested scale escapement correction. This adjustment is to be added half before and half after each glyph's escapement.

In effect, each secrange defines the start or end of a correction range, and the correction value associated with the start or end of that range. Linear interpolation should be performed within the correction range to calculate the appropriate escapement correction for font sizes not directly specified. By convention, the first scale escapement correction applies to all font sizes less than or equal to its associated secsze value, and the last scale escapement correction applies to all font sizes greater than or equal to its associated secsze value.

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```
secx-property ::= secx-name, secx-value-value-list
secx-name ::= STRUCTURED-NAME
                  -- ISO/IEC 9541-1//SECX
secx-value-value-list ::=  (secrange)+
secrange ::= secsze, secadj
secsze ::= RATIONAL
secadj ::= REL-RATIONAL

secy-property ::= secy-name, secy-value-value-list
secy-name ::= STRUCTURED-NAME
                  -- ISO/IEC 9541-1//SECY
secy-value-value-list ::=  (secrange)+
```

8.7.1.11 Recommended Pairwise Escapement Adjustment Size (MINESCADJSZE, MAXESCADJSZE)

MINESCADJSZE and MAXESCADJSZE are *rationals*, the recommended minimum and maximum of the range of font sizes over which the pairwise, class-pairwise and sector-pairwise escapement adjustment glyph properties are designed to be usable for this writing mode of this font resource, according to the judgment of the design source (DSNSOURCE). Each size is specified in units of millimeters.

```
minescadjsze-property ::= minescadjsze-name, minescadjsze-value
minescadjsze-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//MINESCADJSZE
minescadjsze-value ::= RATIONAL

maxescadjsze-property ::= maxescadjsze-name, maxescadjsze-value
maxescadjsze-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//MAXESCADJSZE
maxescadjsze-value ::= RATIONAL
```

8.7.1.12 Scores (SCORES)

A score is a line drawn through or along a line of text, parallel to the escapement direction, often used for emphasis. Commonly used types of scores include underscores, overscores, and throughscores (the last also known as a strike-out). This property-list is also used to define positioning information for Kanji kendot.

SCORES is a property-list of score *property-list*, defining the scores for this writing mode of the font resource. Each score property-list usually contains the structured score name and corresponding translation and score thickness properties which when applied to this writing mode or the font resource will produce the associated score.

```
scores-property-list ::= scores-name, scores-value-property-list
scores-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//SCORES
scores-value-property-list :: = (score-property-list | property-list)*
```


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8.7.1.12.1 Score (SCORE)

SCORE is a property-list, defining a score for this writing mode of this font resource. This property-list is repeated for each score supported by this writing mode of the font resource.

```
score-property-list ::= score-name, score-value-property-list
score-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//SCORE
score-value-property-list :: = scorename-property,
                               (scoreoffsetx-property |
                                scoreoffsety-property |
                                scorethick-property |
                                property-list)*
```

The SCORENAME property shall be unique within the context of the SCORES property-list and shall be the first property in its associated property-list; all other properties can appear in any order.

8.7.1.12.1.1 Score Name (SCORENAME)

SCORENAME is a structured-name, the name that identifies the type of score.

The ISO/IEC 9541 score object names, are

RIGHTSCORE ⇒ A score drawn 270 ° counterclockwise from the escapement direction (i.e., to the right of the path while facing along the path), and near the right font extent of the font resource in this writing mode. In a left-to-right writing mode this constitutes an underscore;

LEFTSCORE ⇒ A score drawn 90 ° counterclockwise from the escapement direction (i.e., to the left of the path), and near the left font extent of the font resource in this writing mode. In a left-to-right writing mode this constitutes an overscore;

THROUGHSCORE ⇒ A score drawn through the visual centers of the glyphs in this mode, i.e., a throughscore;

KENDOT ⇒ A score placed as a centered dot on a line at 90 ° to the escapement path and near to the left font extent of the font resource in this writing mode. Intended to be used in Kanji, the kendot constitutes an emphasis and has significance similar to an underscore in Latin fonts.

```
scorename-property ::= scorename-name, scorename-value
scorename-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//SCORENAME
scorename-value ::= STRUCTURED-NAME
```

Other structured variant score names are possible, but their significance is not defined within ISO/IEC 9541.

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8.7.1.12.1.2 Score Position Offset (SCOREOFFSETX, SCOREOFFSETY)

SCOREOFFSETX and SCOREOFFSETY are *rel-rationals*, the signed *x* and *y* components, respectively, of the offset distance of the center of the named score, relative to the active position point of regular text, measured in the glyph coordinate system. By convention, either of these properties defaults to zero if not specified in a font resource.

```
scoreoffsetx-property ::= scoreoffsetx-name, scoreoffsetx-value
scoreoffsetx-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//SCOREOFFSETX
scoreoffsetx-value ::= REL-RATIONAL

scoreoffsety-property ::= scoreoffsety-name, scoreoffsety-value
scoreoffsety-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//SCOREOFFSETY
scoreoffsety-value ::= REL-RATIONAL
```

8.7.1.12.1.3 Score Thickness (SCORETHICK)

SCORETHICK is an unsigned rel-rational, the suggested thickness of the score.

```
scorethick-property ::= scorethick-name, scorethick-value
scorethick-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//SCORETHICK
scorethick-value ::= REL-RATIONAL -- unsigned
```

8.7.1.13 Variant Scripts (VSCRIPTS)

A variant script is one which varies from regular text by positional offset, and possible size scale. Commonly used types of variant scripts include superscripts and subscripts in Latin fonts, and Ruby scripts in Ideographic fonts.

VSCRIPTS is a property-list of variant script *property-list*, defining the variant scripts for this writing mode of the font resource. Each variant script property-list usually contains the structured variant script name and corresponding translation and scale factors which when applied to this writing mode of the font resource will produce the named variant.

```
vscripts-property-list ::= vscripts-name, vscripts-value-property-list
vscripts-name ::= STRUCTURED-NAME
                  -- ISO/IEC 9541-1//VSCRIPTS
vscripts-value-property-list ::= (vscript-property-list,
                                  property-list)*
```

8.7.1.13.1 Variant Script (VSCRIPT)

VSCRIPT is a property-list, defining a single variant script for this writing mode of this font resource. This property-list is repeated for each variant script supported by the writing mode.

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```
vscript-property-list ::= vscript-name, vscript-value-property-list
vscript-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//VSCRIPT
vscript-value-property-list ::= vsname-property,
                                (vsoffsetx-property | vsoffsety-property |
                                 vsscalex-property | vsscaley-property |
                                 property-list)*
```

The VSNAME property shall be unique within the context of the VSCRIPTS property-list and shall be the first property in its associated property-list; all other properties can appear in any order.

8.7.1.13.1.1 Variant Script Name (VSNAME)

VSNAME is a structured-name, the name that identifies the type of variant script.

The ISO/IEC 9541 variant script object names, are

LEFT-VSCRIPT ⇒ A variant script slightly reduced in size and slightly offset primarily in a direction 90 ° counterclockwise from the escapement direction (i.e., to the left of escapement path). In a left-to-right writing mode this constitutes a generic superscript;

RIGHT-VSCRIPT ⇒ A variant script slightly reduced in size and slightly offset primarily in a direction 270 ° counterclockwise from the escapement direction (i.e., offset to the right of the escapement path). In a left-to-right writing mode this constitutes a generic subscript;

RUBY-VSCRIPT ⇒ A variant script reduced in size and offset primarily in a direction 90 ° counterclockwise from the escapement direction (i.e., offset to the left of the escapement path). This variant is intended to support Japanese Ruby text composition.

```
vsname-property ::= vsname-name, vsname-value
vsname-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//VSNAME
vsname-value ::= STRUCTURED-NAME
```

NOTE 29 Other structured variant script names are possible, but their significance is not defined within ISO/IEC 9541.

8.7.1.13.1.2 Variant Script Position Offset (VSOFFSETX, VSOFFSETY)

VSOFFSETX and VSOFFSETY are *rel-rationals*, the signed *x* and *y* components, respectively, of the offset distance of the named variant script, relative to the current position point of regular text, measured in the glyph coordinate system. By convention, either of these properties defaults to zero if not specified for a variant script.

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```
vsoffsetx-property ::= vsoffsetx-name, vsoffsetx-value
vsoffsetx-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//VSOFFSETX
vsoffsetx-value ::= REL-RATIONAL

vsoffsety-property ::= vsoffsety-name, vsoffsety-value
vsoffsety-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//VSOFFSETY
vsoffsety-value ::= REL-RATIONAL
```

NOTE 30 As used with Ruby scripts, these values establish only the offset from the current writing mode's alignment line to the Ruby variant script alignment line, i.e., the offset parallel to the escapement direction must be determined by the formatting process.

8.7.1.13.1.3 Variant Script Anamorphic Scale Factors (VSSCALEX, VSSCALEY)

VSSCALEX and VSSCALEX are *rationals*, the *x* and *y* components, respectively, of the anamorphic scale factors to be applied to the named variant script, expressed as a ratio of the body size of variant script to the font size of regular text. By convention, this value defaults to 1, indicating that no scaling is to be performed.

```
vsscalex-property ::= vsscalex-name, vsscalex-value
vsscalex-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//VSSCALEX
vsscalex-value ::= RATIONAL

vsscaley-property ::= vsscaley-name, vsscaley-value
vsscaley-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//VSSCALEY
vsscaley-value ::= RATIONAL
```

8.7.1.14 Recommended Minimum Alignment Line-to-Line Spacing Distance (MINLINESP)

MINLINESP is an ordered-value-list of two *rel-rationals*, the suggested left and right components of the minimum line-to-line spacing distance between successive lines of text. Each distance is measured from the nominal alignment line, perpendicular to the nominal escapement direction of this writing mode of the font resource, in the glyph coordinate system. This distance usually allows for all ascenders, descenders, accents, and a small shoulder, so that successive lines of text at this spacing will be separated by a small amount of white space.

```
minlinesp-property ::= minlinesp-name, minlinesp-value-value-list
minlinesp-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//MINLINESP
minlinesp-value-value-list ::= minlinesp-left, minlinesp-right
minlinesp-left :: = REL-RATIONAL
minlinesp-right ::= REL-RATIONAL
```

8.7.1.15 Recommended Minimum and Maximum Anamorphic Scale Factors (MINANASCALE, MAXANASCALE)

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MINANASCALE and MAXANASCALE are *rationals*, the recommended minimum and maximum anamorphic scale factors, respectively, of the range over which this font resource is designed to be scalable in the nominal escapement direction of this writing mode, each factor given as a ratio of the size for that direction to the font size of the font resource. By convention, each of these values defaults to 1, indicating that no anamorphic scaling is recommended.

```
minanascale-property ::= minanascale-name, minanascale-value
minanascale-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//MINANASCALE
minanascale-value ::= RATIONAL

maxanascale-property ::= maxanascale-name, maxanascale-value
maxanascale-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//MAXANASCALE
maxanascale-value ::= RATIONAL
```

NOTE 31 In a mode which is monospaced, as indicated by its escapement class property (ESCCLASS), these scale factors can be used in conjunction with the average escapement property (AVGESC) to determine the range of spacings over which this font resource may be anamorphically scaled.

8.7.1.16 Nominal Alignment Mode (NOMALIGN)

NOMALIGN is a structured-name, the name of the nominal alignment mode for which this writing mode of the font resource was designed to be used, according to the judgment of the design source (DSNSOURCE).

