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Information technology — Universal Multiple-Octet Coded Character Set (UCS) —

Architecture and Basic Multilingual Plane

Supplementary Planes

Contents

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 or 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.

International Standards are drafted in accordance with the rules given on the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC1. 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.

Attention is drawn to the possibility that some of the element of this part of ISO/IEC 10646 may be the subject of patent rights, ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standards ISO/IEC 10646 was prepared by Joint Technical Committee ISO/IEC JTC1, *Information technology*, Subcommittee SC 2, Coded *Character sets*.

This third edition cancels and replaces the previous editions of this International Standard which was published in two parts: Part 1 second edition (ISO/IEC 10646-1:2000) and Part 2 first edition (ISO/IEC 10646-2:2001). It also incorporates Amendments 1 and 2 to Part 1 and Amendment 1 to Part 2.

Annexes A to D form a normative part of ISO/IEC 10646. Annexes E to U are for information only.

The standard contains material which may only be available to users who obtain their copy in a machine readable format. That material consists of the following printable files:

— CJKUA_SR.txt

— CJKC0SR.txt

— Allnames.txt

Introduction

ISO/IEC 10646 specifies the Universal Multiple-Octet Coded Character Set (UCS). It is applicable to the representation, transmission, interchange, processing, storage, input and presentation of the written form of the languages (scripts) of the world as well as additional symbols.

ISO/IEC 10464 specifies the overall architecture, the Basic Multilingual Plane (BMP) and the Supplementary Planes of the UCS.

Information technology — Universal Multiple-Octet Coded Character Set (UCS) —

1 Scope

ISO/IEC 10646 specifies the Universal Multiple-Octet Coded Character Set (UCS). It is applicable to the representation, transmission, interchange, processing, storage, input, and presentation of the written form of the languages of the world as well as of additional symbols.

This document:

- specifies the architecture of ISO/IEC 10646,
- defines terms used in ISO/IEC 10646,
- describes the general structure of the coded character set;
- specifies the Basic Multilingual Plane (BMP) of the UCS,
- specifies supplementary planes of the UCS: the Supplementary Multilingual Plane (SMP), the Supplementary Ideographic Plane (SIP) and the Supplementary Special-purpose Plane (SSP),
- defines a set of graphic characters used in scripts and the written form of languages on a world-wide scale;
- specifies the names for the graphic characters of the BMP, SMP, SIP, SSP and their coded representations;
- specifies the four-octet (32-bit) canonical form of the UCS: UCS-4;
- specifies a two-octet (16-bit) BMP form of the UCS: UCS-2;
- specifies the coded representations for control functions;
- specifies the management of future additions to this coded character set.

The UCS is a coding system different from that specified in ISO/IEC 2022. The method to designate UCS from ISO/IEC 2022 is specified in 16.2.

Graphic characters that are already encoded in the BMP are no duplicated in the supplementary planes. In addition, any character us assigned to only one code position within the set of supplementary planes.

NOTE 1 – The Unicode Standard Version 4.0 includes a set of characters, names, and coded representations that are identical with those in this International Standard.. It additionally provides details of character properties, processing algorithms, and definitions that are useful to implementers.

NOTE 3 – Previous editions of ISO/IEC 10646 were published in parts: Part 1 specified the architecture and the BMP, Part 2 specified the SMP, SIP and SSP.

2 Conformance

2.1 General

Whenever private use characters are used as specified in ISO/IEC 10646, the characters themselves shall not be covered by these conformance requirements.

2.2 Conformance of information interchange

A coded-character-data-element (CC-data-element) within coded information for interchange is in conformance with ISO/IEC 10646 if

a) all the coded representations of graphic characters within that CC-data-element conform to clauses 6 and 7, to an identified form chosen from clause 13 or annex C or annex D, and to an identified implementation level chosen from clause 14;

b) all the graphic characters represented within that CC-data-element are taken from those within an identified subset (clause 12);

c) all the coded representations of control functions within that CC-data-element conform to clause 15.

A claim of conformance shall identify the adopted form, the adopted implementation level and the adopted subset by means of a list of collections and/or characters.

2.3 Conformance of devices

A device is in conformance with ISO/IEC 10646 if it conforms to the requirements of item a) below, and either or both of items b) and c).

NOTE – The term device is defined (in 4.18) as a component of information processing equipment which can transmit and/or receive coded information within CC-data-elements. A device may be a conventional input/output device, or a process such as an application program or gateway function.

A claim of conformance shall identify the document that contains the description specified in a) below, and shall identify the adopted form(s), the adopted implementation level, the adopted subset (by means of a list of collections and/or characters), and the selection of

control functions adopted in accordance with clause 15.

Device description: A device that conforms to ISO/IEC 10646 shall be the subject of a description that identifies the means by which the user may supply characters to the device and/or may recognize them when they are made available to the user, as specified respectively, in sub-clauses b), and c) below.

Originating device: An originating device shall allow its user to supply any characters from an adopted subset, and be capable of transmitting their coded representations within a CC-data-element in accordance with the adopted form and implementation level.

Receiving device: A receiving device shall be capable of receiving and interpreting any coded representation of characters that are within a CC-data-element in accordance with the adopted form and implementation level, and shall make any corresponding characters from the adopted subset available to the user in such a way that the user can identify them.

Any corresponding characters that are not within the adopted subset shall be indicated to the user. The way used for indicating them need not distinguish them from each other.

NOTE 1 – An indication to the user may consist of making available the same character to represent all characters not in the adopted subset, or providing a distinctive audible or visible signal when appropriate to the type of user.

NOTE 2 – See also annex J for receiving devices with retransmission capability.

3 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of ISO/IEC 10646. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on ISO/IEC 10646 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 2022:1994 *Information technology — Character code structure and extension techniques*.

ISO/IEC 6429:1992 *Information technology — Control functions for coded character sets.*

Unicode Standard Annex, UAX#9, The Unicode Bidirectional Algorithm, Version 3.1.0, 2001-03-23.

Unicode Standard Annex, UAX#15, Unicode Normalization Forms, Version 3.2.0, 2002-03-27.

4 Terms and definitions

For the purposes of ISO/IEC 10646, the following terms and definitions apply:

4.1 Basic Multilingual Plane (BMP):
Plane 00 of Group 00.

4.2 Block:
A contiguous range of code positions to which a set of characters that share common characteristics, such as script, are allocated. A block does not overlap another block. One or more of the code positions within a block may have no character allocated to it.

4.3 Canonical form:
The form with which characters of this coded character set are specified using four octets to represent each character.

4.4 CC-data-element (coded-character-data-element):
An element of interchanged information that is specified to consist of a sequence of coded representations of characters, in accordance with one or more identified standards for coded character sets.

4.5 Cell:
The place within a row at which an individual character may be allocated.

4.6 Character:
A member of a set of elements used for the organization, control, or representation of data.

4.7 Character boundary:
Within a stream of octets the demarcation between the last octet of the coded representation of a character and the first octet of that of the next coded character.

4.8 Coded character:
A character together with its coded representation.

4.9 Coded character set:
A set of unambiguous rules that establishes a character set and the relationship between the characters of the set and their coded representation.

4.10 Code table:
A table showing the characters allocated to the octets in a code.

4.11 Collection:
A set of coded characters which is numbered and named and which consists of those coded characters whose code positions lie within one or more identified ranges.

NOTE – If any of the identified ranges include code positions to which no character is allocated, the repertoire of the collection will change if an additional character is assigned to any of those positions at a future amendment of this International Standard. However it is intended that the collection number and name will remain unchanged in future editions of this International Standard.

4.12 Combining character:
A member of an identified subset of the coded character set of ISO/IEC 10646 intended for combination with the preceding non-combining graphic character, or with a sequence of combining characters preceded by a non-combining character (see also 4.14).

NOTE – ISO/IEC 10646 specifies several subset collections which include combining characters.

4.13 Compatibility character:
A graphic character included as a coded character of ISO/IEC 10646 primarily for compatibility with existing coded character sets.

4.14 Composite sequence:
A sequence of graphic characters consisting of a non-combining character followed by one or more combining characters (see also 4.12).

NOTE 1 – A graphic symbol for a composite sequence generally consists of the combination of the graphic symbols of each character in the sequence.

NOTE 2 – A composite sequence is not a character and therefore is not a member of the repertoire of ISO/IEC 10646.

4.15 Control function:
An action that affects the recording, processing, transmission, or interpretation of data, and that has a coded representation consisting of one or more octets.

4.16 Default state:
The state that is assumed when no state has been explicitly specified.

4.17 Detailed code table:
A code table showing the individual characters, and normally showing a partial row.

4.18 Device:
A component of information processing equipment which can transmit and/or receive coded information within CC-data-elements. (It may be an input/output device in the conventional sense, or a process such as an application program or gateway function.)

4.19 Fixed collection:
A collection in which every code position within the identified range(s) has a character allocated to it, and which is intended to remain unchanged in future editions of this International Standard.

4.20 Graphic character:
A character, other than a control function, that has a visual representation normally handwritten, printed, or displayed.

4.21 Graphic symbol:
The visual representation of a graphic character or of a composite sequence.

4.22 Group:
A subdivision of the coding space of this coded character set; of 256 x 256 x 256 cells.

4.23 High-half zone:
a set of cells reserved for use in UTF-16 (see annex C); an RC-element corresponding to any of these cells may be used in UTF-16 as the first of a pair of RC-elements which represents a character from a plane other than the BMP.

4.24 Interchange:
The transfer of character coded data from one user to another, using telecommunication means or interchangeable media.

4.25 Interworking:
The process of permitting two or more systems, each employing different coded character sets, meaningfully to interchange character coded data; conversion between the two codes may be involved.

4.26 ISO/IEC 10646-1
A former subdivision of the standard. It is also referred as Part 1 of ISO/IEC 10646 and contained the specification of the overall architecture and the Basic Multilingual Plane (BMP). There are a First and a Second Edition of ISO/IEC 10646-1.

4.27 ISO/IEC 10646-2
A former subdivision of the standard. It is also referred as Part 2 of ISO/IEC 10646 and contained the specification of the Supplementary Multilingual Plane (SMP), the Supplementary Ideographic Plane (SIP) and the Supplementary Special-purpose Plane (SSP). There is only a First Edition of ISO/IEC 10646-2.

4.28 Low-half zone:
A set of cells reserved for use in UTF-16 (see annex C); an RC-element corresponding to any of these cells may be used in UTF-16 as the second of a pair of RC-elements which represents a character from a plane other than the BMP.

4.29 Octet:
An ordered sequence of eight bits considered as a unit.

4.30 Plane:
A subdivision of a group; of 256 x 256 cells.

4.31 Presentation; to present:
The process of writing, printing, or displaying a graphic symbol.

4.32 Presentation form:
In the presentation of some scripts, a form of a graphic symbol representing a character that depends on the position of the character relative to other characters.

4.33 Private use plane:
A plane within this coded character set the contents of which is not specified in ISO/IEC 10646 (see clause 10)

4.34 RC-element:
A two-octet sequence comprising the R-octet and the C-octet (see 6.2) from the four octet sequence (in the canonical form) that corresponds to a cell in the coding space of this coded character set.

4.35 repertoire:
A specified set of characters that are represented in a coded character set.

4.36 row:
A subdivision of a plane; of 256 cells.

4.37 script:
A set of graphic characters used for the written form of one or more languages.

4.38 Supplementary plane:
A plane that accommodates characters which have not been allocated to the Basic Multilingual Plane.

4.39 Supplementary Multilingual Plane for scripts and symbols (SMP)
Plane 01 of Group 00.

4.40 Supplementary Ideographic Plane (SIP)
Plane 02 of Group 00.

4.41 Supplementary Special-purpose Plane (SSP)
Plane 0E of Group 00.

4.42 Unpaired RC-element:
An RC-element in a CC-data element that is either:

- an RC-element from the high-half zone that is not immediately followed by an RC-element from the low-half zone, or
- an RC-element from the low-half zone that is not immediately preceded by a high-half RC-element from the high-half zone.

4.43 User:
A person or other entity that invokes the service provided by a device. (This entity may be a process such as an application program if the “device” is a code converter or a gateway function, for example.)

4.44 Zone:
A sequence of cells of a code table, comprising one or more rows, either in whole or in part, containing characters of a particular class (for example see clause 8).

5 General structure of the UCS

The general structure of the Universal Multiple-Octet Coded Character Set (referred to hereafter as “this coded character set”) is described in this explanatory clause, and is illustrated in figures 1 and 2. The normative specification of the structure is given in the following clauses.

The value of any octet is expressed in hexadecimal notation from 00 to FF in ISO/IEC 10646 (see annex K).

The canonical form of this coded character set – the way in which it is to be conceived – uses a four-dimensional coding space, regarded as a single entity, consisting of 128 three-dimensional groups.

NOTE 1 – Thus, bit 8 of the most significant octet in the canonical form of a coded character can be used for internal processing purposes within a device as long as it is set to zero within a conforming CC-data-element.

Each group consists of 256 two-dimensional planes. Each plane consists of 256 one-dimensional rows, each row containing 256 cells. A character is located and coded at a cell within this coding space or the cell is declared unused.

In the canonical form, four octets are used to represent each character, and they specify the group, plane, row and cell, respectively. The canonical form consists of four octets since two octets are not sufficient to cover all the characters in the world, and a 32-bit representation follows modern processor architectures.

The four-octet canonical form can be used as a four-octet coded character set, in which case it is called UCS-4.

NOTE 2 – The use of the term “canonical” for this form does not imply any restriction or preference for this form over transformation formats that a conforming implementation may choose for the representation of UCS characters.

ISO/IEC 10646 defines graphic characters and their coded representation for the following planes:

- The Basic Multilingual Plane (BMP, Plane 00 of Group 0). The Basic Multilingual Plane can be used as a two-octet coded character set identified as UCS-2.
- The Supplementary Multilingual Plane for scripts and symbols (SMP, Plane 01 of Group 00).
- The Supplementary Ideographic Plane (SIP, Plane 02 of Group 00).
- The Supplementary Special-purpose Plane (SSP, Plane 0E of Group 0).

Additional supplementary planes may be defined in the future to accommodate additional graphic characters.

The planes that are reserved for private use are specified in clause 10. The contents of the cells in private use zones are not specified in ISO/IEC 10646.

Each character is located within the coded character set in terms of its Group-octet, Plane-octet, Row-octet, and Cell-octet.

Subsets of the coding space may be used in order to give a sub-repertoire of graphic characters.

A UCS Transformation Format (UTF-16) is specified in annex C which can be used to represent characters from 16 planes of group 00, additional to the BMP, in a form that is compatible with the two-octet BMP form.

Another UCS Transformation Format (UTF-8) is specified in annex D which can be used to transmit text data through communication systems which are sensitive to octet values for control characters coded according to the 8-bit structure of ISO/IEC 2022, and to ISO/IEC 4873. UTF-8 also avoids the use of octet values according to ISO/IEC 4873 which have special significance during the parsing of file-name character strings in widely-used file-handling systems.

6 Basic structure and nomenclature

6.1 Structure

The Universal Multiple-Octet Coded Character Set as specified in ISO/IEC 10646 shall be regarded as a single entity.

This entire coded character set shall be conceived of as comprising 128 groups of 256 planes. Each plane shall be regarded as containing 256 rows of characters, each row containing 256 cells. In a code table representing the contents of a plane (such as in figure 2), the horizontal axis shall represent the least significant octet, with its smaller value to the left; and the vertical axis shall represent the more significant octet, with its smaller value at the top.

Each axis of the coding space shall be coded by one octet. Within each octet the most significant bit shall be bit 8 and the least significant bit shall be bit 1. Accordingly, the weight allocated to each bit shall be

bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1
128	64	32	16	8	4	2	1

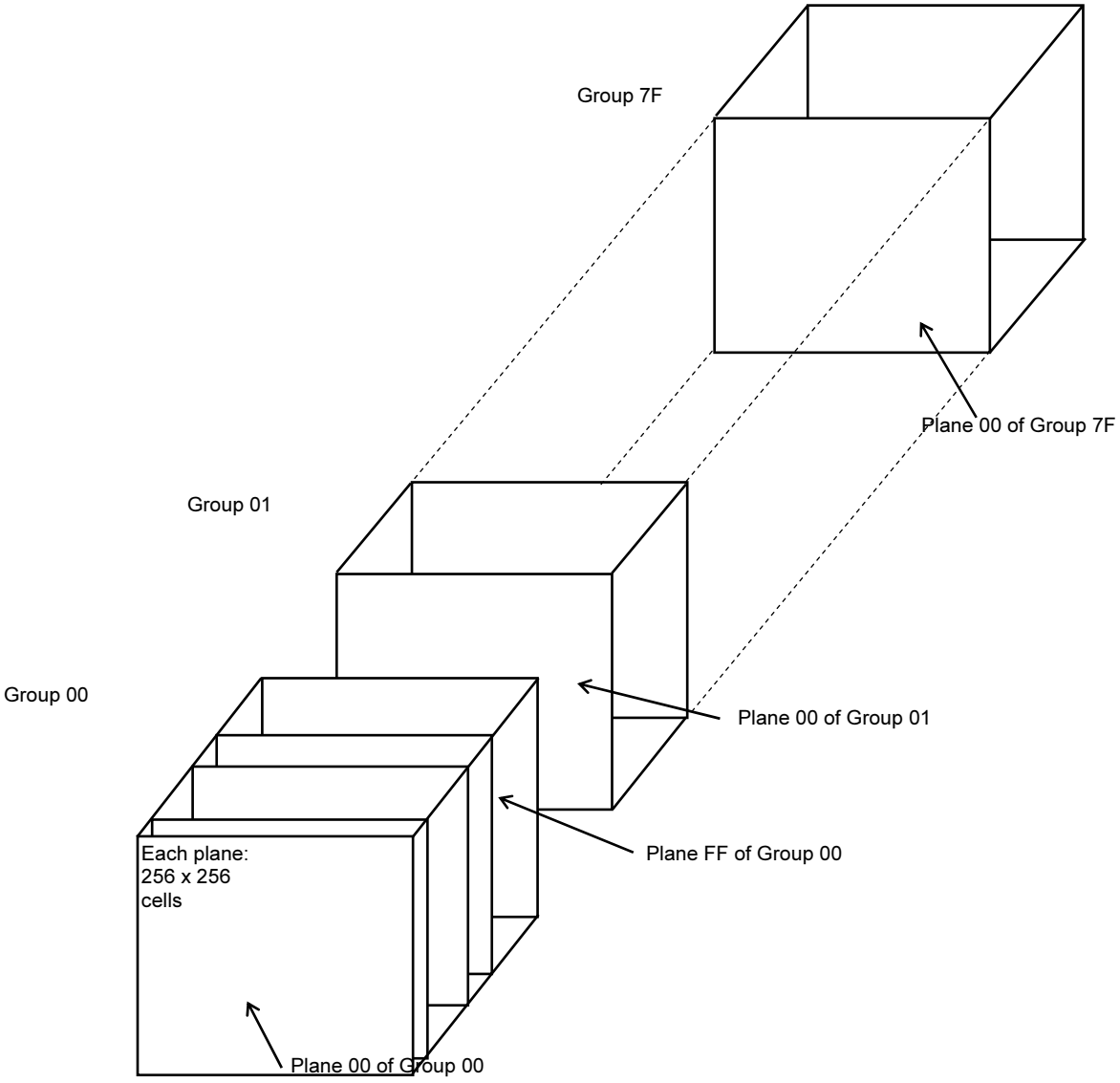
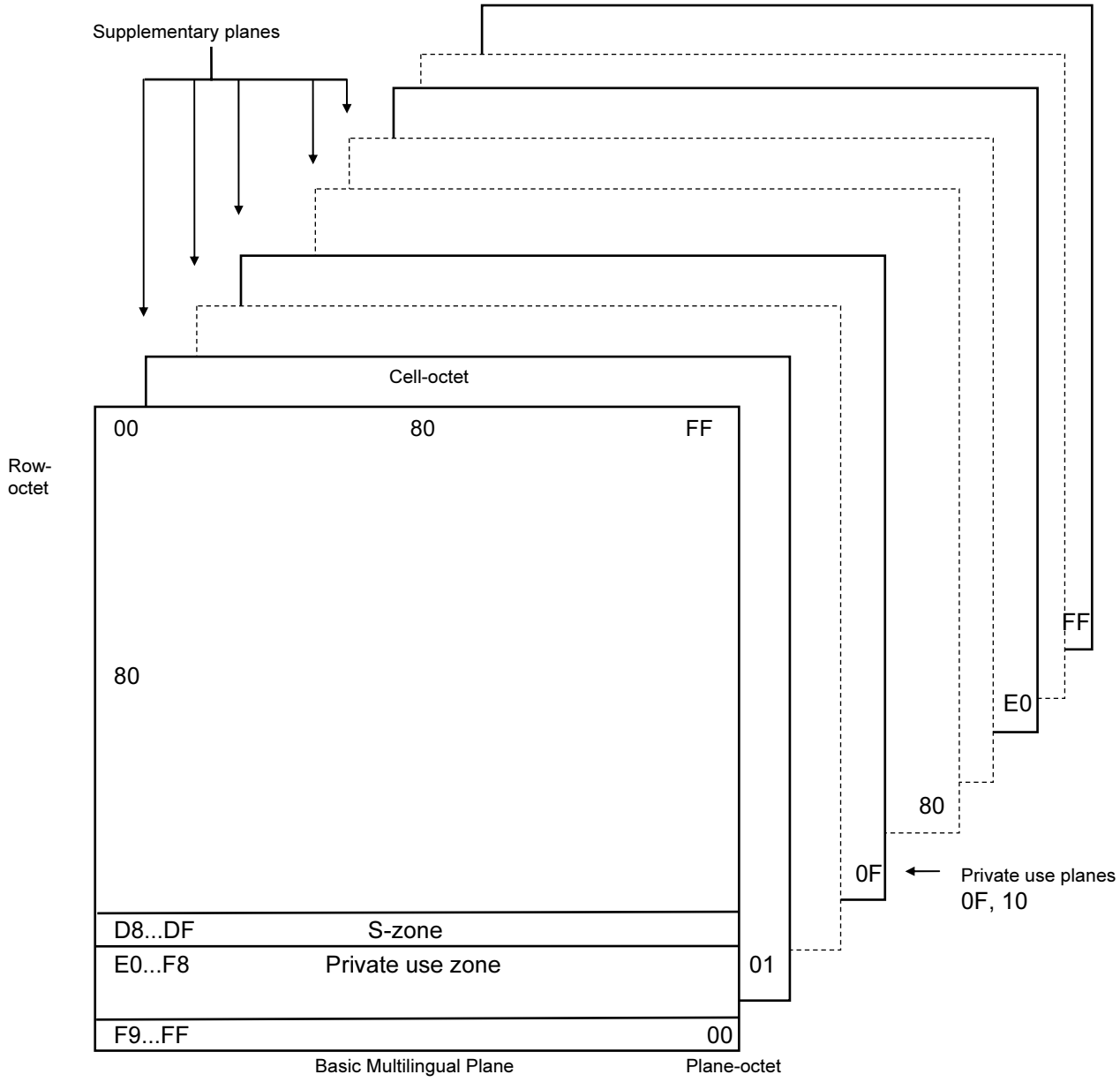


Figure 1 - Entire coding space of the Universal Multiple-Octet Coded Character Set



NOTE - Labels “S-zone” and “Private use zone” are specified in clause 8.

Figure 2 - Group 00 of the Universal Multiple-Octet Coded Character Set

6.2 Coding of characters

In the canonical form of the coded character set, each character within the entire coded character set shall be represented by a sequence of four octets. The most significant octet of this sequence shall be the group-octet. The least significant octet of this sequence shall be the cell-octet. Thus this sequence may be represented as

m.s.			l.s.
Group-octet	Plane-octet	Row-octet	Cell-octet

where m.s. means the most significant octet, and l.s. means the least significant octet.

For brevity, the octets may be termed

m.s.			l.s.
G-octet	P-octet	R-octet	C-octet

Where appropriate, these may be further abbreviated to G, P, R, and C.

The value of any octet shall be represented by two hexadecimal digits, for example: 31 or FE. When a single character is to be identified in terms of the values of its group, plane, row, and cell, this shall be represented such as:

0000 0030 for DIGIT ZERO

0000 0041 for LATIN CAPITAL LETTER A

When referring to characters within an identified plane, the leading four digits (for G-octet and P-octet) may be omitted. For example, within plane 00, 0030 may be used to refer to DIGIT ZERO.

When referring to characters within planes 00 to 0F, the leading three digits may be omitted. For example, the five-digit value 11100 corresponds to the canonical form 0001 1100 and the corresponding coded character is part of plane 01.

6.3 Octet order

The sequence of the octets that represent a character, and the most significant and least significant ends of it, shall be maintained as shown above. When serialized as octets, a more significant octet shall precede less significant octets. When not serialized as octets, the order of octets may be specified by agreement between sender and recipient (see 16.1 and annex H).

6.4 Naming of characters

ISO/IEC 10646 assigns a unique name to each character. The name of a character either:

a. denotes the customary meaning of the character, or

b. describes the shape of the corresponding graphic symbol, or

c. follows the rule given in clause 27 for Chinese /Japanese/Korean (CJK) unified ideographs.

Guidelines to be used for constructing the names of characters in cases a. and b. are given in annex L.

6.5 Short identifiers for code positions (UIDs)

ISO/IEC 10646 defines short identifiers for each code position, including code positions that are reserved. A short identifier for any code position is distinct from a short identifier for any other code position. If a character is allocated at a code position, a short identifier for that code position can be used to refer to the character allocated at that code position.

NOTE 1 – For instance, U+DC00 identifies a code position that is permanently reserved for UTF-16, and U+FFFF identifies a code position that is permanently reserved. U+0025 identifies a code position to which a character is allocated; U+0025 also identifies that character (named PERCENT SIGN).

NOTE 2 – These short identifiers are independent of the language in which this standard is written, and are thus retained in all translations of the text.

The following alternative forms of notation of a short identifier are defined here.

a. The eight-digit form of short identifier shall consist of the sequence of eight hexadecimal digits that represents the code position of the character (see 6.2).

b. The four-to-six-digit form of short identifier shall consist of the last four to six digits of the eight-digit form. It is not defined if the eight-digit form is greater than 0010FFFF. Leading zeroes beyond four digits are suppressed.

c. The character “-” (HYPHEN-MINUS) may, as an option, precede the 8-digit form of short identifier.

d. The character “+” (PLUS SIGN) may, as an option, precede the four-to-six-digit form of short identifier.

e. The prefix letter “U” (LATIN CAPITAL LETTER U) may, as an option, precede any of the four forms of short identifier defined in a. to d. above.

f. For the 8 digit forms, the characters SPACE or NO-BREAK SPACE may optionally be inserted before the four last digits.

The capital letters A to F, and U that appear within short identifiers may be replaced by the corresponding small letters.

The full syntax of the notation of a short identifier, in Backus-Naur form, is:

{ U | u } [{+}(xxxx | xxxxx | xxxxxx) | {-}xxxxxxxx]

where “x” represents one hexadecimal digit (0 to 9, A to F, or a to f), for example:

-hhhhhhhh +kkkk
Uhhhhhhhh U+kkkk

where hhhhhhhh indicates the eight-digit form and kkkk indicates the four-to-six-digit form.

NOTE 3 – As an example the short identifier for LATIN SMALL LETTER LONG S (see tables for Row 01 in clause 26) may be notated in any of the following forms:

0000017F	-0000017F	U0000017F	U-0000017F
017F	+017F	U017F	U+017F

Any of the capital letters may be replaced by the corresponding small letter.

NOTE 4 – Two special prefixed forms of notation have also been used, in which the letter T (LATIN CAPITAL LETTER T or LATIN SMALL LETTER T) replaces the letter U in the corresponding prefixed forms. The forms of notation that included the prefix letter T indicated that the short identifier refers to a character in ISO/IEC 10646-1 First Edition (before the application of any Amendments), whereas the forms of notation that include the prefix letter U always indicate that the short identifier refers to a character in ISO/IEC 10646 at the most recent state of amendment. Corresponding short identifiers of the form T-xxxxxxxx and U-xxxxxxxx refer to the same character except when xxxxxxxx lies in the range 00003400 to 00004DFF inclusive. Forms of notation that include no prefix letter always indicate a reference to the most recent state of amendment of ISO/IEC 10646, unless otherwise qualified.

6.6 UCS Sequence Identifiers)

"ISO/IEC 10646 defines an identifier for any sequence of code positions taken from the standard. Such an identifier is known as a UCS Sequence Identifier (USI). For a sequence of n code positions it has the following form:

<UID1, UID2, ..., UIDn>

where UID1, UID2, etc. represent the short identifiers of the corresponding code positions, in the same order as those code positions appear in the sequence. If each of the code positions in such a sequence has a character allocated to it, the USI can be used to identify the sequence of characters allocated at those code positions. The syntax for UID1, UID2, etc. is specified in clause 6.5. A COMMA character (optionally followed by a SPACE character) separates the UIDs. The UCS Sequence Identifier shall include at least two UIDs; it shall begin with a LESS-THAN SIGN and be terminated by a GREATER-THAN SIGN."

NOTE – UCS Sequences Identifiers cannot be used for specification of subset and collection content. They may be used outside this standard to identify: composite sequences for mapping purposes, font repertoire, etc.

7 General requirements for the UCS

The following requirements apply to the entire coded character set.

a. The values of P-, and R-, and C-octets used for representing graphic characters shall be in the range 00 to FF. The values of G-octets used for representation of graphic characters shall be in the range 00 to 7F. On any plane, code positions FFFE and FFFF shall not be used.

b. Code positions to which a character is not allocated, except for the positions reserved for private use characters or for transformation formats, are reserved for future standardization and shall not be used for any other purpose. Future editions of ISO/IEC 10646 will not allocate any characters to code positions reserved for private use characters or for transformation formats.

c. The same graphic character shall not be allocated to more than one code position. There are graphic characters with similar shapes in the coded character set; they are used for different purposes and have different character names.

8 The Basic Multilingual Plane

Plane 00 of Group 00 shall be the Basic Multilingual Plane (BMP). The BMP can be used as a two-octet coded character set in which case it shall be called UCS-2 (see 13.1).

NOTE 1 – Since UCS-2 only contains the repertoire of the BMP it is not fully interoperable with UCS-4, UTF-8 and UTF-16.

Code positions 0000 0000 to 0000 001F in the BMP are reserved for control characters, and code position 0000 007F is reserved for the character DELETE (see clause 15). Code positions 0000 0080 to 0000 009F are reserved for control characters.

Code positions 0000 2060 to 0000 206F, 0000 FFF0 to 0000 FFFC, and 000E 0000 to 000E 0FFF are reserved for Alternate Format Characters (see annex F).

NOTE 2 – Unassigned code positions in those ranges may be ignored in normal processing and display.

Code positions 0000 D800 to 0000 DFFF are reserved for the use of UTF-16 (see annex C). These positions are known as the S-zone.

Code positions 0000 E000 to 0000 F8FF are reserved for private use (see clause 10). These positions are known as the private use zone.

Code positions 0000 FDD0 to 0000 FDEF, 0000 FFFE, and 0000 FFFF are permanently reserved.

NOTE 3 – Code position 0000 FFFE is reserved for "signature" (see annex H). Code positions 0000 FDD0 to 0000 FDEF, and 0000 FFFF can be used for internal processing uses requiring numeric values which are guaranteed not to be coded characters, such as in terminating tables, or signaling end-of-text. Furthermore, since 0000 FFFF is the largest BMP value, it may also be used as the final value in binary or sequential searching index within the context of UCS-2 or UTF-16."

NOTE 4 – A “permanently reserved” code position cannot be changed by future amendments.

9 Supplementary planes

9.1 Planes accessible by UTF-16

Each code position in Planes 01 to 10 of Group 00 has a unique mapping to a four-octet sequence in accordance with the UTF-16 form of coded representation (see annex C). This form is compatible with the two-octet BMP form of UCS-2 (see 13.1).

The planes 01, 02 and 0E of Group 00 shall be the Supplementary Multilingual Plane (SMP), the Supplementary Ideographic Plane (SIP) and the Supplementary Special-purpose Plane (SSP) respectively. Like the BMP, these planes contain graphic characters allocated to code positions. The Planes from 03 to 0D of Group 00 are reserved for future standardization. See clause 10.2 for the definition of Plane 0F and 10 of Group 00.

NOTE - The following table shows the boundary code positions for planes 01, 02 and 0E expressed in UCS-4 abbreviated five-digit values and in UTF-16 pairs values.

Plane	UCS-4 values	UTF-16 pairs values
01	10000 - 1FFFF	D800 DC00 - D83F DFFF
02	20000 - 2FFFF	D840 DC00 - D87F DFFF
0E	E0000 - EFFFF	DB40 DC00 - DB7F DFFF

In the UCS Transformation Format UTF-8 (see annex D), the UCS-4 representation of characters shall be used as the source for the mapping. Using the high-half zone value and low-half zone values as source for the mapping is undefined.

NOTE - The following table shows the boundary code positions for planes 01, 02 and 0E expressed in UCS-4 five-digit abbreviated values and in UTF-8 sequence values.

Plane	UCS-4 values	UTF-8 sequence values
01	10000 - 1FFFF	F0908080 - F09FBFBF
02	20000 - 2FFFF	F0A08080 - F0AFBFBF
0E	E0000 - EFFFF	F3A08080 - F3AFBFBF

UCS-2 cannot be used to represent any characters on the Supplementary Planes.

Code positions 1FFFE, 1FFFF, 2FFFE, 2FFFF, EFFFE and EFFFF are permanently reserved.

NOTE – These code positions can be used for internal processing uses requiring a numeric value that is guaranteed not to be a coded character.

9.2 Other Planes reserved for future standardization

Planes 11 to FF in Group 00 and all planes in any other groups (i.e. Planes 00 to FF in Groups 01 to 7F) are reserved for future standardization, and thus those code positions shall not be used for any other purpose.

Code positions in these planes do not have a mapping to the UTF-16 form (see Annex C).

NOTE – To ensure continued interoperability between the UTF-16 form and other coded representations of the UCS, it is intended that no characters will be allocated to code positions in Planes 11 to FF in Group 00 or any planes in any other groups.

10 Private use groups, planes, and zones

10.1 Private use characters

Private use characters are not restrained in any way by ISO/IEC 10646. Private use characters can be used to provide user-defined characters. For example, this is a common requirement for users of ideographic scripts.

NOTE 1 – For meaningful interchange of private use characters, an agreement, independent of ISO/IEC 10646, is necessary between sender and recipient.

Private use characters can be used for dynamically-redefinable character applications.

NOTE 2 – For meaningful interchange of dynamically-redefinable characters, an agreement, independent of ISO/IEC 10646 is necessary between sender and recipient. ISO/IEC 10646 does not specify the techniques for defining or setting up dynamically-redefinable characters.

10.2 Code positions for private use characters

The code positions of Plane 0F and Plane 10 of Group 00 shall be for private use.

The 6400 code positions E000 to F8FF of the Basic Multilingual Plane shall be for private use.

The contents of these code positions are not specified in ISO/IEC 10646 (see 10.1).

11 Revision and updating of the UCS

The revision and updating of this coded character set will be carried out by ISO/IEC JTC1/SC2.

NOTE – It is intended that in future editions of ISO/IEC 10646, the names and allocation of the characters in this edition will remain unchanged.

12 Subsets

ISO/IEC 10646 provides the specification of subsets of coded graphic characters for use in interchange, by originating devices, and by receiving devices.

There are two alternatives for the specification of subsets: limited subset and selected subset. An adopted subset may comprise either of them, or a combination of the two.

12.1 Limited subset

A limited subset consists of a list of graphic characters in the specified subset. This specification allows appli-

cations and devices that were developed using other codes to interwork with this coded character set.

A claim of conformance referring to a limited subset shall list the graphic characters in the subset by the names of graphic characters or code positions as defined in ISO/IEC 10646.

12.2 Selected subset

A selected subset consists of a list of collections of graphic characters as defined in ISO/IEC 10646. The collections from which the selection may be made are listed in annex A. A selected subset shall always automatically include the Cells 20 to 7E of Row 00 of Plane 00 of Group 00.

A claim of conformance referring to a selected subset shall list the collections chosen as defined in ISO/IEC 10646.

13 Coded representation forms of the UCS

ISO/IEC 10646 provides four alternative forms of coded representation of characters. Two of these forms are specified in this clause, and two others, UTF-16 and UTF-8, are specified in annexes C and D respectively.

NOTE – The characters from the ISO/IEC 646 IRV repertoire are coded by simple zero extensions to their coded representations in ISO/IEC 646 IRV. Therefore, their coded representations have the same integer values when represented as 8-bit, 16-bit, or 32-bit integers. For implementations sensitive to a zero-valued octet (e.g. for use as a string terminator), use of 8-bit based array data type should be avoided as any zero-valued octet may be interpreted incorrectly. Use of data types at least 16-bits wide is more suitable for UCS-2, and use of data types at least 32-bits wide is more suitable for UCS-4.

13.1 Two-octet BMP form

This coded representation form permits the use of characters from the Basic Multilingual Plane with each character represented by two octets.

Within a CC-data-element conforming to the two-octet BMP form, a character from the Basic Multilingual Plane shall be represented by two octets comprising the R-octet and the C-octet as specified in 6.2 (i.e. its RC-element).

NOTE – A coded graphic character using the two-octet BMP form may be implemented by a 16-bit integer for processing.

13.2 Four-octet canonical form (UCS-4)

The canonical form permits the use of all the characters of ISO/IEC 10646, with each character represented by four octets.

Within a CC-data-element conforming to the four-octet canonical form, every character shall be represented by four octets comprising the G-octet, the P-octet, the R-octet, and the C-octet as specified in 6.2.

