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Universal Multiple Octet Coded Character Set
International Organization for Standardization
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Международная организация по стандартизации

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Title: An introduction of Korean Standard KS X 1026-1:2007,
Hangul processing guide for information interchange
Source: Kim, Kyongsok, Head of delegation
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1. Background

- Some confusion as to representing Hangul in UCS.
- Also a discrepancy between ISO/IEC 10646 and Unicode in representing Hangul.
- Clarify these points and establish guidelines so that Hangul can be processed and interchanged without confusion --> KS X 1026-1

2. Title and scope of KS X 1026-1

- Title: Information Technology - Universal Multiple Octet Coded Character Set - Hangul - Part 1 Hangul Processing Guide for Information Interchange
- Scope: ... the representation format and processing method of Hangul used for interchanging information ...

3. Two major types of Hangul blocks

- 1) Wanseong (Precomposed) Hangul Syllable block (UAC00 ~ D7A3)
 - 2) Johab Hangul Jamo block (U11xx + more letters in Amd5)
- some confusion as to how these code positions can be concatenated

4. KS X 1026-1

- 1) Modern Hangul Syllable Blocks - Only code positions of Wanseong (Precomposed) Hangul Syllable block (UAC00 ~ D7A3)
- 2) Old Hangul Syllable Blocks - Only code positions of Johab Hangul Jamo block (U11xx)
- 3) Two or more code positions of simple letters cannot be concatenated to represent a complex letter.
- 4) A Wanseong Syllable block (UAC00 ~ UD7A3) and Johab Hangul letter(s) (U11xx) cannot be concatenated to represent another Hangul Syllable block.
 - Implementation algorithms for separating, searching, sorting and normalizing Hangul text syllables.

5. A discrepancy between ISO/IEC 10646 and Unicode

- A syllable-final letter alone: "syllable-initial filler (U115F) + syllable final letter" in ISO/IEC 10646.

26.1 Hangul syllable composition method

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In rendering, a sequence of Hangul Jamo (from HANGUL JAMO block: 1100 to 11FF) is 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.

- Unicode: "syllable-initial filler (U115F) + syllable-peak filler (U1160) + syllable final letter"

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Transforming into Standard Korean Syllables. A sequence of jamos that do not all match the regular expression for a standard Korean syllable block can be transformed into a sequence of standard Korean syllable blocks by the correct insertion of choseong fillers and jungseong fillers. This transformation of a string of text into standard Korean syllables is performed by determining the syllable breaks as explained in the earlier subsection "Hangul Syllable Boundaries," then inserting one or two fillers as necessary to transform each syllable into a standard Korean syllable. Thus

$$L [\wedge V] \rightarrow L V_f [\wedge V]$$

$$[\wedge L] V \rightarrow [\wedge L] L_f V$$

$$[\wedge V] T \rightarrow [\wedge V] L_f V_f T$$

where $[\wedge X]$ indicates a character that is not X, or the absence of a character.

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Examples. In Table 3-13, the first row shows syllable breaks in a standard sequence, the second row shows syllable breaks in a nonstandard sequence, and the third row shows how the sequence in the second row could be transformed into standard form by inserting fillers into each syllable. Syllable breaks are shown by *middle dots* ".".

Table 3-13. Korean Syllable Break Examples

No.	Sequence		Sequence with Syllable Breaks Marked
1	LVTlVlVlV _f L _f V _f T	→	LVT · LV · LV · LV _f · L _f V · L _f V _f T
2	LLTtVvTtVvLLVv	→	LL · TT · VvTT · Vv · LLVv
3	LLTtVvTtVvLLVv	→	LLV _f · L _f V _f Tt · L _f VvTT · L _f Vv · LLVv

6. Conclusions

- Comments and feedbacks are welcome.
- Korea national body suggests that we have "Study Period" (JTC1 directives 12.3) to review these issues.
- JTC1 directives 12.3, stage 0, Study Period Underway -- This stage is usually optional. An SC may approve a study period when it is too early to identify precise NPs, but agreement exists that the subject area is likely to need future standardisation (See 6.2.1.3) ...

Attachment: An English translation of KS X 1026-1 -- (Note. An English version is NOT a Korean Standard.)

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KS X 1026-1

2008-04-15

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Information Technology -
Universal Multiple Octet Coded Character Set - Hangul -

Part 1

Hangul processing guide for information interchange

KS X 1026-1: 2007

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Ministry of Knowledge Economy

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This document is a translation of Korean Standard KS X 1026-1:2007. However, this English version is not a Korean Standard. If there is any discrepancy between Korean and English versions, the Korean Standard, i.e., the Korean version, is the final authority.

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KOREAN INDUSTRIAL STANDARD

KS X 1026-1 : 2007

Information Technology -
Universal Multiple-Octet Coded Character Set(UCS) -
Hangul -

Part1

Hangul processing guide for information interchange

1 Scope

This standard specifies the representation format and processing method of Hangul used for interchanging information between systems that process information and transmit data using ISO/IEC 10646 Universal Multiple Octet Coded Character Set.

2 Normative Reference

The following references contain provisions which, through reference in this text, constitute provisions of this standard. A designated version at the time of publication applies.

Since all references are subordinate to revisions, parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the references indicated below.

KS X 1001 : 2004 Code for Information Interchange (Hangeul¹ and Hanja)

KS X ISO/IEC 10646 : 2005 Information technology - Universal Multiple-Octet Coded Character Set (UCS) - Architecture and Basic Multilingual Plane, Supplementary Planes

ISO/IEC 10646 : 2003 Information technology - Universal Multiple-Octet Coded Character Set (UCS) - Architecture and Basic Multilingual Plane, Supplementary Planes

ISO/IEC 10646 : 2003 Amandement 5 Information technology - Universal Multiple-Octet Coded Character Set (UCS) - Architecture and Basic Multilingual Plane, Supplementary Planes

The Unicode Standard 5.0 – The Unicode Standard 5.0

Unicode Standard Annex 15 (UAX #15) – Unicode Normalization

Unicode Standard Annex 29 (UAX #29) – Text Boundaries

¹ Hangul is also written "Hangeul" in many recent Korean publications, according to the Revised Romanization of Korean script (released on 4 July 2000 by the South Korean Ministry of Culture and Tourism), which spelling the South Korean government uses in all English publications and encourages for all purposes. However, Hangul is used in this document as in ISO/IEC 10646:2003.

Hangeul Orthography – Gosi 88-1 of Ministry of Education (Jan. 9, 1988) [한글 맞춤법 - 문교부 고시 제88-1호 (1988년 1월 19일)]

3 Terms and Definitions

3.1 Information Interchange: The exchange of information between system.

3.2 Character: A member of a finite set of elements used for the representation of data or control. Characters are classified into graphic characters and control characters.

3.3 Hangul Jamo: Hangul consonant letters and vowel letters or Hangul syllable-initial (Choseong), syllable-peak (Jungseong) or syllable-final (Jongseong) letters which Hangul syllable blocks (see 3.4) are composed of (complex letters such as “ㄴㅇ” or “ㅏ” are also considered as one Jamo).

3.4 Hangul Syllable: A unit of Hangul composed of syllable-initial and syllable-peak letters or syllable-initial, syllable-peak and syllable-final letters.

3.5 Modern Hangul: Hangul syllable blocks and Hangul letters (Jamos) specified in Modern Hangul Orthography. The total number of Hangul syllable blocks included in UCS is 11,172.

3.6 Old Hangul: Hangul syllable blocks and Hangul letters (Jamos) that have been used since when Hangul was invented until recently (the end of 19th century or the beginning of 20th century) but which are not used in Modern Hangul Orthography.

3.7 Normalization: Operations such as search, sort and comparison become complicated, because it is possible to have more than one binary representation for a certain character. Therefore, ISO/IEC 10646:2003 contains a normative reference to a process called Normalization which returns one and the same binary representation for two different representations transmitted.

4 Classes of Hangul Character

There are a few classes of Hangul characters in UCS: Hangul letters, Hangul syllable blocks and Hangul-embedded symbols (see 4.8). In this section, we will define those classes of Hangul characters. These characters are shown in Annex A.

4.1 Johap Hangul Letters

Hangul letters specified in Hangul Jamo U+1100 ~ U+11FF, Hangul Jamo Extended-A U+A960 ~ U+A97F, and Hangul Jamo Extended-B U+D7B0 ~ U+D7FF in UCS. These letters are used for composing Old Hangul syllable blocks. These letters are not used alone (i.e., a single code position does not represent a Hangul letter).

4.2 Hangul Compatibility Letters

Hangul letters specified in Hangul Compatibility Jamo U+3130 ~ U+318F in UCS. These letters are used for representing fullwidth Hangul consonant and vowel letters individually. These letters are not used for composing Hangul syllable blocks, but used alone (i.e., a single code position represents a Hangul Jamo). They are included for compatibility with Hangul Jamos in KS X 1001.

4.3 Halfwidth Hangul Letters

Hangul letters specified in halfwidth Hangul Jamo U+FFA0 ~ U+FFDF in UCS. These letters are not used for composing Hangul syllable blocks. They are included for compatibility with 7-bit Hangul code in Annex 4, KS X 1001.

4.4 Wanseong Hangul Syllable Blocks

A Wanseong Hangul syllable block represents one of 11,172 Hangul syllable blocks as a single code position and is in Hangul Syllables U+AC00 ~ U+D7A3 in UCS.

4.5 Johab Hangul Syllable Blocks

A Johab Hangul syllable block is represented as a sequence of Johab Hangul letters. It is composed of either syllable-initial and syllable-peak letters or syllable-initial, syllable-peak and syllable-final letters. Syllable-initial filler and syllable-peak filler characters are used for representing incomplete syllable blocks such as a syllable-initial letter alone, a syllable-peak letter alone, a syllable-final letter alone, or a syllable-peak letter followed by a syllable-final letter.

4.6 Incomplete Syllable Blocks

In this standard, an incomplete syllable block means one of the following cases.

- 1) a syllable-initial letter alone,
- examples: ㄱ, ㅋ, ㆁ
- 2) a syllable-peak letter alone,
- examples: ㅏ, ㅑ, ㅓ
- 3) a syllable-final letter alone, or
- examples: ㄴ, ㄷ, ㄹ
- 4) a syllable-peak letter followed by a syllable-final letter.
- examples: ㅏㄴ, ㅑㄷ, ㅓㄹ

Note. A sequence of syllable-initial and syllable-final letters is not used.

4.7 Bangjeom

A Bangjeom is a notation in Hunminjeongeum for representing tones for Hangul syllable blocks. Two dots are put at the left of a Syllable Block to represent Sangseong (rising tone) and one dot to represent Geoseong (high tone). No dot is needed to represent Pyeongseong (low tone). In UCS, code positions for Geoseong and Sangseong tone marks are U+302E and U+302F, respectively.

4.8 Hangul-Embedded Symbols

Hangul-embedded symbols refer to parenthesized and circled Hangul letters and syllable blocks in U+3200 ~ U+32FF in UCS.