```
nomalign-property ::= nomalign-name, nomalign-value
nomalign-name ::= STRUCTURED-NAME
                  -- ISO/IEC 9541-1//NOMALIGN
nomalign-value ::= STRUCTURED-NAME
```

8.7.1.17 Alignment Modes (ALIGNMODES)

Different writing systems generally use one alignment mode when setting lines of text in that mode (usually vertical or horizontal), but sometimes incorporate text using font resources designed for a different alignment mode (e.g., Japanese text composition often combines Kanji fonts with Latin fonts).

The alignment modes properties define the recommended translation fro m the nominal alignment mode to all other recognized alignment modes, and possible anamorphic scale factors to be applied to a font resource used in a secondary alignment mode. For example, Latin fonts are generally designed to be visually aligned to a baseline, while Ideographic fonts are generally designed to visually align to a centerline. The alignment modes property-list for an Ideographic font resource, then, would give the recommended offsets from the centerline alignment of the base Ideographic font to the baseline alignment of a secondary Latin font, and the anamorphic scale factors to be applied to the Latin font for proper body size balance, for a given writing mode. See figure 4.

ALIGNMODES is a property-list defining the alignment mode properties for this writing mode of the font resource. Each alignment mode property-list usually contains the structured alignment mode name and corresponding translation and scale factors which define that alignment mode.

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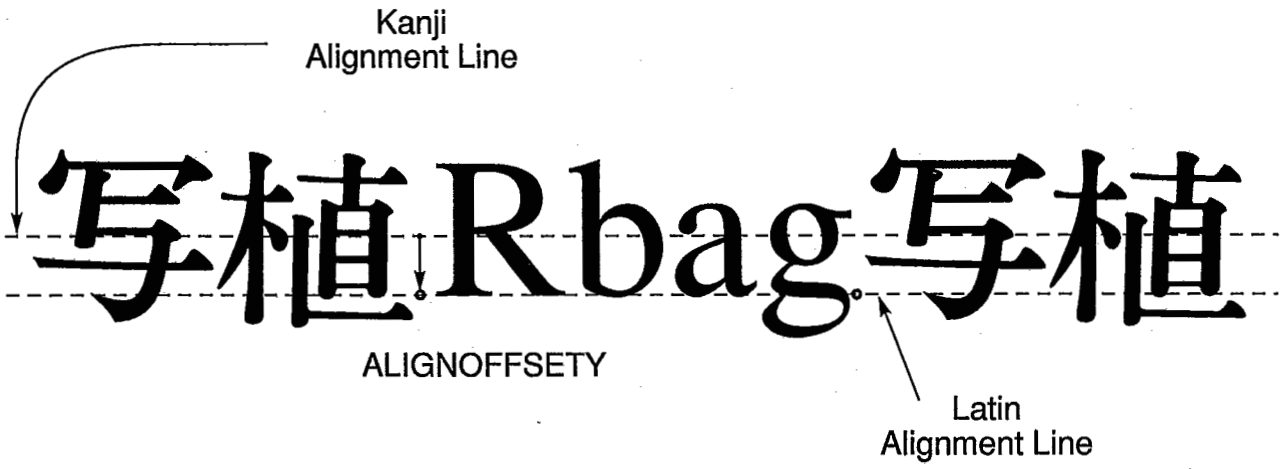


Figure 4 — Example of text using multiple alignment modes in the LEFT-TO-RIGHT writing mode

```
alignmodes-property-list ::= alignmodes-name,
                             alignmodes-value-property-list
alignmodes-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//ALIGNMODES
alignmodes-value-property-list ::= (align-property-list |
                                    property-list)*
```

8.7.1.17.1 Alignment Mode (ALIGN)

ALIGN is a property-list, defining a single alignment mode for this writing mode of the font resource. This property-list is repeated for each alignment mode defined for the writing mode.

```
align-property-list ::= align-name, align-value-property-list
align-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//ALIGN
align-value-property-list :: = alignname-property,
                               (alignoffsetx | alignoffsety |
                                alignscalex | alignscaley |
                                property-list)*
```

The ALIGNNAME property shall be unique within the context of the ALIGNMODES property-list and shall appear first in its associated property-list; all other properties can appear in any order.

8.7.1.17.1.1 Alignment Mode Name (ALIGNNAME)

ALIGNNAME is a structured-name, the name that identifies the type of alignment mode.

The ISO/IEC 9541 alignment mode object names, are

BASE-ALIGN ⇒ An alignment mode for the setting of text where most glyphs are visually aligned on an imaginary baseline, parallel to the writing mode's

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escapement direction. Some glyphs, such as the Latin lowercase *"p"*, may extend past this baseline. Latin fonts are usually designed to be so aligned;

CENTRE-ALIGN ⇒ An alignment mode for the setting of text where most glyphs are visually aligned to an imaginary centreline, parallel to the writing mode's escapement direction. Ideographic fonts, and Latin glyphs designed to be used with such fonts, are usually designed to be so aligned;

TOP-ALIGN ⇒ An alignment mode for the setting of text where most glyphs are visually aligned to an imaginary topline, parallel to the writing mode's escapement direction. Hindi fonts are usually designed to be so aligned;

BOTTOM-ALIGN ⇒ An alignment mode for the setting of text where most glyphs are visually aligned to an imaginary bottomline, parallel to the writing mode's escapement direction.

```
alignname-property ::= alignname-name, alignname-value
alignname-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//ALIGNNAME
alignname-value ::= STRUCTURED-NAME
```

NOTE 32 Other structured alignment mode names are possible, but their significance is not defined within ISO/IEC 9541.

8.7.1.17.1.2 Alignment Line Position Offset (ALIGNOFFSETX, ALIGNOFFSETY)

ALIGNOFFSETX and ALIGNOFFSETY are *rel-rationals*, the signed *x* and *y* components, respectively, of the recommended offset distance of the named alignment mode's alignment line, relative to the nominal alignment line of this writing mode, measured in the glyph coordinate system. By convention, either of these properties defaults to zero if not specified in a font resource.

```
alignoffsetx-property ::= alignoffsetx-name, alignoffsetx-value
alignoffsetx-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//ALIGNOFFSETX
alignoffsetx-value ::= REL-RATIONAL

alignoffsety-property ::= alignoffsety-name, alignoffsety-value
alignoffsety-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//ALIGNOFFSETY
alignoffsety-value ::= REL-RATIONAL
```

8.7.1.17.1.3 Alignment Mode Anamorphic Scale Factors (ALIGNSCALEX, ALIGNSCALEY)

ALIGNSCALEX and ALIGNSCALEY are *rationals*, the *x* and *y* components, respectively, of the anamorphic scale factors to be applied to the named alignment mode, expressed as a ratio of the body size of the alignment mode to the font size of regular text. By convention, this value defaults to 1, indicating that no scaling is to be performed.

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```
alignscalex-property ::= alignscalex-name, alignscalex-value
alignscalex-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//ALIGNSCALEX
alignscalex-value ::= RATIONAL

alignscaley-property ::= alignscaley-name, alignscaley-value
alignscaley-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//ALIGNSCALEY
alignscaley-value ::= RATIONAL
```

8.7.1.18 Copy Fit Techniques (COPYFITS)

Copy fitting is the process of determining how many glyphs will occur in a given two dimensional space, typically a column of text, according to some copy fit technique. A copy fit value, as specified in a font resource, identifies the anticipated number of glyphs that would typically occur in a unit of measure according to that copy fit technique, which permits identification of a font resource or a substitute font resource that may satisfy a copy fitting requirement. The actual techniques used to calculate copy fit values vary by font supplier, and are generally language-dependent.

COPYFITS is a property-list, of copy fit *property-list*, defining named copy fit techniques and associated copy fit values for this writing mode of the font resource. Each copy fit property-list usually contains the structured copy fit technique name, and a corresponding measure indicating the number of glyphs per centimeter, according to that copy fit technique.

```
copyfits-property-list ::= copyfits-name, copyfits-value-property-list
copyfits-name ::= STRUCTURED-NAME
                  -- ISO/IEC 9541-1//COPYFITS
copyfits-value-property-list ::= (copyfit-property-list |
                                  property-list)*
```

8.7.1.18.1 Copy Fit Technique (COPYFIT)

COPYFIT is a property-list, defining a single copy fit technique and measure for this writing mode of the font resource. This property-list is repeated for each copy fit technique supported by this writing mode of the font resource.

```
copyfit-property-list ::= copyfit-name, copyfit-value-property-list
copyfit-name ::= STRUCTURED-NAME
                 -- ISO/IEC 9541-1//COPYFIT
copyfit-value-property-list :: = copyfitname-property,
                                 (copyfitmeasure-property |
                                  property-list)*
```

The COPYFITNAME property shall be unique with the context of the COPYFITS property-list and shall be first in its associated property-list; all other properties can appear in any order.

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8.7.1.18.1.1 Copy Fit Technique Name (COPYFITNAME)

COPYFITNAME is a structured-name, the name that identifies the copy fit technique.

```
copyfitname-property ::= copyfitname-name, copyfitname-value
copyfitname-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//COPYFITNAME
copyfitname-value ::= STRUCTURED-NAME
```

The structured copy fit technique name is assigned by the data source (DATASOURCE); its significance is not defined within ISO/IEC 9541.

8.7.1.18.1.2 Copy Fit Measure (COPYFITMEASURE)

COPYFITMEASURE is an unsigned rational, the number of glyphs per linear centimeter, as measured in the nominal escapement direction of the writing mode, according to the copy fit technique specified by the copy fit name (COPYFITNAME).

```
copyfitmeasure-property ::= copyfitmeasure-name, copyfitmeasure-value
copyfitmeasure-name ::= STRUCTURED-NAME
                        -- ISO/IEC 9541-1//COPYFITMEASURE
copyfitmeasure-value ::= RATIONAL -- unsigned
```

8.7.1.19 Design, Recommended Minimum and Maximum Wordspace Adjustments (DSNWORDADD, DSNWORDAMPL, MINWORDADD, MINWORDAMPL, MAXWORDADD, MAXWORDAMPL)

DSNWORDADD, MINWORDADD and MAXWORDADD are rel-rational, the design, recommended minimum and maximum additive escapement adjustments, respectively, which properly may be applied to word-spacing glyphs in this writing mode of the font resource for the purposes of text justification, according to the judgment of the design source (DSNSOURCE). The escapements of all such word-spacing glyphs are modified a constant amount.

DSNWORDAMPL, MINWORDAMPL and MAXWORDAMPL are rational, the design, recommended minimum and maximum multiplicative escapement adjustments, respectively, which properly may be applied to word-spacing glyphs in this writing mode of the font resource, for the purposes of text justification, according to the judgment of the design source (DSNSOURCE). As each glyph potentially has a different escapement, these multiplicative factors will generally modify the escapements of all such word-spacing glyphs an amount proportionate to the escapement of each glyph.