NOTE 1 – A coded graphic character using the four-octet canonical form may be implemented by a 32-bit integer for processing.

NOTE 2 – When confined to the code positions in Planes 0 to 10 (U+0000 to U+10FFFF), UCS-4 is also referred to as UCS Transformation Format 32 (UTF-32). The Unicode Standard, Version 3.2, defines the following forms of UTF-32:

- UTF-32: the ordering of octets (specified in sub-clause 6.3) is not defined and the signatures (specified in Annex H) may appear;
- UTF-32BE: in the ordering of octets the more significant octets precede the less significant octets, as specified in sub-clause 6.2, and no signatures appear;
- UTF-32LE: in the ordering of octets the less significant octets precede the more significant octets, and no signatures appear.

14 Implementation levels

ISO/IEC 10646 specifies three levels of implementation. Combining characters are described in 24 and listed in annex B.

14.1 Implementation level 1

When implementation level 1 is used, a CC-data-element shall not contain coded representations of combining characters (see clause B.1) nor of characters from HANGUL JAMO block (see clause 26.1). When implementation level 1 is used the unique-spelling rule shall apply (26.2).

14.2 Implementation level 2

When implementation level 2 is used, a CC-data-element shall not contain coded representations of characters listed in clause B.2. When implementation level 2 is used the unique-spelling rule shall apply (26.2).

14.3 Implementation level 3

When implementation level 3 is used, a CC-data-element may contain coded representations of any characters.

15 Use of control functions with the UCS

This coded character set provides for use of control functions encoded according to ISO/IEC 6429 or similarly structured standards for control functions, and standards derived from these. A set or subset of such coded control functions may be used in conjunction with this coded character set. These standards encode a control function as a sequence of one or more octets.

When a control character of ISO/IEC 6429 is used with this coded character set, its coded representation as specified in ISO/IEC 6429 shall be padded to correspond with the number of octets in the adopted form

(see clause 13 and annexes C and D). Thus, the least significant octet shall be the bit combination specified in ISO/IEC 6429, and the more significant octet(s) shall be zeros.

For example, the control character FORM FEED is represented by “000C” in the two-octet form, and “0000 000C” in the four-octet form.

For escape sequences, control sequences, and control strings (see ISO/IEC 6429) consisting of a coded control character followed by additional bit combinations in the range 20 to 7F, each bit combination shall be padded by octet(s) with value 00.

For example, the escape sequence “ESC 02/00 04/00” is represented by “001B 0020 0040” in the two-octet form, and “0000 001B 0000 0020 0000 0040” in the four-octet form.

NOTE – The term “character” appears in the definition of many of the control functions specified in ISO/IEC 6429, to identify the elements on which the control functions will act. When such control functions are applied to coded characters according to ISO/IEC 10646 the action of those control functions will depend on the type of element from ISO/IEC 10646 that has been chosen, by the application, to be the element (or character) on which the control functions act. These elements may be chosen to be characters (non-combining characters and/or combining characters) or may be chosen in other ways (such as composite sequences) when applicable.

Code extension control functions for the ISO/IEC 2022 code extension techniques (such as designation escape sequences, single shift, and locking shift) shall not be used with this coded character set.

16 Declaration of identification of features

16.1 Purpose and context of identification

CC-data-elements conforming to ISO/IEC 10646 are intended to form all or part of a composite unit of coded information that is interchanged between an originator and a recipient. The identification of ISO/IEC 10646 (including the form), the implementation level, and any subset of the coding space that have been adopted by the originator must also be available to the recipient. The route by which such identification is communicated to the recipient is outside the scope of ISO/IEC 10646.

However, some standards for interchange of coded information may permit, or require, that the coded representation of the identification applicable to the CC-data-element forms a part of the interchanged information. This clause specifies a coded representation for the identification of UCS with an implementation level and a subset of ISO/IEC 10646, and also of a C0 and a C1 set of control functions from ISO/IEC 6429 for use in conjunction with ISO/IEC 10646. Such coded representations provide all or part of an identification data element, which may be included in information interchange in accordance with the relevant standard.

If two or more of the identifications are present, the order of those identifications shall follow the order as specified in this clause.

NOTE – An alternative method of identification is described in annex N.

16.2 Identification of UCS coded representation form with implementation level

When the escape sequences from ISO/IEC 2022 are used, the identification of a coded representation form of UCS (see clause 13) and an implementation level (see clause 14) specified by ISO/IEC 10646 shall be by a designation sequence chosen from the following list:

ESC 02/05 02/15 04/00
UCS-2 with implementation level 1

ESC 02/05 02/15 04/01
UCS-4 with implementation level 1

ESC 02/05 02/15 04/03
UCS-2 with implementation level 2

ESC 02/05 02/15 04/04
UCS-4 with implementation level 2

ESC 02/05 02/15 04/05
UCS-2 with implementation level 3

ESC 02/05 02/15 04/06
UCS-4 with implementation level 3

or from the lists in C.5 and D.6.

If such an escape sequence appears within a CC-data-element conforming to ISO/IEC 2022, it shall consist only of the sequences of bit combinations as shown above.

If such an escape sequence appears within a CC-data-element conforming to ISO/IEC 10646, it shall be padded in accordance with clause 15.

16.3 Identification of subsets of graphic characters

When the control sequences of ISO/IEC 6429 are used, the identification of subsets (see clause 12) specified by ISO/IEC 10646 shall be by a control sequence IDENTIFY UNIVERSAL CHARACTER SUBSET (IUCS) as shown below.

CSI Ps... 02/00 06/13

Ps... means that there can be any number of selective parameters. The parameters are to be taken from the subset collection numbers as shown in annex A of ISO/IEC 10646. When there is more than one parameter, each parameter value is separated by an octet with value 03/11.

Parameter values are represented by digits where octet values 03/00 to 03/09 represent digits 0 to 9.

If such an escape sequence appears within a CC-data-element conforming to ISO/IEC 2022, it shall consist only of the sequences of bit combinations as shown above.

If such a control sequence appears within a CC-data-element conforming to ISO/IEC 10646, it shall be padded in accordance with clause 15.

16.4 Identification of control function set

When the escape sequences from ISO/IEC 2022 are used, the identification of each set of control functions (see clause 15) of ISO/IEC 6429 to be used in conjunction with ISO/IEC 10646 shall be an identifier sequence of the type shown below.

ESC 02/01 04/00	identifies the full C0 set of ISO/IEC 6429
ESC 02/02 04/03	identifies the full C1 set of ISO/IEC 6429

For a subset of C0 or C1 sets, the final octet F shall be obtained from the International Register of Coded Character Sets. The identifier sequences for these sets shall be:

ESC 02/01 F	identifies a C0 set
ESC 02/02 F	identifies a C1 set

If such an escape sequence appears within a CC-data-element conforming to ISO/IEC 2022, it shall consist only of the sequences of bit combinations as shown above.

If such an escape sequence appears within a CC-data-element conforming to ISO/IEC 10646, it shall be padded in accordance with clause 15.

16.5 Identification of the coding system of ISO/IEC 2022

When the escape sequences from ISO/IEC 2022 are used, the identification of a return, or transfer, from UCS to the coding system of ISO/IEC 2022 shall be by the escape sequence ESC 02/05 04/00. If such an escape sequence appears within a CC-data-element conforming to ISO/IEC 10646, it shall be padded in accordance with clause 15.

If such an escape sequence appears within a CC-data-element conforming to ISO/IEC 2022, it shall consist only of the sequence of bit combinations as shown above.

NOTE – Escape sequence ESC 02/05 04/00 is normally used for return to the restored state of ISO/IEC 2022. The escape sequence ESC 02/05 04/00 specified here is sometimes not exactly as specified in ISO/IEC 2022 due to the presence of padding octets. For this reason the escape sequences in 16.2 for the identification of UCS include the octet 02/15 to indicate that the return does not always conform to that standard.

17 Structure of the code tables and lists

The clause 33 sets out the detailed code tables and the lists of character names for the graphic characters. It specifies graphic characters, their coded representation, and the character name for each character.

The graphic symbols are to be regarded as typical visual representations of the characters. ISO/IEC 10646 does not attempt to prescribe the exact shape of each character. The shape is affected by the design of the font employed, which is outside the scope of ISO/IEC 10646.

Graphic characters specified in ISO/IEC 10646 are uniquely identified by their names. This does not imply that the graphic symbols by which they are commonly imaged are always different. Examples of graphic characters with similar graphic symbols are LATIN CAPITAL LETTER A, GREEK CAPITAL LETTER ALPHA and CYRILLIC CAPITAL LETTER A.

The meaning attributed to any character is not specified by ISO/IEC 10646; it may differ from country to country, or from one application to another.

For the alphabetic scripts, the general principle has been to arrange the characters within any row in approximate alphabetic sequence; where the script has capital and small letters, these are arranged in pairs. However, this general principle has been overridden in some cases. For example, for those scripts for which a relevant standard exists, the characters are allocated according to that standard. This arrangement within the code tables will aid conversion between the existing standards and this coded character set. In general, however, it is anticipated that conversion between this coded character set and any other coded character set will use a table lookup technique.

It is not intended, nor will it often be the case, that the characters needed by any one user will be found all grouped together in one part of the code table.

Furthermore, the user of any script will find that needed characters may have been coded elsewhere in this coded character set. This especially applies to the digits, to the symbols, and to the use of Latin letters in dual-script applications.

Therefore, in using this coded character set, the reader is advised to refer first to the block names list in annex A.2 or an overview of the Planes in figures 3 to 7, and then to turn to the specific code table rows for the relevant script and for symbols and digits. In addition, annex G contains an alphabetically sorted list of character names.

18 Block names

Named blocks of contiguous code positions are specified within a plane for the purpose of allocation of

characters sharing some common characteristic, such as script. The blocks specified within the BMP, SMP, SIP and SSP are listed in A.2 of annex A, and are illustrated in figures 3 to 7.

19 Characters in bi-directional context

A class of left/right handed pairs of characters has special significance in the context of bi-directional text. In this context the terms LEFT or RIGHT in the character name are also intended to imply “opening” or “closing” forms of character shape, rather than a strict left-hand or right-hand form. These characters are listed below.

Code Position	Name
0028	LEFT PARENTHESIS
0029	RIGHT PARENTHESIS
005B	LEFT SQUARE BRACKET
005D	RIGHT SQUARE BRACKET
007B	LEFT CURLY BRACKET
007D	RIGHT CURLY BRACKET
2045	LEFT SQUARE BRACKET WITH QUILL
2046	RIGHT SQUARE BRACKET WITH QUILL
207D	SUPERSCRIPT LEFT PARENTHESIS
207E	SUPERSCRIPT RIGHT PARENTHESIS
208D	SUBSCRIPT LEFT PARENTHESIS
208E	SUBSCRIPT RIGHT PARENTHESIS
2329	LEFT-POINTING ANGLE BRACKET
232A	RIGHT-POINTING ANGLE BRACKET
3008	LEFT ANGLE BRACKET
3009	RIGHT ANGLE BRACKET
300A	LEFT DOUBLE ANGLE BRACKET
300B	RIGHT DOUBLE ANGLE BRACKET
300C	LEFT CORNER BRACKET
300D	RIGHT CORNER BRACKET
300E	LEFT WHITE CORNER BRACKET
300F	RIGHT WHITE CORNER BRACKET
3010	LEFT BLACK LENTICULAR BRACKET
3011	RIGHT BLACK LENTICULAR BRACKET
3014	LEFT TORTOISE SHELL BRACKET
3015	RIGHT TORTOISE SHELL BRACKET
3016	LEFT WHITE LENTICULAR BRACKET
3017	RIGHT WHITE LENTICULAR BRACKET
3018	LEFT WHITE TORTOISE SHELL BRACKET
3019	RIGHT WHITE TORTOISE SHELL BRACKET
301A	LEFT WHITE SQUARE BRACKET
301B	RIGHT WHITE SQUARE BRACKET

The interpretation and rendering of any of these characters depend on the state related to the symmetric swapping characters (see F.2.2) and on the direction of the character being rendered that are in effect at the point in the CC-data-element where the coded representation of the character appears.

For example, if the character
ACTIVATE SYMMETRIC SWAPPING
occurs and if the direction of the character is from right to left, the character shall be interpreted as if the term LEFT or RIGHT in its name had been replaced by the term RIGHT or LEFT, respectively.

NOTE – In the context of Arabic bi-directional text, certain mathematical symbols may also have special significance (see annex E).

19.1 Directionality of bi-directional text

The Unicode Bidirectional Algorithm describes the algorithm used to determine the directionality for bidirectional text.

20 Special characters

There are some characters that do not have printable graphic symbols.

20.1 Space characters

The following characters are space characters. They are

Code Position	Name
0020	SPACE
00A0	NO-BREAK SPACE
2000	EN QUAD
2001	EM QUAD
2002	EN SPACE
2003	EM SPACE
2004	THREE-PER-EM SPACE
2005	FOUR-PER-EM SPACE
2006	SIX-PER-EM SPACE
2007	FIGURE SPACE
2008	PUNCTUATION SPACE
2009	THIN SPACE
200A	HAIR SPACE
3000	IDEOGRAPHIC SPACE

20.2 Currency symbols

Currency symbols in ISO/IEC 10646 do not necessarily identify the currency of a country. For example, YEN SIGN can be used for Japanese Yen and Chinese Yuan. Also, DOLLAR SIGN is used in numerous countries including the United States of America.

20.3 Alternate Format Characters

There is a special class of characters called Alternate Format Characters which are included for compatibility with some industry practices. They are:

00AD	SOFT HYPHEN
180E	MONGOLIAN VOWEL SEPARATOR
200B	ZERO WIDTH SPACE
200C	ZERO WIDTH NON-JOINER
200D	ZERO WIDTH JOINER
200E	LEFT-TO-RIGHT MARK
200F	RIGHT-TO-LEFT MARK
2028	LINE SEPARATOR
2029	PARAGRAPH SEPARATOR
202A	LEFT-TO-RIGHT EMBEDDING
202B	RIGHT-TO-LEFT EMBEDDING
202C	POP DIRECTIONAL FORMATTING
202D	LEFT-TO-RIGHT OVERRIDE

202E	RIGHT-TO-LEFT OVERRIDE
202F	NARROW NO-BREAK SPACE
206A	INHIBIT SYMMETRIC SWAPPING
206B	ACTIVATE SYMMETRIC SWAPPING
206C	INHIBIT ARABIC FORM SHAPING
206D	ACTIVATE ARABIC FORM SHAPING
206E	NATIONAL DIGIT SHAPES
206F	NOMINAL DIGIT SHAPES
2FF0	IDEOGRAPHIC DESCRIPTION CHARACTER LEFT TO RIGHT
2FF1	IDEOGRAPHIC DESCRIPTION CHARACTER ABOVE TO BELOW
2FF2	IDEOGRAPHIC DESCRIPTION CHARACTER LEFT TO MIDDLE AND RIGHT
2FF3	IDEOGRAPHIC DESCRIPTION CHARACTER ABOVE TO MIDDLE AND BELOW
2FF4	IDEOGRAPHIC DESCRIPTION CHARACTER FULL SURROUND
2FF5	IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM ABOVE
2FF6	IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM BELOW
2FF7	IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM LEFT
2FF8	IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM UPPER LEFT
2FF9	IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM UPPER RIGHT
2FFA	IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM LOWER LEFT
2FFB	IDEOGRAPHIC DESCRIPTION CHARACTER OVERLAID
3164	HANGUL FILLER
FEFF	ZERO WIDTH NO-BREAK SPACE
FFA0	HALFWIDTH HANGUL FILLER
FFF9	INTERLINEAR ANNOTATION ANCHOR
FFFA	INTERLINEAR ANNOTATION SEPARATOR
FFFB	INTERLINEAR ANNOTATION TERMINATOR

These characters are described in annex F.

20.4 Variation selectors

Variation selectors are combining characters following immediately a specific base character to indicate a specific variant form of graphic symbol for that character. Some variation selectors are specific to a script, such as the Mongolian free variation selectors, others are used with various other base characters such as the mathematical symbols. Variations selectors following other characters have no effect on the selection of the graphic symbol for that character.

No sequences using characters from VARIATION SELECTOR-2 to VARIATION SELECTOR-16 from the Basic Multilingual Plane and VARIATION SELECTOR-17 to VARIATION SELECTOR-256 from the Supplementary Special-purpose Plane are defined at this time.

The following table provides a description of the variant appearances corresponding to the use of appropriate variation selectors with all allowed base mathematical symbols.

NOTE 1 – The VARIATION SELECTOR-1 is the only variation selector used with mathematical symbols.

Sequence (UID notation)	Description of variant appearance
<2229, FE00>	INTERSECTION with serifs
<222A, FE00>	UNION with serifs
<2268, FE00>	LESS-THAN BUT NOT EQUAL TO with vertical stroke
<2269, FE00>	GREATER-THAN BUT NOT EQUAL TO with vertical stroke
<2272, FE00>	LESS-THAN OR EQUIVALENT TO following the slant of the lower leg
<2273, FE00>	GREATER-THAN OR EQUIVALENT TO following the slant of the lower leg
<228A, FE00>	SUBSET OF WITH NOT EQUAL TO with stroke through bottom members
<228B, FE00>	SUPERSET OF WITH NOT EQUAL TO with stroke through bottom members
<2293, FE00>	SQUARE CAP with serifs
<2294, FE00>	SQUARE CUP with serifs
<2295, FE00>	CIRCLED PLUS with white rim
<2297, FE00>	CIRCLED TIMES with white rim
<229C, FE00>	CIRCLED EQUALS equal sign touching the circle
<22DA, FE00>	LESS-THAN EQUAL TO OR GREATER-THAN with slanted equal
<22DB, FE00>	GREATER-THAN EQUAL TO OR LESS-THAN with slanted equal
<2A3C, FE00>	INTERIOR PRODUCT tall variant with narrow foot
<2A3D, FE00>	RIGHTHAND INTERIOR PRODUCT tall variant with narrow foot
<2A9D, FE00>	SIMILAR following the slant of the upper leg OR LESS-THAN
<2A9E, FE00>	SIMILAR following the slant of the upper leg OR GREATER-THAN
<2AAC, FE00>	SMALLER THAN OR EQUAL TO with slanted equal
<2AAD, FE00>	LARGER THAN OR EQUAL TO with slanted equal
<2ACB, FE00>	SUBSET OF ABOVE NOT EQUAL TO with stroke through bottom members
<2ACC, FE00>	SUPERSET OF ABOVE NOT EQUAL TO with stroke through bottom members

The following table provides a description of the variant appearances corresponding to the use of appropriate variation selectors with all allowed base Mongolian characters. Only some presentation forms of the base Mongolian characters used with the Mongolian free variation selectors produce variant appearances. These combinations are described in the following table.

NOTE 2 – The Mongolian characters have various presentation forms depending on their position in a CC-data element. These presentations forms are called isolate, initial, medial and final.

Sequence (UID notation)	**position**	**Description of variant appearance**
<1820, 180B>	isolate, medial, final	MONGOLIAN LETTER A second form
<1820, 180C>	medial	MONGOLIAN LETTER A third form
<1821, 180B>	initial, final	MONGOLIAN LETTER E second form
<1822, 180B>	medial	MONGOLIAN LETTER I second form
<1823, 180B>	medial, final	MONGOLIAN LETTER O second form
<1824, 180B>	medial	MONGOLIAN LETTER U second form
<1825, 180B>	medial, final	MONGOLIAN LETTER OE second form
<1825, 180C>	medial	MONGOLIAN LETTER OE third form
<1826, 180B>	isolate, medial, final	MONGOLIAN LETTER UE second form
<1826, 180C>	medial	MONGOLIAN LETTER UE third form
<1828, 180B>	initial, medial	MONGOLIAN LETTER NA second form
<1828, 180C>	medial	MONGOLIAN LETTER NA third form
<1828, 180D>	medial	MONGOLIAN LETTER NA separate form
<182A, 180B>	final	MONGOLIAN LETTER BA alternative form
<182C, 180B>	initial, medial	MONGOLIAN LETTER QA second form
<182C, 180B>	isolate	MONGOLIAN LETTER QA feminine second form
<182C, 180C>	medial	MONGOLIAN LETTER QA third form
<182C, 180D>	medial	MONGOLIAN LETTER QA fourth form
<182D, 180B>	initial, medial	MONGOLIAN LETTER GA second form
<182D, 180B>	final	MONGOLIAN LETTER GA feminine form
<182D, 180C>	medial	MONGOLIAN LETTER GA third form
<182D, 180D>	medial	MONGOLIAN LETTER GA feminine form
<1830, 180B>	final	MONGOLIAN LETTER SA second form
<1830, 180C>	final	MONGOLIAN LETTER SA third form
<1832, 180B>	medial	MONGOLIAN LETTER TA second form
<1833, 180B>	initial, medial, final	MONGOLIAN LETTER DA second form
<1835, 180B>	final	MONGOLIAN LETTER JA second form
<1836, 180B>	initial, medial	MONGOLIAN LETTER YA second form
<1836, 180C>	medial	MONGOLIAN LETTER YA third form
<1838, 180B>	final	MONGOLIAN LETTER WA second form
<1844, 180B>	medial	MONGOLIAN LETTER TODO E second form
<1845, 180B>	medial	MONGOLIAN LETTER TODO I second form
<1846, 180B>	medial	MONGOLIAN LETTER TODO O second form
<1847, 180B>	isolate, medial, final	MONGOLIAN LETTER TODO U second form
<1847, 180C>	medial	MONGOLIAN LETTER TODO U third form
<1848, 180B>	medial	MONGOLIAN LETTER TODO OE second form
<1849, 180B>	isolate, medial	MONGOLIAN LETTER TODO UE second form
<184D, 180B>	initial, medial	MONGOLIAN LETTER TODO QA feminine form
<184E, 180B>	medial	MONGOLIAN LETTER TODO GA second form
<185D, 180B>	medial, final	MONGOLIAN LETTER SIBE E second form
<185E, 180B>	medial, final	MONGOLIAN LETTER SIBE I second form
<185E, 180C>	medial, final	MONGOLIAN LETTER SIBE I third form

<1860, 180B>	medial, final	MONGOLIAN LETTER SIBE UE second form
<1863, 180B>	medial	MONGOLIAN LETTER SIBE KA second form
<1868, 180B>	initial, medial	MONGOLIAN LETTER SIBE TA second form
<1868, 180C>	medial	MONGOLIAN LETTER SIBE TA third form
<1869, 180B>	initial, medial	MONGOLIAN LETTER SIBE DA second form
<186F, 180B>	initial, medial	MONGOLIAN LETTER SIBE ZA second form
<1873, 180B>	medial, final	MONGOLIAN LETTER MANCHU I second form
<1873, 180C>	medial, final	MONGOLIAN LETTER MANCHU I third form
<1873, 180D>	medial	MONGOLIAN LETTER MANCHU I fourth form
<1874, 180B>	medial	MONGOLIAN LETTER MANCHU KA second form
<1874, 180B>	final	MONGOLIAN LETTER MANCHU KA feminine first form
<1874, 180C>	medial	MONGOLIAN LETTER MANCHU KA feminine first form
<1874, 180C>	final	MONGOLIAN LETTER MANCHU KA feminine second form
<1874, 180D>	medial	MONGOLIAN LETTER MANCHU KA feminine second form
<1876, 180B>	initial, medial	MONGOLIAN LETTER MANCHU FA second form
<1880, 180B>	all	MONGOLIAN LETTER ALI GALI ANUSVARA ONE second form
<1881, 180B>	all	MONGOLIAN LETTER ALI GALI VISARGA ONE second form
<1887, 180B>	isolate, final	MONGOLIAN LETTER ALI GALI A second form
<1887, 180C>	final	MONGOLIAN LETTER ALI GALI A third form
<1887, 180D>	final	MONGOLIAN LETTER ALI GALI A fourth form
<1888, 180B>	final	MONGOLIAN LETTER ALI GALI I second form
<188A, 180B>	initial, medial	MONGOLIAN LETTER ALI GALI NGA second form

NOTE 3 – The variation selector only selects a different *appearance* of an already encoded character. It is not intended as a general code extension mechanism. Only the sequences specifically defined in this annex are sanctioned for standard use; all other sequences are undefined. No sequences containing combining characters or composite characters will be defined.

NOTE 4 – The exhaustive list of standardized variants is also described as *StandardizedVariants.html* in the Unicode character database.

20.5 Format characters for musical symbols

The following characters are format characters used for the presentation of musical symbols.

1D159 MUSICAL SYMBOL NULL NOTEHEAD
1D173 MUSICAL SYMBOL BEGIN BEAM
1D174 MUSICAL SYMBOL END BEAM
1D175 MUSICAL SYMBOL BEGIN TIE
1D176 MUSICAL SYMBOL END TIE
1D177 MUSICAL SYMBOL BEGIN SLUR
1D178 MUSICAL SYMBOL END SLUR
1D179 MUSICAL SYMBOL BEGIN PHRASE
1D17A MUSICAL SYMBOL END PHRASE

These characters are further described in Annex U.

20.6 Tag characters

The functionality of the TAGS characters, part of the TAGS block within the Supplementary Special-purpose Plane (SSP), is not specified by this international standard.

NOTE - However the intended use of these characters is described in annex T.

21 Presentation forms of characters

Each presentation form of a character provides an alternative form, for use in a particular context, to the nominal form of the character or sequence of characters from the other zones of graphic characters. The transformation from the nominal form to the presentation forms may involve substitution, superimposition, or combination.

The rules for the superimposition, choice of differently shaped characters, or combination into ligatures, or conjuncts, which are often of extreme complexity, are not specified in ISO/IEC 10646.

In general, presentation forms are not intended to be used as a substitute for the nominal forms of the graphic characters specified elsewhere within this coded character set. However, specific applications may encode these presentation forms instead of the nominal forms for specific reasons among which is compatibility with existing devices. The rules for searching, sorting, and other processing operations on presentation forms are outside the scope of ISO/IEC 10646.

Within the BMP these characters are mostly allocated to positions in rows FB to FF.

22 Compatibility characters

Compatibility characters are included in ISO/IEC 10646 primarily for compatibility with existing coded character sets to allow two-way code conversion without loss of information.

Within the BMP many of these characters are allocated to positions within rows F9, FA, FE, and FF, and within rows 31 and 33. Some compatibility characters are also allocated within other rows.

Within the Supplementary Ideographic Plane (SIP) these characters are allocated to positions within rows F8 to FA.

The CJK compatibility ideographs (characters part of the CJK COMPATIBILITY IDEOGRAPHS-2001 collection) are ideographs that should have been unified with one of the CJK unified ideographs (characters part of the CJK UNIFIED IDEOGRAPHS-2001 collection), per the unification rule described in Annex S of this International Standard.

However, they are included in this International Standard as separate characters, because, based on various national, cultural, or historical reason for some specific country and region, some national and regional standards assign separate code positions for them.

NOTE – For this reason, compatibility ideographs should only be used for maintaining and guaranteeing a round trip conversion with the specific national, regional, or other standard. Other usage is strongly discouraged.

23 Order of characters

Usually, coded characters appear in a CC-data-element in logical order (logical or backing store order corresponds approximately to the order in which characters are entered from the keyboard, after corrections such as insertions, deletions, and overtyping have taken place). This applies even when characters of different dominant direction are mixed: left-to-right (Greek, Latin, Thai) with right-to-left (Arabic, Hebrew), or with vertical (Mongolian) script.

Some characters may not appear linearly in final rendered text. For example, the medial form of DEVANAGARI VOWEL SIGN I is displayed before the character that it logically follows in the CC-data-element.

24 Normalization forms

Normalization forms are the mechanisms allowing the selection of a unique coded representation among alternative, but equivalent coded text representations of the same text. Normalization forms for use with ISO/IEC 10646 are specified in the Unicode Standard UAX#15.

NOTE 1 – By definition, the result of applying any of these normalization forms is stable over time. It means that a normalized representation of text remains normalized even when the standard is amended.

NOTE 2 – Some normalizations forms favor composite sequences over shorter representations of text, others favor the shorter representations. The backward compatibility requirement is provided by establishing ISO/IEC 10646-1:2000 (2nd Edition) and ISO/IEC 10646-2:2001 (1st Edition) as the reference versions for the definition of the shorter representation of text.

25 Combining characters

This clause specifies the use of combining characters. A list of combining characters is shown in clause B.1. A list of combining characters not allowed in implementation level 2 is shown in clause B.2.

NOTE - The names of many script-independent combining characters contain the word “COMBINING”.

25.1 Order of combining characters

Coded representations of combining characters shall follow that of the graphic character with which they are associated (for example, coded representations of LATIN SMALL LETTER A followed by COMBINING TILDE represent a composite sequence for Latin “ã”).
If a combining character is to be regarded as a composite sequence in its own right, it shall be coded as a composite sequence by association with the character SPACE. For example, grave accent can be composed as SPACE followed by COMBINING GRAVE ACCENT.

NOTE – Indic matras form a special category of combining characters, since the presentation can depend on more than one of the surrounding characters. Thus it might not be desirable to associate Indic matra with the character SPACE.

25.2 Appearance in code tables

Combining characters intended to be positioned relative to the associated character are depicted within the character code tables above, below, to the right of, to the left of, in, around, or through a dotted circle. In presentation, these characters are intended to be positioned relative to the preceding base character in some manner, and not to stand alone or function as base characters. This is the motivation for the term “combining”. Diacritics are the principal class of combining characters used in European alphabets.

In the code tables for some scripts, such as Hebrew, Arabic, and the scripts of India and South East Asia, combining characters are indicated in relation to dotted circles to show their position relative to the base character. Many of these combining characters encode vowel letters; as such they are not generally referred to as “diacritical marks”.

25.3 Alternate coded representations

Alternate coded representations of text are generated by using multiple combining characters in different orders, or using various equivalent combinations of characters and composite sequences. These alternate coded representations result in multiple representation of the same text. Normalizing these coded representations creates a unique representation.

NOTE – For example, in implementation level 3 the French word “là” may be represented by the characters LATIN SMALL LETTER L followed by LATIN SMALL LETTER A WITH GRAVE, or may be represented by the characters LATIN SMALL LETTER L followed by LATIN SMALL LETTER A followed by COMBINING GRAVE ACCENT. When the normalizations forms are applied on those alternate coded representations, only one representation remains. The form of the remaining representation depends on the normalization form used.

25.4 Multiple combining characters

There are instances where more than one combining character is applied to a single graphic character. ISO/IEC 10646 does not restrict the number of combining characters that can follow a base character. The following rules shall apply:

a. If the combining characters can interact in presentation (for example, COMBINING MACRON and COMBINING DIAERESIS), then the position of the combining characters in the resulting graphic display is determined by the order of the coded representation of the combining characters. The presentations of combining characters are to be positioned from the base character outward. For example, combining characters placed above a base character are stacked vertically, starting with the first encountered in the sequence of coded representations and continuing for as many marks above as are required by the coded combining characters following the coded base character. For combining characters placed below a base character, the situation is inverted, with the combining characters starting from the base character and stacking downward.

   An example of multiple combining characters above the base character is found in Thai, where a consonant letter can have above it one of the vowels 0000 0E34 to 0000 0E37 and, above that, one of four tone marks 0000 0E48 to 0000 0E4B. The order of the coded representation is: base consonant, followed by a vowel, followed by a tone mark.

b. Some specific combining characters override the default stacking behavior by being positioned horizontally rather than stacking, or by forming a ligature with an adjacent combining character. When positioned horizontally, the order of coded representations is reflected by positioning in the dominant order of the script with which they are used. For example, horizontal accents in a left-to-right script are coded left-to-right.

   Prominent characters that show such override behavior are associated with specific scripts or alphabets. For example, the COMBINING GREEK KORONIS (0000 0343) requires that, together with a following acute or grave accent, they be rendered side-by-side above a letter, rather than the accent marks being stacked above the COMBINING GREEK KORONIS. The order of the coded representations is: the letter itself, followed by that of the breathing mark, followed by that of the accent marks. Two Vietnamese tone marks which have the same graphic appearance as the Latin acute and grave accent marks do not stack above the three Vietnamese vowel letters which already contain the circumflex diacritic (â, ê, ô). Instead, they form ligatures with the circumflex component of the vowel letters.

c. If the combining characters do not interact in presentation (for example, when one combining character is above a graphic character and another is below), the resultant graphic symbol from the base character and combining characters in different orders may appear the same. For example, the coded representations of LATIN SMALL LETTER A, followed by COMBINING CARON, followed by COMBINING OGONEK may result in the same graphic symbol as the coded representations of LATIN SMALL LETTER A, followed by COMBINING OGONEK, followed by COMBINING CARON.

   Combining characters in Hebrew or Arabic scripts do not normally interact. Therefore, the sequence of their coded representations in a composite sequence does not affect its graphic symbol. The rules for forming the combined graphic symbol are beyond the scope of ISO/IEC 10646.

25.5 Collections containing combining characters

In some collections of characters listed in annex A, such as collections 14 (BASIC ARABIC) or 25 (THAI), both combining characters and non-combining characters are included.

When implementation level 1 or 2 is adopted, a CC-data-element shall not contain the coded representations of combining characters listed in annex B, even though the adopted subset may include them.

Other collections of characters listed in annex A comprise only combining characters, for example collection 7 (COMBINING DIACRITICAL MARKS). Such a collection shall not be included in the adopted subset when implementation level 1 is adopted.

26 Special features of individual scripts

26.1 Hangul syllable composition method

In rendering, a sequence of Hangul Jamo (from HANGUL JAMO block: 1100 to 11FF) are displayed as a series of syllable blocks. Jamo can be classified into three classes: Choseong (syllable-initial character), Jungseong (syllable-peak character), and Jongseong (syllable-final character). A complete syllable block is composed of a Choseong and a Jungseong, and optionally a Jongseong.

An incomplete syllable is a string of one or more characters which does not constitute a complete syllable (for example, a Choseong alone, a Jungseong alone, a Jongseong alone, or a Jungseong followed by a Jongseong). An incomplete syllable which starts with a Jungseong or a Jongseong shall be preceded by a CHOSEONG FILLER (0000 115F). An incomplete syllable composed of a Choseong alone shall be followed by a JUNGSEONG FILLER (0000 1160).

The implementation level 3 shall be used for the Hangul syllable composition method.

NOTE 1 – Hangul Jamo are not combining characters.

NOTE 2 – When a combining character such as HANGUL SINGLE DOT TONE MARK (0000 302E) is intended to apply to a sequence of Hangul Jamo it should be placed at the end of the sequence, after the Hangul Jamo character which completes the syllable block.

26.2 Features of Indic alphabetic scripts

In the tables for Rows 09 to 0D and 0F, and for the MYANMAR block in Row 10, of the BMP (see clause 33) the graphic symbols shown for some characters appear to be formed as compounds of the graphic symbols for two other characters in the same table.

Examples:

Row 0B Tamil.

> The graphic symbol for 0B94 TAMIL LETTER AU appears as if it is constructed from the graphic symbols for:
> 0B93 TAMIL LETTER OO and 0BD7 TAMIL AU LENGTH MARK

Row 0D Malayalam.

> The graphic symbol for 0D4A MALAYALAM VOWEL SIGN O appears as if it is constructed from the graphic symbols for:
> 0D46 MALAYALAM VOWEL SIGN E and 0D3E MALAYALAM VOWEL SIGN AA

In such cases a single coded character may appear to the user to be equivalent to the sequence of two coded characters whose graphic symbols, when combined, are visually similar to the graphic symbol of that single character, as in a composite sequence (4.14).

A “unique-spelling” rule is defined as follows. According to this rule, no coded character from a table for Rows 09 to 0D or 0F, or for the MYANMAR block in Row 10, shall be regarded as equivalent to a sequence of two or more other coded characters taken from the same table.

This “unique-spelling” rule shall apply in Levels 1 and 2.

NOTE – In Levels 1 and 2, if such a sequence occurs in a CC-data-element it is always made available to the user as two distinct characters in accordance with their respective character names.

27 Source references for CJK Ideographs

A CJK Ideograph is always referenced by at least one source reference. These sources references are provided in a machine-readable format that is accessible as links to this document. The content pointed by these links is also normative.

NOTE – The referenced files are only available to users who obtain their copy of the standard in a machine-readable format. However, the file format makes them printable.

27.1 Source references for CJK Unified Ideographs

The procedures that were used to derive the unified ideographs from the source character set standards, and the rules for their arrangement in the code tables on the following pages, are described in annex S.

NOTE 1 – The source separation rule described by the clause S.1.6 of that annex only apply to CJK Unified Ideographs within the BMP.

The following list identifies all sources referenced by the CJK Unified Ideographs in both Plane 0 (BMP) and Plane 2 (SIP). The set of CJK Unified Ideographs is represented by the collection CJK UNIFIED IDEOGRAPHS-2001 (See annex A.1).

The Hanzi G sources are

G0	GB2312-80
G1	GB12345-90 with 58 Hong Kong and 92 Korean “Idu” characters
G3	GB7589-87 unsimplified forms
G5	GB7590-87 unsimplified forms
G7	General Purpose Hanzi List for Modern Chinese Language, and General List of Simplified Hanzi
GS	Singapore Characters
G8	GB8565-88
GE	GB16500-95
G_KX	Kangxi Dictionary ideographs（康熙字典） including the addendum（康熙字典）補遺.

G_HZ Han Yu Da Zi Dian ideographs （漢語大字典）.