5 A representation format of Hangul

5.1 A representation format of Hangul Letters

In this standard, a Hangul letter is represented either as a consonant or a vowel letter or as a syllable-initial, a syllable-peak or a syllable-final letter.

For representing a consonant or a vowel letter alone, one of code positions of Hangul letters in Hangul Compatibility Jamo U+3131 ~ U+318E is used.

For representing a syllable-initial, a syllable-peak or a syllable-final letter alone, one of code positions of Johab Hangul letters in Hangul Jamo U+1100 ~ U+11FF, Hangul Jamo Extended-A U+A960 ~ U+A97F, and Hangul Jamo Extended-B U+D7B0 ~ U+D7FF is used. It is prohibited to use a code position in these ranges individually without a filler character but must be used together with a filler character. In addition, two or more code positions of simple letters cannot be concatenated to represent a single complex letter.

If L, V, T stand for a syllable-initial letter, a syllable-peak letter, a syllable-final letter, respectively; and if LF, VF stand for a syllable-initial filler, a syllable-peak filler, respectively, these rules can be expressed as regular expressions as shown below:

- 1) A representation of a syllable-initial letter alone: $L V_F$
 - an example: a Syllable-Initial Letter alone $\lrcorner \Rightarrow \lrcorner V_F$ (U+1100 U+1160)
- 2) A representation of a syllable-peak letter alone: $L_F V$
 - an example: a representation of a syllable-peak letter alone $\lrcorner \Rightarrow L_F \lrcorner$ (U+115F U+1161)
- 3) A representation of a syllable-final letter alone: $L_F V_F T$
 - an example: a syllable-final letter alone $\lrcorner \Rightarrow L_F V_F \lrcorner$ (U+115F U+1160 U+11A8)

Note: There is a discrepancy between ISO/IEC 10646 and Unicode regarding this rule. There is no VF in ISO/IEC 10646.

5.2 A representation format of Modern Hangul syllable blocks

For representing Modern Hangul syllable blocks, we must use code positions of 11,172 Hangul syllables U+AC00 ~ U+D7A3. An application must use Wanseong Hangul syllable blocks when exchanging data with units outside of the application. 'Exchanging data' means all possible methods of information interchange, including (but not limited to) 'clipboard' input/output, file input/output, and input/output over communication protocols.

5.3 A representation format of Old Hangul syllable blocks

For representing Old Hangul syllable blocks, we must use code positions of Johab Hangul letters in Hangul Jamo U+1100 ~ U+11FF, Hangul Jamo Extended-A U+A960 ~ U+A97F, and Hangul Jamo Extended-B U+D7B0 ~ U+D7FF, adhering to the following three rules. For representing incomplete Hangul syllable blocks such as a syllable-peak letter followed by a syllable-final letter, we must also follow these rules.

If we use L for a syllable-initial letter (including LF), V for a syllable-peak letter (including VF), T for a syllable-final letter, LF for a syllable-initial filler and VF for a syllable-peak filler, these three rules can be expressed as regular expressions as the followings:

- 1) A syllable block composed of syllable-initial and syllable-peak letters: $L V$
 - an example: \lrcorner (U+1112 U+119E)
- 2) A syllable block composed of syllable-initial, syllable-peak and syllable-final letters: $L V T$
 - an example: \lrcorner (U+1112 U+119E U+11AB)

- 3) An incomplete syllable block composed of syllable-peak and syllable-final letters: L_F V T
 - an example: ㅏ (U+115F U+1161 U+11AE)

In addition, we must adhere to the following rules when representing in Johab Hangul syllable blocks.

- 1) As same as in the rules of representation format of Hangul letters (see 5.1), two or more code positions of simple letters cannot be concatenated to represent a single complex letter.
 - an example. ㅏㅏ (U+1100 U+1100, incorrect) ⇒ ㅑ (U+1101, correct)
- 2) A Wanseong syllable block cannot be recomposed with Johab Hangul letter(s) to represent another Hangul syllable block.
 - an example. 가ㅏ (U+AC00 U+11EB, incorrect) ⇒ ㅑ (U+1101 U+1161 U+11EB, correct)
- 3) A modern syllable block must be represented in Wanseong Hangul syllable block. It is forbidden to represent a modern syllable block in Johab Hangul syllable block.
 - an example. ㅏㅑ (U+1100 U+1161, incorrect) ⇒ 가 (U+AC00, correct)

5.4 A representation format of Bangjeom

A Bangjeom (Geoseong U+302E, Sangseong U+302F) is combining mark and therefore cannot be used alone. It must be appended to a Hangul syllable block (a modern or old Hangul syllable block). In other words, a Bangjeom cannot be in the middle of a Hangul syllable block. In addition, two Bangjeoms cannot be used together; only one Bangjeom can be applied to a Hangul syllable block. If we use S for a modern Hangul syllable block, M for Bangjeom and '?' for a quantifier which indicates there can be no symbol at all or one preceding symbol, the rule for Hangul syllable blocks with a Bangjeom can be expressed as regular expressions as the followings.

- 1) A modern Hangul syllable block possibly with a Bangjeom: S M?
- 2) An old Hangul syllable block possibly with a Bangjeom: L V T? M?

Since Bangjeoms are used as combining marks in UCS, when processing Hangul syllable blocks, Bangjeoms are processed separately.

6 Normalization of Hangul

6.1 Normalization of Hangul Code

In UCS, some characters can be represented by different binary representation (using a composite sequence or not). In other words, since there can be more than one equivalent representation for representing one and the same character, searching, sorting, comparing and other operations become more complicated. Four normalization forms, NFC, NFD, NFKC and NFKD which returns a unique binary expression for any equivalent expression are defined in UAX #15. The same normalization process also applies to Hangul. For example, applications can use Wanseong Hangul syllable blocks and Johab Hangul syllable blocks inside it after transforming them using Normalization process. However, to solve the Hangul incompatibility problem which can arise from the above normalization process, it is recommended to follow Sections 6.2 to 6.4. For related processing algorithms, refer to Annex B.

6.2 Normalization of Compatibility and Halfwidth Hangul Letters

In UCS, Compatibility and Halfwidth Hangul letters are specified not to be concatenated to make up a syllable. However, if these letters are transformed to Johab Hangul letter without a filler character in Normalization Form NFKD, then these letters and a preceding or following Hangul syllable block can be transformed to a Wanseong Hangul syllable block in Normalization Form NFKC. Therefore, when transforming Compatibility and Halfwidth Hangul letters to Normalization Form NFKD or NFKC, it is recommended to put a filler character so that these letters can be processed as a correct Hangul syllable block.

Table 1. An example showing a non-recommended Normalization

Original	NFKD	NFKC
ㄱ ㅏ	ㄱ ㅏ	가
U+3131 U+314F	U+1100 U+1161	U+AC00

Table 2. An example showing a recommended Normalization

Original	NFKD	NFKC																
ㄱ ㅏ	ㄱ <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>H</td><td>J</td></tr><tr><td>F</td><td>F</td></tr></table> <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>H</td><td>C</td></tr><tr><td>F</td><td>F</td></tr></table> ㅏ	H	J	F	F	H	C	F	F	ㄱ <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>H</td><td>J</td></tr><tr><td>F</td><td>F</td></tr></table> <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>H</td><td>C</td></tr><tr><td>F</td><td>F</td></tr></table> ㅏ	H	J	F	F	H	C	F	F
H	J																	
F	F																	
H	C																	
F	F																	
H	J																	
F	F																	
H	C																	
F	F																	
U+3131 U+314F	U+1100 U+1160 U+115F U+1161	U+1100 U+1160 U+115F U+1161																

6.3 Normalization of Hangul-embedded symbols

Several symbols, so-called parenthesized Hangul Jamo and syllable blocks and circled Hangul Jamo and syllable blocks, are included in Enclosed CJK Letters and Months U+3200 ~ U+32FF.

The Hangul letters embedded in these symbols are also transformed to Johab Hangul letter without a filler character in Normalization Forms NFKD and NFKC.

When transforming these Hangul-embedded symbols to Normalization Form NFKD or NFKC, it is recommended to put a filler character so that these letters can be processed as a correct Hangul syllable block.

Table 3. An example showing a non-recommended Normalization

Original	NFD	NFC	NFKD	NFKC
㉿	㉿	㉿	ㄱ	ㄱ
U+3260	U+3260	U+3260	U+1100	U+1100

Table 4. An example showing a recommended Normalization

Original	NFD	NFC	NFKD	NFKC								
㉿	㉿	㉿	ㄱ <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>H</td><td>J</td></tr><tr><td>F</td><td>F</td></tr></table>	H	J	F	F	ㄱ <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>H</td><td>J</td></tr><tr><td>F</td><td>F</td></tr></table>	H	J	F	F
H	J											
F	F											
H	J											
F	F											
U+3260	U+3260	U+3260	U+1100 U+1160	U+1100 U+1160								

6.4 Normalization of Hangul syllable blocks

In character strings of a text using only modern Hangul, Hangul syllable blocks are processed correctly by applying existing Normalization processes. However, in character strings containing old Hangul, if syllable-initial and syllable-peak letters are modern Hangul letters and a syllable-final letter is an old Hangul letter, then, in NFC and NFKC, syllable-initial and syllable-peak letters are transformed to a Wanseong Hangul syllable block and a syllable-final letter can remain alone. Therefore, even in this case, we need to process the old Hangul syllable block in a correct form, that is, as a sequence of syllable-initial, syllable-peak and syllable-final Hangul letters.

Table 5. An example showing a non-recommended Normalization

Original	NFC	NFKC
값	가 △	가 △
U+1100 U+1161 U+11EB	U+AC00 U+11EB	U+AC00 U+11EB

Table 6. An example showing a recommended Normalization

Original	NFC	NFKC
값	값	값
U+1100 U+1161 U+11EB	U+1100 U+1161 U+11EB	U+1100 U+1161 U+11EB

7 Splitting into Hangul syllable blocks

7.1 Splitting into Hangul syllable blocks

According to the representation format of Hangul in Section 5, we define methods to correctly split a given character string into Hangul letters (7.2), modern Hangul syllable block (7.2) and old Hangul syllable block (7.3).

Note. We call the position between two consecutive Hangul syllable blocks (including not only complete and incomplete syllable blocks but also improper Hangul syllable blocks) a syllable block boundary.

7.2 Splitting rules for Modern Hangul syllable blocks

There are always syllable block boundaries right before and right after a Wanseong Hangul syllable block, a Hangul Compatibility letter and a Halfwidth Hangul letter.

Wanseong Hangul syllable blocks representing modern Hangul syllable blocks, Hangul Compatibility Letters and Halfwidth Hangul letters are processed as separate Hangul syllable blocks; they are never concatenated with preceding and/or following Hangul syllable blocks or Hangul letters and are never decomposed to be concatenated with other Hangul syllable blocks.