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```
dsnwordadd-property ::= dsnwordadd-name, dsnwordadd-value
dsnwordadd-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//DSNWORDADD
dsnwordadd-value ::= REL-RATIONAL

dsnwordampl-property ::= dsnwordampl-name, dsnwordampl-value
dsnwordampl-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//DSNWORDAMPL
dsnwordampl-value ::= RATIONAL

minwordadd-property ::= minwordadd-name, minwordadd-value
minwordadd-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//MINWORDADD
minwordadd-value ::= REL-RATIONAL

minwordampl-property ::= minwordampl-name, minwordampl-value
minwordampl-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//MINWORDAMPL
minwordampl-value ::= RATIONAL

maxwordadd-property ::= maxwordadd-name, maxwordadd-value
maxwordadd-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//MAXWORDADD
maxwordadd-value ::= REL-RATIONAL

maxwordampl-property ::= maxwordampl-name, maxwordampl-value
maxwordampl-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//MAXWORDAMPL
maxwordampl-value ::= RATIONAL
```

NOTES

33 These properties usually increase or decrease the total escapement, in the direction of the unmodified escapement, of the glyph(s) to which they are applied [see the escapement adjustment indicator (EAI) glyph property, 8.8.1.7].

34 The escapement adjustment values are relative to the design size (DSNSIZE) and minimum line spacing (MINLINESP) of the font resource, assuming an appropriate number of glyphs per text line. Modifications to the adjustment values are generally required when scaling the font resource smaller or larger than the design size.

35 These properties are not defined for font resources intended for writing systems that do not generally support the notion of *word*, e.g., Ideographic fonts as used in Japanese composition.

8.7.1.20 Design, Recommended Minimum and Maximum Letterspace Adjustments (DSNLETTERADD, DSNLETTERAMPL, MINLETTERADD, MINLETTERAMPL, MAXLETTERADD, MAXLETTERAMPL)

DSNLETTERADD, MINLETTERADD and MAXLETTERADD are rel-rational, the design, recommended minimum and maximum additive inter-glyph escapement adjustments, respectively, which properly may be made to letter-spacing glyphs in this writing mode of the font resource for the purposes of text justification, according to the judgment of the design source (DSNSOURCE). The escapements of all such letter-spacing glyphs are modified a constant amount.

DSNLETTERAMPL, MINLETTERAMPL and MAXLETTERAMPL are rational, the design, recommended minimum and maximum multiplicative escapement adjustments, respectively, which properly may be made to letter-spacing glyphs in this writing mode of the font resource for the purposes of text justification, according to the judgment of the design source (DSNSOURCE). As each glyph potentially has a different escapement, these multiplicative factors will generally modify the escapements of all such letter-spacing glyphs an amount proportionate with the escapement of each glyph.

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```
dsnletteradd-property ::= dsnletteradd-name, dsnletteradd-value
dsnletteradd-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//DSNLETTERADD
dsnletteradd-value ::= REL-RATIONAL

dsnletterampl-property ::= dsnletterampl-name, dsnletterampl-value
dsnletterampl-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//DSNLETTERAMPL
dsnletterampl-value ::= RATIONAL

minletteradd-property ::= minletteradd-name, minletteradd-value
minletteradd-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//MINLETTERADD
minletteradd-value ::= REL-RATIONAL

minletterampl-property ::= minletterampl-name, minletterampl-value
minletterampl-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//MINLETTERAMPL
minletterampl-value ::= RATIONAL

maxletteradd-property ::= maxletteradd-name, maxletteradd-value
maxletteradd-name ::= STRUCTURED-NAME
                        -- ISO/IEC 9541-1//MAXLETTERADD
maxletteradd-value ::= REL-RATIONAL

maxletterampl-property ::= maxletterampl-name, maxletterampl-value
maxletterampl-name ::= STRUCTURED-NAME
                        -- ISO/IEC 9541-1//MAXLETTERAMPL
maxletterampl-value ::= RATIONAL
```

NOTES

36 These properties usually increase or decrease the total escapement, the modification to be added half before and half after each glyph in the direction of the unmodified escapement, of the glyph(s) to which they are applied (see the escapement adjustment indicator (EAI) glyph property, 8.8.1.7).

37 The escapement adjustment values are relative to the design size (DSNSIZE) and minimum line spacing (MINLINESP) of the font resource, assuming an appropriate number of glyphs per text line. Modifications to the adjustment values are generally required when scaling the font resource smaller or larger than the design size.

8.8 Specification of font resource glyph metrics properties (GLYPHMETRICS)

Each writing mode of a font resource contains a list of glyph metrics properties for each glyph defined in that writing mode of the font resource.

Each glyph metrics property-list usually specifies a structured glyph name, the glyph extents, position and escapement points, etc. Specific glyphs may also define ligature relationships, pairwise and sector-pairwise escapement adjustments, etc.

GLYPHMETRICS is a property-list of glyph metrics *property-list*, defining all glyph metrics properties associated with this writing mode of the font resource.

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```
glyphmetrics-property-list ::= glyphmetrics-name,
                               glyphmetrics-value-property-list
glyphmetrics-name ::= STRUCTURED-NAME
                      -- ISO/IEC 9541-1//GLYPHMETRICS
glyphmetrics-value-property-list :: (gmetric-property-list |
                                     property-list)*
```

8.8.1 Glyph Metric (GMETRIC)

GMETRIC is a property-list, defining all the metrics properties associated with this glyph of the font resource, in this writing mode. A modal glyph metrics property-list will normally have a number of such glyph metrics properties.

```
gmetric-property-list ::= gmetric-name, gmetric-value-property-list
gmetric-name ::= STRUCTURED-NAME
                 -- ISO/IEC 9541-1//GMETRIC
gmetric-value-property-list :: = gname-property,
                           (px-property | py-property |
                            ex-property | ey-property |
                            ext-property | lgs-property-list |
                            peas-property-list | cpeai-property |
                            eai-property | minex-property |
                            miney-property | maxex-property |
                            maxey-property | property-list)*
```

The GNAME property shall be unique within the context of the GLYPHMETRICS property-list and shall be first in its associated property-list; all other properties can appear in any order.

The remainder of this clause defines the ISO/IEC 9541 modal glyph metrics properties.

8.8.1.1 Glyph Name (GNAME)

GNAME is a structured-name, the structured glyph name that identifies this glyph.

```
gname-property ::= gname-name, gname-value
gname-name ::= STRUCTURED-NAME
                   -- ISO/IEC 9541-1//GNAME
gname-value ::= STRUCTURED-NAME
```

8.8.1.2 Glyph Position and Escapement Points (PX, PY, EX, EY)

In imaging glyphs in sequence, each glyph is usually first translated so that its scaled position point is at the current position on the presentation surface, then the glyph shape is imaged, then the current position is moved to the glyph's scaled escapement point. The net escapement, i.e., the net change in current position for ordinary imaging of a glyph in this writing mode, is thus the distance from the position point to the escapement point. The escapement direction for the glyph is the direction from its position point to escapement point.

For operational efficiency, however, glyphs should generally be defined within the glyph coordinate system so that the most frequently used position point coincides with the origin of the glyph coordinate system, and the escapement points lie on the *x* or *y* axis. For example, for Latin fonts, which are normally designed to be used in a

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left-to-right writing mode, visually aligned on a common baseline, each glyph generally would be positioned in the glyph coordinate system so that the position point coincides with the origin of the glyph coordinate system, and the escapement point lies on the horizontal *x* axis. In this case, only the EX property need be specified.

Ideographic fonts are often designed to be used in both left-to-right and top-to-bottom writing modes, visually centered on a horizontal or vertical centreline, respectively. Each glyph, then, would generally be positioned in the glyph coordinate system so that the position and escapement points in the left-to-right writing mode lie on the horizontal *x* axis, and conversely, in the top-to-bottom writing mode, the position and escapement points would lie on the vertical *y* axis. For each writing mode, then, only the *x* or *y* component of these properties need be defined as the remaining components default to zero. See figure 2.

PX, PY, EX and EY are rel-rational, the *x* and *y* coordinates of the position and escapement points, respectively, of the named glyph in this writing mode of the font resource, as measured in the glyph coordinate system. Any of the coordinate values may be zero, i.e., on the glyph coordinate system axis or at its origin. By convention, these property values default to zero if not specified in a font resource.

```
px-property ::= px-name, px-value
px-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//PX
px-value ::= REL-RATIONAL

py-property ::= py-name, py-value
py-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//PY
py-value ::= REL-RATIONAL

ex-property ::= ex-name, ex-value
ex-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//EX
ex-value ::= REL-RATIONAL

ey-property ::= ey-name, ey-value
ey-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//EY
ey-value ::= REL-RATIONAL
```

Let $P_{x,y}$ be the current position point on the presentation surface; let PX', PY', EX' and EY' be the scaled *x* and *y* components of the position and escapement points of the glyph, respectively. The net displacement of the current position point is given by:

$$P'_x = P_x - PX' + EX'$$

$$P'_y = P_y - PY' + EY'$$

8.8.1.3 Glyph Extents (EXT)

EXT is an ordered-value-list of four *rel-rationals*, the *x* and *y* coordinates of the minimum and maximum glyph extents, respectively, of the named glyph in this writing mode of the font resource, as measured from the named glyph's position point in the glyph coordinate system. All four extents are zero if the glyph has no shape, i.e., if it is a space.

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```
ext-property ::= ext-name, ext-value-value-list
ext-name ::= STRUCTURED-NAME
              -- ISO/IEC 9541-1//EXT
ext-value-value-list  ::= ext-minx, ext-miny,
                          ext-maxx, ext-maxy
ext-minx ::= REL-RATIONAL
ext-miny ::= REL-RATIONAL
ext-maxx ::= REL-RATIONAL
ext-maxy ::= REL-RATIONAL
```

NOTE 38 Conceptually, an extent is the limit of the inked portion of the glyph shape definition as imaged on a presentation surface, not including any embedded whitespace. Also note that, within the model presented here, glyphs may kern, i.e., their shapes may extend beyond their position and escapement points (see figure 5).

8.8.1.4 Glyph Ligature Relationships (LGS)

LGS is an ordered-property-list of ligature *property-list*, defining all the possible ligature relationships for the named glyph in this writing mode of the font resource. LGS is ordered according to the successor glyph structured-name and the number of successor glyphs in the ligature relationship, longest successor list first.

```
lgs-property-list ::= lgs-name, lgs-value-property-list
lgs-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//LGS
lgs-value-property-list :: (lg-property | property-list)*
```


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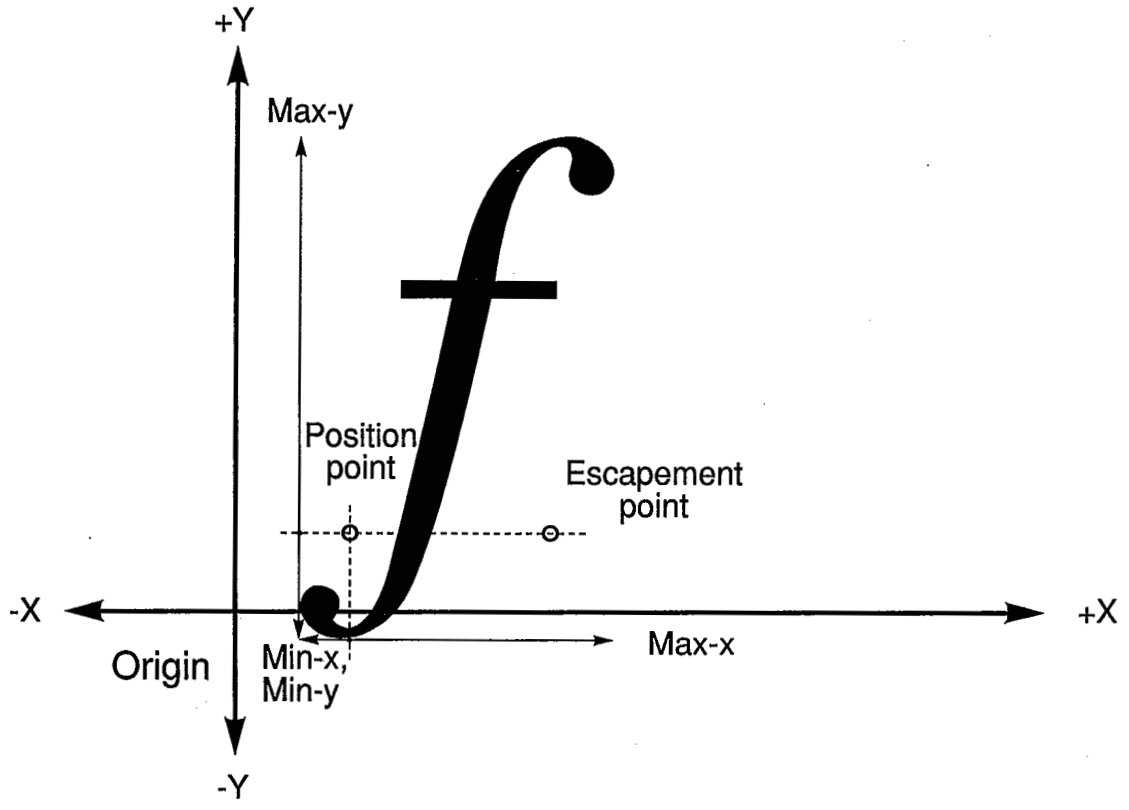