G_CY Ci Yuan （辭源）

G_CH Ci Hai （辞海）

G_HC Hanyu Da Cidian （漢語大詞典）

G_BK Chinese Encyclopedia （中國大百科全書）

G_FZ Founder Press System （方正排版系统）

G_4K Siku Quanshu （四庫全書）

The Hanzi H source is

H Hong Kong Supplementary Character Set

Hanzi T sources are

T1 TCA-CNS 11643-1992 1st plane

T2 TCA-CNS 11643-1992 2nd plane

T3 TCA-CNS 11643-1992 3rd plane with some additional characters

T4 TCA-CNS 11643-1992 4th plane

T5 TCA-CNS 11643-1992 5th plane

T6 TCA-CNS 11643-1992 6th plane

T7 TCA-CNS 11643-1992 7th plane

TF TCA-CNS 11643-1992 15th plane

Kanji J sources are

J0 JIS X 0208-1990

J1 JIS X 0212-1990

J3 JIS X 0213:2000 level-3

J4 JIS X 0213:2000 level-4

JA Unified Japanese IT Vendors Contemporary Ideographs, 1993

Hanja K sources are

K0 KS C 5601-1987

K1 KS C 5657-1991

K2 PKS C 5700-1 1994

K3 PKS C 5700-2 1994

K4 PKS 5700-3:1998

Hanja KP sources are

KP0 KPS 9566-97

KP1 KPS 10721-2000

ChuNom V sources are

V0 TCVN 5773:1993

V1 TCVN 6056:1995

V2 VHN 01:1998

V3 VHN 02: 1998

The content linked to is a plain text file, using ISO/IEC 646-IRV characters with LINE FEED as end of line mark, that specifies, after a 11-line header, as many lines as CJK Unified Ideographs in the sum of the two blocks; each containing the following information organized in fixed width fields:

- 01-05 octet: Plane 0 or Plane 2 code position `(0hhhh)`, `(2hhhh)`
- 06-12 octet: Hanzi G sources `(G0-hhhh)`, `(G1-hhhh)`, `(G3-hhhh)`, `(G5-hhhh)`, `(G7-hhhh)`, `(GS-hhhh)`, `(G8-hhhh)`, `(GE-hhhh)`, `(G_KX  )`, `(G_HZ  )`, `(G_CY  )`, `(G_CH  )`, `(G_HC  )`, `(G_BK  )`, `(G_FZ  )` or `(G_4K  )`.
- 13-19 octet: Hanzi T sources `(T1-hhhh)`, `(T2-hhhh)`, `(T3-hhhh)`, `(T4-hhhh)`, `(T5-hhhh)`, `(T6-hhhh)`, `(T7-hhhh)` or `(TF-hhhh)`.
- 20-26 octet: Kanji J sources `(J0-hhhh)`, `(J1-hhhh)`, `(J3-hhhh)`, `(J4-hhhh)` or `(JA-hhhh)`.
- 27-33 octet: Hanja K source `(K0-hhhh)`, `(K1-hhhh)`, `(K2-hhhh)`, `(K3-hhhh)` or `(K4-dddd)`.
- 34-40 octet: ChuNom V sources `(V0-hhhh)`, `(V1-hhhh)`, `(V2-hhhh)` or `(V3-hhhh)`.
- 41-47 octet: Hanzi H source `(H-hhhh )`.
- 48-55 octet: Hanja KP sources `(KP0-hhhh)` or `(KP1-hhhh)`.

The format definition uses `'d'` as a decimal unit and `'h'` as a hexadecimal unit. Uppercase characters and all other symbols between parentheses including the space character appear as shown.

Click on this highlighted text to access the reference file.

NOTE 2 – The content is also available as a separate viewable file in the same file directory as this document. The file is named: “CJKUA_SR.txt”.

27.2 Source reference presentation for BMP CJK Unified Ideographs

In the BMP code tables, entries for both CJK Unified Ideographs and its Extension A are arranged as follows.

Row/Cell Hex code	C G- Hanzi	-T	J Kanji	K Hanja	V ChuNom
078/000	———	———	———	———	———
4E00	0-523B 0-5027	1-4421 1-3601	0-306C 0-1676	0-6C69 0-7673	1-2121 1-0101

NOTE - Under each ideograph the two lines of numbers indicate the source code positions; the first line shows hexadecimal values, the second line shows decimal values.

The leftmost column of an entry shows the code position in ISO/IEC 10646, giving the code representation both in decimal and in hexadecimal notation.

Each of the other columns shows the graphic symbol for the character, and its coded representation, as specified in a source standard for character sets that is also identified in the table entry. Each of these source standards is assigned to one of five groups indicated by G, T, J, K, or V as shown in the lists below. In each table entry, a separate column is assigned for the corresponding character (if any) from each of those groups of source standards.

An entry in any of the G, T, J, K, or V columns includes a sample graphic symbol from the source character set standard, together with its coded representation in that standard. The first line below the graphic symbol shows the coded representation in hexadecimal notation. The second line shows the coded representation in decimal notation which comprises two digits for section number followed by two digits for position number. Each of the coded representations is prefixed by a one-character source identification followed by a hyphen. This source character identifies the coded character set standard from which the character is taken as shown in the lists above.

27.3 Source references for CJK Compatibility Ideographs

The following list identifies all sources referenced by the CJK Compatibility Ideographs in both Plane 0 (BMP) and Plane 2 (SIP). The set of CJK Compatibility Ideographs is represented by the collection CJK COMPATIBILITY IDEOGRAPHS-2003 (See annex A.1).

The Hanzi H source is:

H Hong Kong Supplementary Character Set

Hanzi T sources are

T3 TCA-CNS 11643-1992 3rd plane
T4 TCA-CNS 11643-1992 4th plane
T5 TCA-CNS 11643-1992 5th plane
T6 TCA-CNS 11643-1992 6th plane
T7 TCA-CNS 11643-1992 7th plane
TF TCA-CNS 11643-1992 15th plane

Kanji J sources are:

J3 JIS X 213:2000 level-3
J4 JIS X 213:2000 level-4

The Hanja K source is:

K0 KS C 5601-1987

The Hanja KP source is:

KP1 KPS 10721-2000

The Unicode U source is:

U0 The Unicode Standard 3.0-2000

The content linked to is a plain text file, using ISO/IEC 646-IRV characters with LINE FEED as end of line mark, that specifies, after a 11-line header, as many lines as CJK Compatibility Ideographs; each containing the following information organized in fixed width fields:

- 01-06 octet: Plane 0 or Plane 2 code position (`0hhhh`) or (`2hhhh`).
- 07-12 octet: Corresponding CJK Unified Ideograph (`0hhhh`) or (`2hhhh`).
- 13-20 octet: Hanzi T sources (`T3-hhhh`), (`T4-hhhh`), (`T5-hhhh`), (`T6-hhhh`), (`T7-hhhh`), or (`TF-hhhh`).
- 21-27 octet: Hanzi H sources (`H-hhhh`).
- 28-35 octet: Kanji J sources (`J3-hhhh`), (`J4-hhhh`).
- 36-43 octet: Hanja K sources (`K0-hhhh`).
- 44-51 octet: Unicode U sources (`U0-hhhh`)
- 52-59 octet: Hanja KP sources (`KP1-hhhh`)

The format definition uses ‘h’ as a hexadecimal unit. Uppercase characters and all other symbols including the space character between parentheses appear as shown.

Click on this highlighted text to access the reference file.

NOTE – The content is also available as a separate viewable file in the same file directory as this document. The file is named: “CJKC0SR.txt”.

28 Character names and annotations

28.1 General

Guidelines to be used for constructing names of characters are given in annex L for information. In some cases, a name of a character is followed by additional explanatory statements not part of the name. These statements are in parentheses and not in capital letters except for the initials of the word, where required.

28.2 Character names for CJK Ideographs

For CJK Ideographs the names are algorithmically constructed by appending their coded representation in hexadecimal notation to “CJK UNIFIED

IDEOGRAPH-" for CJK Unified Ideographs and "CJK COMPATIBILITY IDEOGRAPH-" for CJK Compatibility Ideographs.

For CJK Ideographs within the BMP, the coded representation is their two-octet value. For example, the first CJK Ideograph character in the BMP has the name "CJK UNIFIED IDEOGRAPH-3400".

For CJK Ideographs within the SIP, the coded representation is their five-digit value. For example, the first CJK Ideograph character in the SIP has the name "CJK UNIFIED IDEOGRAPH-20000".

28.3 Character names and annotations for Hangul syllables

Names for the Hangul syllable characters in code positions 0000 AC00 - 0000 D7A3 are derived from their code position numbers by the numerical procedure described below. Lists of names for these characters are not provided opposite the code tables.

1. Obtain the code position number of the Hangul syllable character. It is of the form $0000\ h_1h_2h_3h_4$ where h_1, h_2, h_3, and h_4 are hexadecimal digits; h_1h_2 is the Row number within the BMP and h_3h_4 is the cell number within the row. The number $h_1h_2h_3h_4$ lies within the range AC00 to D7A3.

2. Derive the decimal numbers d_1, d_2, d_3, d_4 that are numerically equal to the hexadecimal digits h_1, h_2, h_3, h_4 respectively.

3. Calculate the character index C from the formula:

$$C = 4096 \times (d_1 - 10) + 256 \times (d_2 - 12) + 16 \times d_3 + d_4$$

NOTE: – If $C < 0$ or > 11,171 then the character is not in the HANGUL SYLLABLES block.

4. Calculate the syllable component indices I, P, F from the following formulae:

$I = C / 588$ (Note: $0 \le I \le 18$)

$P = (C \% 588) / 28$ (Note: $0 \le P \le 20$)

$F = C \% 28$ (Note: $0 \le F \le 27$)

where "/" indicates integer division (i.e. x / y is the integer quotient of the division), and "%" indicates the modulo operation (i.e. $x \% y$ is the remainder after the integer division x / y).

5. Obtain the Latin character strings that correspond to the three indices I, P, F from columns 2, 3, and 4 respectively of table 1 below (for $I = 11$ and for $F = 0$ the corresponding strings are null). Concatenate these three strings in left-to-right order to make a single string, the syllable-name.

6. The character name for the character at position $0000\ h_1h_2h_3h_4$ is then:

HANGUL SYLLABLE *s-n*

where "*s-n*" indicates the syllable-name string derived in step 5.

Example.
For the character in code position D4DE:
$d_1 = 13$, $d_2 = 4$, $d_3 = 13$, $d_4 = 14$.
$C = 10462$
$I = 17$, $P = 16$, $F = 18$.
The corresponding Latin character strings are:
P , WI, BS.
The syllable-name is PWIBS, and the character name is:
HANGUL SYLLABLE PWIBS

For convenience a list of the syllable-names is provided in annex R.

For each Hangul syllable character a short annotation is defined. This annotation consists of an alternative transliteration of the Hangul syllable into Latin characters.

Annotations for the Hangul syllable characters in code positions 0000 AC00 - 0000 D7A3 are also derived from their code position numbers by a similar numerical procedure described below.

7. Carry out steps 1 to 4 as described above.

8. Obtain the Latin character strings that correspond to the three indices I, P, F from columns 5, 6, and 7 respectively of Table 1 below (for $I = 11$ and for $F = 0$ the corresponding strings are null). Concatenate these three strings in left-to-right order to make a single string, and enclose it within parentheses to form the annotation.

Example.
For the character in code position D4DE:
$d_1 = 13$, $d_2 = 4$, $d_3 = 13$, $d_4 = 14$.
$C = 10462$
$I = 17$, $P = 16$, $F = 18$.
The corresponding Latin character strings are:
ph, wi, ps,
and the annotation is (phwips).

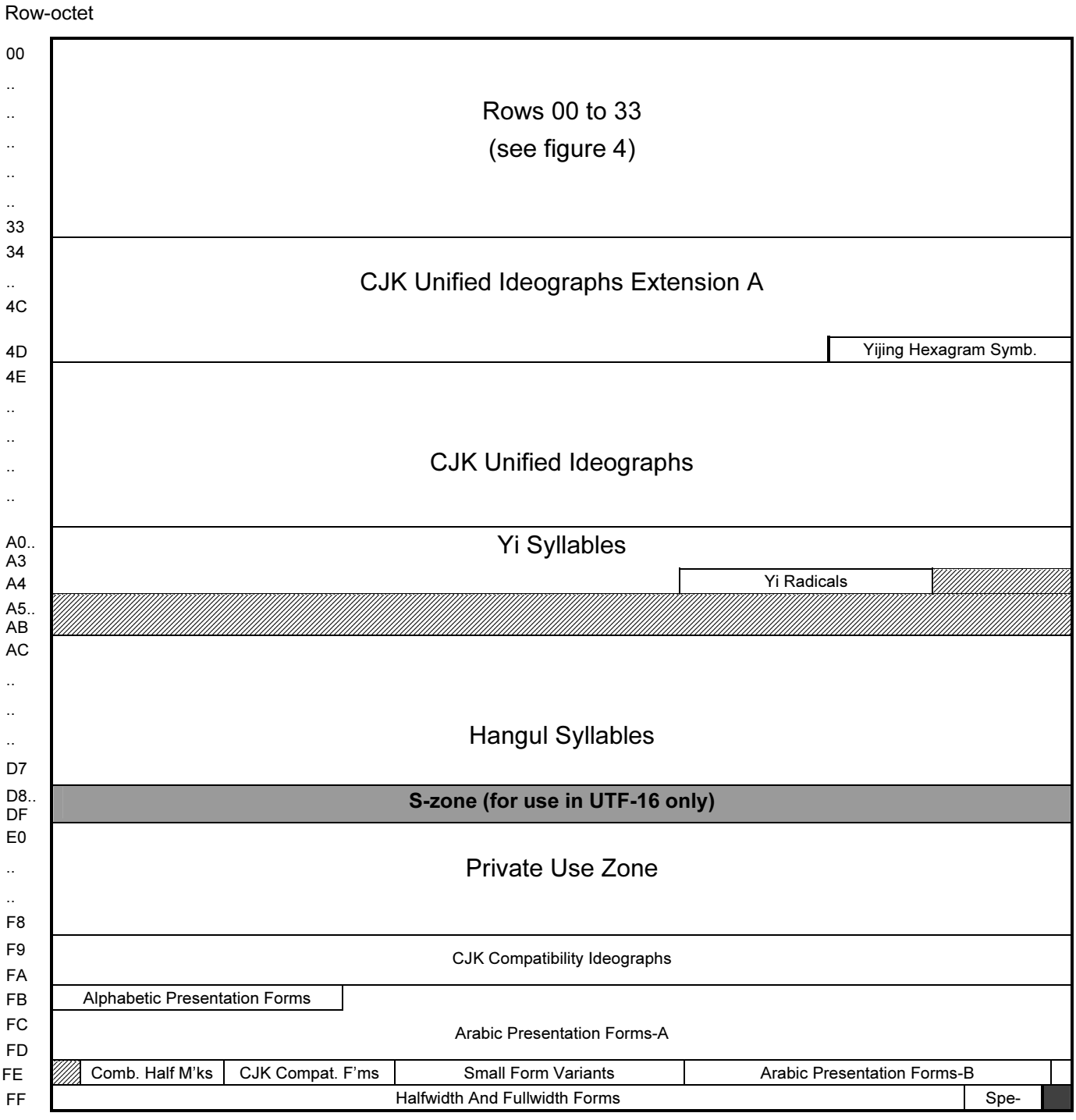
Table 1: Elements of Hangul syllable names and annotations

Index number	Syllable name elements			Annotation elements		
	I string	*P* string	*F* string	*I* string	*P* string	*F* string
0	G	A		k	a	
1	GG	AE	G	kk	ae	k
2	N	YA	GG	n	ya	kk
3	D	YAE	GS	t	yae	ks
4	DD	EO	N	tt	eo	n
5	R	E	NJ	r	e	nc
6	M	YEO	NH	m	yeo	nh
7	B	YE	D	p	ye	t
8	BB	O	L	pp	o	l
9	S	WA	LG	s	wa	lk
10	SS	WAE	LM	ss	wae	lm
11		OE	LB		oe	lp
12	J	YO	LS	c	yo	ls
13	JJ	U	LT	cc	u	lth
14	C	WEO	LP	ch	weo	lph
15	K	WE	LH	kh	we	lh
16	T	WI	M	th	wi	m
17	P	YU	B	ph	yu	p
18	H	EU	BS	h	eu	ps
19		YI	S		yi	s
20		I	SS		i	ss
21			NG			ng
22			J			c
23			C			ch
24			K			kh
25			T			th
26			P			ph
27			H			h

29 Structure of the Basic Multilingual Plane

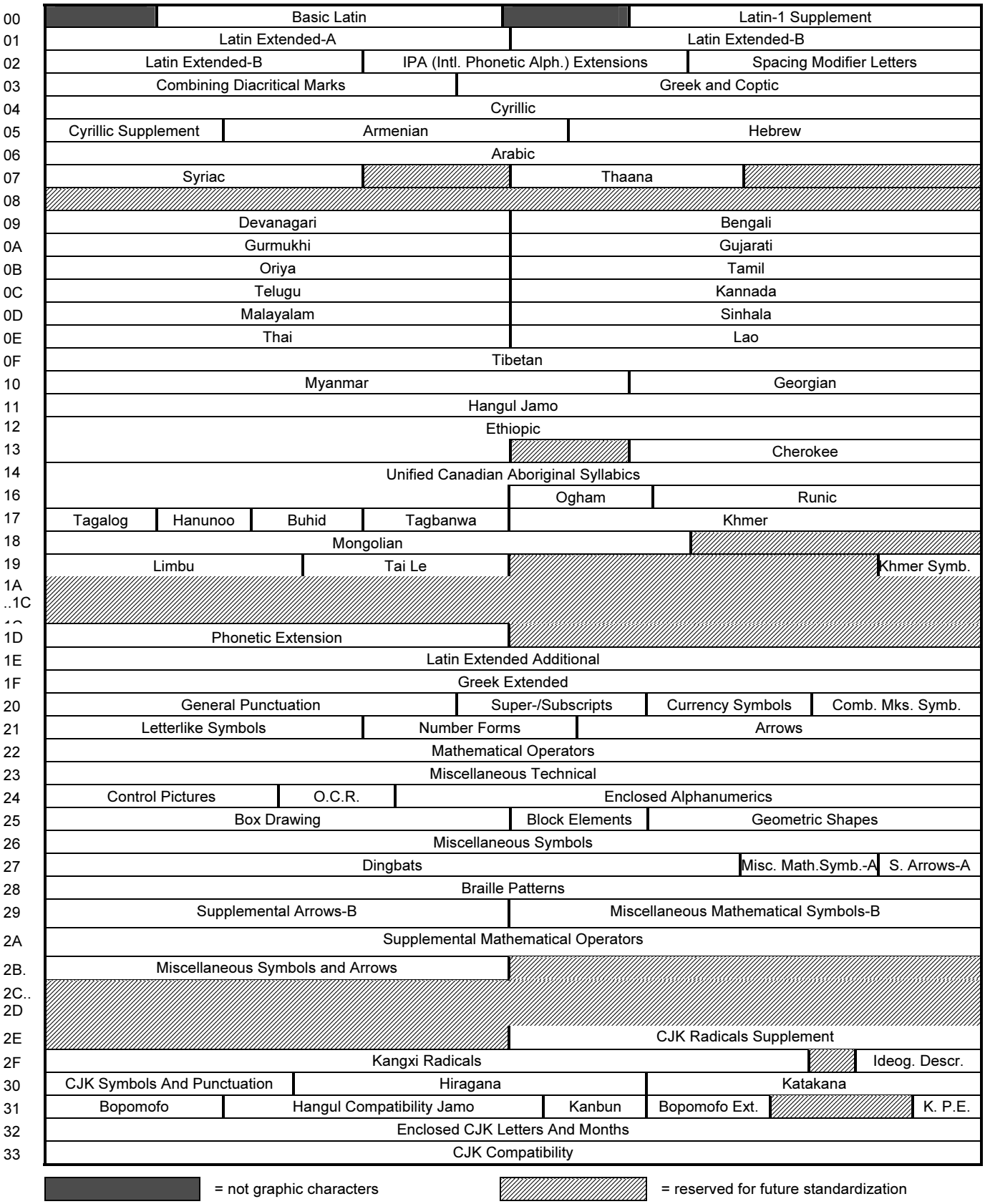
An overview of the Basic Multilingual Plane is shown in figure 3 and a more detailed overview of Rows 00 to 33 is shown in figure 4.

The Basic Multilingual Plane includes characters in general use in alphabetic, syllabic, and ideographic scripts together with various symbols and digits.



NOTE - Vertical boundaries within rows are indicated in approximate positions only.

Figure 3 - Overview of the Basic Multilingual Plane



NOTE - Vertical boundaries within rows are indicated in approximate positions only.

Figure 4 - Overview of Rows 00 to 33 of the Basic Multilingual Plane

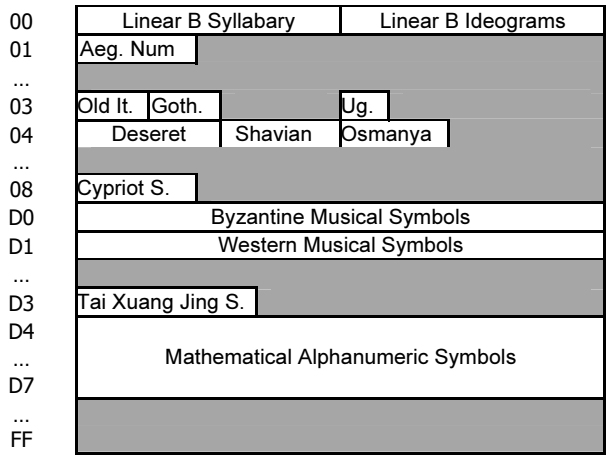
30 Structure of the Supplementary Multilingual Plane for Scripts and symbols

Because another supplementary plane is reserved for additional CJK Ideographs, the SMP is not used to encode any CJK Ideographs. The SMP is scheduled to contain coded graphic characters used in other scripts of the world that are not encoded or not already scheduled for encoding in the BMP. Most, but not all, of the scripts encoded or scheduled for encoding in the SMP are not in use as living scripts by modern user communities.

NOTE - The following subdivision of the SMP has been proposed:
- Alphabetic scripts,
- Hieroglyphic, ideographic and syllabaries,
- Non CJK ideographic scripts,
- Newly invented scripts,
- Symbol sets.

An overview of the Secondary Multilingual Plane for scripts and symbols is shown in figure 5.

Row-octet



= reserved for future standardization

NOTE - Vertical boundaries within rows are indicated in approximate positions only.

Figure 5 – Overview of the Secondary Multilingual Plane for scripts and symbols

NOTE - The Old Italic block represents a unified script that covers the Etruscan, Oscan, Umbrian, Faliscan, North Picene, and South Picene alphabets. Some of these alphabets can be written with characters oriented in either left-to-right or right-to-left direction. The glyphs in the code table are shown with left to right orientation.

31 Structure of the Supplementary Ideographic Plane

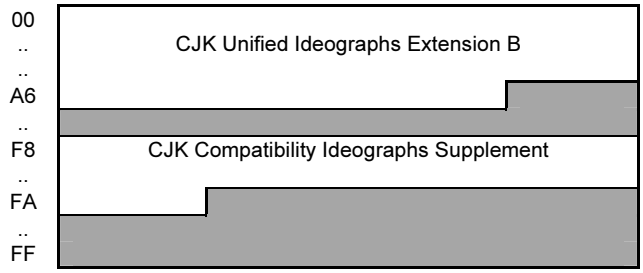
The Plane 02 of Group 00 is the Supplementary Ideographic Plane (SIP).

The SIP is used for CJK unified ideographs (unified East Asian ideographs) that are not encoded in the BMP. The procedure for the unification and arrangement of the SIP CJK unified Ideographs is described in clause 27.1.

The SIP is also used for compatibility CJK ideographs. These ideographs are compatibility characters as specified in clause 4.13 of ISO/IEC 10646-1.

The following figure 6 shows an overview of the Supplementary Ideographic Plane.

Row-octet



= reserved for future standardization

NOTE - Vertical boundaries within rows are indicated in approximate positions only.

Figure 6 – Overview of the Supplementary Ideographic Plane

32 Supplementary Special-purpose Plane

The Plane 0E of Group 0 is the Supplementary Special-purpose Plane (SSP).

The SSP is used for special purpose use graphic characters. Code positions from E0000 to E0FFF are reserved for Alternate Format Characters (see 20).

NOTE - Some of these characters do not have a visual representation and do not have printable graphic symbols. The Tag Characters are example of such characters.

An overview of the Supplementary Special-purpose Plane is shown in figure 7.

NOTE - Unassigned code points in this range should be ignored in normal processing and display.

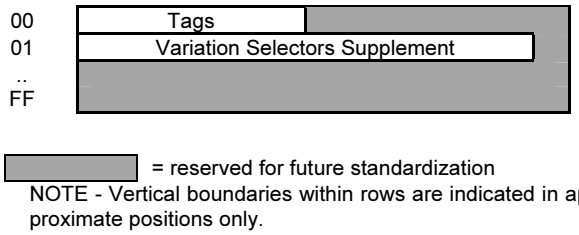


Figure 7 – Overview of the Special Purpose Plane

33 Code tables and lists of character names

Detailed code tables and lists of character names for the BMP, SMP, SIP and SSP are shown on the following pages.

[Charts]

Tables of character graphic symbols for all Planes
will appear on this and following pages in the Final Text.
(total xxx pages numbered aaa to bbb)

[Charts]

Tables of character graphic symbols for all Planes
will appear on this and following pages in the Final Text.
(total xxx pages numbered aaa to bbb)

Annex A
(normative)

Collections of graphic characters for subsets

A.1 Collections of coded graphic characters

The collections listed below are ordered by collection number. An * in the "positions" column indicates that the collection is a fixed collection.

Collection number and name		Positions
1	BASIC LATIN	0020 - 007E *
2	LATIN-1 SUPPLEMENT	00A0 - 00FF *
3	LATIN EXTENDED-A	0100 - 017F *
4	LATIN EXTENDED-B	0180 - 024F
5	IPA EXTENSIONS	0250 - 02AF
6	SPACING MODIFIER LETTERS	02B0 - 02FF *
7	COMBINING DIACRITICAL MARKS	0300 - 036F
8	BASIC GREEK	0370 - 03CF
9	GREEK SYMBOLS AND COPTIC	03D0 - 03FF
10	CYRILLIC	0400 - 04FF
11	ARMENIAN	0530 - 058F
12	BASIC HEBREW	05D0 - 05EA *
13	HEBREW EXTENDED	0590 - 05CF 05EB - 05FF
14	BASIC ARABIC	0600 - 065F
15	ARABIC EXTENDED	0660 - 06FF *
16	DEVANAGARI	0900 - 097F 200C, 200D
17	BENGALI	0980 - 09FF 200C, 200D
18	GURMUKHI	0A00 - 0A7F 200C, 200D
19	GUJARATI	0A80 - 0AFF 200C, 200D
20	ORIYA	0B00 - 0B7F 200C, 200D
21	TAMIL	0B80 - 0BFF 200C, 200D
22	TELUGU	0C00 - 0C7F 200C, 200D
23	KANNADA	0C80 - 0CFF 200C, 200D
24	MALAYALAM	0D00 - 0D7F 200C, 200D
25	THAI	0E00 - 0E7F
26	LAO	0E80 - 0EFF
27	BASIC GEORGIAN	10D0 - 10FF
28	GEORGIAN EXTENDED	10A0 - 10CF
29	HANGUL JAMO	1100 - 11FF
30	LATIN EXTENDED ADDITIONAL	1E00 - 1EFF
31	GREEK EXTENDED	1F00 - 1FFF
32	GENERAL PUNCTUATION	2000 - 206F
33	SUPERSCRIPTS AND SUBSCRIPTS	2070 - 209F
34	CURRENCY SYMBOLS	20A0 - 20CF
35	COMBINING DIACRITICAL MARKS FOR SYMBOLS	20D0 - 20FF
36	LETTERLIKE SYMBOLS	2100 - 214F
37	NUMBER FORMS	2150 - 218F
38	ARROWS	2190 - 21FF *
39	MATHEMATICAL OPERATORS	2200 - 22FF *
40	MISCELLANEOUS TECHNICAL	2300 - 23FF
41	CONTROL PICTURES	2400 - 243F
42	OPTICAL CHARACTER RECOGNITION	2440 - 245F
43	ENCLOSED ALPHANUMERICS	2460 - 24FF *
44	BOX DRAWING	2500 - 257F *
45	BLOCK ELEMENTS	2580 - 259F *
46	GEOMETRIC SHAPES	25A0 - 25FF *
47	MISCELLANEOUS SYMBOLS	2600 - 26FF

48	DINGBATS	2700 - 27BF
49	CJK SYMBOLS AND PUNCTUATION	3000 - 303F *
50	HIRAGANA	3040 - 309F
51	KATAKANA	30A0 - 30FF *
52	BOPOMOFO	3100 - 312F 31A0 - 31BF
53	HANGUL COMPATIBILITY JAMO	3130 - 318F
54	CJK MISCELLANEOUS	3190 - 319F
55	ENCLOSED CJK LETTERS AND MONTHS	3200 - 32FF
56	CJK COMPATIBILITY	3300 - 33FF *
57, 58, 59	(These collection numbers shall not be used, see Note 2.)	
60	CJK UNIFIED IDEOGRAPHS	4E00 - 9FFF
61	PRIVATE USE AREA	E000 - F8FF
62	CJK COMPATIBILITY IDEOGRAPHS	F900 - FAFF
63	(Collection specified as union of other collections)	
64	ARABIC PRESENTATION FORMS-A	FB50 - FDFF
65	COMBINING HALF MARKS	FE20 - FE2F
66	CJK COMPATIBILITY FORMS	FE30 - FE4F *
67	SMALL FORM VARIANTS	FE50 - FE6F
68	ARABIC PRESENTATION FORMS-B	FE70 - FEFE
69	HALFWIDTH AND FULLWIDTH FORMS	FF00 - FFEF
70	SPECIALS	FFF0 - FFFD
71	HANGUL SYLLABLES	AC00 - D7A3 *
72	BASIC TIBETAN	0F00 - 0FBF
73	ETHIOPIC	1200 - 137F
74	UNIFIED CANADIAN ABORIGINAL SYLLABICS	1400 - 167F
75	CHEROKEE	13A0 - 13FF
76	YI SYLLABLES	A000 - A48F
77	YI RADICALS	A490 - A4CF
78	KANGXI RADICALS	2F00 - 2FDF
79	CJK RADICALS SUPPLEMENT	2E80 - 2EFF
80	BRAILLE PATTERNS	2800 - 28FF
81	CJK UNIFIED IDEOGRAPHS EXTENSION A	3400 - 4DBF FA1F, FA23
82	OGHAM	1680 - 169F
83	RUNIC	16A0 - 16FF
84	SINHALA	0D80 - 0DFF
85	SYRIAC	0700 - 074F
86	THAANA	0780 - 07BF
87	BASIC MYANMAR	1000 - 104F 200C, 200D
88	KHMER	1780 - 17FF 200C, 200D
89	MONGOLIAN	1800 - 18AF
90	EXTENDED MYANMAR	1050 - 109F
91	TIBETAN	0F00 - 0FFF
92	CYRILLIC SUPPLEMENT	0500 - 052F
93	TAGALOG	1700 - 171F
94	HANUNOO	1720 - 173F
95	BUHID	1740 - 175F
96	TAGBANWA	1760 - 177F
97	MISCELLANEOUS MATHEMATICAL SYMBOLS-A	27C0 - 27EF
98	SUPPLEMENTAL ARROWS-A	27F0 - 27FF *
99	SUPPLEMENTAL ARROWS-B	2900 - 297F *
100	MISCELLANEOUS MATHEMATICAL SYMBOLS-B	2980 - 29FF *
101	SUPPLEMENTAL MATHEMATICAL OPERATORS	2A00 - 2AFF *
102	KATAKANA PHONETIC EXTENSIONS	31F0 - 31FF *
103	VARIATION SELECTORS	FE00 - FE0F *
104	LTR ALPHABETIC PRESENTATION FORMS	FB00 - FB1C
105	RTL ALPHABETIC PRESENTATION FORMS	FB1D – FB4F106
	LIMBU	1900 - 194F107
	TAI LE	1950 - 197F
108	KHMER SYMBOLS	19E0 - 19FF *
109	PHONETIC EXTENSIONS	1D00 - 1D7F
110	MISCELLANEOUS SYMBOLS AND ARROWS	2B00-2B7F
111	YIJING HEXAGRAM SYMBOLS	4DC0-4DDD *

1001	OLD ITALIC	10300-1032F
1002	GOTHIC	10330-1034F
1003	DESERET	10400-1044F*
1004	BYZANTINE MUSICAL SYMBOLS	1D000-1D0FF
1005	MUSICAL SYMBOLS	1D100-1D1FF
1006	MATHEMATICAL ALPHANUMERIC SYMBOLS	1D400-1D7FF
1007	LINEAR B SYLLABARY	10000-1007F
1008	LINEAR B IDEOGRAMS	10080-100FF
1009	AEGEAN NUMBERS	10100-1013F
1010	UGARATIC	10380-1039F
1011	SHAVIAN	10450-1047F*
1012	OSMANYA	10480-104AF
1013	CYPRIOT SYLLABARY	10800-1083F
2001	CJK UNIFIED IDEOGRAPHS EXTENSION B	20000-2A6DF
2002	CJK COMPATIBILITY IDEOGRAPHS SUPPLEMENT	2F800-2FA1F
3001	TAGS	E0000-E007F
3003	VARIATION SELECTORS SUPPLEMENT	E0100-E01EF*

The following collections specify characters used for alternate formats and script-specific formats. See annex F for more information.

200	ZERO-WIDTH BOUNDARY INDICATORS	200B - 200D FEFF
201	FORMAT SEPARATORS	2028 - 2029
202	BI-DIRECTIONAL FORMAT MARKS	200E - 200F
203	BI-DIRECTIONAL FORMAT EMBEDDINGS	202A - 202E
204	HANGUL FILL CHARACTERS	3164, FFA0
205	CHARACTER SHAPING SELECTORS	206A - 206D
206	NUMERIC SHAPE SELECTORS	206E - 206F
207	IDEOGRAPHIC DESCRIPTION CHARACTERS	2FF0 - 2FFF
3002	ALTERNATE FORMAT CHARACTERS	E0000-E0FFF

The following specify collections which are the union of particular collections defined above.

63	ALPHABETIC PRESENTATION FORMS	Collections 104-105
250	GENERAL FORMAT CHARACTERS	Collections 200 - 203
251	SCRIPT-SPECIFIC FORMAT CHARACTERS	Collections 204 - 207

The following specify other collections.

270	COMBINING CHARACTERS characters specified in annex B.1	
271	COMBINING CHARACTERS B-2 characters specified in annex B.2	
281	MES-1	see A.4.1 *
282	MES-2	see A.4.2 *
283	MODERN EUROPEAN SCRIPTS	see A.4.3 *
299	(This collection number shall not be used, see A.3.2.)	
300	BMP	0000 - D7FF E000 - FFFD
301	BMP-AMD.7	see A.3.1 *
302	BMP SECOND EDITION	see A.3.3 *
1000	SMP	10000-1FFFD
1900	SMP COMBINING CHARACTERS characters specified in annex B.1	
2000	SIP	20000-2FFFD
3000	SSP	E0000-EFFFD
4000	UCS PART-2	10000-1FFFD 20000-2FFFD E0000-EFFFD

The following collections contain characters both inside and outside the Basic Multilingual Plane.

303	UNICODE 3.1	see A5.1 *
304	UNICODE 3.2	see A5.2 *
305	UNICODE 4.0	see A5.3 *

380 CJK UNIFIED IDEOGRAPHS-2001 *
3400-4DB5
4E00-9FA5
FA0E-FA0F
FA11
FA13-FA14
FA1F
FA21
FA23-FA24
FA27-FA29
20000-2A6D6

381 CJK COMPATIBILITY IDEOGRAPHS-2001 *
F900-FA0D
FA10
FA12
FA15-FA1E
FA20
FA22
FA25-FA26
FA2A-FA6A
2F800-2FA1D

10646 UNICODE
0000-FDCF
FDF0-FFFD
10000-1FFFD
20000-2FFFD
30000-3FFFD
40000-4FFFD
50000-5FFFD
60000-6FFFD
70000-7FFFD
80000-8FFFD
90000-9FFFD
A0000-AFFFD
B0000-BFFFD
C0000-CFFFD
D0000-DFFFD
E0000-EFFFD
F0000-FFFFD
100000-10FFFD

NOTE – The UNICODE collection incorporates all characters currently encoded in the standard.

The following collections are outside the Basic Multilingual Plane.

400 –(This collection number shall not be used, see Note 2.)

401 PRIVATE USE PLANES-0F-10 G=00, P=0F-10

500 (This collection number shall not be used, see Note 2.)

NOTE 1 - Use of implementation levels 1 and 2 restricts the repertoire of some character collections (see 24.4). Collections which include combining characters are 7, 10, 13 to 26, 35, 49, 50, 63, 65, 72, 84, 85, 86, 87, 88, 89, 90, 91, 93, 94, 95, 96 ,104 AND 1005.

NOTE 2 - Collections numbered 57, 58, and 59 were specified in the First Edition of ISO/IEC 10646-1 but have now been deleted. Collections numbered 400 and 500 were specified in the First and Second Editions of ISO/IEC 10646-1 but have now been deleted.

NOTE 3 - The principal terms (keywords) used in the collection names shown above are listed below in alphabetical order. The entry for a term shows the collection number of every collection whose name includes the term. These terms do not provide a complete cross-reference to all the collections where characters sharing a particular attribute, such as script name, may be found. Although most of the terms identify an attribute of the characters within the collection, some characters that possess that attribute may be present in other collections whose numbers do not appear in the entry for that term.