7.3 Splitting rules for Old Hangul syllable blocks

Hangul letters other than Wanseong Hangul syllable block, Hangul Compatibility Letter and Halfwidth Hangul letter are grouped into Hangul syllable blocks. Splitting rules for old Hangul syllable blocks are related with rules in Section 5.3. Assuming that syllable-initial filler and syllable-final filler characters used for incomplete Hangul syllable blocks are considered as syllable-initial and syllable-peak letters, respectively, Hangul syllable blocks represented using a filler character follow rules shown below. The symbol '×' indicates that there must be no syllable block boundary in the middle of a Hangul syllable block.

- 1) L × V: There is no syllable block boundary between consecutive syllable-Initial (L) and syllable-peak letters (V).
- 2) L V × T: When there is a sequence of syllable-initial, syllable-peak and syllable-final letters, there is no syllable block boundary between syllable-peak (V) and syllable-final letters (T).
- 3) V × T: There is no syllable block boundary between syllable-peak (V) and syllable-final letters (T).

Therefore, after splitting rules are applied, each Johab Hangul syllable block must be in the form of L V T?. In other words, it must be in the form of either L V or L V T and must not be split into two or more Hangul syllable blocks.

7.4 A summary of splitting rules for Hangul syllable blocks

Splitting rules for Hangul syllable blocks between Johab Hangul letters and other characters are summarized in Table 7.

Table 7. Rules of splitting into Hangul syllable blocks (grapheme break chart)

	Other	Extend	L	V	T	S
Other	÷	×	÷	÷	÷	÷
Extend	÷	×	÷	÷	÷	÷
L	÷	×	÷	×	÷	÷
V	÷	×	÷	÷	×	÷
T	÷	×	÷	÷	÷	÷
S	÷	×	÷	÷	÷	÷

- S : modern Hangul syllable blocks (U+AC00 ~ U+D7A3)
- ÷ : a syllable block boundary
- ×
- Extend : combining characters including Bangjeom
- Other : UCS characters other than S, L, V, T and Extend

Examples showing how a character string is split into syllable blocks by applying the splitting rules are given in Table 8.

Table 8 Examples of splitting a character string into syllable blocks

No	A character string		Split into syllable blocks (before applying a Filler character)
1	LVTLVLVLV _F L _F V _{L_F} V _F T	⇒	LVT·LV·LV·LV _F ·L _F V·L _F V _F T
2	LLTTVVTTV _L LLV _V	⇒	L·L·T·T·V·VT·T·V·V·L·LV·V
3	LLV _F L _F V _F T _{L_F} T _{L_F} V _V T _{L_F} V _V LLV _V	⇒	L·LV _F ·L _F V _F T·T·L _F V·VT·T·L _F V·V·L·LV·V

Note: The character '.' indicates a syllable block boundary.

7.5 Pulling out a Hangul Syllable Block starting at the Syllable Block Boundary of a given character string

Rules to pull out a Hangul syllable block starting either at the beginning of or at the syllable block boundary of the given character string are as follows. However, non-Hangul characters shall follow the splitting rules of syllable blocks of the script to which these characters belong.

Note. In the explanations below, SIL stands for syllable-initial letter, SPL for syllable-peak letter and SPL for syllable-final letter.

- 1) If the current character is an Hangul syllable block (S), then pull out S.
- 2) If the current character is an SIL (L), then check the next character.
 - A. If the next character is an SPL (V), then check the second next character.
 - i. If the second next character is an SPL (T), then pull out L V T.

- ii. If the second next character is not an SPL (T), then pull out L V.
- B. If the next character is not an SPL (V), then pull out L.
- 3) If the current character is an SPL (V), then check the next character.
 - A. If the next character is an SFL (T), then pull out V T.
 - B. If the next character is not an SFL (T), then pull out V.
- 4) If the current character is an SFL (T), then pull out T.
- 5) If the current character is any other character, then pull out the character.

7.6 A forward search of a syllable block boundary in a Hangul character string

Starting at an arbitrary character position, rules to find the next syllable block boundary in the forward direction in the given character string are as follows. If we start in the middle of a Hangul syllable block, we will find the syllable block boundary between the current and the next Hangul syllable blocks.

- 1) If the current character is an SIL (L), then check the next character.
 - A. If the next character is an SPL (V), then check the second next character.
 - i. If the second next character is an SFL (T), then there is a syllable block boundary between T and the following character.
 - ii. If the second next character is not an SFL (T), then there is a syllable block boundary between V and the following character.
- 2) If the current character is an SPL (V), then check the next character.
 - A. If the next character is an SFL (T), then there is a syllable block boundary between T and the following character.
 - B. If the next character is not an SFL (T), then there is a syllable block boundary between V and the following character.
- 3) If the current character is any other character, then there is a syllable block boundary between the current character and the following character.

7.7 A backward search of a syllable block boundary in a Hangul character string

Starting at an arbitrary character position, rules to find the previous syllable block boundary in the backward direction in the given character string are as follows. If we start in the middle of a Hangul syllable block, we will find the syllable block boundary between the current and the previous Hangul syllable blocks.

- 1) The starting character becomes the current character.
- 2) If the current character is an SFL (T), then check the previous character.
 - A. If the previous character is an SFL (V), then check the second previous character.
 - i. If the second previous character is an SIL (L), then there is a syllable block boundary between L and the preceding character.
 - ii. If the second previous character is not an SFL (T), then there is a syllable block boundary between V and the preceding character.
- 3) If the current character is an SPL (V), then check the previous character.
 - A. If the previous character is an SIL (L), then there is a syllable block boundary between L and the preceding character.
 - B. If the previous character is not an SIL (L), then there is a syllable block boundary between V and the preceding character.
- 4) If the current character is any other character, then there is a syllable block boundary between the current character and the preceding character.

7.8 Processing Hangul syllable blocks not conforming to the representation format

When splitting rules are applied to a character string not following the representation format in Section 5.3, there can be Improper Hangul syllable blocks not in L V T? format. In such cases, we transform

them using Filler characters as follows:

- 1) L ⇒ L V_F
- 2) V ⇒ L_F V
- 3) V T ⇒ L_F V T
- 4) T ⇒ L_F V_F T

When we apply the above rules to the character strings in Table 8, we get the results shown in Table 9.

Table 9. Examples processing Improper Hangul syllable blocks

No	Character strings (before applying a Filler character)		Transformed character strings (after applying a Filler character)
1	LVT·LV·LV·LV _F ·L _F V·L _F V _F T	⇒	LVT·LV·LV·LV _F ·L _F V·L _F V _F T
2	L·L·T·T·V·VT·T·V·V·L·LV·V	⇒	LV _F ·LV _F ·L _F V _F T·L _F V _F T·L _F V·L _F VT·L _F V _F T·L _F V·L _F V·LV _F ·LV·L _F V
3	L·LV _F ·L _F V _F T·T·L _F V·VT·T·L _F V·V·L·LV·V	⇒	LV _F ·LV _F ·L _F V _F T·L _F V _F T·L _F V·L _F VT·L _F V _F T·L _F V·L _F V·LV _F ·LV·L _F V

8 Sorting Hangul characters

8.1 The order and names of Hangul Letters

The order and names of modern Hangul letters for the purpose of sorting Hangul follow Hangul Orthography. The order and names of letters including old Hangul letters in glyph-based order are as follows.

- 1) The order and names of Hangul Consonant Letters

ㄱ(KIYEOK), ㄴ(NIEUN), ㄷ(TIKEUT), ㄹ(RIEUL), ㅁ(KAPYEOUNRIEUL), ㅂ(MIEUM), ㅃ(KAPYEOUNMIEUM), ㅅ(PIEUP), ㅆ(KAPYEOUNSSANGPIEUP), ㅇ(SIOS), ㆁ(CHITUEUMSIOS), ㆁ(CEONGCHIEUMSIOS), ㆁ(PANSIOS), ㆁ(IEUNG), ㆁ(YESIEUNG), ㆁ(CIEUC), ㆁ(CHITUEUMCIEUC), ㆁ(CEONGCHIEUMCIEUC), ㆁ(CHIEUCH), ㆁ(CHITUEUMCHIEUCH), ㆁ(CEONGCHIEUMCHIEUCH), ㆁ(KHIEUKH), ㆁ(THIEUTH), ㆁ(PHIEUPH), ㆁ(KAPYEOUNPHIEUPH), ㆁ(HIEUH), ㆁ(YEORINHIEUH)

- 2) The order and names of Hangul Vowel Letters

ㅏ(A), ㅑ(YA), ㅓ(EO), ㅕ(YEO), ㅗ(O), ㅛ(YO), ㅜ(U), ㅠ(YU), ㅡ(EU), ㅣ(I), ㅚ(ARAEA)

Complex letters not listed above can be ordered based on the their glyphs as with their corresponding simple letters. The code positions and names of all Hangul Letters encoded in ISO/IEC 10646: 2003 and ISO/IEC 10646: 2003 – Amendment 5 are shown in Annex A.

8.2 The order and names of changed letters

The names of four Hangul letters U+11EC ~ U+11EF are changed by way of annotations in ISO/IEC 10646:2003 - Amendment 5, as shown in Table 10.

Table 10. Hangul Letters whose names are changed.

11EC ㅇㄱ	한글 종성 이음-기역(옛이음-기역) HANGUL JONGSEONG IEUNG-KIYEOK(YESIEUNG-KIYEOK)
11ED ㅇㅈ	한글 종성 이음-쌍기역(옛이음-쌍기역) HANGUL JONGSEONG IEUNG-SSANGKIYEOK(YESIEUNG-SSANGKIYEOK)
11EE ㅇㅇ	한글 종성 쌍이음(쌍옛이음) HANGUL JONGSEONG SSANGIEUNG(SSANGYESIEUNG)
11EF ㅇㅋ	한글 종성 이음-키음(옛이음-키음) HANGUL JONGSEONG IEUNG-KHIEUKH(YESIEUNG-KHIEUK)

This was to change the incorrect names of Old Hangul letters beginning with ㅇ (IEUNG) to names beginning with ㅇ (YESIEUNG). These four letters need be implemented and processed by treating that they do not belong to ㅇ (IEUNG) but belong to ㅇ (YESIEUNG). Therefore, when we make a font, their glyphs should be ㅇ (YESIEUNG) and, in sorting, their order should be after ㅇ (IEUNG).

8.3 Sorting order of Hangul letters and Hangul syllable blocks

Basically, sorting order used in a Korean dictionary is as follows: among Hangul letters and Hangul syllable blocks, the first Hangul consonant letter (i.e., KIYEOK) come first, then Hangul syllable blocks beginning with the first Hangul consonant letter come, then the second Hangul consonant letter (i.e., NIEUN) come, then Hangul syllable blocks beginning with the second Hangul consonant letter come, ..., and then finally come vowel letters.