Figure 5 — Glyph extents showing a kern for a typical Latin glyph in the LEFT-TO-RIGHT writing mode

8.8.1.4.1 Ligature (LG)

LG is a property-list, specifying a single possible ligature relationship for the named glyph in this writing mode of the font resource. A ligature relationship is composed of the named glyph and a number of successor glyphs (LGSN) which, when occurring in an electronic document in the given sequence, are equivalent to, and may be replaced with, the ligature specified by the LGN property.

```
lg-property ::= lg-name, lg-value-property-list
lg-name ::= STRUCTURED-NAME
                -- ISO/IEC 9541-1//LG
lg-value-property-list ::= lgn-property,
                           (lgsn-property | property-list)*
```

The LGN property shall be unique within the context of the LGS property-list and shall be the first property in its associated property-list; all other properties can appear in any order.

NOTE 39 A ligature is consonant(s) and a vowel or consonants joined together and having a different design, but not a different pronunciation or meaning, than if separated. The definition of possible ligature relationships for a given glyph is highly dependent on the writing system and typeface design and will generally vary from one font resource to another.

8.8.1.4.1.1 Ligature Name (LGN)

LGN is a structured-name, the name that identifies the ligature glyph associated with the ligature relationship.

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```
lgn-property ::= lgn-name, lgn-value
lgn-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//LGN
lgn-value ::= STRUCTURED-NAME
```

8.8.1.4.1.2 Ligature Successor Names (LGSN)

LGSN is an ordered-value-list of *structured-name*, the names that identify the successor glyphs associated with this ligature relationship, ordered according to the sequence of successor glyphs making up the ligature.

```
lgsn-property ::= lgsn-name, lgsn-value-value-list
lgsn-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//LGSN
lgsn-value ::= (STRUCTURED-NAME)+
```

8.8.1.5 Glyph Pairwise Escapement Adjustments (PEAS)

Certain font resources will accomplish most or all pairwise escapement adjustment by defining precise *x* and *y* values on a per-glyph basis for either or both pairwise or sector-pairwise adjustments. These per-glyph adjustments are usually designed to work in concert with the class-pairwise and scale escapement correction adjustments given for an entire writing mode of the font resource of the same escapement adjustment mode, if provided for that writing mode (see the escapement adjustments property (ESCADJS), 8.7.1.10).

PEAS is a property-list of pairwise escapement adjustment *property-list*, defining all the possible pairwise and sector-pairwise escapement adjustment relationships for the named glyph in this writing mode of this font resource.

```
peas-property-list ::= peas-name, peas-value-property-list
peas-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//PEAS
peas-value-property-list :: (pea-property-list | property-list)*
```

8.8.1.5.1 Pairwise Escapement Adjustment (PEA)

PEA is a property-list, defining possible pairwise and sector-pairwise escapement adjustment relationships for the named glyph for a particular escapement adjustment mode. A PEAS property-list may have more than one such glyph pairwise escapement adjustment property-list.

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```
pea-property-list ::= pea-name, pea-value-property-list
pea-name ::= STRUCTURED-NAME
                  -- ISO/IEC 9541-1//PEA
pea-value-property-list ::= pean-property,
                           (peax-property | peay-property |
                            speaforwdx-property |
                            speaforwdy-property |
                            speabackwdx-property |
                            speabackwdy-property |
                            property-list)*
```

The PEAN property shall be unique within the context of the PEAS property-list and shall be the first property in its associated property-list; all other properties can appear in any order.

The remainder of this clause defines the ISO/IEC 9541 modal pairwise and sector-pairwise escapement adjustment properties.

8.8.1.5.1.1 Pairwise Escapement Adjustment Name (PEAN)

PEAN is a structured-name, the name that identifies the pairwise escapement adjustment mode.

The ISO/IEC 9541 pairwise escapement adjustment mode object names are given in 8.8.1.7.

```
pean-property ::= pean-name, pean-value
pean-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//PEAN
pean-value ::= STRUCTURED-NAME
```

Variations on pairwise setting can be approximated by linear interpolation of the *x* and *y* escapement adjustment values given for the KERN and TOUCH pairwise escapement adjustment modes.

NOTE 40 Other structured pairwise escapement adjustment mode names are possible, but their significance is not defined within ISO/IEC 9541.

8.8.1.5.1.2 Pairwise Escapement Adjustment (PEAX, PEAY)

PEAX and PEAY are *value-lists* of *peascsr* data structures, describing the *x* and *y* components, respectively, of the suggested pairwise escapement adjustments between the named glyph and various successor glyphs when imaged successively in this writing mode. No ordering is implied.

Each peascsr defines an ordered pair of *peasn* and *pea-adj* values, giving the structured-name for the successor glyph (peasn) and the *x* or *y* component of the suggested pairwise escapement adjustment for that successor glyph (pea-adj).

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```
peax-property ::= peax-name, peax-value-value-list
peax-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//PEAX
peax-value-value-list ::= (peascsr)+
peascsr ::= peasn, pea-adj
peasn ::= STRUCTURED-NAME
pea-adj ::= REL-RATIONAL

peay-property ::= peay-name, peay-value-value-list
peay-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//PEAY
peay-value-value-list ::= (peascsr)+
```

8.8.1.5.1.3 Sector-Pairwise Escapement Adjustment Extents (SPEAFORWDX, SPEAFORWDY, SPEABACKWDX, SPEABACKWDY)

SPEAFORWDX and SPEAFORWDY are *ordered-value-lists* of *rel-rationals*, the *x* and *y* components, respectively, of the forward sector-pairwise escapement adjustment extents, for the named glyph in this writing mode of the font resource. SPEAFORWDX and SPEAFORWDY values are the designated forward extents of each sector of this glyph, measured in the glyph coordinate system, one extent per sector, in order by sector.

SPEABACKWDX and SPEABACKWDY are *ordered-value-lists* of *rel-rationals*, the *x* and *y* components, respectively, of the backward sector-pairwise escapement adjustment extents, for the named glyph in this writing mode of the font resource. SPEABACKWDX and SPEABACKWDY values are the designated backward extents of each sector of this glyph, measured in the glyph coordinate system, one extent per sector, in order by sector. See figure 6.

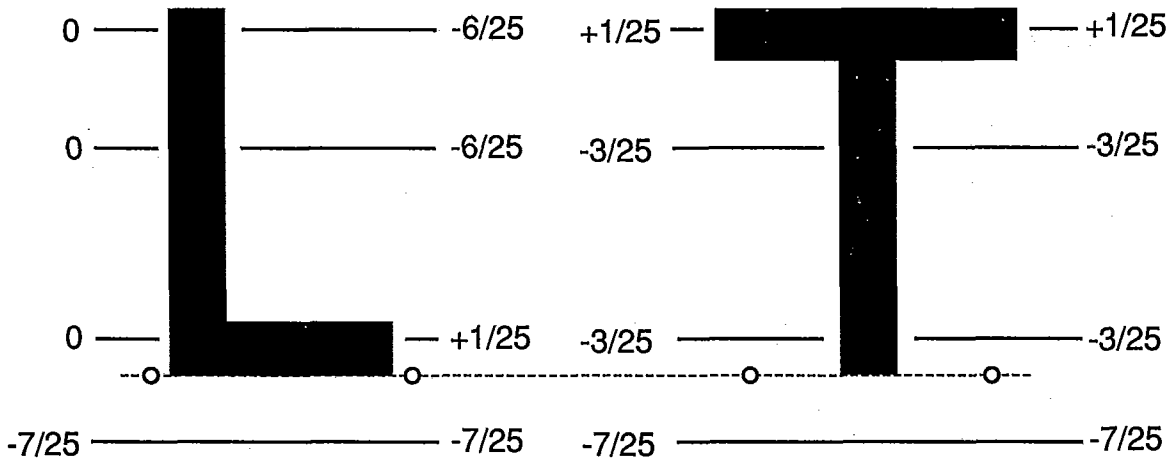


Figure 6 — Example of sector-pairwise escapement adjustment extents

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```
speaforwdx-property ::= speaforwdx-name, speaforwdx-value-value-list
speaforwdx-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//SPEAFORWDX
speaforwdx-value-value-list ::= (REL-RATIONAL)+

speaforwdy-property ::= speaforwdy-name, speaforwdy-value-value-list
speaforwdy-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//SPEAFORWDY
speaforwdy-value-value-list ::= (REL-RATIONAL)+

speabackwdx-property ::= speabackwdx-name,
speabackwdx-value-value-list
speabackwdx-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//SPEABACKWDX
speabackwdx-value-value-list  ::= (REL-RATIONAL)+

speabackwdy-property ::= speabackwdy-name,
speabackwdy-value-value-list
speabackwdy-name ::= STRUCTURED-NAME
                     -- ISO/IEC 9541-1//SPEABACKWDY
speabackwdy-value-value-list  ::= (REL-RATIONAL)+
```

Let X,Y_i be the sum of glyph a's i^{th} sector-pairwise forward x and y extents and a successor glyph b's i^{th} sector-pairwise backward x and y extents, for all i for which both those extents are given. Let X,Y_{max} be the signed maximum (most positive or least negative) of all such X,Y_i's. Then the suggested escapement adjustment is X,Y_{max}. This distance will most often be negative so as to reduce the spacing between glyphs.

NOTE 41 It is up to the data source (DATASOURCE) to assure that the number, order and meaning of the forward and backward sector extents are the same for all glyphs of the font resource. However, the number, order and meaning of these property values are not generally the same across all font resources.

8.8.1.6 Class-Pairwise Escapement Adjustment Class Indicator (CPEAI)

Class-pairwise escapement adjustment class information is used to determine a suggested escapement adjustment based upon the forward and backward shape profiles of the named glyph and a possible successor glyph (see the class-pairwise escapement adjustment property (CPEA), 8.7.1.10.1.2).

CPEAI is a an ordered-value-list of two *cardinals*, indicating the forward and backward pairwise escapement adjustment classes to which this glyph belongs, for this writing mode of the font resource.

```
cpeai-property ::= cpeai-name, cpeai-value-value-list
cpeai-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//CPEAI
cpeai-value-value-list ::= cpeai-forward, cpeai-backward
cpeai-forward ::= CARDINAL
cpeai-backward ::= CARDINAL
```

In general, a font resource will not provide all escapement adjustment properties, however, if present the exact adjustment given by the PEAX or PEAY property gives better typographic results over those determined from application of the glyph's sector-pairwise escapement or the class-pairwise adjustment modal escapement adjustments.