Aegean numbers	1009
Alphabetic	63
Alphanumeric	43
Arabic	14 15 64 68
Armenian	11
Arrows	38 110
Bengali	17
Bi-directional	202 203
Block elements	45
BMP	300 301 302 (299)
Box drawing	44
Bopomofo	52
Braille patterns	80
Buhid	95
Byzantine musical symbols	1004
Canadian Aboriginal	74
Cherokee	75
CJK	49 54 55 56 60 62 66 78 81 2001 2002
Combining	7 35 65 270 271
Compatibility	53 56 62 66
Control pictures	41
Coptic	9
Currency	34
Cypriot syllabary	1013
Cyrillic	10 92
Deseret	1003
Devanagari	16
Diacritical marks	7 35
Dingbats	48
Enclosed	43 55
Ethiopic	73
Format	201 202 203 250 251
Fullwidth	69
Geometric shapes	46
Georgian	27 28
Gothic	1002
Greek	8 9 31
Gujarati	19
Gurmukhi	18
Half (marks, width)	65 69
Hangul	29 53 71 204
Hanunoo	94
Hebrew	12 13
Hiragana	50
Ideographs	60 62 81 207
IPA extensions	5
Jamo	29 53
Kangxi	78
Kannada	23

A.2 Blocks lists

A.2.1 Blocks in the BMP

The following blocks are specified in the Basic Multilingual Plane. They are ordered by code position.

Block name	from to
BASIC LATIN	0020 - 007E
LATIN-1 SUPPLEMENT	00A0 - 00FF
LATIN EXTENDED-A	0100 - 017F
LATIN EXTENDED-B	0180 - 024F
IPA (INTERNATIONAL PHONETIC ALPHABET) EXTENSIONS	0250 - 02AF
SPACING MODIFIER LETTERS	02B0 - 02FF
COMBINING DIACRITICAL MARKS	0300 - 036F
GREEK AND COPTIC	0370 - 03FF
CYRILLIC	0400 - 04FF
CYRILLIC SUPPLEMENT	0500 - 052F
ARMENIAN	0530 - 058F
HEBREW	0590 - 05FF
ARABIC	0600 - 06FF
SYRIAC	0700 - 074F
THAANA	0780 - 07BF
DEVANAGARI	0900 - 097F
BENGALI	0980 - 09FF
GURMUKHI	0A00 - 0A7F
GUJARATI	0A80 - 0AFF
ORIYA	0B00 - 0B7F
TAMIL	0B80 - 0BFF
TELUGU	0C00 - 0C7F
KANNADA	0C80 - 0CFF
MALAYALAM	0D00 - 0D7F
SINHALA	0D80 - 0DFF
THAI	0E00 - 0E7F
LAO	0E80 - 0EFF
TIBETAN	0F00 - 0FFF
MYANMAR	1000 - 109F
GEORGIAN	10A0 - 10FF
HANGUL JAMO	1100 - 11FF
ETHIOPIC	1200 - 137F
CHEROKEE	13A0 - 13FF
UNIFIED CANADIAN ABORIGINAL SYLLABICS	1400 - 167F
OGHAM	1680 - 169F
RUNIC	16A0 - 16FF
TAGALOG	1700 - 171F
HANUNOO	1720 - 173F
BUHID	1740 - 175F
TAGBANWA	1760 - 177F
KHMER	1780 - 17FF
MONGOLIAN	1800 - 18AF
LIMBU	1900 - 194F
TAI LE	1950 - 197F
KHMER SYMBOLS	19E0 - 19FF
PHONETIC EXTENSIONS	1D00 - 1D7F
LATIN EXTENDED ADDITIONAL	1E00 - 1EFF
GREEK EXTENDED	1F00 - 1FFF
GENERAL PUNCTUATION	2000 - 206F
SUPERSCRIPTS AND SUBSCRIPTS	2070 - 209F
CURRENCY SYMBOLS	20A0 - 20CF
COMBINING DIACRITICAL MARKS FOR SYMBOLS	20D0 - 20FF
LETTERLIKE SYMBOLS	2100 - 214F
NUMBER FORMS	2150 - 218F
ARROWS	2190 - 21FF
MATHEMATICAL OPERATORS	2200 - 22FF
MISCELLANEOUS TECHNICAL	2300 - 23FF
CONTROL PICTURES	2400 - 243F
OPTICAL CHARACTER RECOGNITION	2440 - 245F

ENCLOSED ALPHANUMERICS	2460 - 24FF
BOX DRAWING	2500 - 257F
BLOCK ELEMENTS	2580 - 259F
GEOMETRIC SHAPES	25A0 - 25FF
MISCELLANEOUS SYMBOLS	2600 - 26FF
DINGBATS	2700 - 27BF
MISCELLANEOUS MATHEMATICAL SYMBOLS-A	27C0 - 27EF
SUPPLEMENTAL ARROWS-A	27F0 - 27FF
BRAILLE PATTERNS	2800 - 28FF
SUPPLEMENTAL ARROWS-B	2900 - 297F
MISCELLANEOUS MATHEMATICAL SYMBOLS-B	2980 - 29FF
SUPPLEMENTAL MATHEMATICAL OPERATORS	2A00 - 2AFF
MISCELLANEOUS SYMBOLS AND ARROWS	2B00 - 2B7F
CJK RADICALS SUPPLEMENT	2E80 - 2EFF
KANGXI RADICALS	2F00 - 2FDF
IDEOGRAPHIC DESCRIPTION CHARACTERS	2FF0 - 2FFF
CJK SYMBOLS AND PUNCTUATION	3000 - 303F
HIRAGANA	3040 - 309F
KATAKANA	30A0 - 30FF
BOPOMOFO	3100 - 312F
HANGUL COMPATIBILITY JAMO	3130 - 318F
KANBUN (CJK miscellaneous)	3190 - 319F
BOPOMOFO EXTENDED	31A0 - 31BF
KATAKANA PHONETIC EXTENSIONS	31F0 - 31FF
ENCLOSED CJK LETTERS AND MONTHS	3200 - 32FF
CJK COMPATIBILITY	3300 - 33FF
CJK UNIFIED IDEOGRAPHS EXTENSION A	3400 - 4DBF
YIJING HEXAGRAM SYMBOLS	4DC0 - 4DFF
CJK UNIFIED IDEOGRAPHS	4E00 - 9FFF
YI SYLLABLES	A000 - A48F
YI RADICALS	A490 - A4CF
HANGUL SYLLABLES	AC00 - D7A3
PRIVATE USE AREA	E000 - F8FF
CJK COMPATIBILITY IDEOGRAPHS	F900 - FAFF
ALPHABETIC PRESENTATION FORMS	FB00 - FB4F
ARABIC PRESENTATION FORMS-A	FB50 - FDFF
VARIATION SELECTORS	FE00 - FE0F
COMBINING HALF MARKS	FE20 - FE2F
CJK COMPATIBILITY FORMS	FE30 - FE4F
SMALL FORM VARIANTS	FE50 - FE6F
ARABIC PRESENTATION FORMS-B	FE70 - FEFE
HALFWIDTH AND FULLWIDTH FORMS	FF00 - FFEF
SPECIALS	FFF0 - FFFD

A.2.2 Blocks in the SMP

The following blocks are specified in the Supplementary Multilingual Plane for scripts and symbols. They are ordered by code position.

Block name	from to
LINEAR B SYLLABARY	10000-1007F
LINEAR B IDEOGRAMS	10080-100FF
AEGEAN NUMBERS	10100-1013F
OLD ITALIC	10300-1032F
GOTHIC	10330-1034F
UGARITIC	10380-1039F
DESERET	10400-1044F
SHAVIAN	10450-1047F
OSMANYA	10480-104AF
CYPRIOT SYLLABARY	10800-1083F
BYZANTINE MUSICAL SYMBOLS	1D000-1D0FF
MUSICAL SYMBOLS	1D100-1D1FF
MATHEMATICAL ALPHANUMERIC SYMBOLS	1D400-1D7FF

A.2.3 Blocks in the SIP

The following blocks are specified in the Supplementary Ideographic. They are ordered by code position.

Block name	from to
CJK UNIFIED IDEOGRAPHS EXTENSION B	20000-2A6DF
CJK COMPATIBILITY IDEOGRAPHS SUPPLEMENT	2F800-2FA1F

A.2.4 Blocks in the SSP

The following blocks are specified in the Supplementary Special-purpose Plane. They are ordered by code position.

Block name	from to
TAGS	E0000-E007F
VARIATION SELECTORS SUPPLEMENT	E0100-E01EF

A.3 Fixed collections of the whole BMP

A.3.1 301 BMP-AMD.7

The collection 301 BMP-AMD.7 is specified below as a fixed collection (4.19). It comprises only those coded characters that were in the BMP after amendments up to, but not after, AMD.7 were applied to the First Edition of ISO/IEC 10646-1. Accordingly the repertoire of this collection is not subject to change if new characters are added to the BMP by any subsequent amendments.

> NOTE - The repertoire of the collection 300 BMP is subject to change if new characters are added to the BMP by an amendment to this International Standard.

301 BMP-AMD.7 is specified by the following ranges of code positions as indicated for each row or contiguous series of rows.

Rows	Positions (cells)
00	20-7E A0-FF
01	00-F5 FA-FF
02	00-17 50-A8 B0-DE E0-E9
03	00-45 60-61 74-75 7A 7E 84-8A 8C 8E-A1 A3-CE D0-D6 DA DC DE E0 E2-F3
04	01-0C 0E-4F 51-5C 5E-86 90-C4 C7-C8 CB-CC D0-EB EE-F5 F8-F9
05	31-56 59-5F 61-87 89 91-A1 A3-B9 BB-C4 D0-EA F0-F4
06	0C 1B 1F 21-3A 40-52 60-6D 70-B7 BA-BE C0-CE D0-ED F0-F9

09 01-03 05-39 3C-4D 50-54 58-70 81-83 85-8C 8F-90 93-A8 AA-B0 B2 B6-B9 BC BE-C4 C7-C8 CB-CD D7 DC-DD DF-E3 E6-FA
0A 02 05-0A 0F-10 13-28 2A-30 32-33 35-36 38-39 3C 3E-42 47-48 4B-4D 59-5C 5E 66-74 81-83 85-8B 8D 8F-91 93-A8 AA-B0 B2-B3 B5-B9 BC-C5 C7-C9 CB-CD D0 E0 E6-EF
0B 01-03 05-0C 0F-10 13-28 2A-30 32-33 36-39 3C-43 47-48 4B-4D 56-57 5C-5D 5F-61 66-70 82-83 85-8A 8E-90 92-95 99-9A 9C 9E-9F A3-A4 A8-AA AE-B5 B7-B9 BE-C2 C6-C8 CA-CD D7 E7-F2
0C 01-03 05-0C 0E-10 12-28 2A-33 35-39 3E-44 46-48 4A-4D 55-56 60-61 66-6F 82-83 85-8C 8E-90 92-A8 AA-B3 B5-B9 BE-C4 C6-C8 CA-CD D5-D6 DE E0-E1 E6-EF
0D 02-03 05-0C 0E-10 12-28 2A-39 3E-43 46-48 4A-4D 57 60-61 66-6F
0E 01-3A 3F-5B 81-82 84 87-88 8A 8D 94-97 99-9F A1-A3 A5 A7 AA-AB AD-B9 BB-BD C0-C4 C6 C8-CD D0-D9 DC-DD
0F 00-47 49-69 71-8B 90-95 97 99-AD B1-B7 B9
10 A0-C5 D0-F6 FB
11 00-59 5F-A2 A8-F9
1E 00-9B A0-F9
1F 00-15 18-1D 20-45 48-4D 50-57 59 5B 5D 5F-7D 80-B4 B6-C4 C6-D3 D6-DB DD-EF F2-F4 F6-FE
20 00-2E 30-46 6A-70 74-8E A0-AB D0-E1
21 00-38 53-82 90-EA
22 00-F1
23 00 02-7A
24 00-24 40-4A 60-EA
25 00-95 A0-EF
26 00-13 1A-6F
27 01-04 06-09 0C-27 29-4B 4D 4F-52 56 58-5E 61-67 76-94 98-AF B1-BE
30 00-37 3F 41-94 99-9E A1-FE
31 05-2C 31-8E 90-9F
32 00-1C 20-43 60-7B 7F-B0 C0-CB D0-FE
33 00-76 7B-DD E0-FE
4E-9F 4E00-9FA5
AC-D7 AC00-D7A3
E0-F8 E000-F8FF
F9-FA F900-FA2D
FB 00-06 13-17 1E-36 38-3C 3E 40-41 43-44 46-B1 D3-FF
FC 00-FF
FD 00-3F 50-8F 92-C7 F0-FB
FE 20-23 30-44 49-52 54-66 68-6B 70-72 74 76-FC FF
FF 01-5E 61-BE C2-C7 CA-CF D2-D7 DA-DC E0-E6 E8-EE FD

A.3.2 299 BMP FIRST EDITION

The collection number and collection name 299 BMP FIRST EDITION have been reserved to identify the fixed collection comprising all of the coded characters that were in the BMP in the First Edition of ISO/IEC 10646-1. This collection is not now in conformity with this International Standard.

NOTE - The specification of collection 299 BMP FIRST EDITION consisted of the specification of collection 301 BMP-AMD.7 except for the replacement of the corresponding entries in the list above with the entries shown below:

rows	positions
05	31-56 59-5F 61-87 89 B0-B9 BB-C3 D0-EA F0-F4
0F	[no positions]
1E	00-9A A0-F9
20	00-2E 30-46 6A-70 74-8E A0-AA D0-E1
AC-D7	[no positions]

and by including an additional entry:

34-4D 3400-4DFF

for the code position ranges of three collections (57, 58, 59) of coded characters which have been deleted from this International Standard since the First Edition of IO/IEC 10646-1.

A.3.3 302 BMP SECOND EDITION

The fixed collection 302 BMP SECOND EDITION comprises only those coded characters that are in the BMP in the Second Edition of ISO/IEC 10646-1. The repertoire of this collection is not subject to change if new characters are added to the BMP by any subsequent amendments.

302 BMP SECOND EDITION is specified by the following ranges of code positions as indicated for each row or contiguous series of rows.

Rows	Positions (cells)
00	20-7E A0-FF
01	00-FF
02	00-1F 22-33 50-AD B0-EE
03	00-4E 60-62 74-75 7A 7E 84-8A 8C 8E-A1 A3-CE D0-D7 DA-F3
04	00-86 88-89 8C-C4 C7-C8 CB-CC D0-F5 F8-F9
05	31-56 59-5F 61-87 89-8A 91-A1 A3-B9 BB-C4 D0-EA F0-F4
06	0C 1B 1F 21-3A 40-55 60-6D 70-ED F0-FE
07	00-0D 0F-2C 30-4A 80-B0
09	01-03 05-39 3C-4D 50-54 58-70 81-83 85-8C 8F-90 93-A8 AA-B0 B2 B6-B9 BC BE-C4 C7-C8 CB-CD D7 DC-DD DF-E3 E6-FA
0A	02 05-0A 0F-10 13-28 2A-30 32-33 35-36 38-39 3C 3E-42 47-48 4B-4D 59-5C 5E 66-74 81-83 85-8B 8D 8F-91 93-A8 AA-B0 B2-B3 B5-B9 BC-C5 C7-C9 CB-CD D0 E0 E6-EF
0B	01-03 05-0C 0F-10 13-28 2A-30 32-33 36-39 3C-43 47-48 4B-4D 56-57 5C-5D 5F-61 66-70 82-83 85-8A 8E-90 92-95 99-9A 9C 9E-9F A3-A4 A8-AA AE-B5 B7-B9 BE-C2 C6-C8 CA-CD D7 E7-F2
0C	01-03 05-0C 0E-10 12-28 2A-33 35-39 3E-44 46-48 4A-4D 55-56 60-61 66-6F 82-83 85-8C 8E-90 92-A8 AA-B3 B5-B9 BE-C4 C6-C8 CA-CD D5-D6 DE E0-E1 E6-EF

0D	02-03 05-0C 0E-10 12-28 2A-39 3E-43 46-48 4A-4D 57 60-61 66-6F 82-83 85-96 9A-B1 B3-BB BD C0-C6 CA CF-D4 D6 D8-DF F2-F4
0E	01-3A 3F-5B 81-82 84 87-88 8A 8D 94-97 99-9F A1-A3 A5 A7 AA-AB AD-B9 BB-BD C0-C4 C6 C8-CD D0-D9 DC-DD
0F	00-47 49-6A 71-8B 90-97 99-BC BE-CC CF
10	00-21 23-27 29-2A 2C-32 36-39 40-59 A0-C5 D0-F6 FB
11	00-59 5F-A2 A8-F9
12	00-06 08-46 48 4A-4D 50-56 58 5A-5D 60-86 88 8A-8D 90-AE B0 B2-B5 B8-BE C0 C2-C5 C8-CE D0-D6 D8-EE F0-FF
13	00-0E 10 12-15 18-1E 20-46 48-5A 61-7C A0-F4
14-15	1401-15FF
16	00-76 80-9C A0-F0
17	80-DC E0-E9
18	00-0E 10-19 20-77 80-A9
1E	00-9B A0-F9
1F	00-15 18-1D 20-45 48-4D 50-57 59 5B 5D 5F-7D 80-B4 B6-C4 C6-D3 D6-DB DD-EF F2-F4 F6-FE
20	00-46 48-4D 6A-70 74-8E A0-AF D0-E3
21	00-3A 53-83 90-F3
22	00-F1
23	00-7B 7D-9A
24	00-26 40-4A 60-EA
25	00-95 A0-F7
26	00-13 19-71
27	01-04 06-09 0C-27 29-4B 4D 4F-52 56 58-5E 61-67 76-94 98-AF B1-BE
28	00-FF
2E	80-99 9B-F3
2F	00-D5 F0-FB
30	00-3A 3E-3F 41-94 99-9E A1-FE
31	05-2C 31-8E 90-B7
32	00-1C 20-43 60-7B 7F-B0 C0-CB D0-FE
33	00-76 7B-DD E0-FE
34-4D	3400-4DB5
4E-9F	4E00-9FA5
A0-A3	A000-A3FF
A4	00-8C 90-A1 A4-B3 B5-C0 C2-C4 C6
AC-D7	AC00-D7A3
E0-F8	E000-F8FF
F9-FA	F900-FA2D
FB	00-06 13-17 1D-36 38-3C 3E 40-41 43-44 46-B1 D3-FF
FC	00-FF
FD	00-3F 50-8F 92-C7 F0-FB
FE	20-23 30-44 49-52 54-66 68-6B 70-72 74 76-FC FF
FF	01-5E 61-BE C2-C7 CA-CF D2-D7 DA-DC E0-E6 E8-EE F9-FD

A.4 Other collections within the BMP

The collections specified within this clause are entirely within Plane 00.

NOTE – The acronym MES indicates Multilingual European Subset.

A.4.1 281 MES-1

281 MES-1 is specified by the following ranges of code positions as indicated for each row.

Rows	Positions (cells)
00	20-7E A0-FF
01	00-13 16-2B 2E-4D 50-7E
02	C7 D8-DB DD
20	15 18-19 1C-1D AC
21	22 26 5B-5E 90-93
26	6A

A.4.2 282 MES-2

282 MES-2 is specified by the following ranges of code positions as indicated for each row.

Rows	Positions (cells)
00	20-7E A0-FF
01	00-7F 8F 92 B7 DE-EF FA-FF
02	18-1B 1E-1F 59 7C 92 BB-BD C6-C7 C9 D8-DD EE
03	74-75 7A 7E 84-8A 8C 8E-A1 A3-CE D7 DA-E1
04	00-5F 90-C4 C7-C8 CB-CC D0-EB EE-F5 F8-F9
1E	02-03 0A-0B 1E-1F 40-41 56-57 60-61 6A-6B 80-85 9B F2-F3
1F	00-15 18-1D 20-45 48-4D 50-57 59 5B 5D 5F-7D 80-B4 B6-C4 C6-D3 D6-DB DD-EF F2-F4 F6-FE
20	13-15 17-1E 20-22 26 30 32-33 39-3A 3C 3E 44 4A 7F 82 A3-A4 A7 AC AF
21	05 16 22 26 5B-5E 90-95 A8
22	00 02-03 06 08-09 0F 11-12 19-1A 1E-1F 27-2B 48 59 60-61 64-65 82-83 95 97
23	02 10 20-21 29-2A
25	00 02 0C 10 14 18 1C 24 2C 34 3C 50-6C 80 84 88 8C 90-93 A0 AC B2 BA BC C4 CA-CB D8-D9
26	3A-3C 40 42 60 63 65-66 6A-6B
FB	01-02
FF	FD

A.4.3 283 MODERN EUROPEAN SCRIPTS

283 MODERN EUROPEAN SCRIPTS is specified by the following collections:

Collection number and name	
1	BASIC LATIN
2	LATIN-1 SUPPLEMENT
3	LATIN EXTENDED-A
4	LATIN EXTENDED-B
5	IPA EXTENSIONS
6	SPACING MODIFIER LETTERS
7	COMBINING DIACRITICAL MARKS
8	BASIC GREEK
9	GREEK SYMBOLS AND COPTIC
10	CYRILLIC
11	ARMENIAN
27	BASIC GEORGIAN
30	LATIN EXTENDED ADDITIONAL

31 GREEK EXTENDED
32 GENERAL PUNCTUATION
33 SUPERSCRIPTS AND SUBSCRIPTS
34 CURRENCY SYMBOLS
35 COMBINING DIACRITICAL MARKS FOR SYMBOLS
36 LETTERLIKE SYMBOLS
37 NUMBER FORMS
38 ARROWS
39 MATHEMATICAL OPERATORS
40 MISCELLANEOUS TECHNICAL
42 OPTICAL CHARACTER RECOGNITION
44 BOX DRAWING
45 BLOCK ELEMENTS
46 GEOMETRIC SHAPES
47 MISCELLANEOUS SYMBOLS
65 COMBINING HALF MARKS
70 SPECIALS
92 CYRILLIC SUPPLEMENT
104 LTR ALPHABETIC PRESENTATION FORMS

A.5 Unicode collections

These collections correspond to Unicode 3.1 and 3.2. They include characters from the BMP as well as Supplementary Planes.

A.5.1 303 UNICODE 3.1

303 The fixed collection UNICODE 3.1 consists of collections from A.3 above and several ranges of code positions. The collection list is arranged by planes as follows.

Plane 0

Collection number and name

302 BMP SECOND EDITION

Row Positions (cells)

03 F4-F5

Plane 1

Row Positions (cells)

03 00-1E 20-23 30-4A
04 00-25 28-4D
D0 00-F5
D1 00-26 2A-DD
D4 00-54 56-9C 9E-9F A2 A5-A6 A9-AC AE-B9 BB BD-C0 C2-C3 C5-FF
D5 00-05 07-0A 0D-14 16-1C 1E-39 3B-3E 40-44 46 4A-50 52-FF
D6 00-A3 A8-FF
D7 00-C9 CE-FF

Plane 2

Row Positions (cells)

00-A6 0000-A6D6
F8-FA F800-FA1D

Plane 0E

Row Positions (cells)

00 01 20-7F

Plane 0F

Row Positions (cells)

00-FF 0000-FFFD

Plane 10

Row Positions (cells)

00-FF 0000-FFFD

A.5.2 304 UNICODE 3.2

304 The fixed collection UNICODE 3.2 consists of fixed collections from A.5.1 above and several ranges of code positions arranged by planes as follows.

Plane 0-10

Collection number and name
303 UNICODE 3.1

Plane 0

Collection number and name

98 SUPPLEMENTAL ARROWS-A
99 SUPPLEMENTAL ARROWS-B
100 MISCELLANEOUS MATHEMATICAL SYMBOLS-B
101 SUPPLEMENTAL MATHEMATICAL OPERATORS
102 KATAKANA PHONETIC EXTENSIONS
103 VARIATION SELECTORS

Rows Positions (cells)

02 20
03 4F 63-6F D8-D9 F6
04 8A-8B C5-C6 C9-CA CD-CE
05 00-0F
06 6E-6F
07 B1
10 F7-F8
17 00-0C 0E-14 20-36 40-53 60-6C 6E-70 72-73
20 47 4E-52 57 5F-63 71 B0-B1 E4-EA
21 3D-4B F4-FF
22 F2-FF
23 7C 9B-CE
24 EB-FE
25 96-9F F8-FF
26 16-17 72-7D 80-89
27 68-75 D0-EB
30 3B-3D 95-96 9F-A0 FF
32 51-5F B1-BF
A4 A2-A3 B4 C1 C5
FA 30-6A
FE 45-46 73

FF 5F-60

A.5.3 305 UNICODE 4.0

305 The fixed collection UNICODE 4.0 consists of fixed collections from A.5.2 above and several ranges of code positions arranged by planes as follows.

Plane 0-10

Collection number and name

304 UNICODE 3.2

Plane 0

Collection number and name

108 KHMER SYMBOLS
111 YIJING HEXAGRAM SYMBOLS

Rows	Positions
02	21 34-36 AE-AF EF-FF
03	50-57 5D-5F F7-F8
06	00-03 0D-14 56-59 EE-EF FF
07	2D-2F 4D-4F
09	04 BD
0A	01 03 8C E1-E3 F1
0B	35 F3-FA
0C	BC-BD
17	DD F0-F9
19	00-1C 20-2B 30-3B 40 44-4F 50-6D 70-74
1D	00-6A
20	53-54
21	3B
23	CF
24	FF
26	14-15 8A-91 A0-A1
2B	00-0D
32	1D-1E 50 7C-7D CC-CF
33	77-7A DE-DF FF
FA	70-E9
FD	FD
FE	47-48

Plane 1

Collection number and name

1011 SHAVIAN

Rows	Positions
00	00-0B 0D-26 28-3A 3C-3D 3F-4D 50-5D 80-FA
01	00-02 07-33 37-3F
03	80-9D 9F
04	26-27 4E-4F 80-9D A0-A9
08	00-05 08 0A-35 37-38 3C 3F
D3	00-56
D4	C1

Plane E

Collection number and name

3003 VARIATION SELECTORS SUPPLEMENT

Annex B
(normative)

List of combining characters

B.1 List of all combining characters

The characters in the subset collections
COMBINING DIACRITICAL MARKS (0300 to 036F),
COMBINING DIACRITICAL MARKS FOR SYMBOLS (20D0 to 20FF), and
COMBINING HALF MARKS (FE20 to FE2F)
are combining characters. In addition, the following characters are combining characters.

0483 COMBINING CYRILLIC TITLO
0484 COMBINING CYRILLIC PALATALIZATION
0485 COMBINING CYRILLIC DASIA PNEUMATA
0486 COMBINING CYRILLIC PSILI PNEUMATA
0488 COMBINING CYRILLIC HUNDRED THOUSANDS SIGN
0489 COMBINING CYRILLIC MILLIONS SIGN
0591 HEBREW ACCENT ETNAHTA
0592 HEBREW ACCENT SEGOL
0593 HEBREW ACCENT SHALSHELET
0594 HEBREW ACCENT ZAQEF QATAN
0595 HEBREW ACCENT ZAQEF GADOL
0596 HEBREW ACCENT TIPEHA
0597 HEBREW ACCENT REVIA
0598 HEBREW ACCENT ZARQA
0599 HEBREW ACCENT PASHTA
059A HEBREW ACCENT YETIV
059B HEBREW ACCENT TEVIR
059C HEBREW ACCENT GERESH
059D HEBREW ACCENT GERESH MUQDAM
059E HEBREW ACCENT GERSHAYIM
059F HEBREW ACCENT QARNEY PARA
05A0 HEBREW ACCENT TELISHA GEDOLA
05A1 HEBREW ACCENT PAZER
05A3 HEBREW ACCENT MUNAH
05A4 HEBREW ACCENT MAHAPAKH
05A5 HEBREW ACCENT MERKHA
05A6 HEBREW ACCENT MERKHA KEFULA
05A7 HEBREW ACCENT DARGA
05A8 HEBREW ACCENT QADMA
05A9 HEBREW ACCENT TELISHA QETANA
05AA HEBREW ACCENT YERAH BEN YOMO
05AB HEBREW ACCENT OLE
05AC HEBREW ACCENT ILUY
05AD HEBREW ACCENT DEHI
05AE HEBREW ACCENT ZINOR
05AF HEBREW MARK MASORA CIRCLE
05B0 HEBREW POINT SHEVA
05B1 HEBREW POINT HATAF SEGOL
05B2 HEBREW POINT HATAF PATAH
05B3 HEBREW POINT HATAF QAMATS
05B4 HEBREW POINT HIRIQ
05B5 HEBREW POINT TSERE
05B6 HEBREW POINT SEGOL
05B7 HEBREW POINT PATAH
05B8 HEBREW POINT QAMATS
05B9 HEBREW POINT HOLAM
05BB HEBREW POINT QUBUTS
05BC HEBREW POINT DAGESH OR MAPIQ
05BD HEBREW POINT METEG
05BF HEBREW POINT RAFE
05C1 HEBREW POINT SHIN DOT
05C2 HEBREW POINT SIN DOT
05C4 HEBREW MARK UPPER DOT
0610 ARABIC SIGN SALLALLAHOU ALAYHE WASALLAM
0611 ARABIC SIGN ALAYHE ASSALAM
0612 ARABIC SIGN RAHMATULLAH ALAYHE
0613 ARABIC SIGN RADI ALLAHOU ANHU
0614 ARABIC SIGN takhallus
064B ARABIC FATHATAN
064C ARABIC DAMMATAN
064D ARABIC KASRATAN
064E ARABIC FATHA
064F ARABIC DAMMA
0650 ARABIC KASRA
0651 ARABIC SHADDA
0652 ARABIC SUKUN
0653 ARABIC MADDAH ABOVE
0654 ARABIC HAMZA ABOVE
0655 ARABIC HAMZA BELOW
0656 ARABIC SUBSCRIPT ALEF
0657 ARABIC INVERTED DAMMA
0658 ARABIC NOON-GHUNNA
0659 ARABIC SMALL HIGH TAH
0670 ARABIC LETTER SUPERSCRIPT ALEF
06D7 ARABIC SMALL HIGH LIGATURE QAF WITH LAM WITH ALEF MAKSURA
06D8 ARABIC SMALL HIGH MEEM INITIAL FORM
06D9 ARABIC SMALL HIGH LAM ALEF
06DA ARABIC SMALL HIGH JEEM
06DB ARABIC SMALL HIGH THREE DOTS
06DC ARABIC SMALL HIGH SEEN
06DE ARABIC START OF RUB EL HIZB
06DF ARABIC SMALL HIGH ROUNDED ZERO
06E0 ARABIC SMALL HIGH UPRIGHT RECTANGULAR ZERO
06E1 ARABIC SMALL HIGH DOTLESS HEAD OF KHAH
06E2 ARABIC SMALL HIGH MEEM ISOLATED FORM
06E3 ARABIC SMALL LOW SEEN
06E4 ARABIC SMALL HIGH MADDA
06E7 ARABIC SMALL HIGH YEH
06E8 ARABIC SMALL HIGH NOON

06EA	ARABIC EMPTY CENTRE LOW STOP
06EB	ARABIC EMPTY CENTRE HIGH STOP
06EC	ARABIC ROUNDED HIGH STOP WITH FILLED CENTRE
06ED	ARABIC SMALL LOW MEEM
0711	SYRIAC LETTER SUPERSCRIPT ALAPH
0730	SYRIAC PTHAHA ABOVE
0731	SYRIAC PTHAHA BELOW
0732	SYRIAC PTHAHA DOTTED
0733	SYRIAC ZQAPHA ABOVE
0734	SYRIAC ZQAPHA BELOW
0735	SYRIAC ZQAPHA DOTTED
0736	SYRIAC RBASA ABOVE
0737	SYRIAC RBASA BELOW
0738	SYRIAC DOTTED ZLAMA HORIZONTAL
0739	SYRIAC DOTTED ZLAMA ANGULAR
073A	SYRIAC HBASA ABOVE
073B	SYRIAC HBASA BELOW
073C	SYRIAC HBASA-ESASA DOTTED
073D	SYRIAC ESASA ABOVE
073E	SYRIAC ESASA BELOW
073F	SYRIAC RWAHA
0740	SYRIAC FEMININE DOT
0741	SYRIAC QUSHSHAYA
0742	SYRIAC RUKKAKHA
0743	SYRIAC TWO VERTICAL DOTS ABOVE
0744	SYRIAC TWO VERTICAL DOTS BELOW
0745	SYRIAC THREE DOTS ABOVE
0746	SYRIAC THREE DOTS BELOW
0747	SYRIAC OBLIQUE LINE ABOVE
0748	SYRIAC OBLIQUE LINE BELOW
0749	SYRIAC MUSIC
074A	SYRIAC BARREKH
07A6	THAANA ABAFILI
07A7	THAANA AABAAFILI
07A8	THAANA IBIFILI
07A9	THAANA EEBEEFILI
07AA	THAANA UBUFILI
07AB	THAANA OOBOOFILI
07AC	THAANA EBEFILI
07AD	THAANA EYBEYFILI
07AE	THAANA OBOFILI
07AF	THAANA OABOAFILI
07B0	THAANA SUKUN
0901	DEVANAGARI SIGN CANDRABINDU
0902	DEVANAGARI SIGN ANUSVARA
0903	DEVANAGARI SIGN VISARGA
093C	DEVANAGARI SIGN NUKTA
093E	DEVANAGARI VOWEL SIGN AA
093F	DEVANAGARI VOWEL SIGN I
0940	DEVANAGARI VOWEL SIGN II
0941	DEVANAGARI VOWEL SIGN U
0942	DEVANAGARI VOWEL SIGN UU
0943	DEVANAGARI VOWEL SIGN VOCALIC R
0944	DEVANAGARI VOWEL SIGN VOCALIC RR
0945	DEVANAGARI VOWEL SIGN CANDRA E
0946	DEVANAGARI VOWEL SIGN SHORT E
0947	DEVANAGARI VOWEL SIGN E
0948	DEVANAGARI VOWEL SIGN AI
0949	DEVANAGARI VOWEL SIGN CANDRA O
094A	DEVANAGARI VOWEL SIGN SHORT O
094B	DEVANAGARI VOWEL SIGN O
094C	DEVANAGARI VOWEL SIGN AU
094D	DEVANAGARI SIGN VIRAMA
0951	DEVANAGARI STRESS SIGN UDATTA
0952	DEVANAGARI STRESS SIGN ANUDATTA
0953	DEVANAGARI GRAVE ACCENT
0954	DEVANAGARI ACUTE ACCENT
0962	DEVANAGARI VOWEL SIGN VOCALIC L
0963	DEVANAGARI VOWEL SIGN VOCALIC LL
0981	BENGALI SIGN CANDRABINDU
0982	BENGALI SIGN ANUSVARA
0983	BENGALI SIGN VISARGA
09BC	BENGALI SIGN NUKTA
09BE	BENGALI VOWEL SIGN AA
09BF	BENGALI VOWEL SIGN I
09C0	BENGALI VOWEL SIGN II
09C1	BENGALI VOWEL SIGN U
09C2	BENGALI VOWEL SIGN UU
09C3	BENGALI VOWEL SIGN VOCALIC R
09C4	BENGALI VOWEL SIGN VOCALIC RR
09C7	BENGALI VOWEL SIGN E
09C8	BENGALI VOWEL SIGN AI
09CB	BENGALI VOWEL SIGN O
09CC	BENGALI VOWEL SIGN AU
09CD	BENGALI SIGN VIRAMA
09D7	BENGALI AU LENGTH MARK
09E2	BENGALI VOWEL SIGN VOCALIC L
09E3	BENGALI VOWEL SIGN VOCALIC LL
0A01	GURMUKHI SIGN ADAK BINDI
0A02	GURMUKHI SIGN BINDI
0A03	GURMUKHI SIGN VISARGA
0A3C	GURMUKHI SIGN NUKTA
0A3E	GURMUKHI VOWEL SIGN AA
0A3F	GURMUKHI VOWEL SIGN I
0A40	GURMUKHI VOWEL SIGN II
0A41	GURMUKHI VOWEL SIGN U
0A42	GURMUKHI VOWEL SIGN UU
0A47	GURMUKHI VOWEL SIGN EE
0A48	GURMUKHI VOWEL SIGN AI
0A4B	GURMUKHI VOWEL SIGN OO
0A4C	GURMUKHI VOWEL SIGN AU
0A4D	GURMUKHI SIGN VIRAMA
0A70	GURMUKHI TIPPI
0A71	GURMUKHI ADDAK
0A81	GUJARATI SIGN CANDRABINDU
0A82	GUJARATI SIGN ANUSVARA
0A83	GUJARATI SIGN VISARGA
0ABC	GUJARATI SIGN NUKTA
0ABE	GUJARATI VOWEL SIGN AA
0ABF	GUJARATI VOWEL SIGN I
0AC0	GUJARATI VOWEL SIGN II
0AC1	GUJARATI VOWEL SIGN U
0AC2	GUJARATI VOWEL SIGN UU
0AC3	GUJARATI VOWEL SIGN VOCALIC R
0AC4	GUJARATI VOWEL SIGN VOCALIC RR
0AC5	GUJARATI VOWEL SIGN CANDRA E
0AC7	GUJARATI VOWEL SIGN E
0AC8	GUJARATI VOWEL SIGN AI
0AC9	GUJARATI VOWEL SIGN CANDRA O
0ACB	GUJARATI VOWEL SIGN O
0ACC	GUJARATI VOWEL SIGN AU
0ACD	GUJARATI SIGN VIRAMA
0AE2	GUJARATI VOWEL SIGN VOCALIC L
0AE3	GUJARATI VOWEL SIGN VOCALIC LL
0B01	ORIYA SIGN CANDRABINDU
0B02	ORIYA SIGN ANUSVARA
0B03	ORIYA SIGN VISARGA