- 1) An example having only Hangul letters and modern Hangul syllable blocks:
 ㄱ, 가 ... 흥, 하 ... 흥 (the last modern Hangul syllable block), ㅈ, ㅉ ... ㅊ
- 2) An example having Hangul letters and all Hangul syllable blocks including old Hangul syllable blocks:
 ㄱ, 가 ... 흥, 하 ... 흥 (the last old Hangul syllable block), ㅈ, ㅉ ... ㅊ, ㅊ

8.4 Sorting order of various types of Hangul letters and Hangul syllable blocks

Various types of Hangul letters in UCS are sorted together with Hangul syllable blocks. The letters of those types are sorted according to the sorting order of each of Hangul letters, Hangul-embedded symbols and Hangul syllable blocks. However, since there is no recognized specification such as a standard or Gosi(Technical regulations) regarding the sorting order depending on the type of letters, in this standard, the following order is recommended as an example.

Note. The format used below is:

an explanation of the character: a UCS code position, a glyph,
 then in the following line, a UCS character name (annotation)

- 1) Johab Hangul Syllable-initial Letter: U+1100 ㄱ
 HANGUL CHOSEONG KIYEOK (g)

2) Johab Hangul Syllable-final Letter: HANGUL JONGSEONG KIYEOK (g)	U+11A8	ㄱ
3) Halfwidth Hangul Consonant Letter: HALFWIDTH HANGUL LETTER KIYEOK	U+FFA1	ㄱ
4) Hangul Compatibility Consonant Letter: HANGUL LETTER KIYEOK	U+3131	ㄱ
5) Parenthesized Hangul Consonant Letter: PARENTHESIZED HANGUL KIYEOK	U+3200	(ㄱ)
6) Circled Hangul Consonant Letter: CIRCLED HANGUL KIYEOK	U+3260	ㄱ
7) Hangul Syllable: HANGUL SYLLABLE GA	U+AC00	가
8) Parenthesized Hangul Syllable GA: PARENTHESIZED HANGUL KIYEOK A	U+320E	(가)
9) Circled Hangul Syllable GA: CIRCLED HANGUL KIYEOK A	U+326E	가

8.5 Hangul Sorting Algorithm

Refer to Annex C for an algorithm to sort Hangul letters, Hangul-embedded symbols, and Hangul syllable blocks.

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Annex A Tables of Hangul Letters and Names

A.1 Tables of Hangul Letters and Names

A.1.1 Tables of Johab Hangul Letters and Names

- 1) Hangul Letters in Hangul Jamo U+1100 ~ U+11FF in UCS are shown in Table A.1.
- 2) Hangul Letters in Hangul Jamo Extended-A U+A960 ~ U+A97F in UCS are shown in Table A.2.
- 3) Hangul Letters in Hangul Jamo Extended-B U+D7B0 ~ U+D7FF in UCS are shown in Table A.2.

A.1.2 Hangul Compatibility Letters and Halfwidth Hangul Letters

- 1) Hangul Letters in Hangul Compatibility Jamo U+3131 ~ U+318E in UCS are shown in Table A.3.
- 2) Hangul-embedded symbols (Parenthesized/Circled Hangul Letters and Syllable Blocks) in Enclosed CJK Letters and Months U+3200 ~ U+32FF in UCS are shown in Table A.3.
- 3) Halfwidth Hangul Letters in Halfwidth and Fullwidth Forms U+FFA0 ~ U+FFDC in UCS are shown in Table A.3.

Table A.1

1100		Hangul Jamo												11FF		
	110	111	112	113	114	115	116	117	118	119	11A	11B	11C	11D	11E	11F
0	ㄱ	ㄷ	ㅂ	ㅅ	ㅇ	ㅈ	ㅊ	ㅋ	ㆁ	ㆁ	ㆁ	ㄹ	ㅌ	ㄺ	ㅇ	ㅇ
	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190	11A0	11B0	11C0	11D0	11E0	11F0
1	ㄲ	ㄸ	ㅃ	ㅆ	ㆁ	ㅉ	ㅑ	ㆁ	ㆁ	ㆁ	ㆁ	ㄹ	ㅌ	ㄻ	ㆁ	ㆁ
	1101	1111	1121	1131	1141	1151	1161	1171	1181	1191	11A1	11B1	11C1	11D1	11E1	11F1
2	ㄴ	ㅎ	ㅅ	ㅈ	ㆁ	ㅊ	ㅋ	ㆁ	ㆁ	ㆁ	ㆁ	ㄹ	ㅎ	ㄼ	ㆁ	ㆁ
	1102	1112	1122	1132	1142	1152	1162	1172	1182	1192	11A2	11B2	11C2	11D2	11E2	11F2
3	ㄷ	ㄴ	ㅅ	ㅈ	ㆁ	ㅊ	ㅋ	ㆁ	ㆁ	ㆁ	ㆁ	ㄹ	ㅌ	ㄽ	ㆁ	ㆁ
	1103	1113	1123	1133	1143	1153	1163	1173	1183	1193	11A3	11B3	11C3	11D3	11E3	11F3
4	ㄸ	ㄴ	ㅅ	ㅈ	ㆁ	ㅊ	ㅋ	ㆁ	ㆁ	ㆁ	ㆁ	ㄹ	ㅌ	ㄾ	ㆁ	ㆁ
	1104	1114	1124	1134	1144	1154	1164	1174	1184	1194	11A4	11B4	11C4	11D4	11E4	11F4
5	ㄹ	ㄴ	ㅅ	ㅈ	ㆁ	ㅊ	ㅋ	ㆁ	ㆁ	ㆁ	ㆁ	ㄹ	ㅌ	ㄿ	ㆁ	ㆁ
	1105	1115	1125	1135	1145	1155	1165	1175	1185	1195	11A5	11B5	11C5	11D5	11E5	11F5
6	ㅁ	ㄴ	ㅅ	ㅈ	ㆁ	ㅊ	ㅋ	ㆁ	ㆁ	ㆁ	ㆁ	ㄹ	ㅌ	ㅀ	ㆁ	ㆁ
	1106	1116	1126	1136	1146	1156	1166	1176	1186	1196	11A6	11B6	11C6	11D6	11E6	11F6
7	ㅂ	ㄴ	ㅅ	ㅈ	ㆁ	ㅊ	ㅋ	ㆁ	ㆁ	ㆁ	ㆁ	ㄹ	ㅌ	ㅁ	ㆁ	ㆁ
	1107	1117	1127	1137	1147	1157	1167	1177	1187	1197	11A7	11B7	11C7	11D7	11E7	11F7
8	ㅃ	ㄴ	ㅅ	ㅈ	ㆁ	ㅊ	ㅋ	ㆁ	ㆁ	ㆁ	ㆁ	ㄹ	ㅌ	ㅂ	ㆁ	ㆁ
	1108	1118	1128	1138	1148	1158	1168	1178	1188	1198	11A8	11B8	11C8	11D8	11E8	11F8
9	ㅅ	ㄴ	ㅅ	ㅈ	ㆁ	ㅊ	ㅋ	ㆁ	ㆁ	ㆁ	ㆁ	ㄹ	ㅌ	ㅃ	ㆁ	ㆁ
	1109	1119	1129	1139	1149	1159	1169	1179	1189	1199	11A9	11B9	11C9	11D9	11E9	11F9
A	ㅆ	ㄴ	ㅅ	ㅈ	ㆁ	ㅊ	ㅋ	ㆁ	ㆁ	ㆁ	ㆁ	ㄹ	ㅌ	ㅄ	ㆁ	ㆁ
	110A	111A	112A	113A	114A	115A	116A	117A	118A	119A	11AA	11BA	11CA	11DA	11EA	11FA
B	ㅇ	ㄴ	ㅅ	ㅈ	ㆁ	ㅊ	ㅋ	ㆁ	ㆁ	ㆁ	ㆁ	ㄹ	ㅌ	ㅅ	ㆁ	ㆁ
	110B	111B	112B	113B	114B	115B	116B	117B	118B	119B	11AB	11BB	11CB	11DB	11EB	11FB
C	ㅈ	ㅊ	ㅋ	ㆁ	ㆁ	ㆁ	ㆁ	ㆁ	ㆁ	ㆁ	ㆁ	ㄹ	ㅌ	ㅆ	ㆁ	ㆁ
	110C	111C	112C	113C	114C	115C	116C	117C	118C	119C	11AC	11BC	11CC	11DC	11EC	11FC
D	ㅉ	ㅑ	ㅓ	ㅕ	ㅗ	ㅛ	ㅜ	ㅠ	ㅡ	ㅣ	ㅌ	ㅊ	ㅋ	ㅍ	ㅇ	ㅑ
	110D	111D	112D	113D	114D	115D	116D	117D	118D	119D	11AD	11BD	11CD	11DD	11ED	11FD
E	ㅊ	ㅌ	ㅍ	ㅑ	ㅓ	ㅕ	ㅗ	ㅛ	ㅜ	ㅠ	ㅡ	ㅣ	ㅌ	ㅊ	ㅋ	ㅍ
	110E	111E	112E	113E	114E	115E	116E	117E	118E	119E	11AE	11BE	11CE	11DE	11EE	11FE
F	ㅋ	ㅌ	ㅍ	ㅑ	ㅓ	ㅕ	ㅗ	ㅛ	ㅜ	ㅠ	ㅡ	ㅣ	ㅌ	ㅊ	ㅋ	ㅍ
	110F	111F	112F	113F	114F	115F	116F	117F	118F	119F	11AF	11BF	11CF	11DF	11EF	11FF