If escapement adjustment is desired and the various modal and per-glyph escapement adjustment properties are present in a font resource, then these properties shall be added to glyph escapement on a per-escapement adjustment mode basis, according to the following algorithm:

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a) scale escapement correction modal properties (SECX, SECY), per 8.7.1.10.1.3;

b) per-glyph pairwise escapement properties (PEAX, PEAY), if defined for the named glyph's successor, per 8.8.1.5. Done;

c) per-glyph sector-pairwise escapement properties (SPEAFORWDX, SPEAFORWDY) for the named glyph and per-glyph sector-pairwise escapement properties for the named glyph's successor (SPEABACKWDX, SPEABACKWDY), per 8.8.1.5 . Done;

d) class-pairwise escapement adjustment modal properties (CPEAX, CPEAY), per 8.7.1.10.1.2 ;

e) Done.

8.8.1.7 Escapement Adjustment Indicator (EAI)

EAI is a code, a coded value indicating whether or not the various forms of escapement adjustments (scale, wordspace or letterspace) are applicable to this glyph, in this writing mode of the font resource. Generally, wordspace-escapement adjustment may only be applied to space glyphs, whereas most glyphs may be letterspace-escapement adjusted (usually excepting multi-dot leaders, dashes, ligatures and other similar glyphs). By, convention, this property value defaults to *Scale/Letterspace-adjusting* if not specified for this glyph metrics property-list.

The EAI property value is one of:

1 ⇒ Scale/Letterspace-adjusting;

2 ⇒ Wordspace-adjusting;

3 ⇒ Non-adjusting.

All other escapement adjustment indicator codes are reserved for future standardization.

```
eai-property ::= eai-name, eai-value
eai-name ::= STRUCTURED-NAME
                -- ISO/IEC 9541-1//EAI
eai-value ::= CODE
```

8.8.1.8 Minimum and Maximum Adjusted Escapement (MINEX, MINEY, MAXEX, MAXEY)

MINEX, MINEY, MAXEX and MAXEY are rel-rational, the recommended minimum and maximum adjusted escapement of this glyph in this writing mode of the font resource, as specified by the design source (DSNSOURCE). In effect, these properties serve as individual minimum and maximum escapement adjustment refinements to the overall limits imposed by the recommended modal letterspace and wordspace adjustments, according to the glyph's escapement indicator (see 8.7.1.19 , 8.7.1.20, and 8.8.1.7).

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```
minex-property ::= minex-name, minex-value
minex-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//MINEX
minex-value ::= REL-RATIONAL

miney-property ::= miney-name, miney-value
miney-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//MINEY
miney-value ::= REL-RATIONAL

maxex-property ::= maxex-name, maxex-value
maxex-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//MAXEX
maxex-value ::= REL-RATIONAL