0B3C ORIYA SIGN NUKTA
0B3E ORIYA VOWEL SIGN AA
0B3F ORIYA VOWEL SIGN I
0B40 ORIYA VOWEL SIGN II
0B41 ORIYA VOWEL SIGN U
0B42 ORIYA VOWEL SIGN UU
0B43 ORIYA VOWEL SIGN VOCALIC R
0B47 ORIYA VOWEL SIGN E
0B48 ORIYA VOWEL SIGN AI
0B4B ORIYA VOWEL SIGN O
0B4C ORIYA VOWEL SIGN AU
0B4D ORIYA SIGN VIRAMA
0B56 ORIYA AI LENGTH MARK
0B57 ORIYA AU LENGTH MARK
0B82 TAMIL SIGN ANUSVARA
0BBE TAMIL VOWEL SIGN AA
0BBF TAMIL VOWEL SIGN I
0BC0 TAMIL VOWEL SIGN II
0BC1 TAMIL VOWEL SIGN U
0BC2 TAMIL VOWEL SIGN UU
0BC6 TAMIL VOWEL SIGN E
0BC7 TAMIL VOWEL SIGN EE
0BC8 TAMIL VOWEL SIGN AI
0BCA TAMIL VOWEL SIGN O
0BCB TAMIL VOWEL SIGN OO
0BCC TAMIL VOWEL SIGN AU
0BCD TAMIL SIGN VIRAMA
0BD7 TAMIL AU LENGTH MARK
0C01 TELUGU SIGN CANDRABINDU
0C02 TELUGU SIGN ANUSVARA
0C03 TELUGU SIGN VISARGA
0C3E TELUGU VOWEL SIGN AA
0C3F TELUGU VOWEL SIGN I
0C40 TELUGU VOWEL SIGN II
0C41 TELUGU VOWEL SIGN U
0C42 TELUGU VOWEL SIGN UU
0C43 TELUGU VOWEL SIGN VOCALIC R
0C44 TELUGU VOWEL SIGN VOCALIC RR
0C46 TELUGU VOWEL SIGN E
0C47 TELUGU VOWEL SIGN EE
0C48 TELUGU VOWEL SIGN AI
0C4A TELUGU VOWEL SIGN O
0C4B TELUGU VOWEL SIGN OO
0C4C TELUGU VOWEL SIGN AU
0C4D TELUGU SIGN VIRAMA
0C55 TELUGU LENGTH MARK
0C56 TELUGU AI LENGTH MARK
0C82 KANNADA SIGN ANUSVARA
0C83 KANNADA SIGN VISARGA
0CBC KANNADA SIGN NUKTA
0CBE KANNADA VOWEL SIGN AA
0CBF KANNADA VOWEL SIGN I
0CC0 KANNADA VOWEL SIGN II
0CC1 KANNADA VOWEL SIGN U
0CC2 KANNADA VOWEL SIGN UU
0CC3 KANNADA VOWEL SIGN VOCALIC R
0CC4 KANNADA VOWEL SIGN VOCALIC RR
0CC6 KANNADA VOWEL SIGN E
0CC7 KANNADA VOWEL SIGN EE
0CC8 KANNADA VOWEL SIGN AI
0CCA KANNADA VOWEL SIGN O
0CCB KANNADA VOWEL SIGN OO
0CCC KANNADA VOWEL SIGN AU
0CCD KANNADA SIGN VIRAMA
0CD5 KANNADA LENGTH MARK
0CD6 KANNADA AI LENGTH MARK
0D02 MALAYALAM SIGN ANUSVARA
0D03 MALAYALAM SIGN VISARGA
0D3E MALAYALAM VOWEL SIGN AA
0D3F MALAYALAM VOWEL SIGN I
0D40 MALAYALAM VOWEL SIGN II
0D41 MALAYALAM VOWEL SIGN U
0D42 MALAYALAM VOWEL SIGN UU
0D43 MALAYALAM VOWEL SIGN VOCALIC R
0D46 MALAYALAM VOWEL SIGN E
0D47 MALAYALAM VOWEL SIGN EE
0D48 MALAYALAM VOWEL SIGN AI
0D4A MALAYALAM VOWEL SIGN O
0D4B MALAYALAM VOWEL SIGN OO
0D4C MALAYALAM VOWEL SIGN AU
0D4D MALAYALAM SIGN VIRAMA
0D57 MALAYALAM AU LENGTH MARK
0D82 SINHALA SIGN ANUSVARAYA
0D83 SINHALA SIGN VISARGAYA
0DCA SINHALA SIGN AL-LAKUNA
0DCF SINHALA VOWEL SIGN AELA-PILLA
0DD0 SINHALA VOWEL SIGN KETTI AEDA-PILLA
0DD1 SINHALA VOWEL SIGN DIGA AEDA-PILLA
0DD2 SINHALA VOWEL SIGN KETTI IS-PILLA
0DD3 SINHALA VOWEL SIGN DIGA IS-PILLA
0DD4 SINHALA VOWEL SIGN KETTI PAA-PILLA
0DD6 SINHALA VOWEL SIGN DIGA PAA-PILLA
0DD8 SINHALA VOWEL SIGN GAETTA-PILLA
0DD9 SINHALA VOWEL SIGN KOMBUVA
0DDA SINHALA VOWEL SIGN DIGA KOMBUVA
0DDB SINHALA VOWEL SIGN KOMBU DEKA
0DDC SINHALA VOWEL SIGN KOMBUVA HAA AELA-PILLA
0DDD SINHALA VOWEL SIGN KOMBUVA HAA DIGA AELA-PILLA
0DDE SINHALA VOWEL SIGN KOMBUVA HAA GAYANUKITTA
0DDF SINHALA VOWEL SIGN GAYANUKITTA
0DF2 SINHALA VOWEL SIGN DIGA GAETTA-PILLA
0DF3 SINHALA VOWEL SIGN DIGA GAYANUKITTA
0E31 THAI CHARACTER MAI HAN-AKAT
0E34 THAI CHARACTER SARA I
0E35 THAI CHARACTER SARA II
0E36 THAI CHARACTER SARA UE
0E37 THAI CHARACTER SARA UEE
0E38 THAI CHARACTER SARA U
0E39 THAI CHARACTER SARA UU
0E3A THAI CHARACTER PHINTHU
0E47 THAI CHARACTER MAITAIKHU
0E48 THAI CHARACTER MAI EK
0E49 THAI CHARACTER MAI THO
0E4A THAI CHARACTER MAI TRI
0E4B THAI CHARACTER MAI CHATTAWA
0E4C THAI CHARACTER THANTHAKHAT
0E4D THAI CHARACTER NIKHAHIT
0E4E THAI CHARACTER YAMAKKAN
0EB1 LAO VOWEL SIGN MAI KAN
0EB4 LAO VOWEL SIGN I
0EB5 LAO VOWEL SIGN II
0EB6 LAO VOWEL SIGN Y
0EB7 LAO VOWEL SIGN YY
0EB8 LAO VOWEL SIGN U
0EB9 LAO VOWEL SIGN UU
0EBB LAO VOWEL SIGN MAI KON

0EBC	LAO SEMIVOWEL SIGN LO
0EC8	LAO TONE MAI EK
0EC9	LAO TONE MAI THO
0ECA	LAO TONE MAI TI
0ECB	LAO TONE MAI CATAWA
0ECC	LAO CANCELLATION MARK
0ECD	LAO NIGGAHITA
0F18	TIBETAN ASTROLOGICAL SIGN -KHYUD PA
0F19	TIBETAN ASTROLOGICAL SIGN SDONG TSHUGS
0F35	TIBETAN MARK NGAS BZUNG NYI ZLA
0F37	TIBETAN MARK NGAS BZUNG SGOR RTAGS
0F39	TIBETAN MARK TSA -PHRU
0F3E	TIBETAN SIGN YAR TSHES
0F3F	TIBETAN SIGN MAR TSHES
0F71	TIBETAN VOWEL SIGN AA
0F72	TIBETAN VOWEL SIGN I
0F73	TIBETAN VOWEL SIGN II
0F74	TIBETAN VOWEL SIGN U
0F75	TIBETAN VOWEL SIGN UU
0F76	TIBETAN VOWEL SIGN VOCALIC R
0F77	TIBETAN VOWEL SIGN VOCALIC RR
0F78	TIBETAN VOWEL SIGN VOCALIC L
0F79	TIBETAN VOWEL SIGN VOCALIC LL
0F7A	TIBETAN VOWEL SIGN E
0F7B	TIBETAN VOWEL SIGN EE
0F7C	TIBETAN VOWEL SIGN O
0F7D	TIBETAN VOWEL SIGN OO
0F7E	TIBETAN SIGN RJES SU NGA RO
0F7F	TIBETAN SIGN RNAM BCAD
0F80	TIBETAN VOWEL SIGN REVERSED I
0F81	TIBETAN VOWEL SIGN REVERSED II
0F82	TIBETAN SIGN NYI ZLA NAA DA
0F83	TIBETAN SIGN SNA LDAN
0F84	TIBETAN MARK HALANTA
0F86	TIBETAN MARK LCI RTAGS
0F87	TIBETAN MARK YANG RTAGS
0F90	TIBETAN SUBJOINED LETTER KA
0F91	TIBETAN SUBJOINED LETTER KHA
0F92	TIBETAN SUBJOINED LETTER GA
0F93	TIBETAN SUBJOINED LETTER GHA
0F94	TIBETAN SUBJOINED LETTER NGA
0F95	TIBETAN SUBJOINED LETTER CA
0F96	TIBETAN SUBJOINED LETTER CHA
0F97	TIBETAN SUBJOINED LETTER JA
0F99	TIBETAN SUBJOINED LETTER NYA
0F9A	TIBETAN SUBJOINED LETTER TTA
0F9B	TIBETAN SUBJOINED LETTER TTHA
0F9C	TIBETAN SUBJOINED LETTER DDA
0F9D	TIBETAN SUBJOINED LETTER DDHA
0F9E	TIBETAN SUBJOINED LETTER NNA
0F9F	TIBETAN SUBJOINED LETTER TA
0FA0	TIBETAN SUBJOINED LETTER THA
0FA1	TIBETAN SUBJOINED LETTER DA
0FA2	TIBETAN SUBJOINED LETTER DHA
0FA3	TIBETAN SUBJOINED LETTER NA
0FA4	TIBETAN SUBJOINED LETTER PA
0FA5	TIBETAN SUBJOINED LETTER PHA
0FA6	TIBETAN SUBJOINED LETTER BA
0FA7	TIBETAN SUBJOINED LETTER BHA
0FA8	TIBETAN SUBJOINED LETTER MA
0FA9	TIBETAN SUBJOINED LETTER TSA
0FAA	TIBETAN SUBJOINED LETTER TSHA
0FAB	TIBETAN SUBJOINED LETTER DZA
0FAC	TIBETAN SUBJOINED LETTER DZHA
0FAD	TIBETAN SUBJOINED LETTER WA
0FAE	TIBETAN SUBJOINED LETTER ZHA
0FAF	TIBETAN SUBJOINED LETTER ZA
0FB0	TIBETAN SUBJOINED LETTER -A
0FB1	TIBETAN SUBJOINED LETTER YA
0FB2	TIBETAN SUBJOINED LETTER RA
0FB3	TIBETAN SUBJOINED LETTER LA
0FB4	TIBETAN SUBJOINED LETTER SHA
0FB5	TIBETAN SUBJOINED LETTER SSA
0FB6	TIBETAN SUBJOINED LETTER SA
0FB7	TIBETAN SUBJOINED LETTER HA
0FB8	TIBETAN SUBJOINED LETTER A
0FB9	TIBETAN SUBJOINED LETTER KSSA
0FBA	TIBETAN SUBJOINED LETTER FIXED-FORM WA
0FBB	TIBETAN SUBJOINED LETTER FIXED-FORM YA
0FBC	TIBETAN SUBJOINED LETTER FIXED-FORM RA
0FC6	TIBETAN SYMBOL PADMA GDAN
102C	MYANMAR VOWEL SIGN AA
102D	MYANMAR VOWEL SIGN I
102E	MYANMAR VOWEL SIGN II
102F	MYANMAR VOWEL SIGN U
1030	MYANMAR VOWEL SIGN UU
1031	MYANMAR VOWEL SIGN E
1032	MYANMAR VOWEL SIGN AI
1036	MYANMAR SIGN ANUSVARA
1037	MYANMAR SIGN DOT BELOW
1038	MYANMAR SIGN VISARGA
1039	MYANMAR SIGN VIRAMA
1056	MYANMAR VOWEL SIGN VOCALIC R
1057	MYANMAR VOWEL SIGN VOCALIC RR
1058	MYANMAR VOWEL SIGN VOCALIC L
1059	MYANMAR VOWEL SIGN VOCALIC LL
1712	TAGALOG VOWEL SIGN I
1713	TAGALOG VOWEL SIGN U
1714	TAGALOG VIRAMA
1732	HANUNOO VOWEL SIGN I
1733	HANUNOO VOWEL SIGN U
1734	HANUNOO PAMUDPOD
1752	BUHID VOWEL SIGN I
1753	BUHID VOWEL SIGN U
1772	TAGBANWA VOWEL SIGN I
1773	TAGBANWA VOWEL SIGN U
17B6	KHMER VOWEL SIGN AA
17B7	KHMER VOWEL SIGN I
17B8	KHMER VOWEL SIGN II
17B9	KHMER VOWEL SIGN Y
17BA	KHMER VOWEL SIGN YY
17BB	KHMER VOWEL SIGN U
17BC	KHMER VOWEL SIGN UU
17BD	KHMER VOWEL SIGN UA
17BE	KHMER VOWEL SIGN OE
17BF	KHMER VOWEL SIGN YA
17C0	KHMER VOWEL SIGN IE
17C1	KHMER VOWEL SIGN E
17C2	KHMER VOWEL SIGN AE
17C3	KHMER VOWEL SIGN AI
17C4	KHMER VOWEL SIGN OO
17C5	KHMER VOWEL SIGN AU
17C6	KHMER SIGN NIKAHIT
17C7	KHMER SIGN REAHMUK
17C8	KHMER SIGN YUUKALEAPINTU
17C9	KHMER SIGN MUUSIKATOAN
17CA	KHMER SIGN TRIISAP
17CB	KHMER SIGN BANTOC

17CC KHMER SIGN ROBAT
17CD KHMER SIGN TOANDAKHIAT
17CE KHMER SIGN KAKABAT
17CF KHMER SIGN AHSDA
17D0 KHMER SIGN SAMYOK SANNYA
17D1 KHMER SIGN VIRIAM
17D2 KHMER SIGN COENG
17D3 KHMER SIGN BATHAMASAT
17DD KHMER SIGN ATTHACAN
180B MONGOLIAN FREE VARIATION SELECTOR ONE
180C MONGOLIAN FREE VARIATION SELECTOR TWO
180D MONGOLIAN FREE VARIATION SELECTOR THREE
18A9 MONGOLIAN LETTER AG DAGALGA
1920 LIMBU VOWEL SIGN A
1921 LIMBU VOWEL SIGN I
1922 LIMBU VOWEL SIGN U
1923 LIMBU VOWEL SIGN EE
1924 LIMBU VOWEL SIGN AI
1925 LIMBU VOWEL SIGN OO
1926 LIMBU VOWEL SIGN AU
1927 LIMBU VOWEL SIGN E
1928 LIMBU VOWEL SIGN O
1929 LIMBU SUBJOINED LETTER YA
192A LIMBU SUBJOINED LETTER RA
192B LIMBU SUBJOINED LETTER WA
1930 LIMBU SMALL LETTER KA
1931 LIMBU SMALL LETTER NGA
1932 LIMBU SMALL LETTER ANUSVARA
1933 LIMBU SMALL LETTER TA
1934 LIMBU SMALL LETTER NA
1935 LIMBU SMALL LETTER PA
1936 LIMBU SMALL LETTER MA
1937 LIMBU SMALL LETTER RA
1938 LIMBU SMALL LETTER LA
1939 LIMBU SIGN MUKPHRENG
193A LIMBU SIGN KEMPHRENG
193B LIMBU SIGN SA-I
302A IDEOGRAPHIC LEVEL TONE MARK
302B IDEOGRAPHIC RISING TONE MARK
302C IDEOGRAPHIC DEPARTING TONE MARK
302D IDEOGRAPHIC ENTERING TONE MARK
302E HANGUL SINGLE DOT TONE MARK
302F HANGUL DOUBLE DOT TONE MARK
3099 COMBINING KATAKANA-HIRAGANA VOICED SOUND MARK
309A COMBINING KATAKANA-HIRAGANA SEMI-VOICED SOUND MARK
FB1E HEBREW POINT JUDEO-SPANISH VARIKA
FE00 VARIATION SELECTOR-1
FE01 VARIATION SELECTOR-2
FE02 VARIATION SELECTOR-3
FE03 VARIATION SELECTOR-4
FE04 VARIATION SELECTOR-5
FE05 VARIATION SELECTOR-6
FE06 VARIATION SELECTOR-7
FE07 VARIATION SELECTOR-8
FE08 VARIATION SELECTOR-9
FE09 VARIATION SELECTOR-10
FE0A VARIATION SELECTOR-11
FE0B VARIATION SELECTOR-12
FE0C VARIATION SELECTOR-13
FE0D VARIATION SELECTOR-14
FE0E VARIATION SELECTOR-15
FE0F VARIATION SELECTOR-16

1D165 MUSICAL SYMBOL COMBINING STEM
1D166 MUSICAL SYMBOL COMBINING SPRECHGESANG STEM
1D167 MUSICAL SYMBOL COMBINING TREMOLO ONE
1D168 MUSICAL SYMBOL COMBINING TREMOLO TWO
1D169 MUSICAL SYMBOL COMBINING TREMOLO THREE
1D16D MUSICAL SYMBOL COMBINING AUGMENTATION DOT
1D16E MUSICAL SYMBOL COMBINING FLAG ONE
1D16F MUSICAL SYMBOL COMBINING FLAG TWO
1D170 MUSICAL SYMBOL COMBINING FLAG THREE
1D171 MUSICAL SYMBOL COMBINING FLAG FOUR
1D172 MUSICAL SYMBOL COMBINING FLAG FIVE
1D17B MUSICAL SYMBOL COMBINING ACCENT
1D17C MUSICAL SYMBOL COMBINING STACCATO
1D17D MUSICAL SYMBOL COMBINING TENUTO
1D17E MUSICAL SYMBOL COMBINING STACCATISSIMO
1D17F MUSICAL SYMBOL COMBINING MARCATO
1D180 MUSICAL SYMBOL COMBINING MARCATO STACCATO
1D181 MUSICAL SYMBOL COMBINING ACCENT-STACCATO
1D182 MUSICAL SYMBOL COMBINING LOURE
1D185 MUSICAL SYMBOL COMBINING DOIT
1D186 MUSICAL SYMBOL COMBINING RIP
1D187 MUSICAL SYMBOL COMBINING FLIP
1D188 MUSICAL SYMBOL COMBINING SMEAR
1D189 MUSICAL SYMBOL COMBINING BEND
1D18A MUSICAL SYMBOL COMBINING DOUBLE TONGUE
1D18B MUSICAL SYMBOL COMBINING TRIPLE TONGUE
1D1AA MUSICAL SYMBOL COMBINING DOWN BOW
1D1AB MUSICAL SYMBOL COMBINING UP BOW
1D1AC MUSICAL SYMBOL COMBINING HARMONIC
1D1AD MUSICAL SYMBOL COMBINING SNAP PIZZICATO

B.2 List of combining and other characters not allowed in implementation level 2

The characters in the subset collections
COMBINING DIACRITICAL MARKS (0300 to 036F),
COMBINING DIACRITICAL MARKS FOR SYMBOLS (20D0 to 20FF),
HANGUL JAMO (1100 to 11FF) and
COMBINING HALF MARKS (FE20 to FE2F)
are not allowed in implementation level 2. In addition, the following individual characters are also not allowed.

NOTE - This list is a subset of the list in clause B.1 except for HANGUL JAMO (see 25.1).

0483	COMBINING CYRILLIC TITLO
0484	COMBINING CYRILLIC PALATALIZATION
0485	COMBINING CYRILLIC DASIA PNEUMATA
0486	COMBINING CYRILLIC PSILI PNEUMATA
0591	HEBREW ACCENT ETNAHTA
0592	HEBREW ACCENT SEGOL
0593	HEBREW ACCENT SHALSHELET
0594	HEBREW ACCENT ZAQEF QATAN
0595	HEBREW ACCENT ZAQEF GADOL
0596	HEBREW ACCENT TIPEHA
0597	HEBREW ACCENT REVIA
0598	HEBREW ACCENT ZARQA
0599	HEBREW ACCENT PASHTA
059A	HEBREW ACCENT YETIV
059B	HEBREW ACCENT TEVIR
059C	HEBREW ACCENT GERESH
059D	HEBREW ACCENT GERESH MUQDAM
059E	HEBREW ACCENT GERSHAYIM
059F	HEBREW ACCENT QARNEY PARA
05A0	HEBREW ACCENT TELISHA GEDOLA
05A1	HEBREW ACCENT PAZER
05A3	HEBREW ACCENT MUNAH
05A4	HEBREW ACCENT MAHAPAKH
05A5	HEBREW ACCENT MERKHA
05A6	HEBREW ACCENT MERKHA KEFULA
05A7	HEBREW ACCENT DARGA
05A8	HEBREW ACCENT QADMA
05A9	HEBREW ACCENT TELISHA QETANA
05AA	HEBREW ACCENT YERAH BEN YOMO
05AB	HEBREW ACCENT OLE
05AC	HEBREW ACCENT ILUY
05AD	HEBREW ACCENT DEHI
05AE	HEBREW ACCENT ZINOR
05AF	HEBREW MARK MASORA CIRCLE
05C4	HEBREW MARK UPPER DOT
093C	DEVANAGARI SIGN NUKTA
0953	DEVANAGARI GRAVE ACCENT
0954	DEVANAGARI ACUTE ACCENT
09BC	BENGALI SIGN NUKTA
09D7	BENGALI AU LENGTH MARK
0A3C	GURMUKHI SIGN NUKTA
0A70	GURMUKHI TIPPI
0A71	GURMUKHI ADDAK
0ABC	GUJARATI SIGN NUKTA
0B3C	ORIYA SIGN NUKTA
0B56	ORIYA AI LENGTH MARK
0B57	ORIYA AU LENGTH MARK
0BD7	TAMIL AU LENGTH MARK
0C55	TELUGU LENGTH MARK
0C56	TELUGU AI LENGTH MARK
0CD5	KANNADA LENGTH MARK
0CD6	KANNADA AI LENGTH MARK
0D57	MALAYALAM AU LENGTH MARK
0F39	TIBETAN MARK TSA -PHRU
302A	IDEOGRAPHIC LEVEL TONE MARK
302B	IDEOGRAPHIC RISING TONE MARK
302C	IDEOGRAPHIC DEPARTING TONE MARK
302D	IDEOGRAPHIC ENTERING TONE MARK
302E	HANGUL SINGLE DOT TONE MARK
302F	HANGUL DOUBLE DOT TONE MARK
3099	COMBINING KATAKANA-HIRAGANA VOICED SOUND MARK
309A	COMBINING KATAKANA-HIRAGANA SEMI-VOICED SOUND MARK

Annex C
(normative)

Transformation format for 16 planes of Group 00 (UTF-16)

UTF-16 provides a coded representation of over a million graphic characters of UCS-4 in a form that is compatible with the two-octet BMP form of UCS-2 (13.1). This permits the coexistence of those characters from UCS-4 within coded character data that is in accordance with UCS-2.

In UTF-16 each graphic character from the UCS-2 repertoire retains its UCS-2 coded representation. In addition, the coded representation of any character from a single contiguous block of 16 Planes in Group 00 (1,048,576 code positions) consists of a pair of RC-elements (4.33), where each such RC-element corresponds to a cell in a single contiguous block of 8 Rows in the BMP (2,048 code positions). These code positions are reserved for the use of this coded representation form, and shall not be allocated for any other purpose.

C.1 Specification of UTF-16

The specification of UTF-16 is as follows:

1. The high-half zone shall be the 4 rows D8 to DB of the BMP, i.e., the 1,024 cells in the S-zone whose code positions are from D800 through DBFF.
2. The low-half zone shall be the 4 rows DC to DF of the BMP, i.e., the 1,024 cells in the S-zone whose code positions are from DC00 through DFFF.
3. All cells in the high-half zone and the low-half zone shall be permanently reserved for the use of the UTF-16 coded representation form.
4. In UTF-16, any UCS character from the BMP shall be represented by its UCS-2 coded representation as specified by the body of this international standard.
5. In UTF-16, any UCS character whose UCS-4 coded representation is in the range 0001 0000 to 0010 FFFF shall be represented by a sequence of two RC-elements from the S-zone, of which the first is an RC-element from the high-half zone, and the second is an RC-element from the low-half zone.

   The mapping between UCS-4 and UTF-16 for these characters shall be as shown in C.3; the reverse mapping is shown in C.4.

   NOTE - The Unicode Standard, Version 3.0, defines the following forms of UTF-16.

   - UTF-16: the ordering of octets (6.3) is not defined and signatures (Annex H) may appear;
   - UTF-16BE: in the ordering of octets the more significant octet precedes the less significant octet, as specified in 6.2, and no signatures appear;
   - UTF-16LE: in the ordering of octets the less significant octet precedes the more significant octet and no signatures appear.

C.2 Notation

1. All numbers are in hexadecimal notation.
2. Double-octet boundaries in the notations for UTF-16 are indicated with semicolons.
3. The symbol "%" indicates the modulo operation, e.g.: x % y = x modulo y.
4. The symbol "/" indicates the integer division operation, e.g.: 7 / 3 = 2.
5. Precedence is -
   integer-division > modulo-operation >
   integer-multiplication > integer-addition.

C.3 Mapping from UCS-4 form to UTF-16 form

UCS-4 (4-octet)		UTF-16, 2-octet elements
x =	0000 0000 .. 0000 FFFF (see Note 1)	x % 0001 0000;
x =	0001 0000 .. 0010 FFFF	y; z;
where	y = ((x - 0001 0000) / 400) + D800 z = ((x - 0001 0000) % 400) + DC00	
x	0011 0000 .. 7FFF FFFF	(no mapping (is defined

NOTE - Code positions from 0000 D800 to 0000 DFFF are reserved for the UTF-16 form and do not occur in UCS-4. The values 0000 FFFE and 0000 FFFF also do not occur (see clause 8). The mapping of these code positions in UTF-16 is undefined.

Example:

The UCS-4 sequence [0000 0048] [0000 0069] [0001 0000] [0000 0021] [0000 0021]

represents “Hi<0001 0000>!!”.

It is mapped to UTF-16 as:

[0048] [0069] [D800] [DC00] [0021] [0021]

If interpreted as UCS-2 this sequence will be

“Hi<RC-element from high-half zone> <RC-element from low-half zone>!!”

C.4 Mapping from UTF-16 form to UCS-4 form

UTF-16, 2-octet elements		UCS-4 (4-octet)
x =	0000; ... D7FF;	x
x =	E000; ... FFFF;	x

pair (x, y) such that

x =	D800; ... DBFF;	((x - D800) * 400
y =	DC00; ... DFFF;	+ (y - DC00)) + 0001 0000

Example:

The UTF-16 sequence

[0048] [0069] [D800] [DC00] [0021] [0021]

is mapped to UCS-4 as

[0000 0048] [0000 0069] [0001 0000] [0000 0021] [0000 0021]

and represents “Hi<0001 0000>!!”.

C.5 Identification of UTF-16

When the escape sequences from ISO/IEC 2022 are used, the identification of UTF-16 and an implementation level (see clause 14) shall be by a designation sequence chosen from the following list:

ESC 02/05 02/15 04/10
UTF-16 with implementation level 1

ESC 02/05 02/15 04/11
UTF-16 with implementation level 2

ESC 02/05 02/15 04/12
UTF-16 with implementation level 3

If such an escape sequence appears within a CC-data-element conforming to ISO/IEC 2022, it shall consist only of the sequences of bit combinations as shown above.

If such an escape sequence appears within a CC-data-element conforming to ISO/IEC 10646, it shall be padded in accordance with clause 15.

When the escape sequences from ISO 2022 are used, the identification of a return, or transfer, from UTF-16 to the coding system of ISO 2022 shall be as specified in 16.5 for a return or transfer from UCS.

C.6 Unpaired RC-elements: Interpretation by receiving devices

According to C.1 an unpaired RC-element (4.33) is not in conformance with the requirements of UTF-16.

If a receiving device that has adopted the UTF-16 form receives an unpaired RC-element because of error conditions either:

- in an originating device, or
- in the interchange between an originating and the receiving device, or
- in the receiving device itself,

then it shall interpret that unpaired RC-element in the same way that it interprets a character that is outside the adopted subset that has been identified for the device (see 2.3c).

NOTE - Since a high-half RC-element followed by a low-half RC-element is a sequence that is in accordance with UTF-16, the only possible type of syntactically malformed sequence is an unpaired RC-element.

Example:

A receiving/originating device which only handles the Basic Latin repertoire, and uses boxes (shown here as ◊) to display characters outside that repertoire, would display:

“The Greek letter Σ is the capital form of letter σ.”

as:

“The Greek letter ◊ is the capital form of letter ◊.”

Accordingly a similar device that can also interpret a UTF-16 data stream should also display an unpaired RC-element as a box.

C.7 Receiving devices, advisory notes

When a receiving device interprets a CC-data-element that is in accordance with UTF-16 the following advisory notes apply.

1. UTF-16 is designed to be compatible with the UCS-2 two-octet BMP Form (13.1). The high-half and low-half zones are assigned to separate ranges of code positions, to which characters can never be assigned. Thus the function of every RC-element (two-octet unit) within a UTF-16 data stream is always immediately identifiable from its value, without regard to context.

   For example, the valid UTF-16 sequence [0048] [0069] [D800] [DC00] [0021] [0021] may also be interpreted by a receiving device that has adopted only UCS-2 as the coded representation of

   “Hi<unrecognized><unrecognized>!!”

   This form of compatibility is possible because RC-elements from the S-zone are interpreted according to UTF-16 by receiving devices that have adopted UTF-16, and as unrecognized characters by receiv-

ing devices that have only adopted UCS-2. Consequently an originating device may transmit UTF-16 data even if the receiving device can only interpret that data as UCS-2 characters.

2. Designers of devices may choose to use UTF-16 as an internal representation for processing or other purposes. There are two primary issues for such devices:

   • Does the device interpret (i.e., process according to the assigned semantics) some subset of the pairs (high-half + low-half) of RC-elements, e.g., render the pair as the intended single character?

   • Does the device guarantee the integrity of every pair (high-half + low-half) of RC-elements, e.g., never separate such pairs in operations such as string truncation, insertion, or other modifications of the coded character sequence?

   The decisions on these issues give rise to four possible combinations of capability in a device:

   (U) UCS-2 implementations:
   - Interpret no pairs.
   - Do not guarantee integrity of pairs.

   (W) Weak UTF-16 implementations:
   - Interpret a non-null subset of pairs.
   - Do not guarantee integrity of pairs.

   (A) Aware UTF-16 implementations:
   - Interpret no pairs.
   - Guarantee integrity of pairs.

   (S) Strong UTF-16 implementations:
   - Interpret a non-null subset of pairs.
   - Guarantee integrity of pairs.

Example:

The following sentence could be displayed in four different ways, assuming that both the weak and strong implementations have Etruscan fonts but no hieroglyphic fonts:

“The Greek letter Σ corresponds to <hieroglyphic-High> <hieroglyphic-Low> and to <Etruscan-High> <Etruscan-Low>.”

where <xxx-High> and <xxx-Low> represent RC-elements, from the High-half and Low-half zones respectively, corresponding to a character from the block indicated by xxx. These four ways are shown below.

U: “The Greek letter Σ corresponds to ◊◊ and to ◊◊.”

W: “The Greek letter Σ corresponds to ◊◊ and to Σ̲.”

A: “The Greek letter Σ corresponds to ◊ and to ◊.”

S: “The Greek letter Σ corresponds to ◊ and to Σ̲.”

where Σ̲ here indicates the letter ES in the Etruscan font.

Annex D
(normative)

UCS Transformation Format 8 (UTF-8)

UTF-8 is an alternative coded representation form for all of the characters of the UCS. It can be used to transmit text data through communication systems which assume that individual octets in the range 00 to 7F have a definition according to ISO/IEC 4873, including a C0 set of control functions according to the 8-bit structure of ISO/IEC 2022. UTF-8 also avoids the use of octet values in this range which have special significance during the parsing of file-name character strings in widely-used file-handling systems.

The number of octets in the UTF-8 coded representation of the characters of the UCS ranges from one to six; the value of the first octet indicates the number of octets in that coded representation.

D.1 Features of UTF-8

- UCS characters from the BASIC LATIN collection are represented in UTF-8 in accordance with ISO/IEC 4873, i.e. single octets with values ranging from 20 to 7E.
- Control functions in positions 0000 0000 to 0000 001F, and the DELETE character in position 0000 007F, are represented without the padding octets specified in clause 15, i.e. as single octets with values ranging from 00 to 1F, and 7F respectively in accordance with ISO/IEC 4873 and with the 8-bit structure of ISO/IEC 2022.
- Octet values 00 to 7F do not otherwise occur in the UTF-8 coded representation of any character. This provides compatibility with existing file-handling systems and communications sub-systems which parse CC-data-elements for these octet values.
- The first octet in the UTF-8 coded representation of any character can be directly identified when a CC-data-element is examined, one octet at a time, starting from an arbitrary location. It indicates the number of continuing octets (if any) in the multi-octet sequence that constitutes the coded representation of that character.

D.2 Specification of UTF-8

In the UTF-8 coded representation form each character from this International Standard shall have a coded representation that comprises a sequence of octets of length 1, 2, 3, 4, 5, or 6 octets.

For all sequences of one octet the most significant bit shall be a ZERO bit.

For all sequences of more than one octet, the number of ONE bits in the first octet, starting from the most significant bit position, shall indicate the number of octets in the sequence. The next most significant bit shall be a ZERO bit.

> NOTE 1 - For example, the first octet of a 2-octet sequence has bits 110 in the most significant positions, and the first octet of a 6-octet sequence has bits 1111110 in the most significant positions.

All of the octets, other than the first in a sequence, are known as continuing octets. The two most significant bits of a continuing octet shall be a ONE bit followed by a ZERO bit.

The remaining bit positions in the octets of the sequence shall be “free bit positions” that are used to distinguish between the characters of this International Standard. These free bit positions shall be used, in order of increasing significance, for the bits of the UCS-4 coded representation of the character, starting from its least significant bit. Some of the high-order ZERO bits of the UCS-4 representation shall be omitted, as specified below.

Table D.1 below shows the format of the octets of a coded character according to UTF-8. Each free bit position available for distinguishing between the characters is indicated by an x. Each entry in the column “Maximum UCS-4 value” indicates the upper end of the range of coded representations from UCS-4 that may be represented in a UTF-8 sequence having the length indicated in the “Octet usage” column.

Table D.1 - Format of octets in a UTF-8 sequence

Octet usage	Format (binary)	No. of free bits	Maximum UCS-4 value
1st of 1	0xxxxxxx	7	0000 007F
1st of 2	110xxxxx	5	0000 07FF
1st of 3	1110xxxx	4	0000 FFFF
1st of 4	11110xxx	3	001F FFFF
1st of 5	111110xx	2	03FF FFFF
1st of 6	1111110x	1	7FFF FFFF
continuing) 2nd .. 6th)	10xxxxxx	6	

Table D.1 shows that, in a CC-data-element conforming to UTF-8, the range of values for each octet indicates its usage as follows:

00 to 7F first and only octet of a sequence;

80 to BF continuing octet of a multi-octet sequence;

C0 to FD first octet of a multi-octet sequence;

FE or FF not used.

The mapping between UCS-4 and UTF-8 shall be as shown in D.4; the reverse mapping is shown in D.5.

NOTE 2 - Examples of UCS-4 coded representations and the corresponding UTF-8 coded representations are shown in Tables D.2 and D.3.

Table D.2 shows the UCS-4 and the UTF-8 coded representations, in binary notation, for a selection of code positions from the UCS.

Table D.3 shows the UCS-4 and the UTF-8 coded representations, in hexadecimal notation, for the same selection of code positions from the UCS.

NOTE 3 - Control functions in positions 0000 0080 to 0000 009F are represented by two-octet sequences obtained by applying the rules specified in this clause to the four-octet padded forms of the control functions, i.e. such a control function is represented by a sequence in the range C2 80 to C2 9F.

Table D.3 -

Examples in hexadecimal notation

UCS-4 form	UTF-8 form
0000 0001;	01;
0000 007F;	7F;
0000 0080;	C2; 80;
0000 07FF;	DF; BF;
0000 0800;	E0; A0; 80;
0000 FFFF;	EF; BF; BF;
0001 0000;	F0; 90; 80; 80;
0010 FFFF;	F4; 8F; BF; BF;
001F FFFF;	F7; BF; BF; BF;
0020 0000;	F8; 88; 80; 80; 80;
03FF FFFF;	FB; BF; BF; BF; BF;
0400 0000;	FC; 84; 80; 80; 80;80;
7FFF FFFF;	FD; BF; BF; BF; BF; BF;

Table D.2 - Examples in binary notation

Four-octet form - UCS-4	UTF-8 form
00000000 00000000 00000000 00000001;	00000001;
00000000 00000000 00000000 01111111;	01111111;
00000000 00000000 00000000 10000000;	11000010; 10000000;
00000000 00000000 00000111 11111111;	11011111; 10111111;
00000000 00000000 00001000 00000000;	11100000; 10100000; 10000000;
00000000 00000000 11111111 11111111;	11101111; 10111111; 10111111;
00000000 00000001 00000000 00000000;	11110000; 10010000; 10000000;10000000;
00000000 00011111 11111111 11111111;	11110111; 10111111; 10111111;10111111;
00000000 00100000 00000000 00000000;	11111000; 10001000; 10000000;10000000; 10000000;
00000011 11111111 11111111 11111111;	11111011; 10111111; 10111111;10111111; 10111111;
00000100 00000000 00000000 00000000;	11111100; 10000100; 10000000;10000000; 10000000; 10000000;
01111111 11111111 11111111 11111111;	11111101; 10111111; 10111111;10111111; 10111111; 10111111;

D.3 Notation

1. All numbers are in hexadecimal notation, except for the decimal numbers used in the power-of operation (see 5 below).
2. Boundaries of code elements are indicated with semicolons; these are single-octet boundaries within UTF-8 coded representations, and four-octet boundaries within UCS-4 coded representations.
3. The symbol "%" indicates the modulo operation, e.g.: x % y = x modulo y
4. The symbol "/" indicates the integer division operation, e.g.: 7 / 3 = 2
5. Superscripting indicates the power-of operation, e.g.: $2^3 = 8$
6. Precedence is: power-of operation > integer division > modulo operation > integer multiplication > integer addition.

   e.g.: $x / y^z \% w = ((x / (y^z)) \% w)$

D.4 Mapping from UCS-4 form to UTF-8 form

Table D.4 defines in mathematical notation the mapping from the UCS-4 coded representation form to the UTF-8 coded representation form.