Table A.1

부호	문자	명 칭	부호	문자	명 칭
1100	ㄱ	한글 초성 기역 HANGUL CHOSEONG KIYEOK	1116	녀	한글 초성 니은-비읍 HANGUL CHOSEONG NIEUN-PIEUP
1101	ㄲ	한글 초성 쌍기역 HANGUL CHOSEONG SSANGKIYEOK	1117	ㄷ	한글 초성 디귤-기역 HANGUL CHOSEONG TIKEUT-KIYEOK
1102	ㄴ	한글 초성 니은 HANGUL CHOSEONG NIEUN	1118	ㄹ	한글 초성 리을-니은 HANGUL CHOSEONG RIEUL-NIEUN
1103	ㄷ	한글 초성 디귤 HANGUL CHOSEONG TIKEUT	1119	ㄹ	한글 초성 쌍리을 HANGUL CHOSEONG SSANGRIEUL
1104	ㄸ	한글 초성 쌍디귤 HANGUL CHOSEONG SSANGTIKEUT	111A	ㄹ	한글 초성 리을-히읇 HANGUL CHOSEONG RIEUL-HIEUH
1105	ㄹ	한글 초성 리을 HANGUL CHOSEONG RIEUL	111B	ㄹ	한글 초성 가벼운리을 HANGUL CHOSEONG KAPYEOUNRIEUL
1106	ㅁ	한글 초성 미음 HANGUL CHOSEONG MIEUM	111C	ㅁ	한글 초성 미음-비읍 HANGUL CHOSEONG MIEUM-PIEUP
1107	ㅂ	한글 초성 비읍 HANGUL CHOSEONG PIEUP	111D	ㅁ	한글 초성 가벼운미음 HANGUL CHOSEONG KAPYEOUNMIEUM
1108	ㅃ	한글 초성 쌍비읍 HANGUL CHOSEONG SSANGPIEUP	111E	ㅂ	한글 초성 비읍-기역 HANGUL CHOSEONG PIEUP-KIYEOK
1109	ㅅ	한글 초성 시옷 HANGUL CHOSEONG SIOS	111F	ㅂ	한글 초성 비읍-니은 HANGUL CHOSEONG PIEUP-NIEUN
110A	ㅆ	한글 초성 쌍시옷 HANGUL CHOSEONG SSANGSIOS	1120	ㅃ	한글 초성 비읍-디귤 HANGUL CHOSEONG PIEUP-TIKEUT
110B	ㅇ	한글 초성 이응 HANGUL CHOSEONG IEUNG	1121	ㅃ	한글 초성 비읍-시옷 HANGUL CHOSEONG PIEUP-SIOS
110C	ㅈ	한글 초성 지읒 HANGUL CHOSEONG CIEUC	1122	ㅃ	한글 중성 비읍-시옷-기역 HANGUL JONGSEONG PIEUP-SIOS-KIYEOK
110D	ㅉ	한글 초성 쌍지읒 HANGUL CHOSEONG SSANGCIEUC	1123	ㅃ	한글 중성 비읍-시옷-디귤 HANGUL JONGSEONG PIEUP-SIOS-TIKEUT
110E	ㅊ	한글 초성 치읓 HANGUL CHOSEONG CHIEUCH	1124	ㅃ	한글 중성 비읍-시옷-비읍 HANGUL JONGSEONG PIEUP-SIOS-PIEUP
110F	ㅋ	한글 초성 키읓 HANGUL CHOSEONG KHIEUKH	1125	ㅃ	한글 초성 비읍-쌍시옷 HANGUL CHOSEONG PIEUP-SSANGSIOS
1110	ㅌ	한글 초성 티읓 HANGUL CHOSEONG THIEUTH	1126	ㅃ	한글 중성 비읍-시옷-지읒 HANGUL JONGSEONG PIEUP-SIOS-CIEUC
1111	ㅍ	한글 초성 피읓 HANGUL CHOSEONG PHIEUPH	1127	ㅃ	한글 초성 비읍-지읒 HANGUL CHOSEONG PIEUP-CIEUC
1112	ㅎ	한글 초성 히읇 HANGUL CHOSEONG HIEUH	1128	ㅃ	한글 초성 비읍-치읓 HANGUL CHOSEONG PIEUP-CHIEUCH
1113	ㄴ	한글 초성 니은-기역 HANGUL CHOSEONG NIEUN-KIYEOK	1129	ㅃ	한글 초성 비읍-티읓 HANGUL CHOSEONG PIEUP-THIEUTH
1114	ㄵ	한글 초성 쌍니은 HANGUL CHOSEONG SSANGNIEUN	112A	ㅃ	한글 초성 비읍-피읓 HANGUL CHOSEONG PIEUP-PHIEUPH
1115	ㄺ	한글 초성 니은-디귤 HANGUL CHOSEONG NIEUN-TIKEUT	112B	ㄹ	한글 초성 가벼운비읍 HANGUL CHOSEONG KAPYEOUNPIEUP

Table A.1

부호	문자	명칭	부호	문자	명칭
112C	뺑	한글 초성 가벼운쌍비읍 HANGUL CHOSEONG KAPYEOUNSSANGPIEUP	1141	ㅇ7	한글 초성 이응-기역 HANGUL CHOSEONG IEUNG-KIYEOK
112D	ㅅ7	한글 초성 시옷-기역 HANGUL CHOSEONG SIOS-KIYEOK	1142	ㅇㄷ	한글 초성 이응-디귤 HANGUL CHOSEONG IEUNG-TIKEUT
112E	ㅅㄴ	한글 초성 시옷-니은 HANGUL CHOSEONG SIOS-NIEUN	1143	ㅇㅁ	한글 초성 이응-미음 HANGUL CHOSEONG IEUNG-MIEUM
112F	ㅅㄷ	한글 초성 시옷-디귤 HANGUL CHOSEONG SIOS-TIKEUT	1144	ㅇㅂ	한글 초성 이응-비읍 HANGUL CHOSEONG IEUNG-PIEUP
1130	ㅅㄹ	한글 초성 시옷-리을 HANGUL CHOSEONG SIOS-RIEUL	1145	ㅇㅅ	한글 초성 이응-시옷 HANGUL CHOSEONG IEUNG-SIOS
1131	ㅅㅁ	한글 초성 시옷-미음 HANGUL CHOSEONG SIOS-MIEUM	1146	ㅇㄹ	한글 초성 이응-반시옷 HANGUL CHOSEONG IEUNG-PANSIOS
1132	ㅅㅂ	한글 초성 시옷-비읍 HANGUL CHOSEONG SIOS-PIEUP	1147	ㅇㅇ	한글 초성 쌍이응 HANGUL CHOSEONG SSANGIEUNG
1133	ㅅㅅ	한글 초성 시옷-비읍 HANGUL CHOSEONG SIOS-PIEUP	1148	ㅇㅈ	한글 초성 이응-지읒 HANGUL CHOSEONG IEUNG-CIEUC
1134	ㅅㅆ	한글 초성 시옷-쌍시옷 HANGUL CHOSEONG SIOS-SSANGSIOS	1149	ㅇㅊ	한글 초성 이응-치읓 HANGUL CHOSEONG IEUNG-CHIEUCH
1135	ㅅㅇ	한글 초성 시옷-이응 HANGUL CHOSEONG SIOS-IEUNG	114A	ㅇㅊ	한글 초성 이응-티을 HANGUL CHOSEONG IEUNG-THIEUTH
1136	ㅅㅈ	한글 초성 시옷-지읒 HANGUL CHOSEONG SIOS-CIEUC	114B	ㅇㅊ	한글 초성 이응-피읖 HANGUL CHOSEONG IEUNG-PHIEUPH
1137	ㅅㅊ	한글 초성 시옷-치읓 HANGUL CHOSEONG SIOS-CHIEUCH	114C	ㅇ	한글 초성 옛이응 HANGUL CHOSEONG YESIEUNG
1138	ㅅㅋ	한글 초성 시옷-키읃 HANGUL CHOSEONG SIOS-KHIEUKH	114D	ㅅㅇ	한글 초성 지읒-이응 HANGUL CHOSEONG CIEUC-IEUNG
1139	ㅅㅊ	한글 초성 시옷-티을 HANGUL CHOSEONG SIOS-THIEUTH	114E	ㅅㅈ	한글 초성 치두음지읒 HANGUL CHOSEONG CHITUEMCIEUC
113A	ㅅㅊ	한글 초성 시옷-피읖 HANGUL CHOSEONG SIOS-PHIEUPH	114F	ㅅㅈ	한글 초성 치두음쌍지읒 HANGUL CHOSEONG CHITUEMSSANGCIEUC
113B	ㅅㅎ	한글 초성 시옷-히읇 HANGUL CHOSEONG SIOS-HIEUH	1150	ㅅㅈ	한글 초성 정치음지읒 HANGUL CHOSEONG CEONGCHIEUMCIEUC
113C	ㅅ	한글 초성 치두음시옷 HANGUL CHOSEONG CHITUEMSIOS	1151	ㅅㅈ	한글 초성 정치음쌍지읒 HANGUL CHOSEONG CEONGCHIEUMSSANGCIEUC
113D	ㅅㅈ	한글 초성 치두음쌍시옷 HANGUL CHOSEONG CHITUEMSSANGSIOS	1152	ㅅㅋ	한글 초성 치읓-키읃 HANGUL CHOSEONG CHIEUCH-KHIEUKH
113E	ㅅ	한글 초성 정치음시옷 HANGUL CHOSEONG CEONGCHIEUMSIOS	1153	ㅅㅎ	한글 초성 치읓-히읇 HANGUL CHOSEONG CHIEUCH-HIEUH
113F	ㅅㅈ	한글 초성 정치음쌍시옷 HANGUL CHOSEONG CEONGCHIEUMSSANGSIOS	1154	ㅅㅈ	한글 초성 치두음치읓 HANGUL CHOSEONG CHITUEMCHIEUCH
1140	△	한글 초성 반시옷 HANGUL CHOSEONG PANSIOS			

Table A.1

부호	문자	명칭	부호	문자	명칭
1155	ㅈ	한글 초성 정치음치읓 HANGUL CHOSEONG CEONGCHIEUMCHIEUCH	116A	ㅊ	한글 중성 와 HANGUL JUNGSEONG WA
1156	ㅉ	한글 초성 피읓-비읍 HANGUL CHOSEONG PHIEUPH-PIEUP	116B	ㅊ	한글 중성 왜 HANGUL JUNGSEONG WAE
1157	ㅊ	한글 초성 가벼운피읓 HANGUL CHOSEONG KAPYEOUNPHIEUPH	116C	ㅊ	한글 중성 외 HANGUL JUNGSEONG OE
1158	ㅎ	한글 초성 쌍히읓 HANGUL CHOSEONG	116D	ㅊ	한글 중성 요 HANGUL JUNGSEONG YO
1159	ㅎ	한글 초성 여린히읓 HANGUL CHOSEONG YEORINHIEUH	116E	ㅊ	한글 중성 우 HANGUL JUNGSEONG U
115A	ㄱ	한글 초성 기억-디귤 HANGUL CHOSEONG KIYEOK-TIKEUT	116F	ㅊ	한글 중성 위 HANGUL JUNGSEONG WEO
115B	ㄴ	한글 초성 니은-시읏 HANGUL CHOSEONG NIEUN-SIOS	1170	ㅊ	한글 중성 웨 HANGUL JUNGSEONG WE
115C	ㄴ	한글 초성 니은-지읏 HANGUL CHOSEONG NIEUN-CIEUC	1171	ㅊ	한글 중성 위 HANGUL JUNGSEONG WI
115D	ㄴ	한글 초성 니은-히읓 HANGUL CHOSEONG NIEUN-HIEUH	1172	ㅊ	한글 중성 유 HANGUL JUNGSEONG YU
115E	ㄷ	한글 초성 디귤-리을 HANGUL CHOSEONG TIKIUT-RIEUL	1173	ㅊ	한글 중성 으 HANGUL JUNGSEONG EU
115F	ㅊ	한글 초성 채움 HANGUL CHOSEONG FILLER	1174	ㅊ	한글 중성 의 HANGUL JUNGSEONG YI
1160	ㅊ	한글 중성 채움 HANGUL JUNGSEONG FILLER	1175	ㅊ	한글 중성 이 HANGUL JUNGSEONG I
1161	ㅊ	한글 중성 아 HANGUL JUNGSEONG A	1176	ㅊ	한글 중성 아-오 HANGUL JUNGSEONG A-O
1162	ㅊ	한글 중성 애 HANGUL JUNGSEONG AE	1177	ㅊ	한글 중성 아-우 HANGUL JUNGSEONG A-U
1163	ㅊ	한글 중성 야 HANGUL JUNGSEONG YA	1178	ㅊ	한글 중성 야-오 HANGUL JUNGSEONG YA-O
1164	ㅊ	한글 중성 얘 HANGUL JUNGSEONG YAE	1179	ㅊ	한글 중성 야-요 HANGUL JUNGSEONG YA-YO
1165	ㅊ	한글 중성 어 HANGUL JUNGSEONG EO	117A	ㅊ	한글 중성 어-오 HANGUL JUNGSEONG EO-O
1166	ㅊ	한글 중성 ऐ HANGUL JUNGSEONG E	117B	ㅊ	한글 중성 어-우 HANGUL JUNGSEONG EO-U
1167	ㅊ	한글 중성 여 HANGUL JUNGSEONG YEO	117C	ㅊ	한글 중성 어-으 HANGUL JUNGSEONG EO-EU
1168	ㅊ	한글 중성 ऐ HANGUL JUNGSEONG YE	117D	ㅊ	한글 중성 여-오 HANGUL JUNGSEONG YEO-O
1169	ㅊ	한글 중성 오 HANGUL JUNGSEONG O	117E	ㅊ	한글 중성 여-우 HANGUL JUNGSEONG YEO-U
			117F	ㅊ	한글 중성 오-어 HANGUL JUNGSEONG O-EO