maxey-property ::= maxey-name, maxey-value
maxey-name ::= STRUCTURED-NAME
                    -- ISO/IEC 9541-1//MAXEY
maxey-value ::= REL-RATIONAL
```


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Annex A
(normative)

Typeface design grouping[2)]

This annex defines a typeface design grouping scheme, consisting of a three-level hierarchical structure. Typefaces which are similar in appearance or have characteristics that would allow them to be reasonably substituted for each other are grouped together.

Some font designs could be associated with more than one design group, but it is the responsibility of the font designer or font resource generator to choose the group which provides the best appearance for substitution.

The highest (most general) level of the hierarchy is the ISO Class, the second level of the hierarchy is the ISO Subclass, and the third (most specific) level of the hierarchy is the ISO Specific Group. A typeface that is representative of each specific group is shown and named.

NOTE 42 Throughout this grouping scheme, the term "serif" refers to the traditional concept of the serifs of Roman typefaces as well as to any style of non-plain stroke-ending used in a non-Western typeface.

1.0.0 - Uncials class

Typefaces in this general category use as a source of their design writing hands of Europe used during the 6th to the 9th Century.

1.1.0 - Single alphabet subclass

These designs are partly characterized by having one alphabet and within that alphabet design are both upper and lowercase letter shapes.

1.1.1 - Sans serif

Without serifs



Figure A.1 — Amsterdam SIMPLEX

1.1.2 - Serif

With serifs

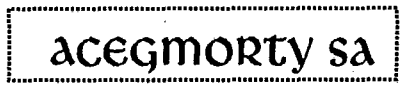


Figure A.2 — Amsterdam LIBRA

1.2.0 - Duplex alphabet subclass

The designs of this sub-class are characterized primarily by having distinct and separate upper and lowercase letter shapes.

1.2.1 - Sans serif

Without serifs



Figure A.3 — (---)

1.2.2 - Serif

With serifs



Figure A.4 — Klingspor AMERICAN UNCIAL

2.0.0 - Inscriptionals class

Latin alphabets of this general class have the characteristics of having been cut in stone. There are only uppercase letters and they are generally based on the proportions of the classic Roman Inscriptional letter

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form, e.g., having a narrow "E", "F", and "L"; sweeping tail on the "R".

2.1.0 - Solids subclass

These designs have solid stems.

2.1.1 - Sans serif

Without serifs



Figure A.5 — Adobe LITHOS

2.1.2 - Serif

With serifs



Figure A.6 — Stempel SISTINA

2.2.0 - Inlines subclass

These designs have a fine line engraved in the stem.

2.2.1 - Sans serif

Without serifs



Figure A.7 — (---)

2.2.2 - Serif

With serifs



Figure A.8 — Nebiolo AUGUSTEA INLINE

2.3.0 - Outlines subclass

The designs of this subclass are characterized by single lines that define the contour or outline of the letters.

2.3.1 - Sans serif

Without serifs



Figure A.9 — (---)

2.3.2 - Serif

With serifs



Figure A.10 — Bauer COLUMNA

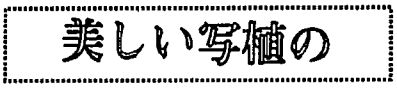


Figure A.11 — Morisawa LINEA

3.0.0 - Blackletters class

Typefaces of this general category have designs which show characteristics resembling those of the writing hands of the German monasteries circa the 12th to the 14th century. Or, they are based on the typestyle designs of the German printers of the late 1400's.

3.1.0 - Formal style subclass

The designs of this subclass are characterized by their condensed appearance; large x-height; with little or no curves, giving an angular look to the lowercase.

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They are based on the formal or ecclesiastical writing style that was reserved for the Bible.

3.1.1 - Sans serif

Without serifs



Figure A.12 — ITC HONDA

3.1.2 - Serif

With serif



Figure A.13 — Lanston Monotype GOUDY TEXT

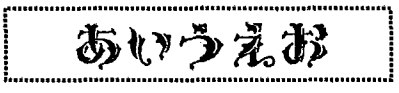


Figure A.14 — Ryobi MIYABI



Figure A.15 — KUFI, Arabic typestyle

3.1.3 - Sans serif, engraved

The designs of this specific group have no serifs and have a pattern of hatching or shading in the stems.



Figure A.16 — (---)

3.1.4 - Serif, engraved

The designs of this specific group have serifs and have hatching or shading in the stems.



Figure A.17 — Klingspor DEUTSCHE ZIERSCHRIFT

3.2.0 - Round style subclass

The designs of this subclass are characterized by their rounded design.

3.2.1 - Sans serif

Without serifs



Figure A.18 — Berthold POST ROMAN

3.2.2 - Serif

With serifs



Figure A.19 — Lanston Monotype GOUDY THIRTY

3.2.3 - Sans serif, engraved

The designs of this specific group have no serifs and have a pattern of hatching or shading in the stems.

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Figure A.20 — (---)

3.2.4 - Serif, engraved

The designs of this specific group have serifs and have hatching or shading in the stems.



Figure A.21 — (---)

3.3.0 - Hybrid style subclass

The designs of this subclass are characterized by their mixture of both Blackletters Formal style and the Serifs style (4.1.1) designs. The historical models for this design are from the late 1400's. (Subiaco Monastery; Da Spira Brothers)

3.3.1 - Sans serif

Without serifs



Figure A.22 — Klingspor WALLAU

3.3.2 - Serif

With serifs.



Figure A.23 — Stephenson Blake BOLOGNA

3.3.3 - Sans serif, engraved

The designs of this specific group have no serifs and have a pattern of hatching or shading in the stems.



Figure A.24 — (---)

3.3.4 - Serif, engraved

The designs of this specific group have serifs and have hatching or shading in the stems.



Figure A.25 — (---)

3.4.0 - Informal style subclass

The designs of this subclass are of a cursive style, having the appearance of a rapidly written design.

3.4.1 - Sans serif

Without serifs



Figure A.26 — (---)

3.4.2 - Serif

With serifs.

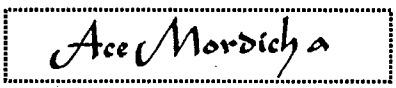


Figure A.27 — Bauer LEGEND

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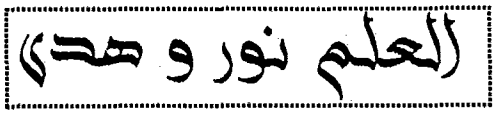


Figure A.28 — Arabic typestyle

3.4.3 - Sans serif, engraved

The designs of this specific group have no serifs and have a pattern of hatching or shading in the stems.



Figure A.29 — (---)

3.4.4 - Serif, engraved

The designs of this specific group have serifs and have
hatching or shading in the stems.



Figure A.30 — (---)

4.0.0 - Serifs class

Typefaces in this general category have designs which have serifs, and are not classed in the Uncials, Inscriptionals, Blackletters, or Ornamentals.

4.1.0 - Oldstyle subclass

The typeface design in this category show characteristics of the designs originally created in Europe between the late 15th Century and the 17th Century.

4.1.1 - Venetian

The Latin-alphabet typeface designs in this category have a diagonal bar on the lowercase "e"; relatively monotone stem thickness; have a sweeping tail on the uppercase "R"; and are based on the type styles of the early Venetian printers circa 1470-1490's.



Figure A.31 — Ludlow EUSEBIUS

4.1.2 - Garalde

These typefaces are generally based on the original typeface designs of printers such as Aldus Manutius and Claude Garamond. General characteristics of the Latin-alphabet typefaces are ascenders taller than the capitals, and a horizontal bar on the lowercase "e".



Figure A.32 — Monotype GARAMOND

4.1.3 - Dutch / English

Latin-alphabet typefaces in this category are characterized in part by a wedge shaped serif on the lowercase "t", spur serif on the capital "G", and a concave apex on the capital "A".



Figure A.33 — Stempel JANSON

4.2.0 - Transitional subclass

Typefaces in this grouping are those that show characteristics in common with the designs of faces that followed after W. Caslon (circa 1720) and before G. Bodoni (circa 1800).

4.2.1 - Direct Line

Typefaces in this category are characterized by fine serifs and noticeable contrast. In Latin-alphabet typefaces, capital letters are nearly all the same width. These typefaces have characteristics in common with the early English designs from the early 1700's to the 1800's (e. g., Baskerville, Bulmer, Bell).

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Figure A.34 — BASKERVILLE

4.2.2 - Modified

These faces, although based on the same models as above (European designs of the 1700's), are so significantly different that they cannot fit into the direct line category.



Figure A.35 — Linotype GOUDY OLD STYLE

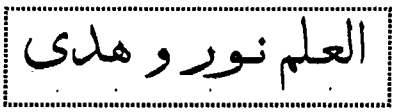


Figure A.36 — Arabic typestyle

4.3.0 - Modern subclass

Extreme contrast between the thick and thin portions of the characters. Hairline serifs and a condensed appearance are some of the characteristics of this group of typefaces.

4.3.1 - Continental

These designs are based on, or exhibit characteristics in common with the typestyles of the Italian printer, Bodoni, or the French printer, Didot.



Figure A.37 — BODONI



Figure A.38 — Monotype SONZINO



Figure A.39 — Gujerathi

4.3.2 - Fat Face

The principal characteristics are in common with those of the typefaces of English origin based on the type designs of W. Thorowgood.



Figure A.40 — Stephenson Blake THOROWGOOD ROMAN



Figure A.41 — Cyrillic Typestyle

4.4.0 - Contemporary subclass

This particular group does not have any clear recognizable historical model.

4.4.1 - Eclectic

These particular typefaces are of mixed design form in which a variety of derivatives are recognizable.

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Figure A.42 — Monotype PERPETUA

4.4.2 - Fine serif

Indicates that the serifs are very small, pointed, with small bracketing.

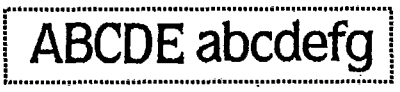


Figure A.43 — ITC QUORUM

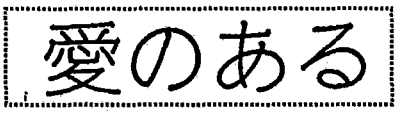


Figure A.44 — Sha-ken KASOGO

4.4.3 - Lettering

Type designs that give the impression of, or are based on, the lettering styles of American sign painters of the early 20th Century.



Figure A.45 — UNIVERSITY

4.5.0 - Legibility subclass

Obvious characteristics of Western-alphabet typefaces of this group are large x-height, short ascenders and descenders.

4.5.1 - Rounded (traditional)

These designs were originally intended to be used for newspapers. In Western-alphabet typefaces of this group, the letters "c", "e", "o" are based on traditional rounded forms.



Figure A.46 — Monotype TIMES ROMAN

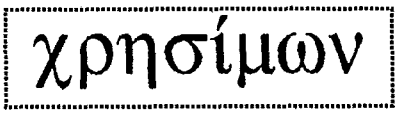


Figure A.47 — Greek: Monotype TIMES ROMAN



Figure A.48 — Sha-ken SHINBUN TOKUFUTO MINCHO

4.5.2 - Super-elliptical (square)

The letters "c", "e", and "o" of Western-alphabet typefaces of this group are based on a super-elliptical (squared-off ellipse) design.



Figure A.49 — Stempel MELIOR

4.6.0 - Square serif subclass

The serifs in all these designs are relatively heavy and may or may not be bracketed.

4.6.1 - Monotone

The designs of this specific group are characterized by serifs that are the same weight (thickness) as the stems, with no fillets or brackets connecting the stems and serifs.

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Figure A.50 — ATF STYMIE



Figure A.54 — ATF BULLETIN TYPEWRITER

4.6.2 - Clarendon

The designs of this specific group are characterized by serifs that are the same weight (thickness) as the stems, with brackets connecting the stems and serifs.



Figure A.51 — Bauer FORTUNE

4.6.3 - French Clarendon

The designs of this specific group are characterized by serifs that are thicker than the stems, and can have brackets between the stems and serifs.



Figure A.52 — ATF P. T. BARNUM

4.6.4 - Short (stub) Serifs

The main distinguishing features of these designs are small stubby serifs and relatively bold stems.



Figure A.53 — ATF CHELTENHAM

4.6.5 - Typewriter

Designs that were originally intended for typewriters or those faces designed to appear as though they were produced on a typewriter.

4.6.6 - Dot matrix

The faces in this group appear to have been produced by a dot matrix output device.



Figure A.55 — (---)

4.7.0 - Latin subclass

These designs are characterized by serifs that have angled fillets, giving the appearance of triangular shaped serifs.

4.7.1 - Solid

The stems of the characters are solid.



Figure A.56 — WIDE LATIN

4.7.2 - Inline

The stems have an incised line.



Figure A.57 — Stephenson Blake CHISEL

4.8.0 - Engraving subclass

Typefaces that are based upon the designs of the copper-plate engravers.

4.8.1 - Barbed serif

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This group of typefaces has serifs with end points bifurcated or barbed.



Figure A.58 — NICHOLAS COCHIN

4.8.2 - Straight serif (fine)

The main characteristics of this group are very small and pointed serifs, with small fillets. In alphabetic typefaces the letters are all uppercase.



Figure A.59 — ATF COPPERPLATE GOTHIC

4.9.0 - Free Form subclass

Characterized by twining fronds, sinuous curves, etc.

4.9.1 - Solid

The typefaces in this group have ornaments and styling derived from, or influenced by the Art Nouveau movements of the late 1800's and the early 1900's; the stems are solid.



Figure A.60 — Weisert ARNOLD BOCKLIN

4.9.2 - Outline

The typefaces in this group have ornaments and styling derived from, or influenced by, the Art Nouveau movements of the late 1800's and the early 1900's; the stems are defined by lines of equal width.



Figure A.61 — ATF ERRATIC OUTLINE

4.10.0 - Computer subclass

The primary characteristics of these faces are that they give the appearance of faces associated with computer printouts and computer display faces.

4.10.1 - OCR

The designs were created originally to be machine readable. However, they may now only carry the type design but not the function.



Figure A.62 — (---)

4.10.2 - Digital

Characters are segmented and composed of straight lines.