In the left column (UCS-4) the notation x indicates the four-octet coded representation of a single character of the UCS. In the right column (UTF-8) x indicates the corresponding integer value.

NOTE 1 - Values of x in the range 0000 D800 .. 0000 DFFF are reserved for the UTF-16 form and do not occur in UCS-4. The mappings of these code positions in UTF-8 are undefined.

NOTE 2 - The algorithm for converting from UCS-4 to UTF-8 can be summarised as follows.

For each coded character in UCS-4 the length of octet sequence in UTF-8 is determined by the entry in the right column of Table D.1. The bits in the UCS-4 coded representation, starting from the least significant bit, are then distributed across the free bit positions in order of increasing significance until no more free bit positions are available.

D.5 Mapping from UTF-8 form to UCS-4 form

Table D.5 defines in mathematical notation the mapping from the UTF-8 coded representation form to the UCS-4 coded representation form.

In the left column (UTF-8) the following notations apply:

z is the first octet of a sequence. Its value determines the number of continuing octets in the sequence.

y is the 2nd octet in the sequence.

x is the 3rd octet in the sequence.

w is the 4th octet in the sequence.

v is the 5th octet in the sequence.

u is the 6th octet in the sequence.

The ranges of values applicable to these octets are shown in D.2 above, following Table D.1.

NOTE - The algorithm for converting from UTF-8 to UCS-4 can be summarised as follows.

For each coded character in UTF-8 the bits in the free bit positions are concatenated as a bit-string. The bits from this string, in increasing order of significance, are then distributed across the bit positions of a four-octet sequence, starting from the least significant bit position. The remaining bit positions of that sequence are filled with ZERO bits.

Table D.4 - Mapping from UCS-4 to UTF-8

Range of values in UCS-4	Sequence of octets in UTF-8
x = 0000 0000 .. 0000 007F;	x;
x = 0000 0080 .. 0000 07FF;	$C0 + x / 2^6$; $80 + x \%2^6$;
x = 0000 0800 .. 0000 FFFF; (see Note 3)	$E0 + x/2^{12}$; $80 + x/2^6\%2^6$; $80 + x\%2^6$;
x = 0001 0000 .. 001F FFFF;	$F0 + x/2^{18}$; $80 + x/2^{12}\%2^6$; $80 + x/2^6\%2^6$; $80 + x\%2^6$;
x = 0020 0000 .. 03FF FFFF;	$F8 + x/2^{24}$; $80 + x/2^{18}\%2^6$; $80 + x/2^{12}\%2^6$; $80 + x/2^6\%2^6$; $80 + x\%2^6$;
x = 0400 0000 .. 7FFF FFFF;	$FC + x/2^{30}$; $80 + x/2^{24}\%2^6$; $80 + x/2^{18}\%2^6$; $80 + x/2^{12}\%2^6$; $80 + x/2^6\%2^6$; $80 + x\%2^6$;

Table D.5 - Mapping from UTF-8 to UCS-4

Sequence of octets in UTF-8	Four-octet sequences in UCS-4
z = 00 .. 7F;	z;
z = C0 .. DF; y;	(z-C0)*2^6 + (y-80);
z = E0 .. EF; y; x;	(z-E0)*2^{12} + (y-80)*2^6 + (x-80);
z = F0 .. F7; y; x; w;	(z-F0)*2^{18} + (y-80)*2^{12} +(x-80)*2^6 + (w-80);
z = F8 ..FB; y; x; w; v;	(z-F8)*2^{24} + (y-80)*2^{18} +(x-80)*2^{12} + (w-80)*2^6 + (v - 80);
z = FC, FD; y; x; w; v; u;	(z-FC)*2^{30} + (y-80)*2^{24} +(x-80)*2^{18} + (w-80)*2^{12} + (v-80)*2^6 + (u-80);

D.6 Identification of UTF-8

When the escape sequences from ISO/IEC 2022 are used, the identification of UTF-8 and an implementation level (see clause 14) shall be by a designation sequence chosen from the following list:

ESC 02/05 02/15 04/07
UTF-8 with implementation level 1

ESC 02/05 02/15 04/08
UTF-8 with implementation level 2

ESC 02/05 02/15 04/09
UTF-8 with implementation level 3

If such an escape sequence appears within a CC-data-element conforming to ISO/IEC 2022, it shall consist only of the sequences of bit combinations as shown above.

If such an escape sequence appears within a CC-data-element conforming to ISO/IEC 10646, it shall be padded in accordance with clause 15.

When the escape sequences from ISO/IEC 2022 are used, the identification of a return, or transfer, from UTF-8 to the coding system of ISO/IEC 2022 shall be as specified in 16.5 for a return or transfer from UCS.

NOTE - The following escape sequence may also be used:

ESC 02/05 04/07 UTF-8.

The implementation level is not defined. The escape sequence used for a return to the coding system of ISO/IEC 2022 is not padded as specified in 16.5.

D.7 Incorrect sequences of octets: Interpretation by receiving devices

According to D.2 an octet in the range 00 to 7F or C0 to FB is the first octet of a UTF-8 sequence, and is followed by the appropriate number (from 0 to 5) of continuing octets in the range 80 to BF. Furthermore, octets whose value is FE or FF are not used; thus they are invalid in UTF-8.

If a CC-data-element includes either:

- a first octet that is not immediately followed by the correct number of continuing octets, or
- one or more continuing octets that are not required to complete a sequence of first and continuing octets, or
- an invalid octet,

then according to D.2 such a sequence of octets is not in conformance with the requirements of UTF-8. It is known as a malformed sequence.

If a receiving device that has adopted the UTF-8 form receives a malformed sequence, because of error conditions either:

- in an originating device, or
- in the interchange between an originating and a receiving device, or
- in the receiving device itself,

then it shall interpret that malformed sequence in the same way that it interprets a character that is outside the adopted subset that has been identified for the device (see 2.3c).

Annex E
(informative)

Mirrored characters in Arabic bi-directional context

In the context of Arabic right-to-left (bi-directional) text, the following characters have semantic meaning. To preserve the meaning in right-to-left text, the graphic symbol representing the character may be rendered as the mirror image of the associated graphical symbol from the left-to-right context. These characters include mathematical symbols and paired characters such as the SQUARE BRACKETS. For example, in a right-to-left text segment, the GREATER-THAN SIGN (rendered as ">" in left-to-right text) may be rendered as the "<" graphic symbol.

0028 LEFT PARENTHESIS
0029 RIGHT PARENTHESIS
003C LESS-THAN SIGN
003E GREATER-THAN SIGN
005B LEFT SQUARE BRACKET
005D RIGHT SQUARE BRACKET
007B LEFT CURLY BRACKET
007D RIGHT CURLY BRACKET
00AB LEFT-POINTING DOUBLE ANGLE QUOTATION MARK
00BB RIGHT-POINTING DOUBLE ANGLE QUOTATION MARK
2039 SINGLE LEFT-POINTING ANGLE QUOTATION MARK
203A SINGLE RIGHT-POINTING ANGLE QUOTATION MARK
2045 LEFT SQUARE BRACKET WITH QUILL
2046 RIGHT SQUARE BRACKET WITH QUILL
207D SUPERSCRIPT LEFT PARENTHESIS
207E SUPERSCRIPT RIGHT PARENTHESIS
208D SUBSCRIPT LEFT PARENTHESIS
208E SUBSCRIPT RIGHT PARENTHESIS
2201 COMPLEMENT
2202 PARTIAL DIFFERENTIAL
2203 THERE EXISTS
2204 THERE DOES NOT EXIST
2208 ELEMENT OF
2209 NOT AN ELEMENT OF
220A SMALL ELEMENT OF
220B CONTAINS AS MEMBER
220C DOES NOT CONTAIN AS MEMBER
220D SMALL CONTAINS AS MEMBER
2211 N-ARY SUMMATION
2215 DIVISION SLASH
2216 SET MINUS
221A SQUARE ROOT
221B CUBE ROOT
221C FOURTH ROOT
221D PROPORTIONAL TO
221F RIGHT ANGLE
2220 ANGLE
2221 MEASURED ANGLE
2222 SPHERICAL ANGLE
2224 DOES NOT DIVIDE
2226 NOT PARALLEL TO
222B INTEGRAL
222C DOUBLE INTEGRAL
222D TRIPLE INTEGRAL
222E CONTOUR INTEGRAL
222F SURFACE INTEGRAL
2230 VOLUME INTEGRAL
2231 CLOCKWISE INTEGRAL
2232 CLOCKWISE CONTOUR INTEGRAL
2233 ANTICLOCKWISE CONTOUR INTEGRAL
2239 EXCESS
223B HOMOTHETIC
223C TILDE OPERATOR
223D REVERSED TILDE
223E INVERTED LAZY S
223F SINE WAVE
2240 WREATH PRODUCT
2241 NOT TILDE
2242 MINUS TILDE
2243 ASYMPTOTICALLY EQUAL TO
2244 NOT ASYMPTOTICALLY EQUAL TO
2245 APPROXIMATELY EQUAL TO
2246 APPROXIMATELY BUT NOT ACTUALLY EQUAL TO
2247 NEITHER APPROXIMATELY NOR ACTUALLY EQUAL TO
2248 ALMOST EQUAL TO
2249 NOT ALMOST EQUAL TO
224A ALMOST EQUAL OR EQUAL TO
224B TRIPLE TILDE
224C ALL EQUAL TO
2252 APPROXIMATELY EQUAL TO OR THE IMAGE OF
2253 IMAGE OF OR APPROXIMATELY EQUAL TO
2254 COLON EQUALS
2255 EQUALS COLON
225F QUESTIONED EQUAL TO
2260 NOT EQUAL TO
2262 NOT IDENTICAL TO
2264 LESS-THAN OR EQUAL TO
2265 GREATER-THAN OR EQUAL TO
2266 LESS-THAN OVER EQUAL TO
2267 GREATER-THAN OVER EQUAL TO
2268 LESS-THAN BUT NOT EQUAL TO
2269 GREATER-THAN BUT NOT EQUAL TO
226A MUCH LESS-THAN
226B MUCH GREATER-THAN
226E NOT LESS-THAN
226F NOT GREATER-THAN
2270 NEITHER LESS-THAN NOR EQUAL TO
2271 NEITHER GREATER-THAN NOR EQUAL TO
2272 LESS-THAN OR EQUIVALENT TO
2273 GREATER-THAN OR EQUIVALENT TO

2274 NEITHER LESS-THAN NOR EQUIVALENT TO
2275 NEITHER GREATER-THAN NOR EQUIVALENT TO
2276 LESS-THAN OR GREATER-THAN
2277 GREATER-THAN OR LESS-THAN
2278 NEITHER LESS-THAN NOR GREATER-THAN
2279 NEITHER GREATER-THAN NOR LESS-THAN
227A PRECEDES
227B SUCCEEDS
227C PRECEDES OR EQUAL TO
227D SUCCEEDS OR EQUAL TO
227E PRECEDES OR EQUIVALENT TO
227F SUCCEEDS OR EQUIVALENT TO
2280 DOES NOT PRECEDE
2281 DOES NOT SUCCEED
2282 SUBSET OF
2283 SUPERSET OF
2284 NOT A SUBSET OF
2285 NOT A SUPERSET OF
2286 SUBSET OF OR EQUAL TO
2287 SUPERSET OF OR EQUAL TO
2288 NEITHER A SUBSET OF NOR EQUAL TO
2289 NEITHER A SUPERSET OF NOR EQUAL TO
228A SUBSET OF WITH NOT EQUAL TO
228B SUPERSET OF WITH NOT EQUAL TO
228C MULTISET
228F SQUARE IMAGE OF
2290 SQUARE ORIGINAL OF
2291 SQUARE IMAGE OF OR EQUAL TO
2292 SQUARE ORIGINAL OF OR EQUAL TO
2298 CIRCLED DIVISION SLASH
22A2 RIGHT TACK
22A3 LEFT TACK
22A6 ASSERTION
22A7 MODELS
22A8 TRUE
22A9 FORCES
22AA TRIPLE VERTICAL BAR TURNSTILE
22AB DOUBLE VERTICAL BAR DOUBLE RIGHT TURNSTILE
22AC DOES NOT PROVE
22AD NOT TRUE
22AE DOES NOT FORCE
22AF NEGATED DOUBLE VERTICAL BAR DOUBLE RIGHT TURNSTILE
22B0 PRECEDES UNDER RELATION
22B1 SUCCEEDS UNDER RELATION
22B2 NORMAL SUBGROUP OF
22B3 CONTAINS AS NORMAL SUBGROUP
22B4 NORMAL SUBGROUP OF OR EQUAL TO
22B5 CONTAINS AS NORMAL SUBGROUP OR EQUAL TO
22B6 ORIGINAL OF
22B7 IMAGE OF
22B8 MULTIMAP
22BE RIGHT ANGLE WITH ARC
22BF RIGHT TRIANGLE
22C9 LEFT NORMAL FACTOR SEMIDIRECT PRODUCT
22CA RIGHT NORMAL FACTOR SEMIDIRECT PRODUCT
22CB LEFT SEMIDIRECT PRODUCT
22CC RIGHT SEMIDIRECT PRODUCT
22CD REVERSE TILDE EQUALS
22D0 DOUBLE SUBSET
22D1 DOUBLE SUPERSET
22D6 LESS-THAN WITH DOT
22D7 GREATER-THAN WITH DOT
22D8 VERY MUCH LESS-THAN
22D9 VERY MUCH GREATER-THAN
22DA LESS-THAN EQUAL TO OR GREATER-THAN
22DB GREATER-THAN EQUAL TO OR LESS-THAN
22DC EQUAL TO OR LESS-THAN
22DD EQUAL TO OR GREATER-THAN
22DE EQUAL TO OR PRECEDES
22DF EQUAL TO OR SUCCEEDS
22E0 DOES NOT PRECEDE OR EQUAL
22E1 DOES NOT SUCCEED OR EQUAL
22E2 NOT SQUARE IMAGE OF OR EQUAL TO
22E3 NOT SQUARE ORIGINAL OF OR EQUAL TO
22E4 SQUARE IMAGE OF OR NOT EQUAL TO
22E5 SQUARE ORIGINAL OF OR NOT EQUAL TO
22E6 LESS-THAN BUT NOT EQUIVALENT TO
22E7 GREATER-THAN BUT NOT EQUIVALENT TO
22E8 PRECEDES BUT NOT EQUIVALENT TO
22E9 SUCCEEDS BUT NOT EQUIVALENT TO
22EA NOT NORMAL SUBGROUP OF
22EB DOES NOT CONTAIN AS NORMAL SUBGROUP
22EC NOT NORMAL SUBGROUP OF OR EQUAL TO
22ED DOES NOT CONTAIN AS NORMAL SUBGROUP OR EQUAL
22F0 UP RIGHT DIAGONAL ELLIPSIS
22F1 DOWN RIGHT DIAGONAL ELLIPSIS
2308 LEFT CEILING
2309 RIGHT CEILING
230A LEFT FLOOR
230B RIGHT FLOOR
2320 TOP HALF INTEGRAL
2321 BOTTOM HALF INTEGRAL
2329 LEFT-POINTING ANGLE BRACKET
232A RIGHT-POINTING ANGLE BRACKET
3008 LEFT ANGLE BRACKET
3009 RIGHT ANGLE BRACKET
300A LEFT DOUBLE ANGLE BRACKET
300B RIGHT DOUBLE ANGLE BRACKET
300C LEFT CORNER BRACKET
300D RIGHT CORNER BRACKET
300E LEFT WHITE CORNER BRACKET
300F RIGHT WHITE CORNER BRACKET
3010 LEFT BLACK LENTICULAR BRACKET
3011 RIGHT BLACK LENTICULAR BRACKET
3014 LEFT TORTOISE SHELL BRACKET
3015 RIGHT TORTOISE SHELL BRACKET
3016 LEFT WHITE LENTICULAR BRACKET
3017 RIGHT WHITE LENTICULAR BRACKET
3018 LEFT WHITE TORTOISE SHELL BRACKET
3019 RIGHT WHITE TORTOISE SHELL BRACKET
301A LEFT WHITE SQUARE BRACKET
301B RIGHT WHITE SQUARE BRACKET
10300 OLD ITALIC LETTER A
10301 OLD ITALIC LETTER BE
10302 OLD ITALIC LETTER KE
10303 OLD ITALIC LETTER DE
10304 OLD ITALIC LETTER E
10305 OLD ITALIC LETTER VE
10306 OLD ITALIC LETTER ZE
10307 OLD ITALIC LETTER HE
10308 OLD ITALIC LETTER THE
10309 OLD ITALIC LETTER I
1030A OLD ITALIC LETTER KA
1030B OLD ITALIC LETTER EL
1030C OLD ITALIC LETTER EM

1030D	OLD ITALIC LETTER EN
1030E	OLD ITALIC LETTER ESH
1030F	OLD ITALIC LETTER O
10310	OLD ITALIC LETTER PE
10311	OLD ITALIC LETTER SHE
10312	OLD ITALIC LETTER KU
10313	OLD ITALIC LETTER ER
10314	OLD ITALIC LETTER ES
10315	OLD ITALIC LETTER TE
10316	OLD ITALIC LETTER U
10317	OLD ITALIC LETTER EKS
10318	OLD ITALIC LETTER PHE
10319	OLD ITALIC LETTER KHE
1031A	OLD ITALIC LETTER EF
1031B	OLD ITALIC LETTER ERS
1031C	OLD ITALIC LETTER CHE
1031D	OLD ITALIC LETTER II
1031E	OLD ITALIC LETTER UU
10320	OLD ITALIC NUMERAL ONE
10321	OLD ITALIC NUMERAL FIVE
10322	OLD ITALIC NUMERAL TEN
10323	OLD ITALIC FIFTY

Annex F
(informative)

Alternate format characters

There is a special class of characters called Alternate Format Characters which are included for compatibility with some industry practices. These characters do not have printable graphic symbols, and are thus represented in the character code tables by dotted boxes.

The function of most of these characters is to indicate the correct presentation of a sequence of characters. For any text processing other than presentation (such as sorting and searching), the alternate format characters, except for ZWJ and ZWNJ described in F.1.1, can be ignored by filtering them out. The alternate format characters are not intended to be used in conjunction with bi-directional control functions from ISO/IEC 6429.

There are collections of graphic characters for selected subsets which consist of Alternate Format Characters (see annex A).

F.1 General format characters

F.1.1 Zero-width boundary indicators

COMBINING GRAPHEME JOINER (034F): The Combining Grapheme Joiner is used to indicate that adjacent characters belong to the same grapheme cluster. Grapheme clusters are sequences of one or more coded characters that correspond to what users think of as characters. They include, but are not limited to, composite sequences such as (g + °), digraphs such as Slovak “ch”, or sequences with letter modifiers such as k^{w}. The Combining Grapheme Joiner has no width in its presentation.

The following characters are used to indicate whether or not the adjacent characters are separated by a word boundary or hyphenation boundary. Each of these zero-width boundary indicators has no width in its usual own presentation.

SOFT HYPHEN (00AD): SOFT HYPHEN (SHY) is a graphic character, the visual representation of which is identical to that of HYPHEN, for use when an allowable automatic hyphenation line-break after it is to be indicated. Unless the SOFT HYPHEN occurs at the very end of a rendered line, the SOFT HYPHEN normally has zero width and no visible representation, and may also suppress the rendering of the following character.

NOTE – For example, for Swedish, “biljett<SHY>tång should be rendered as “biljettång” when there is no line-break after the SHY.

ZERO WIDTH SPACE (200B): This character behaves like a SPACE in that it indicates a word boundary, but unlike SPACE it has no presentational width. For example, this character could be used to indicate word boundaries in Thai, which does not use visible gaps to separate words.

ZERO WIDTH NO-BREAK SPACE (FEFF): This character behaves like a NO-BREAK SPACE in that it indicates the absence of word boundaries, but unlike NO-BREAK SPACE it has no presentational width. For example, this character could be inserted after the fourth character in the text "base+delta" to indicate that there is to be no word break between the "e" and the "+".

NOTE - For additional usages of this character for "signature", see annex H.

The following characters are used to indicate whether or not the adjacent characters are joined together in rendering (cursive joiners).

ZERO WIDTH NON-JOINER (200C): This character indicates that the adjacent characters are not joined together in cursive connection even when they would normally join together as cursive letter forms. For example, ZERO WIDTH NON-JOINER between ARABIC LETTER NOON and ARABIC LETTER MEEM indicates that the characters are not rendered with the normal cursive connection.

ZERO WIDTH JOINER (200D): This character indicates that the adjacent characters are represented with joining forms in cursive connection even when they would not normally join together as cursive letter forms. For example, in the sequence SPACE followed by ARABIC LETTER BEH followed by SPACE, ZERO WIDTH JOINER can be inserted between the first two characters to display the final form of the ARABIC LETTER BEH.

F.1.2 Format separators

The following characters are used to indicate formatting boundaries between lines or paragraphs.

LINE SEPARATOR (2028): This character indicates where a new line starts; although the text continues to the next line, it does not start a new paragraph; e.g. no inter-paragraph indentation might be applied.

PARAGRAPH SEPARATOR (2029): This character indicates where a new paragraph starts; e.g. the text contin-

ues on the next line and inter-paragraph line spacing or paragraph indentation might be applied.

F.1.3 Bi-directional text formatting

The following characters are used in formatting bi-directional text. If the specification of a subset includes these characters, then texts containing right-to-left characters are to be rendered with an implicit bi-directional algorithm.

An implicit algorithm uses the directional character properties to determine the correct display order of characters on a horizontal line of text.

The following characters are format characters that act exactly like right-to-left or left-to-right characters in terms of affecting ordering (Bi-directional format marks). They have no visible graphic symbols, and they do not have any other semantic effect.

Their use can be more convenient than the explicit embeddings or overrides, since their scope is more local.

LEFT-TO-RIGHT MARK (200E): In bi-directional formatting, this character acts like a left-to-right character (such as LATIN SMALL LETTER A).

RIGHT-TO-LEFT MARK (200F): In bi-directional formatting, this character acts like a right-to-left character (such as ARABIC LETTER NOON).

The following format characters indicate that a piece of text is to be treated as embedded, and is to have a particular ordering attached to it (Bi-directional format embeddings). For example, an English quotation in the middle of an Arabic sentence can be marked as being an embedded left-to-right string. These format characters nest in blocks, with the embedding and override characters initiating (pushing) a block, and the pop character terminating (popping) a block.

The function of the embedding and override characters are very similar; the main difference is that the embedding characters specify the implicit direction of the text, while the override characters specify the explicit direction of the text. When text has an explicit direction, the normal directional character properties are ignored, and all of the text is assumed to have the ordering direction determined by the override character.

LEFT-TO-RIGHT EMBEDDING (202A): This character is used to indicate the start of a left-to-right implicit embedding.

RIGHT-TO-LEFT EMBEDDING (202B): This character is used to indicate the start of a right-to-left implicit embedding.

LEFT-TO-RIGHT OVERRIDE (202D): This character is used to indicate the start of a left-to-right explicit embedding.

RIGHT-TO-LEFT OVERRIDE (202E): This character is used to indicate the start of a right-to-left explicit embedding.

POP DIRECTIONAL FORMATTING (202C): This character is used to indicate the termination of an implicit or explicit directional embedding initiated by the above characters.

F.1.4 Other boundary indicators

NARROW NO-BREAK SPACE (202F): This character is a non-breaking space. It is similar to 00A0 NO-BREAK SPACE, except that it is rendered with a narrower width. When used with the Mongolian script this character is usually rendered at one-third of the width of a normal space, and it separates a suffix from the Mongolian word-stem. This allows for the normal rules of Mongolian character shaping to apply, while indicating that there is no word boundary at that position.

F.2 Script-specific format characters

F.2.1 Hangul fill characters

The following format characters have a special usage for Hangul characters.

HANGUL FILLER (3164): This character represents the fill value used with the standard spacing Jamos.

HALFWIDTH HANGUL FILLER (FFA0): As with the other halfwidth characters, this character is included for compatibility with certain systems that provide halfwidth forms of characters.

F.2.2 Symmetric swapping format characters

The following characters are used in conjunction with the class of left/right handed pairs of characters listed in clause 19. The following format characters indicate whether the interpretation of the term LEFT or RIGHT in the character names is OPENING or CLOSING respectively. The following characters do not nest.

The default state of interpretation may be set by a higher level protocol or standard, such as ISO/IEC 6429. In the absence of such a protocol, the default state is as established by ACTIVATE SYMMETRIC SWAPPING.

INHIBIT SYMMETRIC SWAPPING (206A): Between this character and the following ACTIVATE SYMMETRIC SWAPPING format character (if any), the stored characters listed in clause 19 are interpreted and rendered as LEFT and RIGHT, and the processing specified in that clause is not performed.

ACTIVATE SYMMETRIC SWAPPING (206B): Between this character and the following INHIBIT SYMMETRIC SWAPPING format character (if any), the stored characters listed in clause 19 are interpreted and rendered as OPENING and CLOSING characters as specified in that clause.

F.2.3 Character shaping selectors

The following characters are used in conjunction with Arabic presentation forms. During the presentation process, certain characters may be joined together in cursive connection or ligatures. The following characters indicate that the character shape determination process used to achieve this presentation effect is either activated or inhibited. The following characters do not nest.

INHIBIT ARABIC FORM SHAPING (206C): Between this character and the following ACTIVATE ARABIC FORM SHAPING format character (if any), the character shaping determination process is inhibited. The stored Arabic presentation forms are presented without shape modification. This is the default state.

ACTIVATE ARABIC FORM SHAPING (206D): Between this character and the following INHIBIT ARABIC FORM SHAPING format character (if any), the stored Arabic presentation forms are presented with shape modification by means of the character shaping determination process.

NOTE - These characters have no effect on characters that are not presentation forms: in particular, Arabic nominal characters as from 0600 to 06FF are always subject to character shaping, and are unaffected by these formatting characters.

F.2.4 Numeric shape selectors

The following characters allow the selection of the shapes in which the digits from 0030 to 0039 are rendered. The following characters do not nest.

NATIONAL DIGIT SHAPES (206E): Between this character and the following NOMINAL DIGIT SHAPES format character (if any), digits from 0030 to 0039 are rendered with the appropriate national digit shapes as specified by means of appropriate agreements. For example, they could be displayed with shapes such as the ARABIC-INDIC digits from 0660 to 0669.

NOMINAL DIGIT SHAPES (206F): Between this character and the following NATIONAL DIGIT SHAPES format character (if any), the digits from 0030 to 0039 are rendered with the shapes as those shown in the code tables for those digits. This is the default state.

F.2.5 Mongolian vowel separator

MONGOLIAN VOWEL SEPARATOR (180E): This character may be used between the MONGOLIAN LETTER A or the MONGOLIAN LETTER E at the end of a word and the preceding consonant letter. It indicates a special form of the graphic symbol for the letter A or E and the preceding consonant. When rendered in visible form it is generally shown as a narrow space between the letters, but it may sometimes be shown as a distinct graphic symbol to assist the user.

F.3 Ideographic description characters

An Ideographic Description Character (IDC) is a graphic character, which is used with a sequence of other graphic characters to form an Ideographic Description Sequence (IDS). Such a sequence may be used to describe an ideographic character which is not specified within this International Standard.

The IDS describes the ideograph in the abstract form. It is not interpreted as a composed character and does not imply any specific form of rendering.

NOTE - An IDS is not a character and therefore is not a member of the repertoire of ISO/IEC 10646.

F.3.1 Syntax of an ideographic description sequence

An IDS consists of an IDC followed by a fixed number of Description Components (DC). A DC may be any one of the following :

- a coded ideograph
- a coded radical
- another IDS

NOTE - The above description implies that any IDS may be nested within another IDS.

Each IDC has four properties as summarized in table F.1 below;

- the number of DCs used in the IDS that commences with that IDC,
- the definition of its acronym,
- the syntax of the corresponding IDS,
- the relative positions of the DCs in the visual representation of the ideograph that is being described in its abstract form.

The syntax of the IDS introduced by each IDC is indicated in the "IDS Acronym and Syntax" column of the table by the abbreviated name of the IDC (e.g. IDC-LTR) followed by the corresponding number of DCs, i.e. (D_1 D_2) or (D_1 D_2 D_3).

NOTE - An IDS is restricted to no more than 16 characters in length. Also no more than six ideographs and/or radicals occur between any two instances of an IDC character within an IDS.

F.3.2 Individual definitions of the ideographic description characters

IDEOGRAPHIC DESCRIPTION CHARACTER LEFT TO RIGHT (2FF0): The IDS introduced by this character describes the abstract form of the ideograph with D_1 on the left and D_2 on the right.

IDEOGRAPHIC DESCRIPTION CHARACTER ABOVE TO BELOW (2FF1): The IDS introduced by this character describes the abstract form of the ideograph with D_1 above D_2.

IDEOGRAPHIC DESCRIPTION CHARACTER LEFT TO MIDDLE AND RIGHT (2FF2): The IDS introduced by this character describes the abstract form of the ideograph with D_1 on the left of D_2, and D_2 on the left of D_3.

IDEOGRAPHIC DESCRIPTION CHARACTER ABOVE TO MIDDLE AND BELOW (2FF3): The IDS introduced by this character describes the abstract form of the ideograph with D_1 above D_2, and D_2 above D_3.

IDEOGRAPHIC DESCRIPTION CHARACTER FULL SURROUND (2FF4): The IDS introduced by this character describes the abstract form of the ideograph with D_1 surrounding D_2 .

IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM ABOVE (2FF5): The IDS introduced by this character describes the abstract form of the ideograph with D_1 above D_2, and surrounding D_2 on both sides.

IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM BELOW (2FF6): The IDS introduced by this character describes the abstract form of the ideograph with D_1 below D_2, and surrounding D_2 on both sides.

IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM LEFT (2FF7): The IDS introduced by this character describes the abstract form of the ideograph with D_1 on the left of D_2, and surrounding D_2 above and below.

IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM UPPER LEFT (2FF8): The IDS introduced by this character describes the abstract form of the ideograph with D_1 at the top left corner of D_2, and partly surrounding D_2 above and to the left.

IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM UPPER RIGHT (2FF9): The IDS introduced by this character describes the abstract form of the ideograph with D_1 at the top right corner of D_2, and partly surrounding D_2 above and to the right.

IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM LOWER LEFT (2FFA): The IDS introduced by this character describes the abstract form of the ideograph with D_1 at the bottom left corner of D_2, and partly surrounding D_2 below and to the left.

IDEOGRAPHIC DESCRIPTION CHARACTER OVERLAID (2FFB): The IDS introduced by this character describes the abstract form of the ideograph with D_1 and D_2 overlaying each other.

F.4 Interlinear annotation characters

The following characters are used to indicate that an identified character string (the annotation string) is regarded as providing an annotation for another identified character string (the base string).

INTERLINEAR ANNOTATION ANCHOR (FFF9): This character indicates the beginning of the base string.

INTERLINEAR ANNOTATION SEPARATOR (FFFA): This character indicates the end of the base string and the beginning of the annotation string.

INTERLINEAR ANNOTATION TERMINATOR (FFFB): This character indicates the end of the annotation string.

The relationship between the annotation string and the base string is defined by agreement between the user of the originating device and the user of the receiving device. For example, if the base string is rendered in a visible form the annotation string may be rendered on a different line from the base string, in a position close to the base string.

If the interlinear annotation characters are filtered out during processing, then all characters between the Interlinear Annotation Separator and the Interlinear Annotation Terminator should also be filtered out.

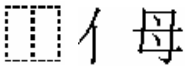
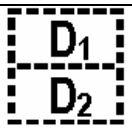
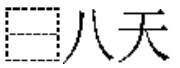
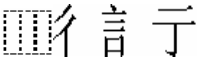
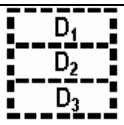
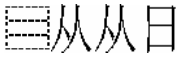
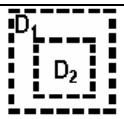
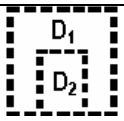
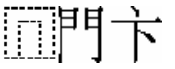
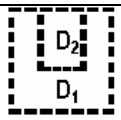
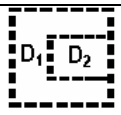
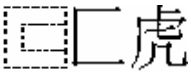
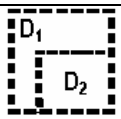
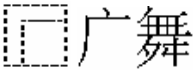
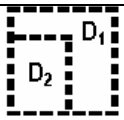
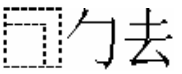
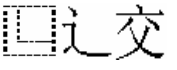
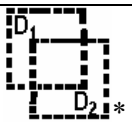
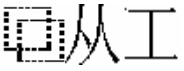
F.5 Subtending format characters

The following characters are used to subtend a sequence of subsequent characters:

0600 ARABIC NUMBER SIGN
0601 ARABIC SIGN sanah
0602 ARABIC FOOTNOTE MARKER
06DD ARABIC END OF AYAH
070F SYRIAC ABREVIATION MARK

The scope of these characters is the subsequent sequence of digits (plus certain other characters), with the exact specification as defined in the Unicode Standard, Version 3.2, for ARABIC END OF AYAH.

Table F.1: Properties of ideographic description characters

Character Name: IDEOGRAPHIC DESCRIPTION CHARACTER ...	no. of DCs	IDS Acronym and Syntax	Relative positions of DCs	Example of IDS	IDS example represents:
LEFT TO RIGHT	2	IDC-LTR D_1 D_2			
ABOVE TO BELOW	2	IDC-ATB D_1 D_2			
LEFT TO MIDDLE AND RIGHT	3	IDC-LMR D_1 D_2 D_3			
ABOVE TO MIDDLE AND BELOW	3	IDC-AMB D_1 D_2 D_3			
FULL SURROUND	2	IDC-FSD D_1 D_2			
SURROUND FROM ABOVE	2	IDC-SAV D_1 D_2			
SURROUND FROM BELOW	2	IDC-SBL D_1 D_2			
SURROUND FROM LEFT	2	IDC-SLT D_1 D_2			
SURROUND FROM UPPER LEFT	2	IDC-SUL D_1 D_2			
SURROUND FROM UPPER RIGHT	2	IDC-SUR D_1 D_2			
SURROUND FROM LOWER LEFT	2	IDC-SLL D_1 D_2			
OVERLAID	2	IDC-OVL D_1 D_2			

* NOTE - D_1 and D_2 overlap each other. This diagram does not imply that D_1 is on the top left corner and D_2 is on the bottom right corner.

Annex G
(informative)

Alphabetically sorted list of character names

The alphabetically sorted list of character names is provided in machine-readable format that is accessible as link to this document. The content linked to is a plain text file, using ISO/IEC 646-IRV characters with LIN FEED as end of line mark, that specifies, after a 4-line header, all the character names from ISO/IEC 10646 except Hangul syllables and CJK-ideographs (these are characters from blocks HANGUL SYLLABLES,
CJK UNIFIED IDEOGRAPHS,
CJK UNIFIED IDEOGRAPHS EXTENSION A,
CJK UNIFIED IDEOGRAPHS EXTENSION B,
CJK COMPATIBILITY IDEOGRAPHS and
CJK COMPATIBILITY IDEOGRAPHS SUPPLEMENT).

The format of the file, after the header, is as follows:

01-05 octet: UCS-4 five-digit abbreviated form,

06 octet: TAB character,

07-end of line: character name

Click on this highlighted text to access the reference file.

NOTE – The content is also available as a separate viewable file in the same file directory as this document. The file is named: “Allnames.txt”.

Annex H
(informative)

The use of “signatures” to identify UCS

This annex describes a convention for the identification of features of the UCS, by the use of “signatures” within data streams of coded characters. The convention makes use of the character ZERO WIDTH NO-BREAK SPACE, and is applied by a certain class of applications.

When this convention is used, a signature at the beginning of a stream of coded characters indicates that the characters following are encoded in the UCS-2 or UCS-4 coded representation, and indicates the ordering of the octets within the coded representation of each character (see 6.3). It is typical of the class of applications mentioned above, that some make use of the signatures when receiving data, while others do not. The signatures are therefore designed in a way that makes it easy to ignore them.

In this convention, the ZERO WIDTH NO-BREAK SPACE character has the following significance when it is present at the beginning of a stream of coded characters:

UCS-2 signature: FEFF

UCS-4 signature: 0000 FEFF

UTF-8 signature: EF BB BF

UTF-16 signature: FEFF

An application receiving data may either use these signatures to identify the coded representation form, or may ignore them and treat FEFF as the ZERO WIDTH NO-BREAK SPACE character.

If an application which uses one of these signatures recognizes its coded representation in reverse sequence (e.g. hexadecimal FFFE), the application can identify that the coded representations of the following characters use the opposite octet sequence to the sequence expected, and may take the necessary action to recognize the characters correctly.