Table A.1

부호	문자	명칭	부호	문자	명칭
1180	예	한글 중성 오-에 HANGUL JUNGSEONG O-E	1196	쌍으	한글 중성 쌍으 HANGUL JUNGSEONG SSANGEU
1181	예	한글 중성 오-예 HANGUL JUNGSEONG O-YE	1197	의우	한글 중성 의-우 HANGUL JUNGSEONG YI-U
1182	쌍오	한글 중성 쌍오 HANGUL JUNGSEONG SSANGO	1198	이아	한글 중성 이-아 HANGUL JUNGSEONG I-A
1183	우	한글 중성 오-우 HANGUL JUNGSEONG O-U	1199	이야	한글 중성 이-야 HANGUL JUNGSEONG I-YA
1184	야	한글 중성 요-야 HANGUL JUNGSEONG YO-YA	119A	이오	한글 중성 이-오 HANGUL JUNGSEONG I-O
1185	야	한글 중성 요-애 HANGUL JUNGSEONG YO-YAE	119B	이우	한글 중성 이-우 HANGUL JUNGSEONG I-U
1186	여	한글 중성 요-여 HANGUL JUNGSEONG YO-YEO	119C	이으	한글 중성 이-으 HANGUL JUNGSEONG I-EU
1187	요오	한글 중성 요-오 HANGUL JUNGSEONG YO-O	119D	이아래아	한글 중성 이-아래아 HANGUL JUNGSEONG I-ARAEA
1188	이	한글 중성 요-이 HANGUL JUNGSEONG YO-I	119E	아래아	한글 중성 아래아 HANGUL JUNGSEONG ARAEA
1189	우아	한글 중성 우-아 HANGUL JUNGSEONG U-A	119F	아래아-어	한글 중성 아래아-어 HANGUL JUNGSEONG ARAEA-EO
118A	우애	한글 중성 우-애 HANGUL JUNGSEONG U-AE	11A0	아래아-우	한글 중성 아래아-우 HANGUL JUNGSEONG ARAEA-U
118B	우어으	한글 중성 우-어-으 HANGUL JUNGSEONG U-EO-EU	11A1	아래아-이	한글 중성 아래아-이 HANGUL JUNGSEONG ARAEA-I
118C	유예	한글 중성 유-예 HANGUL JUNGSEONG YU-YE	11A2	쌍아래아	한글 중성 쌍아래아 HANGUL JUNGSEONG SSANGARAEA
118D	쌍우	한글 중성 쌍우 HANGUL JUNGSEONG SSANGU	11A3	아으	한글 중성 아-으 HANGUL JUNGSEONG A-EU
118E	유아	한글 중성 유-아 HANGUL JUNGSEONG YU-A	11A4	야우	한글 중성 야-우 HANGUL JUNGSEONG YA-U
118F	유어	한글 중성 유-어 HANGUL JUNGSEONG YU-EO	11A5	야	한글 중성 여-야 HANGUL JUNGSEONG YEO-YA
1190	유예	한글 중성 유-예 HANGUL JUNGSEONG YU-E	11A6	오야	한글 중성 오-야 HANGUL JUNGSEONG O-YA
1191	유여	한글 중성 유-여 HANGUL JUNGSEONG YU-YEO	11A7	오애	한글 중성 오-애 HANGUL JUNGSEONG O-YAE
1192	유예	한글 중성 유-예 HANGUL JUNGSEONG YU-YE			
1193	유우	한글 중성 유-우 HANGUL JUNGSEONG YU-U			
1194	유이	한글 중성 유-이 HANGUL JUNGSEONG YU-I			
1195	으우	한글 중성 으-우 HANGUL JUNGSEONG EU-U			

Table A.1

부호	문자	명 칭	부호	문자	명 칭
11A8	ㄱ	한글 종성 기역 HANGUL JONGSEONG KIYEOK	11BE	ㅊ	한글 종성 치읓 HANGUL JONGSEONG CHIEUCH
11A9	ㄲ	한글 종성 쌍기역 HANGUL JONGSEONG SSANGKIYEOK	11BF	ㅋ	한글 종성 키읓 HANGUL JONGSEONG KHIEUKH
11AA	ㄱㅅ	한글 종성 기역-시읏 HANGUL JONGSEONG KIYEOK-SIOS	11C0	ㅌ	한글 종성 티읓 HANGUL JONGSEONG THIEUTH
11AB	ㄴ	한글 종성 니은 HANGUL JONGSEONG NIEUN	11C1	ㅍ	한글 종성 피읓 HANGUL JONGSEONG PHIEUPH
11AC	ㄴㅅ	한글 종성 니은-지읓 HANGUL JONGSEONG NIEUN-CIEUC	11C2	ㅎ	한글 종성 히읓 HANGUL JONGSEONG HIEUH
11AD	ㄴㅎ	한글 종성 니은-히읓 HANGUL JONGSEONG NIEUN-HIEUH	11C3	ㄱㄹ	한글 종성 기역-리을 HANGUL JONGSEONG KIYEOK-RIEUL
11AE	ㄷ	한글 종성 디귤 HANGUL JONGSEONG TIKEUT	11C4	ㄱㅅ	한글 종성 기역-시읏-기역 HANGUL JONGSEONG KIYEOK-SIOS-KIYEOK
11AF	ㄹ	한글 종성 리을 HANGUL JONGSEONG RIEUL	11C5	ㄴㄱ	한글 종성 니은-기역 HANGUL JONGSEONG NIEUN-KIYEOK
11B0	ㄹㄱ	한글 종성 리을-기역 HANGUL JONGSEONG RIEUL-KIYEOK	11C6	ㄴㄷ	한글 종성 니은-디귤 HANGUL JONGSEONG NIEUN-TIKEUT
11B1	ㄹㅁ	한글 종성 리을-미음 HANGUL JONGSEONG RIEUL-MIEUM	11C7	ㄴㅅ	한글 종성 니은-시읏 HANGUL JONGSEONG NIEUN-SIOS
11B2	ㄹㅂ	한글 종성 리을-비읍 HANGUL JONGSEONG RIEUL-PIEUP	11C8	ㄴㅅ	한글 종성 니은-반시읏 HANGUL JONGSEONG NIEUN-PANSIOS
11B3	ㄹㅅ	한글 종성 리을-시읏 HANGUL JONGSEONG RIEUL-SIOS	11C9	ㄴㅌ	한글 종성 니은-티읓 HANGUL JONGSEONG NIEUN-THIEUTH
11B4	ㄹㅎ	한글 종성 리을-티읓 HANGUL JONGSEONG RIEUL-THIEUTH	11CA	ㄷ	한글 종성 디귤-기역 HANGUL JONGSEONG TIKEUT-KIYEOK
11B5	ㄹㅍ	한글 종성 리을-피읓 HANGUL JONGSEONG RIEUL-PHIEUPH	11CB	ㄷㄹ	한글 종성 디귤-리을 HANGUL JONGSEONG TIKEUT-RIEUL
11B6	ㄹㅎ	한글 종성 리을-히읓 HANGUL JONGSEONG RIEUL-HIEUH	11CC	ㄹㄱ	한글 종성 리을-기역-시읏 HANGUL JONGSEONG RIEUL-KIYEOK-SIOS
11B7	ㅁ	한글 종성 미음 HANGUL JONGSEONG MIEUM	11CD	ㄹㄴ	한글 종성 리을-니은 HANGUL JONGSEONG RIEUL-NIEUN
11B8	ㅂ	한글 종성 비읍 HANGUL JONGSEONG PIEUP	11CE	ㄹㄷ	한글 종성 리을-디귤 HANGUL JONGSEONG RIEUL-TIKEUT
11B9	ㅂㅅ	한글 종성 비읍-시읏 HANGUL JONGSEONG PIEUP-SIOS	11CF	ㄹㅎ	한글 종성 리을-디귤-히읓 HANGUL JONGSEONG RIEUL-TIKEUT-HIEUH
11BA	ㅅ	한글 종성 시읏 HANGUL JONGSEONG SIOS	11D0	ㄹㄹ	한글 종성 쌍리을 HANGUL JONGSEONG SSANGRIEUL
11BB	ㅅㅅ	한글 종성 쌍시읏 HANGUL JONGSEONG SSANGSIOS	11D1	ㄹㅁ	한글 종성 리을-미음-기역 HANGUL JONGSEONG RIEUL-MIEUM-KIYEOK
11BC	ㅇ	한글 종성 이응 HANGUL JONGSEONG IEUNG			
11BD	ㅈ	한글 종성 지읓 HANGUL JONGSEONG CIEUC			