Figure A.63 — (---)

4.11.0 - Miscellaneous subclass

Any typeface that has serifs and does not fit into any of the previous categories.

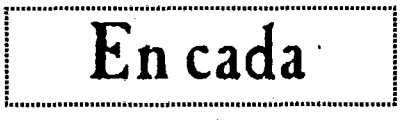


Figure A.64 — ATF CASLON ANTIQUE

4.12.0 - Mincho subclass

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Has thick vertical strokes and thin horizontal strokes. There is a noticeable wedge shape ending on the right end of the horizontal strokes.

4.12.1 - Old Style

Stems and strokes are composed of smooth outlines. Counters are comparatively small and the metrics difference between letters is larger than that of the New Style.

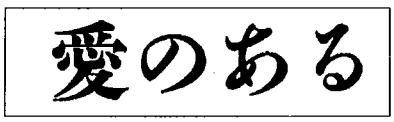


Figure A.65 — Sha-Ken SHUEI MINCHO

4.12.2 - New Style

Stems and strokes edges are sharper than the Old Style Mincho. The counters are large and the metrics difference between the letters is small.



Figure A.66 — Sha-ken HONRAN MINCHO B

4.12.3 - Miscellaneous

Any Mincho design that does not falll into New Style or Old Style.



Figure A.67 — Ryobi NAU MB

5.0.0 - Sans serif class

Typefaces in this general category have designs that do not have serifs, and are not Scripts or Ornamentals.

5.1.0 - Gothic subclass

The earliest of the Latin-alphabet sans serif printing typefaces (circa 1815).

5.1.1 - Grotesque

The Latin-alphabet designs of this specific group are characterized by a two storey lowercase "a" and "g"; and may have a spur serif on the uppercase "G."



Figure A.68 — ATF FRANKLIN GOTHIC



Figure A.69 — Monotype GILL SANS



Figure A.70 — Greek: Monotype GILL SANS

5.1.2 - Neo-grotesque

The Latin-alphabet designs of this specific group have a two storey lowercase "a" and a one storey lowercase "g"; and may have a spur serif on the uppercase "G."



Figure A.71 — Haas HELVETICA

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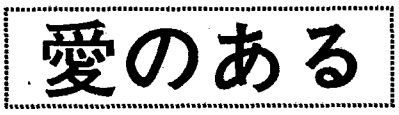


Figure A.72 — Sha-ken ISHII FUTO GOTHIC



Figure A.73 — Arabic Typestyle

5.1.3 - Typewriter

These are faces that were intended for typewriter composition or those faces designed to appear as though they were produced on a typewriter.



Figure A.74 — LETTER GOTHIC

5.2.0 - Humanist subclass

Sans serif typefaces based on or inspired by classical Roman proportions.

5.2.1 - Classical

Characteristics of these typefaces include stems have subtle stress variation. Western-alphabet typefaces of this group have uppercase letters with classic Roman Inscriptional proportions, and, in Latin alphabets, two storey lowercase "a" and "g".



Figure A.75 — Stempel OPTIMA

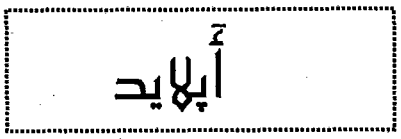


Figure A.76 — Arabic typestyle

5.2.2 - Non-classical

Stem contrast is greater; Western alphabet typefaces have two storey lowercase "a" and "g"; may or may not have the capitals in the classical letter form proportions.



Figure A.77 — Stephenson Blake BRITANNIC

5.2.3 - Typewriter

These are faces that were intended for typewriter composition or those faces designed to appear to be produced on a typewriter.



Figure A.78 — (---)

5.3.0 - Stress variation subclass

These typeface designs have a noticeable variation in the stem or stroke thickness.

5.3.1 - Broad Pen

Type designs that exhibit the characteristics of lettering done with a broad edge pen.



Figure A.79 — ATF LYDIAN

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Figure A.80 — Arabic Typestyle

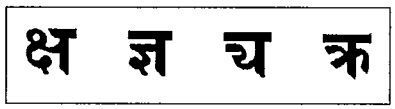


Figure A.81 — Devanagari Typestyle

5.3.2 - Casual

Informal designs, with no real classical proportions.



Figure A.82 — ATF ADLIB

5.3.3 - Typewriter

Typewriter typeface designs.



Figure A.83 — (---)

5.4.0 - Art Deco subclass

The display typeface designs of the 1920's

5.4.1 - Standard

Extreme contrast, one stem is very bold, arms and bowls are very thin.



Figure A.84 — ATF BROADWAY



Figure A.85 — Sha-ken MIN-CURL

5.4.2 - Modified

Lines or patterns have been added to the basic Standard group.



Figure A.86 — Barnhard Bros. & Spindler BOULMICH

5.4.3 - Thin Line

The entire design has one very thin line defining the shapes of the letters.



Figure A.87 — ATF BERNHARD FASHION

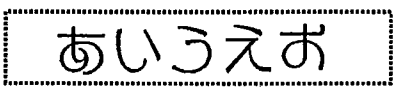


Figure A.88 — Ryobi PICO CASUAL

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5.5.0 - Geometric subclass

The design is monotone, and is basically composed of circles and straight lines.

5.5.1 - Round, straight stem ends

Monotone design, with what may be referred to as "stick characters." In some instances the ascenders may be longer than the descenders. The ends of the stems are straight.



Figure A.89 — Bauer FUTURA



Figure A.90 — Burmese Typestyle



Figure A.91 — Thai Typestyle

5.5.2 - Round, Rounded stem ends

Monotone design, with what may be referred to as "stick characters." In some instances the ascenders may be longer than the descenders. In both Western and Japanese type designs the tips or ends of the stems are rounded.



Figure A.92 — VAG RUNDSCHRIFT

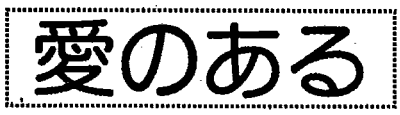


Figure A.93 — Sha-ken NARD

5.5.3 - Super-elliptical

The main characteristic is that in Western alphabet designs, the shape of all traditionally rounded letters, such as "o", "c", "e", are based on the super-ellipse (a squared-off ellipse).



Figure A.94 — Nebiolo EUROSTILE

5.5.4 - Stylized

Monotone design, but less formal, may have curves in the stems and not appear as structured.



Figure A.95 — ATF HOBO



Figure A.96 — Ryobi MAGIC

5.5.5 - Typewriter

These are faces that were intended for typewriter composition or those faces designed to appear as though they were produced on a typewriter.

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Figure A.97 — (---)

5.6.0 - Computer subclass

The primary characteristic of these faces is that they give the appearance of faces associated with computer printouts and computer display faces.

5.6.1 - OCR

The designs were created originally to be machine readable. However, they may now only carry the type design style, but not the function.

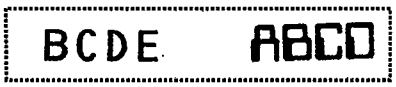


Figure A.98 — OCR B / DATA 70

5.6.2 - Digital

Characters are segmented and composed of straight lines.



Figure A.99 — DIGITAL

5.7.0 - Free Form subclass

Characterized by twining fronds, sinuous curves, etc.

5.7.1 - Solid

The typefaces in this group have ornaments and styling derived from, or influenced by the Art Nouveau movements; of the late 1800's and the early 1900's.

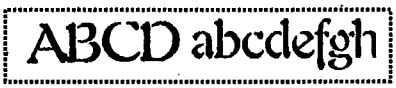


Figure A.100 — Deberny & Peignot AURIOL

5.7.2 - Outline

The typefaces in this group have ornaments and styling derived from, or influenced by the Art Nouveau movements of the late 1800's and the early 1900's; the stems are defined by lines of equal weight.



Figure A.101 — (---)

5.8.0 - Miscellaneous subclass

Any typeface that is a Sans Serif and does not fit into any of the previous categories.



Figure A.102 — (---)

6.0.0 - Scripts class

These faces are designed to resemble handwriting.

6.1.0 - Joined subclass

The characters are connected.

6.1.1 - Formal

Based on a writing style characterized by extreme contrast between the thick and thin parts of the letters.



Figure A.103 — ATF COMMERCIAL SCRIPT



Figure A.104 — Arabic Typestyle

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6.1.2 - Informal

Conveying the style of a rapidly written script. The stems have thick and thin characteristics.



Figure A.105 — Olive MISTRAL

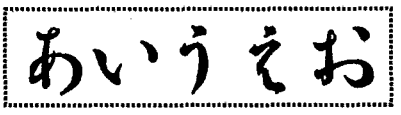


Figure A.106 — Ryobi YUKINARI E

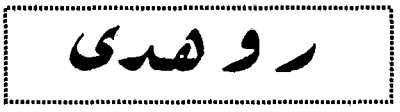


Figure A.107 — Arabic Typestyle

6.1.3 - Monotone

All strokes are of equal thickness



Figure A.108 — ATF KAUFMANN

6.2.0 - Unjoined subclass

The letters, when composed into words, have space between the adjacent characters.

6.2.1 - Formal

Based on a writing style that is characterized by extreme contrast between the thick and thin parts of the letters.



Figure A.109 — Stempel VIRTUOSA

6.2.2 - Informal

A rapidly drawn letter with contrast.



Figure A.110 — Monotype PEPITA

6.2.3 - Monotone

All strokes of the letters are of equal width.



Figure A.111 — Bauer GILLES GOTHIC



Figure A.112 — Arabic Typestyle

6.2.4 - Brush

Characterized by the appearance of having been brush drawn.



Figure A.113 — Klingspor SALTINO

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Figure A.114 — Ryobi NOMURA KANTEI

6.2.5 - Cursive

Typefaces of this group are characterized by having the appearance of handwriting, but are unjoined.



Figure A.115 — ATF MURRAY HILL

6.2.6 - Calligraphic

Characterized by having been drawn with a broad edge pen, and having a narrow angled appearance.



Figure A.116 — ATF THOMPSON QUILLSCRIPT

6.2.7 - Ronde

Based on a French manuscript hand and has the appearance of upright handwriting.



Figure A.117 — Amsterdam RONDO

6.3.0 - Soft Brush subclass (Japan)

The characteristics of this style are that the strokes are brush like. The designs are not written with a pen, and therefore the edges of the stems and strokes are not as sharp.

6.3.1 - Kaisho

All the stems appear to have been written by a soft brush. The stems thickness may vary and there may be a different width-to-height

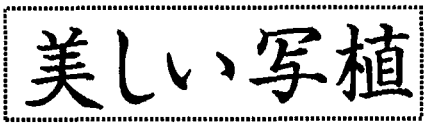


Figure A.118 — Morisawa SHIN SEI KAISHO

6.3.2 - Kyokasho

Simplified version of 6.3.1. Used mainly for children's books and textbooks. The width-to-height ratio of the glyph shape is the same, and any metric differences between the glyphs are small.

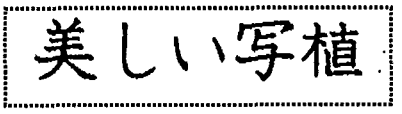


Figure A.119 — Morisawa SHIN FUTO KYOKASHO

6.3.3 - Gyosho

Some of the strokes are smoothly connected to show loci of the brush strokes.

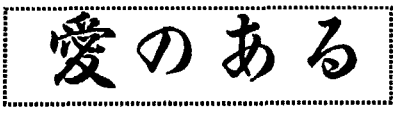


Figure A.120 — Sha-ken IWAKAGE FUTO GYOSHO

6.3.4 - Sosho

Most of the strokes are smoothly connected and therefore dotted strokes could not be identified. It is more simplified than Gyosho (6.3.3).

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Figure A.121 — (---)

6.3.5 - Miscellaneous

Any designs that do not fit in any of the above specific groups.

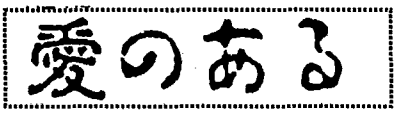


Figure A.122 — Sha-ken TAN KOIN

6.4.0 - Kana subclass (Japan)

The designs are based on the same concept as Mincho. However, they can only be applied to Kana glyph collections.

6.4.1 - Old Style

Stems are made up of smooth lines. Counters are comparatively small and the metric differences between glyphs are larger than that of the New Style (6.4.2)

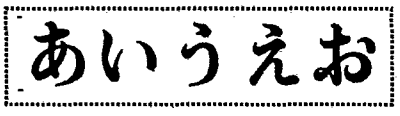


Figure A.123 — Ryobi MIDASHI KANA 1

6.4.2 - New Style

Stems are composed of sharp outlines. Counters are large and the metric differences between glyphs is small.



Figure A.124 — Ryobi KOMACHI GU

6.5.0 - Soucho subclass (China / Japan)

Strokes (horizontal) are inclined slightly upward and to the right. The thickness of the stems is approximately the same as the stroke width. The sharpness of the edges of the stems and strokes is the same as if it had been produced by engraving in wood.

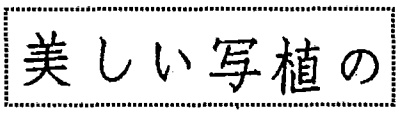


Figure A.125 — Morisawa SOUCHO

7.0.0 - Ornamentals class

Typefaces that were meant for display (not meant for straight matter composition text", e.g., headlines) and can be highly decorated or stylized and cannot fit into any of the other categories.

7.1.0 - Inline subclass

The stems of the letters have a fine line or lines engraved in the stem. The original faces were intended for display purposes. The lines that define the glyph shape are of two different weights.

7.1.1 - Sans serif

Without serifs.



Figure A.126 — Klingspor ZEPPELIN

7.1.2 - Serif

With serifs.



Figure A.127 — Stephenson Blake OLD FACE OPEN

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7.2.0 - Outline subclass

The glyph shape of this design is defined by lines of a single weight.

7.2.1 - Sans serif

Without serifs.



Figure A.128 — ATF GOTHIC OUTLINE

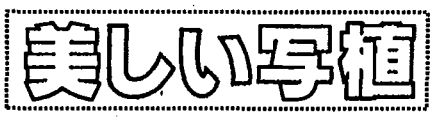


Figure A.129 — Morisawa ARROW G-LINE

7.2.2 - Serif

With serifs.



Figure A.130 — 12 Line Antique Open

7.3.0 - Decorative subclass

The general characteristics of these faces are that they have patterns such as floral or leaf, or the stems are composed of or made up with natural elements such as twigs, or animals, etc.

7.3.1 - Sans serif

Without serifs.



Figure A.131 — RUSTIC

7.3.2 - Serif

With serifs.



Figure A.132 — Stempel SAPHIRE

7.4.0 - Three-dimensional subclass

These type designs have a three dimensional appearance created by means of shading and geometrical effects.

7.4.1 - Sans serif

Without serifs.



Figure A.133 — Ludlow UMBRA



Figure A.134 — Sha-ken NAR SHADOW

7.4.2 - Serif

With serifs.



Figure A.135 — Stephenson Blake THORNE SHADED

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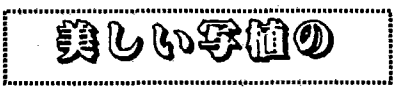


Figure A.136 — Morisawa ARROW M-LINE SHADOW

7.5.0 - Tuscan subclass

It is a characteristic of this design to have a double curved serif and it may or may not be patterned.

7.5.1 - (not applicable)

7.5.2 - Serif

With serifs.



Figure A.137 — Nebiolo FONTANESI

7.6.0 - Stencil subclass

Its appearance is as though it was produced by a stencil.

7.6.1 - Sans serif

Without serifs.



Figure A.138 — FOLIO STENCIL



Figure A.139 — Sha-ken NAMIN

7.6.2 - Serif

With serifs.



Figure A.140 — Ludlow STENCIL



Figure A.141 — Morisawa ARROW R-STENCIL

7.7.0 - Reversed subclass

The designs are characterized by having a white image on a black background.

7.7.1 - Sans serif

Without serifs.



Figure A.142 — Monotype GILL CAMEO

7.7.2 - Serif

With serifs.



Figure A.143 — (---)

7.8.0 - Engraved subclass

The stems of the letters have a hatching or shading.

7.8.1 - Sans serif

Without serifs.