NOTE - The hexadecimal value FFFE does not correspond to any coded character within ISO/IEC 10646.

Annex J
(informative)

Recommendation for combined receiving/originating devices with internal storage

This annex is applicable to a widely-used class of devices that can store received CC-data elements for subsequent retransmission.

This recommendation is intended to ensure that loss of information is minimized between the receipt of a CC-data-element and its retransmission.

A device of this class includes a receiving device component and an originating device component as in 2.3, and can also store received CC-data-elements for retransmission, with or without modification by the actions of the user on the corresponding characters represented within it. Within this class of device, two distinct types are identified here, as follows.

1. Receiving device with full retransmission capability

   The originating device component will retransmit the coded representations of any received characters, including those that are outside the identified subset of the receiving device component, without change to their coded representation, unless modified by the user.

2. Receiving device with subset retransmission capability

   The originating device component can re-transmit only the coded representations of the characters of the subset adopted by the receiving device component.

Annex K
(informative)

Notations of octet value representations

Representation of octet values in ISO/IEC 10646 except in clause 16 is different from other character coding standards such as ISO/IEC 2022, ISO/IEC 6429 and ISO 8859. This annex clarifies the relationship between the two notations.

- In ISO/IEC 10646, the notation used to express an octet value is z, where z is a hexadecimal number in the range 00 to FF.

  For example, the character ESCAPE (ESC) of ISO/IEC 2022 is represented by 1B.

- In other character coding standards, the notation used to express an octet value is x/y, where x and y are two numbers in the range 00 to 15. The correspondence between the notations of the form x/y and the octet value is as follows.

  x is the number represented by bit 8, bit 7, bit 6 and bit 5 where these bits are given the weight 8, 4, 2 and 1 respectively;

  y is the number represented by bit 4, bit 3, bit 2 and bit 1 where these bits are given the weight 8, 4, 2 and 1 respectively.

  For example, the character ESC of ISO/IEC 2022 is represented by 01/11.

Thus ISO/IEC 2022 (and other character coding standards) octet value notation can be converted to ISO/IEC 10646 octet value notation by converting the value of x and y to hexadecimal notation. For example; 04/15 is equivalent to 4F.

Annex L
(informative)

Character naming guidelines

Guidelines for generating and presenting unique names of characters in ISO/IEC JTC1/SC2 standards are listed in this annex for information. These guidelines are used in information technology coded character set standards such as ISO/IEC 646, ISO/IEC 6937, ISO/IEC 8859, ISO/IEC 10367 as well as in ISO/IEC 10646.

These Guidelines specify rules for generating and presenting unique names of characters in those versions of the standards that are in the English language.

NOTE. In a version of such a standard in another language:

a) these rules may be amended to permit names of characters to be generated using words and syntax that are considered appropriate within that language;

b) the names of the characters from this version of the standard may be replaced by equivalent unique names constructed according to the rules amended as in a) above.

Rules 1 to 3 are implemented without exceptions. However it must be accepted that in some cases (e.g. historical or traditional usage, unforeseen special cases, and difficulties inherent to the nature of the character considered), exceptions to some of the other rules will have to be tolerated. Nonetheless, these rules are applied wherever possible.

Rule 1

By convention, only Latin capital letters A to Z, space, and hyphen are used for writing the names of characters.

NOTE - Names of characters may also include digits 0 to 9 (provided that a digit is not the first character in a word) if inclusion of the name of the corresponding digit(s) would be inappropriate. As an example the name of the character at position 201A is SINGLE LOW-9 QUOTATION MARK; the symbol for the digit 9 is included in this name to illustrate the shape of the character, and has no numerical significance.

Rule 2

The names of control functions are coupled with an acronym consisting of Latin capital letters A to Z and, where required, digits. Once the name has been specified for the first time, the acronym may be used in the remainder of the text where required for simplification and clarity of the text. Exceptionally, acronyms may be used for graphic characters where usage already exists and clarity requires it, in particular in code tables.

Examples:

Name: LOCKING-SHIFT TWO RIGHT

Acronym: LS2R

Name: SOFT HYPHEN

Acronym: SHY

NOTE - In ISO/IEC 6429, also the names of the modes have been presented in the same way as control functions.

Rule 3

In some cases, the name of a character can be followed by an additional explanatory statement not part of the name. These statements are in parentheses and not in capital Latin letters except the initials of the word where required. See examples in rule 12.

The name of a character may also be followed by a single * symbol not part of the name. This indicates that additional information on the character appears in Annex P. Any * symbols are omitted from the character names listed in Annex G.

Rule 4

The name of a character wherever possible denotes its customary meaning, for examples PLUS SIGN. Where this is not possible, names describe shapes, not usage; for example: UPWARDS ARROW.

The name of a character is not intended to identify its properties or attributes, or to provide information on its linguistic characteristics, except as defined in Rule 6 below.

Rule 5

Only one name is given to each character.

Rule 6

The names are constructed from an appropriate set of the applicable terms of the following grid and ordered in the sequence of this grid. Exceptions are specified in Rule 11. The words WITH and AND may be included for additional clarity when needed.

1	Script	5	Attribute
2	Case	6	Designation
3	Type	7	Mark(s)
4	Language	8	Qualifier

Examples of such terms:

Script	Latin, Cyrillic, Arabic
Case	capital, small
Type	letter, ligature, digit
Language	Ukrainian
Attribute	final, sharp, subscript, vulgar
Designation	customary name, name of letter
Mark	acute, ogonek, ring above, diaeresis
Qualifier	sign, symbol

Examples of names:

LATIN CAPITAL LETTER A WITH ACUTE
1 2 3 6 7

DIGIT FIVE
3 6

LEFT CURLY BRACKET
5 5 6

NOTE 1 - A ligature is a graphic symbol in which two or more other graphic symbols are imaged as single graphic symbol.

NOTE 2 - Where a character comprises a base letter with multiple marks, the sequence of those in the name is the order in which the marks are positioned relative to the base letter, starting with the marks above the letters taken in upwards sequence, and followed by the marks below the letters taken in downwards sequence.

Rule 7

The letters of the Latin script are represented within their name by their basic graphic symbols (A, B, C, etc.). The letters of all other scripts are represented by their transcription in the language of the first published International Standard.

Examples:

K	LATIN CAPITAL LETTER K
Ю	CYRILLIC CAPITAL LETTER YU

Rule 8

In principle when a character of a given script is used in more than one language, no language name is specified. Exceptions are tolerated where an ambiguity would otherwise result.

Examples:

И	CYRILLIC CAPITAL LETTER I
І	CYRILLIC CAPITAL LETTER BYELORUSSIAN-UKRAINIAN I

Rule 9

Letters that are elements of more than one script are considered different even if their shape is the same; they have different names.

Examples:

A	LATIN CAPITAL LETTER A
Α	GREEK CAPITAL LETTER ALPHA
А	CYRILLIC CAPITAL LETTER A

Rule 10

A character of one script used in isolation in another script, for example as a graphic symbol in relation with physical units of dimension, is considered as a character different from the character of its native script.

Example:

µ	MICRO SIGN

Rule 11

A number of characters have a traditional name consisting of one or two words. It is not intended to change this usage.

Examples:

'	APOSTROPHE
:	COLON
@	COMMERCIAL AT
_	LOW LINE
~	TILDE

Rule 12

In some cases, characters of a given script, often punctuation marks, are used in another script for a different usage. In these cases the customary name reflecting the most general use is given to the character. The customary name may be followed in the list of characters of a particular standard by the name in parentheses which this character has in the script specified by this particular standard.

Example:

‿	UNDERTIE (Enotikon)

Rule 13

The above rules do not apply to ideographic characters. These characters are identified by alpha-numeric identifiers specified for each ideographic character (see clause 27).

Annex M
(informative)

Sources of characters

Several sources and contributions were used for constructing this coded character set. In particular, characters of the following national and international standards are included in ISO/IEC 10646.

ISO 233:1984, *Documentation - Transliteration of Arabic characters into Latin characters*.

ISO/IEC 646:1991, *Information technology - ISO 7-bit coded character set for information interchange*.

ISO 2033:1983, *Information processing - Coding of machine readable characters (MICR and OCR)*.

ISO 2047:1975, *Information processing - Graphical representations for the control characters of the 7-bit coded character set*.

ISO 5426:1983, *Extension of the Latin alphabet coded character set for bibliographic information interchange.*

ISO 5427:1984, *Extension of the Cyrillic alphabet coded character set for bibliographic information interchange.*

ISO 5428:1984, *Greek alphabet coded character set for bibliographic information interchange.*

ISO 6438:1983, *Documentation - African coded character set for bibliographic information interchange.*

ISO 6861, *Information and documentation - Glagolitic coded character set for bibliographic information interchange*.

ISO 6862, *Information and documentation - Mathematical coded character set for bibliographic information interchange.*

ISO 6937:1994, *Information technology - Coded graphic character sets for text communication - Latin alphabet.*

ISO/IEC 8859, *Information technology - 8-bit single-byte coded graphic character sets*

-Part 1: Latin alphabet No. 1 (1998).

-Part 2: Latin alphabet No. 2 (1999).

-Part 3: Latin alphabet No. 3 (1999).

-Part 4: Latin alphabet No. 4 (1998).

-Part 5: Latin/Cyrillic alphabet (1999)

-Part 6: Latin/Arabic alphabet (1999)

-Part 7: Latin/Greek alphabet

-Part 8: . Latin/Hebrew alphabet (1999)

-Part 9: Latin alphabet No. 5 (1999)

-Part 10: Latin alphabet No. 6 (1998).

ISO 8879:1986, *Information processing - Text and office systems - Standard Generalized Markup Language (SGML).*

ISO 8957:1996, *Information and documentation - Hebrew alphabet coded character sets for bibliographic information interchange.*

ISO 9036:1987, *Information processing - Arabic 7-bit coded character set for information interchange.*

ISO/IEC 9995-7:1994, *Information technology – Keyboard layouts for text and office systems – Part 7: Symbols used to represent functions*.

ISO/IEC 10367:1991, *Information technology - Standardized coded graphic character sets for use in 8-bit codes.*

ISO 10754:1984, *Information and documentation – Extension of the Cyrillic alphabet coded character set for non-Slavic languages for bibliographic information interchange.*

ISO 11548-1:2001. *Communication aids for blind persons – identifiers, names and assignation to coded character sets for 8-dot Braille characters – Part 1: General guidelines for Braille identifiers and shift marks.*

ISO/IEC TR 15285:1998, *Information technology - An operational model for characters and glyphs.*

ISO international register of character sets to be used with escape sequences. (registration procedure ISO 2375:1985) .

ANSI X3.4-1986 American National Standards Institute. *Coded character set - 7-bit American national standard code.*

ANSI X3.32-1973 American National Standards Institute. *American national standard graphic representation of the control characters of American national standard code for information interchange.*

ANSI Y10.20-1988 American National Standards Institute. *Mathematic signs and symbols for use in physical sciences and technology.*

ANSI Y14.5M-1982 American National Standard. *Engineering drawings and related document practices, dimensioning and tolerances.*

ANSI Z39.47-1985 American National Standards Institute. *Extended Latin alphabet coded character set for bibliographic use.*

ANSI Z39.64-1989 American National Standards Institute. *East Asian character code for bibliographic use.*

ASMO 449-1982 Arab Organization for Standardization and Metrology. *Data processing - 7-bit coded character set for information interchange.*

GB2312-80 *Code of Chinese Graphic Character Set for Information Interchange: Jishu Biaozhun Chubanshe* (Technical Standards Publishing).

NOTE - For additional sources of the CJK unified ideographs in ISO/IEC 10646 refer to clause 27.

GB13134: *Xinxi jiaohuanyong yiwen bianma zifuji (Yi coded character set for information interchange),* [prepared by] Sichuansheng minzushiwu weiyuanhui. Beijing, Jishu Biaozhun Chubanshe (Technical Standards Press), 1991. (GB 13134-1991).

GBK (*Guo Biao Kuo*) *Han character internal code extension specification: Jishu Biaozhun Chubanshe* (Technical Standards Publishing, Beijing)

IS 13194:1991 Bureau of Indian Standards *Indian script code for information interchange - ISCII*

LTD 37(1610)-1988 *Indian standard code for information interchange.*

I. S. 434:1999, *Information Technology - 8-bit single-byte graphic coded character set for Ogham = Teicneolaíocht Eolais - Tacar carachtar grafach Oghaim códaithe go haonbheartach le 8 ngiotán.* National Standards Authority of Ireland.

JIS X 0201-1976 Japanese Standards Association. *Jouhou koukan you fugou (Code for Information Interchange).*

JIS X 0208-1990 Japanese Standards Association. *Jouhou koukan you kanji fugoukei (Code of the Japanese Graphic Character Set for Information Interchange).*

JIS X 0212-1990 Japanese Standards Association. *Jouhou koukan you kanji fugou-hojo kanji (Code of the supplementary Japanese graphic character set for information interchange).*

JIS X 0213:2000, Japanese Standards Association. *7-bit and 8-bit double byte coded extended KANJI sets for information interchange, 2000-01-20.*

KS C 5601-1992 Korean Industrial Standards Association. *Jeongbo gyohwanyong buho (Code for Information Interchange).*

LVS 18-92 Latvian National Centre for Standardization and Metrology *Libiesu kodu tabula ar 191 simbolu.*

SI 1311.2 - 1996 The Standards Institution of Israel Information Technology. *ISO 8-bit coded character set for information interchange with Hebrew points and cantillation marks.*

SLS 1134:1996 Sri Lanka Standards Institution *Sinhala character code for information interchange*.

TIS 620-2533 *Thai Industrial Standard for Thai Character Code for Computer.* (1990)

The following publications were also used as sources of characters for the Basic Multilingual Plane.

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Armbruster, Carl Hubert. *Initia Amharica: an Introduction to Spoken Amharic*. Cambridge, Cambridge University Press, 1908-20.

Barry, Randall K. 1997. *ALA-LC romanization tables: transliteration schemes for non-Roman scripts*. Washington, DC: Library of Congress Cataloging Distribution Service. ISBN 0-8444-0940-5

Benneth, Solbritt, Jonas Ferenius, Helmer Gustavson, & Marit Åhlén. 1994. *Runmärkt: från brev till klotter. Runorna under medeltiden*. [Stockholm]: Carlsson Bokförlag. ISBN 91-7798-877-9

Beyer, Stephen V. *The classical Tibetan language*. State University of New York. ISBN 0-7914-1099-4

Bburx Ddie Su (= Bian Xiezhe). 1984. *Nuo-su bbur-ma shep jie zzit: Syp-chuo se nuo bbur-ma syt mu curx su niep sha zho ddop ma bbur-ma syt mu wo yuop hop, Bburx Ddie da Su.* [Chengdu]: Syp-chuo co cux tep yy ddurx dde. *Yi wen jian zi ben: Yi Han wen duizhao ban.* Chengdu: Sichuan minzu chubanshe. [*An examination of the fundamentals of the Yi script.* Chengdu: Sichuan National Press.]

Bburx Ddie Su. *Nip huo bbur-ma ssix jie: Nip huo bbur-ma ssi jie Bburx Ddie curx Su. = Yi Han zidian.* Chengdu: Sichuan minzu chubanshe, 1990. ISBN 7-5409-0128-4

Daniels, Peter T., and William Bright, eds. 1996. *The world's writing systems*. New York; Oxford: Oxford University Press. ISBN 0-19-507993-0

Derolez, René. 1954. *Runica manuscripta: the English tradition*. (Rijksuniversiteit te Gent: Werken uitgegeven door de Faculteit van de Wijsbegeerte en Letteren; 118e aflevering) Brugge: De Tempel.

Diringer, David. 1996. *The alphabet: a key to the history of mankind*. New Delhi: Munshiram Manoharlal. ISBN 81-215-0780-0

Esling, John. *Computer coding of the IPA: supplementary report*. Journal of the International Phonetic Association, 20:1 (1990), p. 22-26.

Faulmann, Carl. 1990 (1880). *Das Buch der Schrift*. Frankfurt am Main: Eichborn. ISBN 3-8218-1720-8

Friesen, Otto von. *Runorna*. Stockholm, A. Bonnier [1933]. (Nordisk kultur, 6).

Geiger, Wilhelm. *Maldivian Linguistic Studies*. New Delhi, Asian Educational Services, 1996. ISBN 81-206-1201-9.

Gunasekara, Abraham Mendis. 1986 (1891). *A comprehensive grammar of the Sinhalese language*. New Delhi: Asian Educational Services.

Haarmann, Harald. 1990. *Universalgeschichte der Schrift*. Frankfurt/Main; New York: Campus. ISBN 3-593-34346-0

Holmes, Ruth Bradley, and Betty Sharp Smith. 1976. *Beginning Cherokee: Talisgo galiquogi dideliquasdodi Tsalagi digoweli* . Norman: University of Oklahoma Press.

International Phonetic Association. The IPA 1989 Kiel Convention Workgroup 9 report: *Computer Coding of IPA Symbols and Computer Representation of Individual Languages*. Journal of the International Phon. Assoc., 19:2 (1989), p. 81-82.

Imprimerie Nationale. 1990. *Les caractères de l'Imprimerie Nationale*. Paris: Imprimerie Nationale Éditions. ISBN 2-11-081085-8

International Phonetic Association. *The International Phonetic Alphabet* (revised to 1989).

Jensen, Hans. 1969. *Die Schrift in Vergangenheit und Gegenwart*. 3., neubearbeitete und erweiterte Auflage. Berlin: VEB Deutscher Verlag der Wissenschaften.

Kefarnissy, Paul. *Grammaire de la langue araméenne syriaque*. Beyrouth, 1962.

Knuth, Donald E. *The TeXbook*. – 19th. printing, rev, – Reading, MA : Addison-Wesley, 1990.

Kuruch, Rimma Dmitrievna. *Saamsko-russkiy slovar'*. Moskva: Russkiy iazyk. 1985

Launhardt, Johannes. *Guide to Learning the Oromo (Galla) Language*. Addis Ababa, Launhardt [1973?]

Leslau, Wolf. *Amharic Textbook*. Weisbaden, Harrassowitz; Berkeley, University of California Press, 1968.

Mandarin Promotion Council, Ministry of Education, Taiwan. *Shiangtu yuyan biauyin fuhau shoutse* (*The Handbook of Taiwan Languages Phonetic Alphabet*). 1999.

Nakanishi, Akira. 1990. *Writing systems of the world: alphabets, syllabaries, pictograms*. Rutland, VT: Charles E. Tuttle. ISBN 0-8048-1654-9

Okell, John. 1971. *A guide to the romanization of Burmese*. (James G. Forlang Fund; 27) London: Royal Asiatic Society of Great Britain and Ireland.

Page, R. I. 1987. *Runes*. (Reading the Past; 4) Berkeley & Los Angeles: University of California Press. ISBN 0-520-06114-4

Pullum, Geoffrey K. *Phonetic symbol guide*. Geoffrey K. Pullum and William A. Ladusaw. – Chicago : University of Chicago Press, 1986.

Pullum, Geoffrey K. *Remarks on the 1989 revision of the International Phonetic Alphabet*. Journal of the International Phonetic Association, 20:1 (1990), p. 33-40.

Roop, D. Haigh. 1972. *An introduction to the Burmese writing system*. New Haven and London: Yale University Press. ISBN 0-300-01528-3

Santos, Hector. 1994. *The Tagalog script.* (Ancient Philippine Scripts Series; 1). Los Angeles: Sushi Dog Graphics.

Santos, Hector. 1995. *The living scripts*. (Ancient Philippine Scripts Series; 2). Los Angeles: Sushi Dog Graphics.

Selby, Samuel M. *Standard mathematical tables.* – 16th ed. – Cleveland, OH : Chemical Rubber Co., 1968. Shepherd, Walter.

Shepherd, Walter. *Shepherd's glossary of graphic signs and symbols*. Compiled and classified for ready reference. – New York : Dover Publications, [1971].

Shinmura, Izuru. *Kojien – Dai 4-han*. – Tokyo : Iwanami Shoten, Heisei 3 [1991].

The Unicode Consortium *The Unicode Standard. Worldwide Character Encoding Version 1.0, Volume One*. – Reading, MA : Addison-Wesley, 1991.

The Unicode Consortium *The Unicode standard, Version 2.0*. Reading, MA: Addison-Wesley, 1996. ISBN 0-201-48345-9

The Unicode Consortium *The Unicode standard, Version 3.0*. Reading, MA: Addison-Wesley Developer's Press, 2000. ISBN 0-201-61633-5 FORTHCOMING

The following publications were also used as sources of characters for the Supplementary Multilingual Plane.

Deseret

Ivins, Stanley S. “The Deseret Alphabet” *Utah Humanities Review 1* (1947):223-39.

Old Italic

Bonfante, Larissa. 1996. “The scripts of Italy”, in Petere T. Daniels and William Bright, eds. *The world’s writing*

systems. New York; Oxford: oxford University Press. ISBN 0-19-507993-0

Gothic

Fairbanks, Sydney, and F. P. Magoun Jr. 1940. 'On writing and printing Gothic', in *Speculum* 15:313-16.

Byzantine Musical Symbols

ELOT 1373. *The Greek Byzantine Musical Notation System.* Athens, 1997 (ΣΕΠ ΕΛΟΤ 1373: 1997).

Musical Symbols

Heussenstamm, George. *Norton Manual of Music Notation*. New York: W. W. Norton, 1987

Rastall, Richard. *Notation of Western Music*: An Introduction. London: Dent, 1983.

Annex N
(informative)

External references to character repertoires

N.1 Methods of reference to character repertoires and their coding

Within programming languages and other methods for defining the syntax of data objects there is commonly a need to declare a specific character repertoire from among those that are specified in ISO/IEC 10646. There may also be a need to declare the corresponding coded representations applicable to that repertoire.

For any character repertoire that is in accordance with ISO/IEC 10646 a precise declaration of that repertoire should include the following parameters:

- identification of ISO/IEC 10646,
- the adopted subset of the repertoire, identified by one or more collection numbers,
- the adopted implementation level (1, 2 or 3),
- the adopted coded representation form (4-octet or 2-octet).

One of the methods now in common use for defining the syntax of data objects is Abstract Syntax Notation 1 (ASN.1) specified in ISO/IEC 8824. The corresponding coded representations are specified in ISO/IEC 8825. When this method is used the forms of the references to character repertoires and coding are as indicated in the following clauses.

N.2 Identification of ASN.1 character abstract syntaxes

The set of all character strings that can be formed from the characters of an identified repertoire in accordance with ISO/IEC 10646 is defined to be a "character abstract syntax" in the terminology of ISO/IEC 8824. For each such character abstract syntax, a corresponding object identifier value is defined to permit references to be made to that syntax when the ASN.1 notation is used.

ISO/IEC 8824-1 annex B specifies the form of object identifier values for objects that are specified in an ISO standard. In such an object identifier the features and options of ISO/IEC 10646 are identified by means of numbers (arcs) which follow the arcs "10646" and "0" which identify the whole ISO/IEC 10646.

NOTE 1 – The arc (0) is required to complement the arc(1) and (2) which represents Part 1 and Part 2 of the previous editions of ISO/IEC 10646. These two arcs should not be used.

The first following such arc identifies the adopted implementation level, and is either:

- level-1 (1), or
- level-2 (2), or
- level-3 (3).

The second such arc identifies the repertoire subset, and is either:

- all (0), or
- collections (1).

Arc (0) identifies the entire collection of characters specified in ISO/IEC 10646. No further arc follow this arc.

NOTE 2 - This collection includes private groups and planes, and is therefore not fully-defined. Its use without additional prior agreement is deprecated.

Arc (1) is followed by one or a sequence of further arcs, each of which is a collection number from annex A, in ascending numerical order. This sequence identifies the subset consisting of the collections whose numbers appear in the sequence.

NOTE 3 - As an example, the object identifier for the subset comprising the collections BASIC LATIN, LATIN-1 SUPPLEMENT, and MATHEMATICAL OPERATORS, at implementation level 1, is:

{iso standard 10646 0 level-1 (1) collections (1) 1 2 39}

ISO/IEC 8824 also specifies object descriptors corresponding to object identifier values. For each combination of arcs the corresponding object descriptors are as follows:

1 0 : "ISO 10646 level-1 unrestricted"
2 0 : "ISO 10646 level-2 unrestricted"
3 0 : "ISO 10646 level-3 unrestricted"

For a single collection with collection name "xxx".

1 1 : "ISO 10646 level-1 xxx"
2 1 : "ISO 10646 level-2 xxx"
3 1 : "ISO 10646 level-3 xxx"

For a repertoire comprising more than one collection, numbered m1, m2, etc.

1 1 : "ISO 10646 level-1 collections m1,m2, m3, .. "

2 1 : "ISO 10646 level-2 collections m1,m2, m3, .. "

3 1 : "ISO 10646 level-3 collections m1,m2, m3, .. "

NOTE 4 - All spaces are single spaces.

N.3 Identification of ASN.1 character transfer syntaxes

The coding method for character strings that can be formed from the characters in accordance with ISO/IEC 10646 is defined to be a "character transfer syntax" in the terminology of ISO/IEC 8824. For each such character transfer syntax, a corresponding object identifier value is defined to permit references to be made to that syntax when the ASN.1 notation is used.

In an object identifier in accordance with ISO/IEC 8824-1 annex B, the coded representation form specified in ISO/IEC 10646 is identified by means of numbers (arcs) which follow the arcs "10646" and "0" which identify the whole ISO/IEC 10646.

The first such arc is:
- transfer-syntaxes (0).

The second such arc identifies the form and is either:

- two-octet-BMP-form (2), or
- four-octet-form (4), or
- utf16-form (5), or
- utf8-form (8).

NOTE - As an example, the object identifier for the two-octet coded representation form is:

{iso standard 10646 0 transfer-syntaxes (0) two-octet-BMP-form (2)}

The following form is also valid but deprecated:

{iso standard 10646 1 transfer-syntaxes (0) two-octet-BMP-form (2)}

The corresponding object descriptors are:

- "ISO 10646 form 2"

- "ISO 10646 form 4"

- “ISO 10646 utf-16”

- “ISO 10646 utf-8”.

Annex P
(informative)

Additional information on characters

This annex contains additional information on some of the characters specified in clause 26 of this International Standard. This information is intended to clarify some feature of a character, such as its naming or usage, or its associated graphic symbol.

Each entry in this annex consists of the name of a character preceded by its code position in the two-octet form, followed by the related additional information. Entries are arranged in ascending sequence of code position.

When an entry for a character is included in this annex an * symbol appears immediately following its name in the corresponding table in clause 26 of this International Standard.

00AB LEFT-POINTING DOUBLE ANGLE QUOTATION MARK
This character may be used as an Arabic opening quotation mark, if it appears in a bi-directional context as described in clause 19. The graphic symbol associated with it may differ from that in the table for Row 00.

00BB RIGHT-POINTING DOUBLE ANGLE QUOTATION MARK
This character may be used as an Arabic closing quotation mark, if it appears in a bi-directional context as described in clause 19. The graphic symbol associated with it may differ from that in the table for Row 00.

00C6 LATIN CAPITAL LETTER AE (ash)
In the first edition of this International Standard the name of this character was:
LATIN CAPITAL LIGATURE AE

00E6 LATIN SMALL LETTER AE (ash)
In the first edition of this International Standard the name of this character was:
LATIN SMALL LIGATURE AE

0189 LATIN CAPITAL LETTER AFRICAN D
This character is the capital letter form of:
0256 LATIN SMALL LETTER D WITH TAIL

019F LATIN CAPITAL LETTER O WITH MIDDLE TILDE
This character is the capital letter form of:
0275 LATIN SMALL LETTER BARRED O

01A6 LATIN LETTER YR
This character is the capital letter form of:
0280 LATIN LETTER SMALL CAPITAL R

01E2 LATIN CAPITAL LETTER AE WITH MACRON (ash)
In the first edition of this International Standard the name of this character was:
LATIN CAPITAL LIGATURE AE WITH MACRON

01E3 LATIN SMALL LETTER AE WITH MACRON (ash)
In the first edition of this International Standard the name of this character was:
LATIN SMALL LIGATURE AE WITH MACRON

01FC LATIN CAPITAL LETTER AE WITH ACUTE (ash)
In the first edition of this International Standard the name of this character was:
LATIN CAPITAL LIGATURE AE WITH ACUTE

01FD LATIN SMALL LETTER AE WITH ACUTE (ash)
In the first edition of this International Standard the name of this character was:
LATIN SMALL LIGATURE AE WITH ACUTE

0218 LATIN CAPITAL LETTER S WITH COMMA BELOW
This character is intended for use only in those cases where it is necessary to make a distinction from the letter with cedilla. Both forms of the letter may be found in a single document written in a single language, e.g. Romanian or Turkish.

In ISO/IEC 8859-2 only a single (8-bit) coded character is provided, LATIN CAPITAL LETTER S WITH CEDILLA, which maps to 015E in ISO/IEC 10646 by default, and may map by mutual agreement between sender and receiver to this letter with comma below. See ISO/IEC 8859-2 for further information on the use of that standard.

0219 LATIN SMALL LETTER S WITH COMMA BELOW
This character is intended for use only in those cases where it is necessary to make a distinction from the letter with cedilla. Both forms of the letter may be found in a single document written in a single language, e.g. Romanian or Turkish.

In ISO/IEC 8859-2 only a single (8-bit) coded character is provided, LATIN SMALL LETTER S WITH CEDILLA, which maps to 015F in ISO/IEC 10646 by default, and may map by mutual agreement between sender and receiver to this letter with comma below. See ISO/IEC 8859-2 for further information on the use of that standard.

021A LATIN CAPITAL LETTER T WITH COMMA BELOW
This character is intended for use only in those cases where it is necessary to make a distinction from the letter with cedilla. Both forms of the letter

may be found in a single document written in a single language, e.g. Romanian.

In ISO/IEC 8859-2 only a single (8-bit) coded character is provided, LATIN CAPITAL LETTER T WITH CEDILLA, which maps to 0162 in ISO/IEC 10646 by default, and may map by mutual agreement between sender and receiver to this letter with comma below. See ISO/IEC 8859-2 for further information on the use of that standard.

021B LATIN SMALL LETTER T WITH COMMA BELOW

This character is intended for use only in those cases where it is necessary to make a distinction from the letter with cedilla. Both forms of the letter may be found in a single document written in a single language, e.g. Romanian.

In ISO/IEC 8859-2 only a single (8-bit) coded character is provided, LATIN SMALL LETTER T WITH CEDILLA, which maps to 0163 in ISO/IEC 10646 by default, and may map by mutual agreement between sender and receiver to this letter with comma below. See ISO/IEC 8859-2 for further information on the use of that standard.

0280 LATIN LETTER SMALL CAPITAL R

This character is the small letter form of:

01A6 LATIN LETTER YR

03D8 GREEK LETTER ARCHAIC KOPPA

The name of this character distinguishes it from 03DE GREEK LETTER KOPPA, which is most commonly used with its numeric value, such as in the dating of legal documentation. GREEK LETTER ARCHAIC KOPPA is primarily used alphabetically to represent the letter used in early Greek inscriptions.

03D9 GREEK SMALL LETTER ARCHAIC KOPPA

The name of this character distinguishes it from 03DF GREEK SMALL LETTER KOPPA, which is most commonly used with its numeric value, such as in the dating of legal documentation. GREEK SMALL LETTER ARCHAIC KOPPA is primarily used alphabetically to represent the letter used in early Greek inscriptions.

0596 HEBREW ACCENT TIPEHA

This character may be used as a Hebrew accent tarha.

0598 HEBREW ACCENT ZARQA

This character may be used as a Hebrew accent zinorit.

05A5 HEBREW ACCENT MERKHA

This character may be used as a Hebrew accent yored.

05A8 HEBREW ACCENT QADMA

This character may be used as a Hebrew accent azla.

05AA HEBREW ACCENT YERAH BEN YOMO

This character may be used as a Hebrew accent galgal.

05BD HEBREW POINT METEG

This character may be used as a Hebrew accent sof pasuq or siluq.

05C0 HEBREW PUNCTUATION PASEQ

This character may be used as a Hebrew accent legarme.

05C3 HEBREW PUNCTUATION SOF PASUQ

This character may be used as a Hebrew punctuation colon.

06AF ARABIC LETTER GAF

The symbol for a Hamza (see position 0633) may appear in the centre of the graphic symbol associated with this character.

06D0 ARABIC LETTER E

This character may be used as an Arabic letter Sindhi bbeh.

0F6A TIBETAN LETTER FIXED-FORM RA

This character has the same graphic symbol as that shown in the table for:

0F62 TIBETAN LETTER RA

It may be used when the graphic symbol is required to remain unchanged regardless of context.

0FAD TIBETAN SUBJOINED LETTER WA

The graphic symbol for this character occurs in two alternative forms, a full form and a short form (known as *wa.zur* (wazur)). The short form of the letter is shown in the table, since it occurs more frequently.

0FB1 TIBETAN SUBJOINED LETTER YA

The graphic symbol for this character occurs in two alternative forms, a full form and a short form (known as *ya.btags* (ya ta)). The short form of the letter is shown in the table, since it occurs more frequently.

0FB2 TIBETAN SUBJOINED LETTER RA

The graphic symbol for this character occurs in two alternative forms, a full form and a short form (known as *ra.btags* (ra ta)). The short form of the letter is shown in the table, since it occurs more frequently.

1100 HANGUL CHOSEONG KIYEOK ...
1112 HANGUL CHOSEONG HIEUH

The Latin letters shown in parenthesis after the names of the characters in the range 1100 to 1112 (except 110B) are transliterations of these Hangul characters. These transliterations are used in the construction of the names of the Hangul syllables that are allocated in code positions AC00 to D7A3 in this International Standard.

11A8 HANGUL JONGSEONG KIYEOK ...
11C2 HANGUL JONGSEONG HIEUH

The Latin letters shown in parenthesis after the names of the characters in the range 11A8 to 11C2 are transliterations of these Hangul characters. These transliterations are used in the construction of the names of the Hangul syllables that are allo-

cated in code positions AC00 to D7A3 in this International Standard.

17A3 KHMER INDEPENDENT VOWEL QAQ

This character is only used for Pali/Sanskrit transliteration. The use of this character is discouraged; 17A2 KHMER LETTER QA should be used instead.

17A4 KHMER INDEPENDENT VOWEL QAA

This character is only used for Pali/Sanskrit transliteration. The use of this character is discouraged; the sequence <17A2, 17B6> (KHMER LETTER QA followed by KHMER VOWEL SIGN AA) should be used instead.

17B4 KHMER VOWEL INHERENT AQ

17B5 KHMER VOWEL INHERENT AA

Khmer inherent vowels. These characters are for phonetic transcription to distinguish Indic language inherent vowels from Khmer inherent vowels. They are included solely for compatibility with particular applications; their use in other contexts is discouraged.

17D3 KHMER SIGN BATHAMASAT

This character represents a rare sign representing the first August of leap year in the lunar calendar. The use of this character is discouraged in favor of the characters from the KHMER SYMBOLS collection.

17D8 KHMER SIGN BEYYAL

This character represents the concept of ‘et cetera’. The use of this character is discouraged; other abbreviations for ‘et cetera’ also exist. The preferred spelling is the sequence <17D4, 179B, 17D4>.

234A APL FUNCTIONAL SYMBOL DOWN TACK UNDERBAR

The relation between the name of this character and the orientation of the “tack” element in its graphical symbol is inconsistent with that of other characters in this International Standard, such as:

22A4 DOWN TACK and 22A5 UP TACK

234E APL FUNCTIONAL SYMBOL DOWN TACK JOT

Information for the character at 234A applies.

2351 APL FUNCTIONAL SYMBOL UP TACK OVERBAR

Information for the character at 234A applies.

2355 APL FUNCTIONAL SYMBOL UP TACK JOT

Information for the character at 234A applies.

2361 APL FUNCTIONAL SYMBOL UP TACK DIAERESIS

Information for the character at 234A applies.

FA1F CJK COMPATIBILITY IDEOGRAPH-FA1F

This character should be considered as an extension to the block of characters CJK UNIFIED IDEOGRAPHS EXTENSION A (see clause 27). It is not a duplicate of a character already allocated in the blocks of CJK Unified Ideographs, unlike many other characters in the block CJK COM-PATIBILITY IDEOGRAPHS. The source of this character, shown as described in clause 27, is:

C	J	K	V
G - Hanzi - T	Kanji	Hanja	ChuNom
	藹		
	A-264B		
	A-0643		

FA23 CJK COMPATIBILITY IDEOGRAPH-FA23

This character should be considered as an extension to the block of characters CJK UNIFIED IDEOGRAPHS EXTENSION A (see clause 27). It is not a duplicate of a character already allocated in the blocks of CJK Unified Ideographs, unlike many other characters in the block CJK COM-PATIBILITY IDEOGRAPHS. The sources of this character, shown as described in clause 27, are:

C	J	K	V
G - Hanzi - T	Kanji	Hanja	ChuNom
赹	赹		
F-3862	A-2728		
F-2466	A-0708		

FF5F FULLWIDTH LEFT WHITE PARENTHESIS

This character has a common glyph variation that looks like a double left parenthesis

FF60 FULLWIDTH RIGHT WHITE PARENTHESIS

This character has a common glyph variation that looks like a double right parenthesis

FFE3 FULLWIDTH MACRON

This character is the full-width form of the character: 00AF MACRON. It is also used as the full-width form of the character:

203E OVERLINE

Annex Q
(informative)

Code mapping table for Hangul syllables

This Annex provides a cross-reference between the Hangul syllables (and code positions) that were specified in the First Edition of this International Standard and their amended code positions as now specified in this edition.