Table A.1

부호	문자	명칭	부호	문자	명칭
11D2	래ㅅ	한글 중성 리을-미음-시옷 HANGUL JONGSEONG RIEUL-MIEUM-SIOS	11E7	시기	한글 중성 시옷-기역 HANGUL JONGSEONG SIOS-KIYEOK
11D3	래ㅅ	한글 중성 리을-비읍-시옷 HANGUL JONGSEONG RIEUL-PIEUP-SIOS	11E8	시ㄷ	한글 중성 시옷-디귤 HANGUL JONGSEONG SIOS-TIKEUT
11D4	래ㅎ	한글 중성 리을-비읍-히읇 HANGUL JONGSEONG RIEUL-PIEUP-HIEUH	11E9	시ㄹ	한글 중성 시옷-리을 HANGUL JONGSEONG SIOS-RIEUL
11D5	래ㅇ	한글 중성 리을-가벼운비읍 HANGUL JONGSEONG RIEUL-KAPYEOUNPIEUP	11EA	시ㅅ	한글 중성 시옷-비읍 HANGUL JONGSEONG SIOS-PIEUP
11D6	래ㅅ	한글 중성 리을-쌍시옷 HANGUL JONGSEONG RIEUL-SSANGSIOS	11EB	ㅅ	한글 중성 반시옷 HANGUL JONGSEONG PANSIOS
11D7	래ㅅ	한글 중성 리을-반시옷 HANGUL JONGSEONG RIEUL-PANSIOS	11EC	ㅇ기	한글 중성 이응-기역(옛이응-기역) HANGUL JONGSEONG IEUNG-KIYEOK(YESIEUNG-KIYEOK)
11D8	래기	한글 중성 리을-키읃 HANGUL JONGSEONG RIEUL-KHIEUKH	11ED	ㅇ기	한글 중성 이응-쌍기역(옛이응-쌍기역) HANGUL JONGSEONG IEUNG-SSANGKIYEOK(YESIEUNG-SSANGKIYOEK)
11D9	래ㅎ	한글 중성 리을-여린히읇 HANGUL JONGSEONG RIEUL-YEORINHIEUH	11EE	ㅇㅇ	한글 중성 쌍이응(쌍옛이응) HANGUL JONGSEONG SSANGIEUNG(SSANGYESIEUNG)
11DA	미기	한글 중성 미음-기역 HANGUL JONGSEONG MIEUM-KIYEOK	11EF	ㅇ기	한글 중성 이응-키읃(옛이응-키읃) HANGUL JONGSEONG IEUNG-KHIEUKH(YESIEUNG-KHIEUK)
11DB	미ㄹ	한글 중성 미음-리을 HANGUL JONGSEONG MIEUM-RIEUL	11F0	ㅇ	한글 중성 옛이응 HANGUL JONGSEONG YESIEUNG
11DC	미ㅅ	한글 중성 미음-비읍 HANGUL JONGSEONG MIEUM-PIEUP	11F1	ㅇㅅ	한글 중성 옛이응-시옷 HANGUL JONGSEONG YESIEUNG-SIOS
11DD	미ㅅ	한글 중성 미음-시옷 HANGUL JONGSEONG MIEUM-SIOS	11F2	ㅇㅅ	한글 중성 옛이응-반시옷 HANGUL JONGSEONG YESIEUNG-PANSIOS
11DE	미ㅅ	한글 중성 미음-쌍시옷 HANGUL JONGSEONG MIEUM-SSANGSIOS	11F3	ㅍ	한글 중성 피읃-리을 HANGUL JONGSEONG PHIEUPH-RIEUL
11DF	미ㅅ	한글 중성 미음-반시옷 HANGUL JONGSEONG MIEUM-PANSIOS	11F4	ㅍ	한글 중성 가벼운피읃 HANGUL JONGSEONG KAPYEOUNPHIEUPH
11E0	미ㅅ	한글 중성 미음-치읃 HANGUL JONGSEONG MIEUM-CHIEUCH	11F5	히	한글 중성 히읇-니은 HANGUL JONGSEONG HIEUH-NIEUN
11E1	미ㅎ	한글 중성 미음-히읇 HANGUL JONGSEONG MIEUM-HIEUH	11F6	히ㄹ	한글 중성 히읇-리을 HANGUL JONGSEONG HIEUH-RIEUL
11E2	뎡	한글 초성 가벼운미음 HANGUL CHOSEONG KAPYEOUNMIEUM	11F7	히ㅅ	한글 중성 히읇-미음 HANGUL JONGSEONG HIEUH-MIEUM
11E3	벼ㄹ	한글 중성 비읍-리을 HANGUL JONGSEONG PIEUP-RIEUL	11F8	히ㅅ	한글 중성 히읇-비읍 HANGUL JONGSEONG HIEUH-PIEUP
11E4	벼ㅍ	한글 중성 비읍-피읃 HANGUL JONGSEONG PIEUP-PHIEUPH	11F9	ㅎ	한글 중성 여린히읇 HANGUL JONGSEONG YEORINHIEUH
11E5	벼ㅎ	한글 중성 비읍-히읇 HANGUL JONGSEONG PIEUP-HIEUH	11FA	기	한글 중성 기역-니은 HANGUL JONGSEONG KIYEOK-NIEUN
11E6	벵	한글 초성 가벼운비읍 HANGUL CHOSEONG KAPYEOUNPIEUP			

Table A.1

부호	문자	명 칭	부호	문자	명 칭
11FB	가ㅂ	한글 종성 기억-비읍 HANGUL JONGSEONG KIYEOK-PIEUP			
11FC	가ㅅ	한글 종성 기억-치읓 HANGUL JONGSEONG KIYEOK-CHIEUCH			
11FD	가ㄷ	한글 종성 기억-키읓 HANGUL JONGSEONG KIYEOK-KHIEUKH			
11FE	가ㅎ	한글 종성 기억-히읓 HANGUL JONGSEONG KIYEOK-HIEUH			
11FF	ㄴ	한글 종성 쌍니은 HANGUL JONGSEONG SSANGNIEUN			

Table A.2

A960-A97C

Hangul Jamo Extended-A, B

D7B0-D7FB

	A96	A97
0	ㄱ	ㅋ
	A960	A970
1	ㄷ	ㅌ
	A961	A971
2	ㄴ	ㄸ
	A962	A972
3	ㄹ	ㄺ
	A963	A973
4	ㄺ	ㅃ
	A964	A974
5	ㄻ	ㅆ
	A965	A975
6	ㄼ	ㅇ
	A966	A976
7	ㄽ	ㅅ
	A967	A977
8	ㄾ	ㅈ
	A968	A978
9	ㄿ	ㅊ
	A969	A979
A	ㅀ	ㅅ
	A96A	A97A
B	ㅁ	ㅆ
	A96B	A97B
C	ㅂ	ㅇ
	A96C	A97C
D	ㅅ	
	A96D	
E	ㅈ	
	A96E	
F	ㅊ	
	A96F	

	D7B	D7C	D7D	D7E	D7F
0	ㄱ	ㅋ	ㄴ	ㄸ	ㄹ
	D7B0	D7C0	D7D0	D7E0	D7F0
1	ㄷ	ㅌ	ㄴ	ㅃ	ㅆ
	D7B1	D7C1	D7D1	D7E1	D7F1
2	ㄴ	ㄸ	ㄴ	ㅃ	ㅆ
	D7B2	D7C2	D7D2	D7E2	D7F2
3	ㄹ	ㄺ	ㄴ	ㅃ	ㅆ
	D7B3	D7C3	D7D3	D7E3	D7F3
4	ㄺ	ㅃ	ㄴ	ㅃ	ㅆ
	D7B4	D7C4	D7D4	D7E4	D7F4
5	ㄻ	ㅆ	ㄴ	ㅃ	ㅇ
	D7B5	D7C5	D7D5	D7E5	D7F5
6	ㄼ	ㅇ	ㄴ	ㅃ	ㅇ
	D7B6	D7C6	D7D6	D7E6	D7F6
7	ㄽ		ㄴ	ㅃ	ㅅ
	D7B7		D7D7	D7E7	D7F7
8	ㄾ		ㄴ	ㅃ	ㅆ
	D7B8		D7D8	D7E8	D7F8
9	ㄿ		ㄴ	ㅃ	ㅆ
	D7B9		D7D9	D7E9	D7F9
A	ㅀ		ㄴ	ㅃ	ㅅ
	D7BA		D7DA	D7EA	D7FA
B	ㅁ	ㄴ	ㄴ	ㅃ	ㅆ
	D7BB	D7CB	D7DB	D7EB	D7FB
C	ㅂ	ㄴ	ㅃ	ㅆ	
	D7BC	D7CC	D7DC	D7EC	
D	ㅅ	ㄴ	ㅃ	ㅆ	
	D7BD	D7CD	D7DD	D7ED	
E	ㅈ	ㅃ	ㅃ	ㅆ	
	D7BE	D7CE	D7DE	D7EE	
F	ㅊ	ㅃ	ㅃ	ㅆ	
	D7BF	D7CF	D7DF	D7EF	

Table A.2

부호	문자	명칭	부호	문자	명칭
A960	ㄸ	한글 초성 디귤-미음 HANGUL CHOSEONG TIKEUT-MIEUM	A975	ㅉ	한글 초성 쌍시옷-비음 HANGUL CHOSEONG SSANGSIOS-PIEUP
A961	ㅊ	한글 초성 디귤-비음 HANGUL CHOSEONG TIKEUT-PIEUP	A976	ㅇ	한글 초성 이응-리을 HANGUL CHOSEONG IEUNG-RIEUL
A962	ㅊ	한글 초성 디귤-시옷 HANGUL CHOSEONG TIKEUT-SIOS	A977	ㅇ	한글 초성 이응-히읇 HANGUL CHOSEONG IEUNG-HIEUH
A963	ㅊ	한글 초성 디귤-지읇 HANGUL CHOSEONG TIKEUT-CIEUC	A978	ㅉ	한글 초성 쌍지읇-히읇 HANGUL CHOSEONG SSANGCIEUC-HIEUH
A964	ㄹ	한글 초성 리을-기역 HANGUL CHOSEONG RIEUL-KIYEOK	A979	ㅊ	한글 초성 쌍티을 HANGUL CHOSEONG SSANGTHIEUTH
A965	ㄹ	한글 초성 리을-쌍기역 HANGUL CHOSEONG RIEUL-SSANGKIYEOK	A97A	ㅊ	한글 초성 피읇-히읇 HANGUL CHOSEONG PHIEUPH-HIEUH
A966	ㄹ	한글 초성 리을-디귤 HANGUL CHOSEONG RIEUL-TIKEUT	A97B	ㅊ	한글 초성 히읇-시옷 HANGUL CHOSEONG HIEUH-SIOS
A967	ㄹ	한글 초성 리을-쌍디귤 HANGUL CHOSEONG RIEUL-SSANGTIKEUT	A97C	ㅇ	한글 초성 쌍여린히읇 HANGUL CHOSEONG SSANGYEURINHIEUH
A968	ㄹ	한글 초성 리을-미음 HANGUL CHOSEONG RIEUL-MIEUM	D7B0	ㅛ	한글 중성 오-여 HANGUL JUNGSEONG O-YEO
A969	ㄹ	한글 초성 리을-비음 HANGUL CHOSEONG RIEUL-PIEUP	D7B1	ㅜ	한글 중성 오-오-이 HANGUL JUNGSEONG O-O-I
A96A	ㄹ	한글 초성 리을-쌍비음 HANGUL CHOSEONG RIEUL-SSANGPIEUP	D7B2	ㅜ	한글 중성 요-아 HANGUL JUNGSEONG YO-A
A96B	ㄹ	한글 초성 리을-가벼운비음 HANGUL CHOSEONG RIEUL-KAPYEOUNPIEUP	D7B3	ㅜ	한글 중성 요-애 HANGUL JUNGSEONG YO-AE
A96C	ㄹ	한글 초성 리을-시옷 HANGUL CHOSEONG RIEUL-SIOS	D7B4	ㅜ	한글 중성 요-어 HANGUL JUNGSEONG YO-EO
A96D	ㄹ	한글 초성 리을-지읇 HANGUL CHOSEONG RIEUL-CIEUC	D7B5	ㅜ	한글 중성 우-여 HANGUL JUNGSEONG U-YEO
A96E	ㄹ	한글 초성 리을-키읇 HANGUL CHOSEONG RIEUL-KHIEUKH	D7B6	ㅜ	한글 중성 우-이-이 HANGUL JUNGSEONG U-I-I
A96F	ㅁ	한글 초성 미음-기역 HANGUL CHOSEONG MIEUM-KIYEOK	D7B7	ㅜ	한글 중성 유-애 HANGUL JUNGSEONG YU-AE
A970	ㅁ	한글 초성 미음-디귤 HANGUL CHOSEONG MIEUM-TIKEUT	D7B8	ㅜ	한글 중성 유-오 HANGUL JUNGSEONG YU-O
A971	ㅁ	한글 초성 미음-시옷 HANGUL CHOSEONG MIEUM-SIOS	D7B9	ㅜ	한글 중성 으-아 HANGUL JUNGSEONG EU-A
A972	ㅂ	한글 초성 비읍-시옷-티을 HANGUL CHOSEONG PIEUP-SIOS-THIEUTH	D7BA	ㅜ	한글 중성 으-어 HANGUL JUNGSEONG EU-EO
A973	ㅂ	한글 초성 비읍-키읇 HANGUL CHOSEONG PIEUP-KHIEUKH	D7BB	ㅜ	한글 중성 으-애 HANGUL JUNGSEONG EU-E
A974	ㅂ	한글 초성 비읍-히읇 HANGUL CHOSEONG PIEUP-HIEUH	D7BC	ㅜ	한글 중성 으-오 HANGUL JUNGSEONG EU-O