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Figure A.144 — ATF JIM CROW

7.8.2 - Serif

With serifs.



Figure A.145 — INVITATION SHADED

7.9.0 - Miscellaneous subclass

All designs which cannot be placed in one of the previous ornamental groupings are put here; it is a catch-all group.

7.9.1 - Sans serif

Without serifs.



Figure A.146 — SHATTER

7.9.2 - Serif

With serifs.



Figure A.147 — PAMELA



Figure A.148 — Morisawa HIGEMOJI

8.0.0 - Symbols and Ornaments class

(reserved for future assignment)

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Annex B
(informative)

Font concepts

B.1 General

This annex provides general information about the font resource and processing environments in which ISO/IEC 9541 is used. See figure B.1.

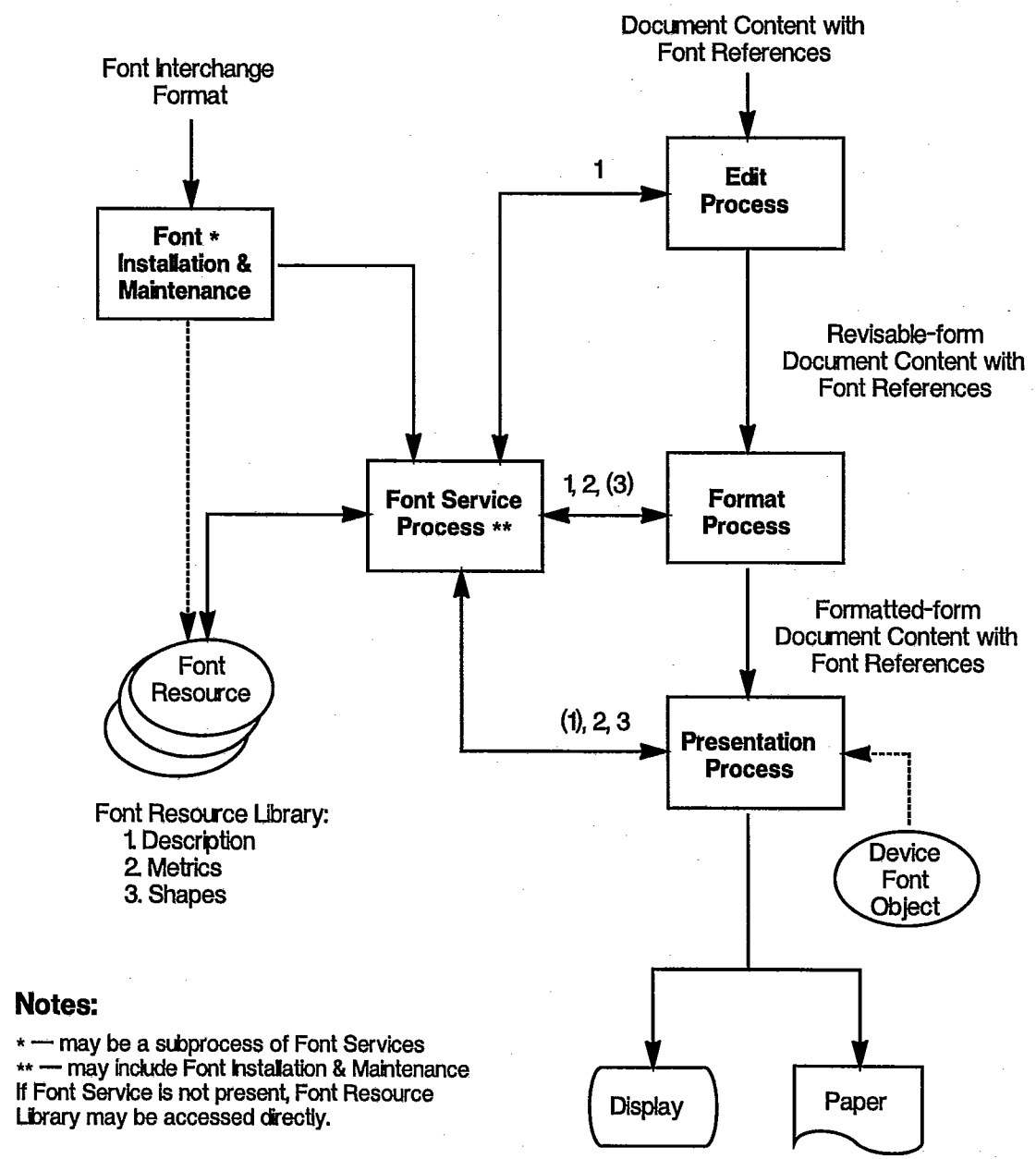


Figure B.1 — Font processing model

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B.2 Font resource environment

B.2.1 Font production

Font production is the process of designing glyph shapes, converting these shapes into a digital technology format (bit image, vector drawing orders, outline algorithm, etc.), defining the height, width, and escapement values of each individual glyph, recording descriptive and identifying information (for the glyphs and the font in general), and assembling this information into a format that can be used by a text processing system.

Font production is performed in diverse and sometimes changing environments. The font producer may be

— an organization specializing in font development using sophisticated design tools to create new font families;

— a computer or text system developer that needs to adapt existing fonts to achieve better performance or meet specific customer requirements;

— an organization that creates special fonts or collections of symbols for distribution to its branch offices;

— an individual that desires to modify glyphs in an existing font for a specified document; or

— a computer based process that assembles font resource components as needed to render text within a document.

B.2.2 Font resource installation, storage and access

The installation, storage and access of font information is fundamental for utilization of font resource information. *Installation* includes the process of accepting an interchange format of a font resource, possible conversion of the data before storing it in a font resource library. *Storage* contains the resource library from which font information is made available to a computer application. *Access* includes the process of locating the desired font information and making it available to another process in a form that is most suitable.

Two factors of critical importance in the storage and access of font information are: maintaining ownership of the data (glyph shapes are not generally shared and/or distributed), and understanding the need for broad distribution of some data (descriptive and metric information must be available to applications, sometimes broadly distributed, which generate or format documents).

When a font resource is generated, information may be contained in a single font file, but this may not be the form most useful to a text processing system. Processing systems or applications may require that a font resource be partitioned into subsets and/or reformatted. Each processing system component or application process can require different subsets of the font resource information.

The following are examples of the purposes for partitioning data differently:

— network distributed library with database program access and communication of information over the network;

— host system library with shared data access or resource management program interface to an attached device or workstation application;

— workstation-resident library or collection of files with shared access available to applications running in that device or another workstation through user action;

— font data compiled or linked into a particular text processing application, with access available only to the modules within that application;

— data resident within and available only to specific presentation devices. Data may be made available to these devices by down-line loading or by exchangeable read-only storage.

Storage and access systems require appropriate subsets of the font resource information and font resource interchange formats which permit identification of individual properties without fixed ordering of properties. Some processes will require only descriptive information, while others will require metric information in addition to descriptive data. Presentation devices will require glyph shape and metric data, but access may be restricted by the owner of that data. Appropriate levels of security need to be employed by system or network service providers for each subset of font resource information.

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B.3 Application environment

The following describes in general, document-processing and text-processing tasks related to fonts describing concepts, but not implementation techniques or document structure. Implementations may include stand-alone programs, components of a larger program, or interwoven lines of code within multiple components. A document may contain text only, or diagrams with text annotation, or may be a composite containing text, graphics and pictures.

B.3.1 Text processing systems

A text processing system includes hardware devices and software or firmware programs required to generate, modify, display, and/or print text. These components (programs and devices) may be contained in a simple, independent system or may be included within a more complex document processing system and/or communication network. Text processing may be a primary function of a component (e.g., a text editing program) or it may be an auxiliary function of a component (e.g., part of a graphics editor, device service program, or resource management program).

A text processing system can include an electronic typewriter with cartridge fonts or may be a distributed network of sytems with shared data and variety of print and/or display devices.

The following are examples of text processing systems and the components which may utilize font resource information:

— personal computer with a character display and an APA (All Points Addressable) dot matrix printer;

— office workstation with a WYSIWYG (What You See Is What You Get) editor/display and an APA laser printer;

— graphic workstation with a high resolution colour display and software applications for rotating and scaling text, and for annotating figures;

— publishing workstation with preview devices (displays and printers that allow the user to preview the final output, usually at a lower quality but faster speed) and software applications for performing page layout, composition and proofing;

— full-function typesetting system.

ISO/IEC 9541 defines font resource properties needed to support the most complex text processing systems. Simpler systems can use the same property definitions, though they require a smaller number of properties. ISO/IEC 9541 also provides for device and resolution independence; that is, all descriptive and metric information is defined independently of the device used to present the text, while multiple sets of glyph shapes at different resolutions may exist to support specific presentation devices. The remaining part of this clause discusses the application aspects of text processing and use of font resource information.

B.3.2 Document processing

B.3.2.1 Document editing

This task utilizes any text or graphic editing program, permitting the user to create or modify a data stream/file (temporary or permanent) containing text in a syntax consistent with a defined format. The text may include formatting commands or document markup that may be executed (immediately or later) by a formatting program. Editing may omit formatting commands for display or printing, encompassing only plain text and text entry, and text modification and data stream/file generation functions. Or, a WYSIWYG editor may be used, which is an integration of all text processing tasks defined in this clause. WYSIWYG editors provide immediate response to users, i.e. visual feedback on a display device.

B.3.2.2 Document formatting

Document formatting is a task which determines where information will appear on a presentation surface, with creation of a data stream/file (temporary or permanent) that contains document data along with formatting controls. The presentation surface may be a video display, a sheet of paper, or some other output medium. The formatting process uses information from a variety of sources (user, system defaults, document defaults, fonts), and prod-

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uces an output data stream/file specific to the requirements of a particular device or generalized for presentation by any of several devices.

B.3.2.3 Document presentation

Document presentation is the task of transforming the formatted data stream/file into a visible form on a physical presentation device. This task involves the use of a hardware device and software for device service or control. The task of document presentation may be as simple as receiving bit-map image data and generating the corresponding image on the presentation surface, or it may involve translating an encoded data stream/file, merging referenced information, and transforming the image information from a parametric form to a form required by the device. In either case, glyph image information contained in a font resource must be obtained, transformed, and positioned properly for presentation.

Tasks are not necessarily performed on a single or integrated system. A workstation used for editing may be remote or detached from the system where formatting will occur; a document for distribution and remote presentation may be formatted by the sender, who may not know what devices or resources will be available for presentation. Many different document content architectures, document interchange data streams, and device data streams may be involved, but all require, in addition, means of referencing fonts, positioning glyph images, and presenting the glyph images on the presentation surface.

B.3.3 Font referencing

Font referencing is the process of identifying or characterising a font resource. The referencing task affects editing, formatting and presentation in that it specifies the desired fonts in the document. Referencing permits the formatting process to acquire glyph metric information and for the presentation process to acquire glyph shape information. Referencing may include identification of a specific font by name, or provide sufficient descriptive information to permit identification of a suitable font or a substitute. An alternative font can be selected through descriptive information if the specified one is not available to the system which will format or present the document.

B.3.4 Glyph referencing

Glyph referencing is the process of identifying the glyphs of a font resource. The reference task affects the formatting and presentation processes, in that they must access the glyph metric and glyph shape information associated with each character code contained in the document being processed.

Characters used in text data may be specified as members of encoded graphic character sets, or as entity references in document markup, or by other document encoding techniques. The process of character association requires knowledge of the document encoding techniques, the font resource glyph identification technique, and the method of associating characters with glyph identifiers.

ISO/IEC 9541 defines a method of uniquely identifying all known glyphs, and of identifying useful collections of glyphs which are independent of any document encoding techniques. ISO/IEC 10036 defines a procedure for the registration of all known glyphs and glyph collections.

B.3.5 Glyph positioning

Glyph positioning is the process of determining where a given glyph is to appear on the presentation surface. This function is performed by the document formatting process, which is a generic name for the process that determines the position of text, graphic, and/or image objects on a document page, including line breaks and how text should flow around graphic or image objects. The document formatting process makes use of font resource information together with user, system, and document layout information. Font resources provide only a portion of the information required for glyph positioning.

Glyphs may be positioned absolutely or relative to each other. That is, the formatting process may specify where each individual glyph is to be positioned or it may specify where the first glyph of a sequence of glyphs is to be positioned, leaving it to the presentation process to position successive glyphs in that sequence. In either case, the process must know each glyph's escapement value and dimensions and any other properties such as may be required for rotation, kerning, creating ligatures, etc. Font resource information should be provided in device and resolution-independent units of measure for maximum utility.

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B.3.6 Glyph shape presentation

Glyph image presentation is the process of forming the glyph shape on the presentation surface. This process is performed by a hardware device (display or printer), supported by software and/or hardware processes which translate the glyph shape information from its interchange format to that required by the presentation device.

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