In the First Edition of this International Standard 6656 Hangul syllables were allocated to consecutive code positions in the range 3400 to 4DFF. These Hangul syllables are now re-allocated non-consecutively to code positions in the larger range AC00 to D7A3.

For each Hangul syllable in the First Edition its code position provides an index to a cell in table Q.1 which appears on the following pages. The first three digits of the code position identify a row in the table, and the final digit identifies a column in the table. The cell at the identified row and column position contains the code position to which the Hangul syllable is now allocated.

Example:
In the table for Row 38 (table 67) of the First Edition of this International Standard

HANGUL SYLLABLE SIOS O RIEUL

is found at position 389D. In row 389, column D, of table Q.1 the entry C194 is found. This entry indicates that this Hangul syllable is now allocated to code position C194.

NOTE - The name shown for the Hangul syllable at C194 is:
HANGUL SYLLABLE SOL.
This is because the names of Hangul syllables are now constructed from the Latin transliterations shown in the tables for Row 11 (see also 26.2 and annex P).

Annex R
(informative)

Names of Hangul syllables

This annex shows in a tabular arrangement the syllable-name of each character in the block HANGUL SYLLABLES (AC00 - D7A3). The syllable-name is the final component of the full character name, and is derived as described in 25.2, steps 1 to 5, which is the definitive specification of the names in that block.

The leftmost column of the table shows the cell numbers (00 - FF) of the corresponding characters. The headings of the other columns of the table show the row numbers of the characters.

Annex S
(informative)

Procedure for the unification and arrangement of CJK Ideographs

The graphic character collections of CJK unified ideographs in ISO/IEC 10646-1 are specified in clause 27. They contain almost 27,500 ideographs, and are derived from over 66,000 ideographs which are found in various different national and regional standards for coded character sets (the "sources").

This Annex describes how the ideographs in this standard are derived from the sources by applying a set of unification procedures. It also describes how the ideographs in this standard are arranged in the sequence of consecutive code positions to which they are assigned.

The source standards are shown in clause 27 in five source groups according to their origins. The source groups are identified as the G-, T-, J-, K- and V-sources.

Within the context of ISO/IEC 10646 a unification process is applied to the ideographic characters taken from the codes in the source groups. In this process, single ideographs from two or more of the source groups are associated together, and a single code position is assigned to them in this standard. The associations are made according to a set of procedures that are described below. Ideographs that are thus associated are described here as “unified”.

NOTE - The unification process does not apply to the following collections of ideographic characters in the Basic multilingual Plane:
- CJK RADICALS SUPPLEMENT (2E80 - 2EFF)
- KANGXI RADICALS (2F00 - 2FDF)
- CJK COMPATIBILITY IDEOGRAPHS (F900 - FAFF with the exception of FA0E, FA0F, FA11, FA13, FA14, FA1F, FA21, FA23, FA24, FA27, FA28 and FA29).

S.1 Unification procedure

S.1.1 Scope of unification

Ideographs that are unrelated in historical derivation (non-cognate characters) have not been unified.

Example:

士 , 士

NOTE - The difference of shape between the two ideographs in the above example is in the length of the lower horizontal line. This is considered an actual difference of shape. Furthermore these ideographs have different meanings. The meaning of the first is "Soldier" and of the second is "Soil or Earth".

An association between ideographs from different sources is made here if their shapes are sufficiently similar, according to the following system of classification.

S.1.2 Two level classification

A two-level system of classification is used to differentiate (a) between abstract shapes and (b) between actual shapes determined by particular typefaces. Variant forms of an ideograph, which can not be unified, are identified based on the difference between their abstract shapes.

S.1.3 Procedure

A unification procedure is used to determine whether two ideographs have the same abstract shape or different ones. The unification procedure has two stages, applied in the following order:

a) Analysis of component structure;

b) Analysis of component features;

S.1.3.1 Analysis of component structure

In the first stage of the procedure the component structure of each ideograph is examined. A component of an ideograph is a geometrical combination of primitive elements. Alternative ideographs can be configured from the same set of components. Components can be combined to create a new component with a more complicated structure. An ideograph, therefore, can be defined as a component tree, where the top node is the ideograph itself, and the bottom nodes are the primitive elements. This is shown in Figure S.1.

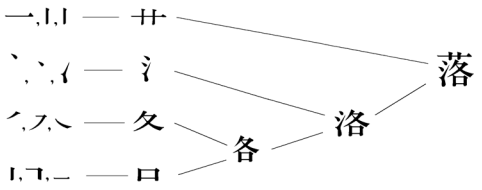


Figure S.1 - Component structure

S.1.3.2 Analysis of component features

In the second stage of the procedure, the components located at corresponding nodes of two ideographs are

compared, starting from the most superior node, as shown in Figure S.2.

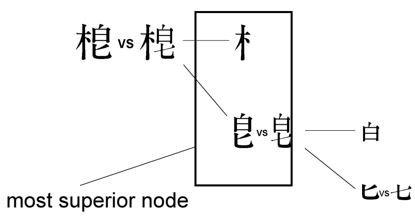


Figure S.2 - The most superior node of a component

The following features of each ideograph to be compared are examined:

a) the number of components,

b) the relative position of the components in each complete ideograph,

c) the structure of corresponding components.

If one or more of the features a) to c) above are different between the ideographs in the comparison, the ideographs are considered to have different abstract shapes and are therefore not unified.

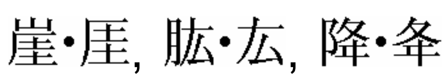
If all of the features a) to c) above are the same between the ideographs, the ideographs are considered to have the same abstract shape and are therefore unified.

S.1.4 Examples of differences of abstract shapes

To illustrate rules derived from a) to c) in S.1.3.2, some typical examples of ideographs that are not unified, owing to differences of abstract shapes, are shown below.

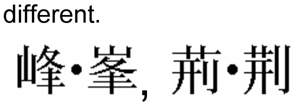
S.1.4.1 Different number of components

The examples below illustrate rule a) since the two ideographs in each pair have different numbers of components.



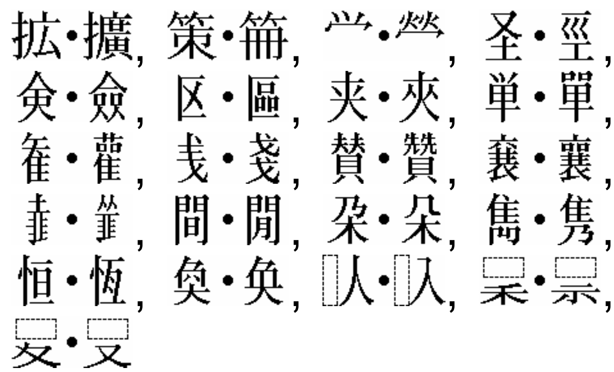
S.1.4.2 Different relative positions of components

The examples below illustrate rule b). Although the two ideographs in each pair have the same number of components, the relative positions of the components are different.



S.1.4.3 Different structure of a corresponding component

The examples below illustrate rule c). The structure of one (or more) corresponding components within the two ideographs in each pair is different.

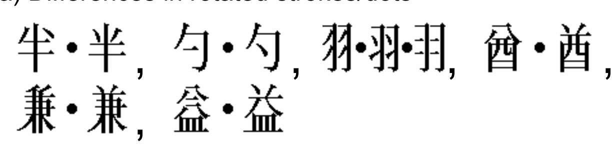


S.1.5 Differences of actual shapes

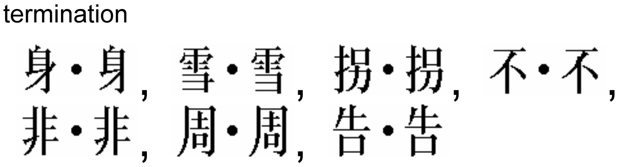
To illustrate the classification described in S.1.2, some typical examples of ideographs that are unified are shown below. The two or three ideographs in each group below have different actual shapes, but they are considered to have the same abstract shape, and are therefore unified.

The differences are further classified according to the following examples.

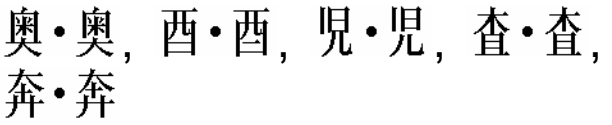
a) Differences in rotated strokes/dots



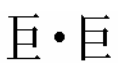
b) Differences in overshoot at the stroke initiation and/or termination



c) Differences in contact of strokes

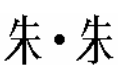


d) Differences in protrusion at the folded corner of strokes

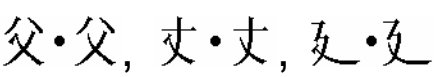


e) Differences in bent strokes

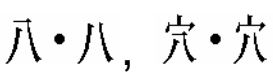
f) Differences in folding back at the stroke termination



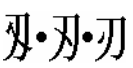
g) Differences in accent at the stroke initiation



h) Differences in "rooftop" modification



j) Combinations of the above differences



These differences in actual shapes of a unified ideograph are presented in the corresponding source columns for each code position entry in the code table in clause 27 of this International Standard.

S.1.6 Source separation rule

To preserve data integrity through multiple stages of code conversion (commonly known as “round-trip integrity”), any ideographs that are separately encoded in any one of the source standards listed below have not been unified.

G-source:	GB2312-80, GB12345-90, GB7589-87*, GB7590-87*, GB8565-88*, General Purpose Hanzi List for Modern Chinese Language*
T-source:	TCA-CNS 11643-1986/1st plane, TCA-CNS 11643-1986/2nd plane, TCA-CNS 11643-1986/14th plane*
J-source:	JIS X 0208-1990, JIS X 0212-1990
K-source:	KS C 5601-1989, KS C 5657-1991

(A " * " after the reference number of a standard indicates that some of the ideographs included in that standard are not introduced into the unified collection.)

However, some ideographs encoded in two standards belonging to the same source group (e.g. GB2312-80 and GB12345-90) have been unified during the process of collecting ideographs from the source group.

The source separation rule described in this clause only applies to the CJK UNIFIED IDEOGRAPHS block specified in the Basic Multilingual Plane.

NOTE – CJK Compatibility Ideographs are created following a rule very similar to the source separation rule. However, the end result is the combination of a single CJK Unified Ideograph and one or several CJK Compatibility Ideographs. When the source separation rule is applied, all ‘similar’ source CJK Ideographs result in separate CJK Unified Ideographs.

S.2 Arrangement procedure

S.2.1 Scope of arrangement

The arrangement of the CJK UNIFIED IDEOGRAPHS in the code table of clause 27 of this International Standard is based on the filing order of ideographs in the following dictionaries.

Priority	Dictionary		Edition
1	Kangxi Dictionary	康熙字典	Beijing 7th edition
2	Daikanwa Jiten	大漢和辞典	9th edition
3	Hanyu Dazidian	汉语大字典	1st edition
4	Daejaweon	大字源	1st edition

The dictionaries are used according to the priority order given in the table above. Priority 1 is highest. If an ideograph is found in one dictionary, the dictionaries of lower priority are not examined.

S.2.2 Procedure

S.2.2.1 Ideographs found in the dictionaries

a) If an ideograph is found in the Kangxi Dictionary, it is positioned in the code table in accordance with the Kangxi Dictionary order.

b) If an ideograph is not found in the Kangxi Dictionary but is found in the Daikanwa Jiten, it is given a position at the end of the radical-stroke group under which is indexed the nearest preceding Daikanwa Jiten character that also appears in the Kangxi dictionary.

c) If an ideograph is found in neither the Kangxi nor the Daikanwa, the Hanyu Dazidian and the Daejaweon dictionaries are referred to with a similar procedure.

S.2.2.2 Ideographs not found in the dictionaries

If an ideograph is not found in any of the four dictionaries, it is given a position at the end of the radical-stroke group (after the characters that are present in the dictionaries) and it is indexed under the same radical-stroke count.

S.3 Source code separation examples

The pairs (or triplets) of ideographs shown below are exceptions to the unification rules described in clause S.1 of

this Annex. They are not unified because of the source separation rule described in clause S.1.6.

NOTE - The particular source group (or groups) that causes the source separation rule to apply is indicated by the letter (G, J, K, or T) that appears to the right of each pair (or triplet) of ideographs. The source groups that correspond to these letters are identified at the beginning of this Annex.

丟丢 T
4E1F 4E22

么幺 GT
4E48 5E7A

争爭 GTJ
4E89 722D

仞刃 J
4EDE 4EED

併倂 T
4F75 5002

侶侶 T
4FA3 4FB6

俣俣 TJK
4FC1 4FE3

俞俞 T
4FDE 516A

俱俱 T
4FF1 5036

値值 T
5024 503C

偷偸 T
5077 5078

偽僞 TJ
507D 50DE

兌兑 T
514C 5151

兎兔 TJ
514E 5154

冗冗 T
5156 5157

冊冊 TJ
518A 518C

淨淨 G
51C0 51C8

凡凢 T
51E2 51E3

刃刃 TJ
5203 5204

刊刊 TJ
520A 520B

刪刪 T
5220 522A

別別 T
5225 522B

券券 TJ
5238 52B5

剎剎 T
5239 524E

剏剏 T
524F 5259

剝剥 T
525D 5265

劍劒 J
5292 5294

勻勻 T
52FB 5300

単単 T
5355 5358

即卽 TK
5373 537D

卷卷 TJ
5377 5DFB

叁參 GT
53C1 53C2

參叅 T
53C3 53C4

呂呂 T
5415 5442

吞吞 T
541E 5451

吳吴吳 TJ
5433 5434 5449

吶吶 T
5436 5450

告告 T
543F 544A

唧唧 T
5527 559E

喻喻 T
55A9 55BB

噓噓 T
5618 5653

嚏嚏 GTJ
568F 5694

国国 T
56EF 56FD

圈圈 TJ
5708 570F

圓圓 T
570E 5713

圖圖 T
5716 5717

垒垒 T
5759 5DE0

埒埒 J
57D2 57D3

墜墜 T
5848 588D

塡填 TJ
5861 586B

增增 T
5897 589E

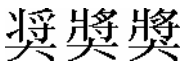
壯壯 GTJ
58EE 58EF

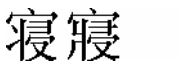
壽壽 T
58FD 5900

奠奠 T
5910 657B

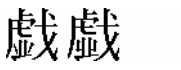
本本 GTJ
5932 672C

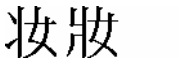
奧奥 J
5965 5967


TJ
5968 596C 734E

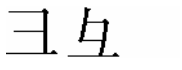

GTJ
5BDD 5BE2


T
5F39 5F3E

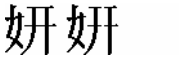

T
622F 6231

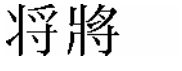

GT
5986 599D

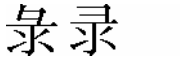

J
5C02 5C08

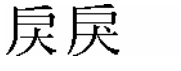

TJ
5F50 5F51

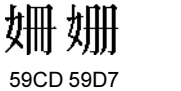

T
6236 6237 6238

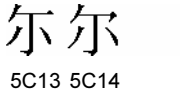

T
598D 59F8


GTJ
5C06 5C07


T
5F54 5F55


T
623B 623E

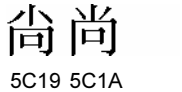

T
59CD 59D7


T
5C13 5C14


T
5F59 5F5A


T
629B 62CB


GT
59EB 59EC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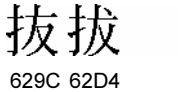
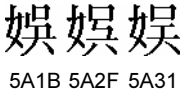
5C19 5C1A

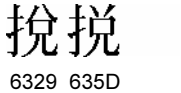

J
5F5B 5F5C

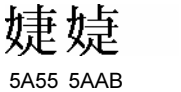

TJ
629C 62D4


T
5A1B 5A2F 5A31


T
5C2A 5C2B

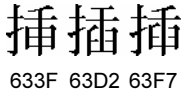

T
5F5D 5F5E


T
6329 635D


T
5A55 5AAB

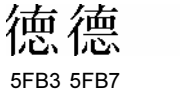

T
5C36 5C37

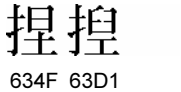

T
5F65 5F66


TJ
633F 63D2 63F7


T
5A7E 5AAE

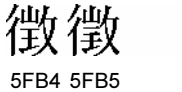

T
5C4F 5C5B


T
5FB3 5FB7


TJ
634F 63D1

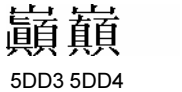

TK
5AAA 5ABC

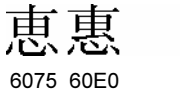

GT
5CE5 5D22

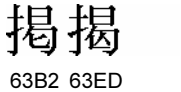

T
5FB4 5FB5


TJ
635C 641C


T
5AAF 5B00


T
5DD3 5DD4


TJ
6075 60E0


T
63B2 63ED

T
5B0E 5B14

T
5E21 5E32

T
6085 60A6

TJ
63FA 6416 6447

GT
5B24 5B37

TJ
5E2F 5E36

T
609E 60AE

T
63FE 6435

T
5B73 5B76

T
5E76 5E77

T
60B3 60EA

TJ
6483 64CA

T
5BAB 5BAE

T
5EC4 5ECF

T
6120 614D

T
654E 6559

T
5BDB 5BEC

T
5F11 5F12

TJ
613C 614E

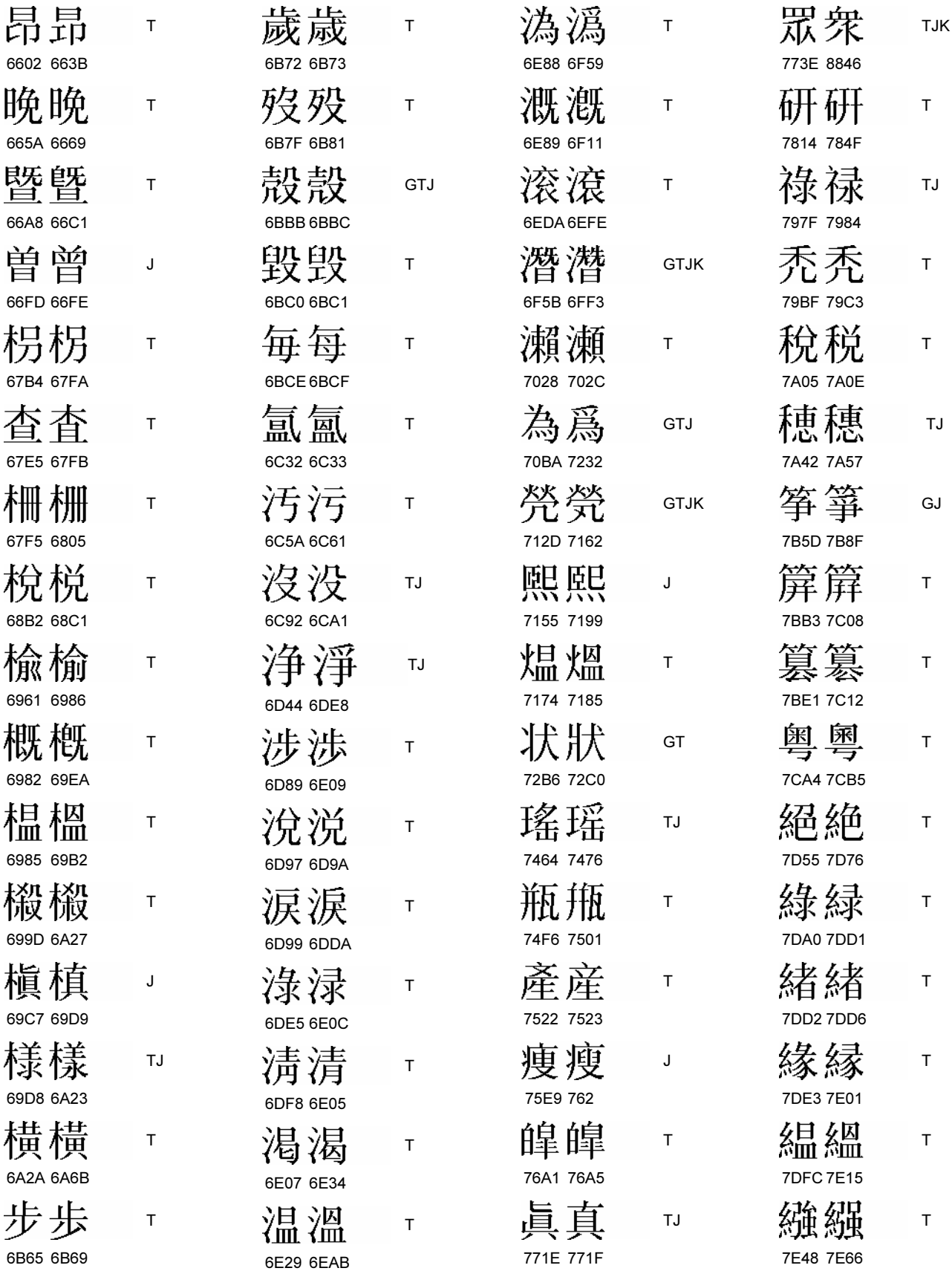
T
6553 655A

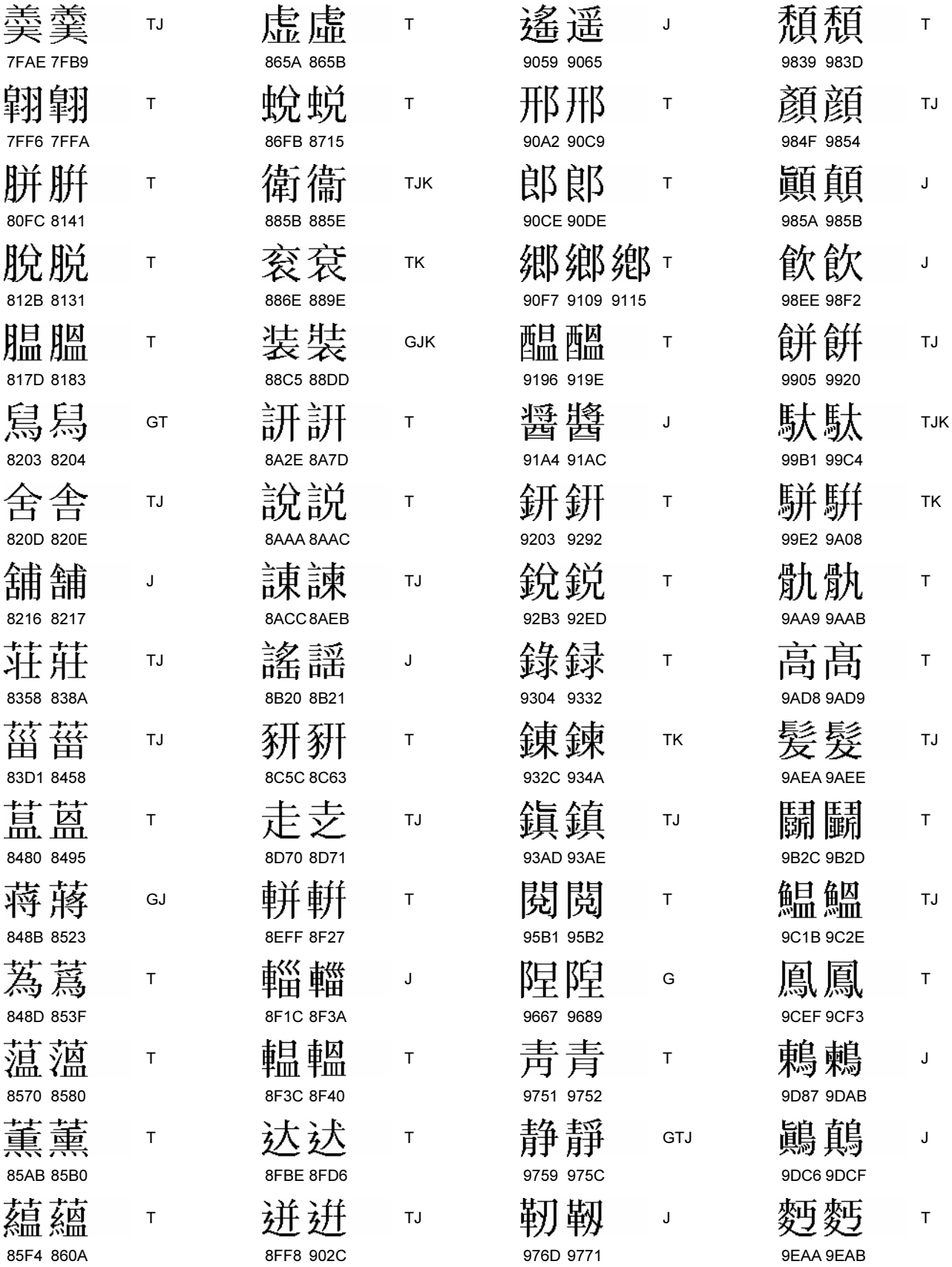
T
5BDC 5BE7

T
5F37 5F3A

GT
6229 622C

T
65E2 65E3

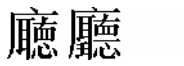
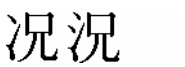
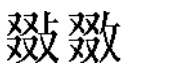
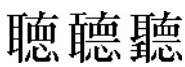
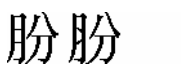
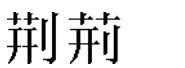
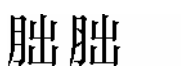
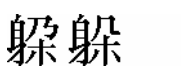

昂 昂 T
6602 663B
歲 歲 T
6B72 6B73
溈 溈 T
6E88 6F59
眾 衆 TJK
773E 8846
晚 晚 T
665A 6669
歿 歿 T
6B7F 6B81
溉 溉 T
6E89 6F11
研 研 T
7814 784F
暨 暨 T
66A8 66C1
殼 殼 GTJ
6BBB 6BBC
滾 滾 T
6EDA 6EFE
祿 祿 TJ
797F 7984
曾 曾 J
66FD 66FE
毀 毀 T
6BC0 6BC1
潛 潛 GTJK
6F5B 6FF3
禿 禿 T
79BF 79C3
枴 枴 T
67B4 67FA
每 每 T
6BCE 6BCF
瀨 瀨 T
7028 702C
稅 稅 T
7A05 7A0E
查 查 T
67E5 67FB
氳 氳 T
6C32 6C33
爲 爲 GTJ
70BA 7232
穗 穗 TJ
7A42 7A57
柵 柵 T
67F5 6805
汚 污 T
6C5A 6C61
煢 煢 GTJK
712D 7162
箏 箏 GJ
7B5D 7B8F
棁 棁 T
68B2 68C1
沒 没 TJ
6C92 6CA1
熙 熙 J
7155 7199
箠 箠 T
7BB3 7C08
榆 榆 T
6961 6986
淨 淨 TJ
6D44 6DE8
熅 熅 T
7174 7185
篡 篡 T
7BE1 7C12
概 概 T
6982 69EA
涉 涉 T
6D89 6E09
狀 狀 GT
72B6 72C0
粵 粵 T
7CA4 7CB5
榲 榲 T
6985 69B2
涗 涗 T
6D97 6D9A
瑤 瑤 TJ
7464 7476
絕 絶 T
7D55 7D76
檓 檓 T
699D 6A27
淚 淚 T
6D99 6DDA
瓶 瓶 T
74F6 7501
綠 緑 T
7DA0 7DD1
槓 槓 J
69C7 69D9
淥 渌 T
6DE5 6E0C
產 産 T
7522 7523
緒 緒 T
7DD2 7DD6
樣 樣 TJ
69D8 6A23
淸 清 T
6DF8 6E05
瘦 瘦 J
75E9 762
緣 緣 T
7DE3 7E01
橫 橫 T
6A2A 6A6B
渴 渴 T
6E07 6E34
皡 皡 T
76A1 76A5
緼 緼 T
7DFC 7E15
步 步 T
6B65 6B69
溫 溫 T
6E29 6EAB
眞 真 TJ
771E 771F
繩 繩 T
7E48 7E66


羹 羹 TJ 7FAE 7FB9
虛 虛 T 865A 865B
遙 遥 J 9059 9065
頹 頹 T 9839 983D
翱 翱 T 7FF6 7FFA
蛻 蛻 T 86FB 8715
邢 邢 T 90A2 90C9
顏 顏 TJ 984F 9854
胼 胼 T 80FC 8141
衛 衛 TJK 885B 885E
郎 郎 T 90CE 90DE
顯 顯 J 985A 985B
脫 脫 T 812B 8131
衮 衮 TK 886E 889E
鄉 鄉 鄉 T 90F7 9109 9115
飲 飲 J 98EE 98F2
腽 腽 T 817D 8183
裝 裝 GJK 88C5 88DD
醞 醞 T 9196 919E
餅 餅 TJ 9905 9920
鳥 鳥 GT 8203 8204
訝 訝 T 8A2E 8A7D
醬 醬 J 91A4 91AC
馱 馱 TJK 99B1 99C4
舍 舍 TJ 820D 820E
說 說 T 8AAA 8AAC
鈃 鈃 T 9203 9292
駢 駢 TK 99E2 9A08
舖 舖 J 8216 8217
諫 諫 TJ 8ACC 8AEB
銳 銳 T 92B3 92ED
骯 骯 T 9AA9 9AAB
莊 莊 TJ 8358 838A
謠 謠 J 8B20 8B21
錄 録 T 9304 9332
高 高 T 9AD8 9AD9
菑 菑 TJ 83D1 8458
豜 豜 T 8C5C 8C63
鍊 鍊 TK 932C 934A
髮 髮 TJ 9AEA 9AEE
葐 葐 T 8480 8495
走 走 TJ 8D70 8D71
鎭 鎮 TJ 93AD 93AE
鬪 鬪 T 9B2C 9B2D
蔣 蔣 GJ 848B 8523
軿 軿 T 8EFF 8F27
閱 閱 T 95B1 95B2
鰛 鰛 TJ 9C1B 9C2E
蔦 蔦 T 848D 853F
輜 輜 J 8F1C 8F3A
隉 隉 G 9667 9689
鳳 鳳 T 9CEF 9CF3
薀 薀 T 8570 8580
轀 轀 T 8F3C 8F40
靑 靑 T 9751 9752
鶇 鶇 J 9D87 9DAB
薰 薰 T 85AB 85B0
达 达 T 8FBE 8FD6
靜 靜 GTJ 9759 975C
鷾 鷾 J 9DC6 9DCF
蘊 蘊 T 85F4 860A
迸 迸 TJ 8FF8 902C
靭 靭 J 976D 9771
麪 麪 T 9EAA 9EAB

	T			T			T				
9EBC 9EBD			9EC3 9EC4			9ED1 9ED2					

In accordance with the unification procedures described in S.1 of this Annex the pairs (or triplets) of ideographs shown below are not unified. The reason for non-unification is indicated by the reference which appears to the right of each pair (or triplet). For “non-cognate” see S.1.1

NOTE - The reason for non-unification in these examples is different from the source separation rule described in clause S.1.6.

	non cognate			S.1.4.3			non cognate			S.1.4.3	
5191 80C4			5BF3 5BF6			6710 80CA			7A32 7A3B		
	S.1.4.3			S.1.4.1			non cognate			S.1.4.3	
51B2 6C96			5EF0 5EF3			6713 8101			7FF1 7FF6		
	S.1.4.3			S.1.4.1			non cognate			S.1.4.3	
51B3 6C7A			61D0 61F7			6718 8127			8007 8008 8009		
	S.1.4.3			S.1.4.3			non cognate			S.1.4.1	
51B5 6CC1			6560 656A			6723 81A7			8074 807C 807D		
	S.1.4.3			non cognate			S.1.4.3			S.1.4.2	
579B 579C			670C 80A6			6735 6736			8346 834A		
	S.1.4.2			non cognate			S.1.4.3			S.1.4.3	
5B7C 5B7D			670F 80D0			7054 7067			8EB1 8EB2		

Annex T
(informative)

Language tagging using Tag Characters

The purpose of Tag characters is to associate a text attribute with a point or range of a text string. The value of a particular tag is not generally considered to be part of the content of the text. For example, tagging could be used to mark the language or the font applied to a portion of text. Outside of that usage, these characters are ignorable.

These tag characters can be used to spell out a character string in any ASCII-based tagging scheme that needs to be embedded into plain text. These characters can be easily identified by their code value and there is no overloading of usage for these tag characters. They can only express tag values and never textual content itself.

When characters are used within the context of a protocol or syntax containing explicit markup providing the same association, the Tag characters may be filtered out and ignored by these protocols.

For example, in SGML/XML context, an explicit language markup is specified. Therefore, the LANGUAGE TAG and other tag characters should not be used to mark a language in that context. The Unicode Consortium and the W3C have co-written a technical report: Unicode in XML and other Markup Languages (TR#20), available from the Unicode web site (http://www.unicode.org), which describes these issues in detail.

The TAGS block contains 97 dedicated tag characters consisting of a clone of the BASIC LATIN graphic characters (names formed by prefixing these BASIC LATIN names with the word 'TAG'), as well as a language tag identification character: LANGUAGE TAG and a cancel tag character: CANCEL TAG.

The tag identification character is used as a mechanism for identifying tags of different types. This enables multiple types of tags to coexist amicably embedded in plain text and solves the problem of delimitation if a tag is concatenated directly onto another tag. Although only one type of tag is currently specified, namely the language tag, the encoding of other tag identification characters in the future would allow for distinct types to be used.

T.1 Syntax for embedding tag characters

In order to embed any ASCII-derived tag in plain text, the tag is simply spelled out with the tag characters, prefixed with the relevant tag identification character. The resultant string is embedded directly in the text.

No termination character is required for a tag. A tag terminates either when the first non Special Purpose Plane character is encountered, or when the next tag identification character is encountered.

Tag arguments can only encoded using tag characters. No other characters are valid for expressing the tag arguments.

T.2 Tag scope and nesting

The value of a tag continues from the point the tag is embedded in text until:

- either the end of the cc-data-element is reached,
- or the tag is explicitly cancelled by the CANCEL TAG character.

Tags of the same type cannot be nested. The appearance of a new embedded language tag, for example after text which was already language-tagged, simply changes the tagged value for subsequent text to that specified in the new tag.

T.3 Canceling tag values

The CANCEL TAG character is provided to allow the specific canceling of a tag value. For example to cancel a language tag, the LANGUAGE TAG must precede the CANCEL TAG character.

The usage of the CANCEL TAG character without a prefixed tag identification character cancels any tag value that may be defined.

The main function of the character is to make possible such operations as blind concatenation of strings in a tagged context without the propagation of inappropriate tag values across the string boundaries.

T.4 Language tags

Language tags are of general interest and may have a high degree of interoperability for protocol usage. For example, to embed a language tag for Japanese, the tag characters would be used as follows:

E0001 E006A E0061

The first value is the coded value of the LANGUAGE TAG character, the second corresponds to the TAG LATIN SMALL LETTER J, and the third corresponds to the TAG LATIN SMALL LETTER A. The sequence ‘ja’ corresponds to the 2-letter code representing the Japanese language in ISO 639:1988.

Annex U
(informative)

Usage of musical symbols

The musical symbols repertoires are comprised of combining characters and other characters. As such their usage is specified by the clause 25. This annex describes in more details the usage of these combining characters.

U.1 Byzantine musical symbols

The Byzantine Musical Notation System makes use of the so-called ‘three-stripe’ effect. There are signs that appear in the Upper, Middle or Lower stripes. Other signs are known as musical characters and appear in the textual part of the notation system. Multiple signs can be stacked together in their appropriate stripe.

U.2 Western musical symbols

This international standard does not specify an encoding solution for musical scores or musical pitch. Solutions for these needs would require another description layer on top of the encoding definition of the characters specified in this standard. However, even without that additional layer, these characters can be used as simple musical reference symbols for general purposes in text descriptions of musical matters.

Extended beams are used frequently in music notation between groups of notes having short values. The format characters MUSICAL SYMBOL BEGIN BEAM and MUSICAL SYMBOL END BEAM can be used to indicate the extents of beam groupings. In some exceptional cases, beams are unclosed on one end. This can be indicated with a "null note" (MUSICAL SYMBOL NULL NOTEHEAD) character if no stem is to appear at the end of the beam.

Similarly, other format characters have been provided for other connecting structures. The characters

- MUSICAL SYMBOL BEGIN TIE
- MUSICAL SYMBOL END TIE
- MUSICAL SYMBOL BEGIN SLUR
- MUSICAL SYMBOL END SLUR
- MUSICAL SYMBOL BEGIN PHRASE
- MUSICAL SYMBOL END PHRASE

indicate the extent of these features.

These pairs of characters modify the layout and grouping of notes and phrases in full music notation. When musical examples are written or rendered in plain text without special software, the start/end control characters may be rendered as brackets or left uninterpreted. More sophisticated in-line processes may interpret them, to the extent possible, in their actual control capacity, rendering ties, slurs, beams, and phrases as appropriate.

For maximum flexibility, the character set includes both pre-composed note values as well as primitives from which complete notes are constructed. Due to their ubiquity, the pre-composed versions are provided mainly for convenience.

Coding convenience notwithstanding, notes built up from alternative noteheads, stems and flags, and articulation symbols are necessary for complete implementations and complex scores. Examples of their use include American shape-note and modern percussion notations. For example,

> MUSICAL SYMBOL SQUARE NOTEHEAD BLACK + MUSICAL SYMBOL COMBINING STEM
>
> MUSICAL SYMBOL X NOTEHEAD + MUSICAL SYMBOL COMBINING STEM

Augmentation dots and articulation symbols may be appended to either the pre-composed or built-up notes.

In addition, augmentation dots and articulation symbols may be repeated as necessary to build a complete note symbol. For example,

> MUSICAL SYMBOL EIGHTH NOTE + MUSICAL SYMBOL COMBINING AUGMENTATION DOT + MUSICAL SYMBOL COMBINING AUGMENTATION DOT + MUSICAL SYMBOL COMBINING ACCENT