Table A.2

부호	문자	명 칭	부호	문자	명 칭
D7BD	ㄱㅛ	한글 중성 이-야-오 HANGUL JUNGSEONG I-YA-O	D7D5	ㄹㅓ	한글 중성 리을-쌍기역 HANGUL JONGSEONG RIEUL-SSANGKIYEOK
D7BE	ㅛ	한글 중성 이-애 HANGUL JUNGSEONG I-YAE	D7D6	ㄹㅕ	한글 중성 리을-기역-히읇 HANGUL JONGSEONG RIEUL-KIYEOK-HIEUH
D7BF	ㅛ	한글 중성 이-여 HANGUL JUNGSEONG I-YEO	D7D7	ㄹㅗ	한글 중성 쌍리을-키읃 HANGUL JONGSEONG SSANGRIEUL-KHIEUKH
D7C0	ㅛ	한글 중성 이-예 HANGUL JUNGSEONG I-YE	D7D8	ㄹㅛ	한글 중성 리을-미음-히읇 HANGUL JONGSEONG RIEUL-MIEUM-HIEUH
D7C1	ㅛ	한글 중성 이-오-이 HANGUL JUNGSEONG I-O-I	D7D9	ㄹㅛ	한글 중성 리을-비읍-디귄 HANGUL JONGSEONG RIEUL-PIEUP-TIKEUT
D7C2	ㅛ	한글 중성 이-요 HANGUL JUNGSEONG I-YO	D7DA	ㄹㅛ	한글 중성 리을-비읍-피읃 HANGUL JONGSEONG RIEUL-PIEUP-PHIEUPH
D7C3	ㅛ	한글 중성 이-유 HANGUL JUNGSEONG I-YU	D7DB	ㄹㅛ	한글 중성 리을-옛이읇 HANGUL JONGSEONG RIEUL-YESIEUNG
D7C4	ㅛ	한글 중성 이-이 HANGUL JUNGSEONG I-I	D7DC	ㄹㅛ	한글 중성 리을-여린히읇-히읇 HANGUL JONGSEONG RIEUL-YEORINHIEUH-HIEUH
D7C5	ㅛ	한글 중성 아래아-아 HANGUL JUNGSEONG ARAEA-A	D7DD	ㄹㅛ	한글 중성 가벼운리을 HANGUL JONGSEONG KAPYEOUNRIEUL
D7C6	ㅛ	한글 중성 아래아-에 HANGUL JUNGSEONG ARAEA-E	D7DE	ㅓ	한글 중성 미음-니은 HANGUL JONGSEONG MIEUM-NIEUN
D7CB	ㄴ	한글 중성 니은-리을 HANGUL JONGSEONG NIEUN-RIEUL	D7DF	ㅓ	한글 중성 미음-쌍니은 HANGUL JONGSEONG MIEUM-SSANGNIEUN
D7CC	ㄴ	한글 중성 니은-치읃 HANGUL JONGSEONG NIEUN-CHIEUCH	D7E0	ㅓ	한글 중성 쌍미음 HANGUL JONGSEONG SSANGMIEUM
D7CD	ㅓ	한글 중성 쌍디귄 HANGUL JONGSEONG SSANGTIKEUT	D7E1	ㅓ	한글 중성 미음-비읍-시읃 HANGUL JONGSEONG MIEUM-PIEUP-SIOS
D7CE	ㅓ	한글 중성 쌍디귄-비읍 HANGUL JONGSEONG SSANGTIKEUT-PIEUP	D7E2	ㅓ	한글 중성 미음-지읃 HANGUL JONGSEONG MIEUM-CIEUC
D7CF	ㅓ	한글 중성 디귄-비읍 HANGUL JONGSEONG TIKEUT-PIEUP	D7E3	ㅓ	한글 중성 비읍-디귄 HANGUL JONGSEONG PIEUP-TIKEUT
D7D0	ㅓ	한글 중성 디귄-시읃 HANGUL JONGSEONG TIKEUT-SIOS	D7E4	ㅓ	한글 중성 비읍-리을-피읃 HANGUL JONGSEONG PIEUP-RIEUL-PHIEUPH
D7D1	ㅓ	한글 중성 디귄-시읃-기역 HANGUL JONGSEONG TIKEUT-SIOS-KIYEOK	D7E5	ㅓ	한글 중성 비읍-미음 HANGUL JONGSEONG PIEUP-MIEUM
D7D2	ㅓ	한글 중성 디귄-지읃 HANGUL JONGSEONG TIKEUT-CIEUC	D7E6	ㅓ	한글 중성 쌍비읍 HANGUL JONGSEONG SSANGPIEUP
D7D3	ㅓ	한글 중성 디귄-치읃 HANGUL JONGSEONG TIKEUT-CHIEUCH			
D7D4	ㅓ	한글 중성 디귄-티읃 HANGUL JONGSEONG TIKEUT-THIEUTH			

Table A.2

부호	문자	명칭	부호	문자	명칭
D7E7	ㅂㅞ	한글 종성 비읍-시옷-디귤 HANGUL JONGSEONG PIEUP-SIOS-TIKEUT			
D7E8	ㅂㅚ	한글 종성 비읍-지읒 HANGUL JONGSEONG PIEUP-CIEUC			
D7E9	ㅂㅜ	한글 종성 비읍-치읓 HANGUL JONGSEONG PIEUP-CHIEUCH			
D7EA	ㅅㅘ	한글 종성 시옷-미읍 HANGUL JONGSEONG SIOS-MIEUM			
D7EB	ㅅㅙ	한글 종성 시옷-가벼운비읍 HANGUL JONGSEONG SIOS-KAPYEOUNPIEUP			
D7EC	ㅅㅢ	한글 종성 쌍시옷-기역 HANGUL JONGSEONG SSANGSIOS-KIYEOK			
D7ED	ㅅㅞ	한글 종성 쌍시옷-디귤 HANGUL JONGSEONG SSANGSIOS-TIKEUT			
D7EE	ㅅㅚ	한글 종성 시옷-반시옷 HANGUL JONGSEONG SIOS-PANSIOS			
D7EF	ㅅㅜ	한글 종성 시옷-지읒 HANGUL JONGSEONG SIOS-CIEUC			
D7F0	ㅅㅜ	한글 종성 시옷-치읓 HANGUL JONGSEONG SIOS-CHIEUCH			
D7F1	ㅅㅜ	한글 종성 시옷-티읕 HANGUL JONGSEONG SIOS-THIEUTH			
D7F2	ㅅㅎ	한글 종성 시옷-히읇 HANGUL JONGSEONG SIOS-HIEUH			
D7F3	ㅅㅢ	한글 종성 반시옷-비읍 HANGUL JONGSEONG PANSIOS-PIEUP			
D7F4	ㅅㅙ	한글 종성 반시옷-가벼운비읍 HANGUL JONGSEONG PANSIOS-KAPYEOUNPIEUP			
D7F5	ㅇㅘ	한글 종성 옛이응-미읍 HANGUL JONGSEONG YESIEUNG-MIEUM			
D7F6	ㅇㅙ	한글 종성 옛이응-히읇 HANGUL JONGSEONG YESIEUNG-HIEUH			
D7F7	ㅈㅞ	한글 종성 지읒-비읍 HANGUL JONGSEONG CIEUC-PIEUP			
D7F8	ㅈㅚ	한글 종성 지읒-쌍비읍 HANGUL JONGSEONG CIEUC-SSANGPIEUP			
D7F9	ㅈㅜ	한글 종성 쌍지읒 HANGUL JONGSEONG SSANGCIEUC			
D7FA	ㅉㅘ	한글 종성 피읖-시옷 HANGUL JONGSEONG PHIEUPH-SIOS			
D7FB	ㅉㅚ	한글 종성 피읖-티읕 HANGUL JONGSEONG PHIEUPH-THIEUTH			

Table A.3

3130 Hangul Compatibility Jamo, Enclosed CJK Letters and Months, FFDF Halfwidth and Fullwidth Forms

	313	314	315	316	317	318	320	321	326	327	FFA	FFB	FFC	FFD		
0		ㄹᄇ	ㅍ	ㅍ	ㅍ	ᄇᄇ		(ㄱ)	(다)	ㄱ	다		HW HF	ᄇᄇ		
		3140	3150	3160	3170	3180		3200	3210	3260	3270		FFA0	FFB0		
1	ㄱ	ㄴ	ㄷ	ㄷ	ㅁ	ㅇ		(ㄴ)	(라)	ㄴ	라		ㄱ	ㄴ		
	3131	3141	3151	3161	3171	3181		3201	3211	3261	3271		FFA1	FFB1		
2	ㄱ	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ		(ㄷ)	(마)	ㄷ	마		ㄱ	ㅅ	ㅅ	ㅅ
	3132	3142	3152	3162	3172	3182		3202	3212	3262	3272		FFA2	FFB2	FFC2	FFD2
3	ㄱ	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ		(ㄷ)	(바)	ㄷ	바		ㄱ	ㅅ	ㅅ	ㅅ
	3133	3143	3153	3163	3173	3183		3203	3213	3263	3273		FFA3	FFB3	FFC3	FFD3
4	ㄴ	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ		(ㅁ)	(사)	ㅁ	사		ㄴ	ㅅ	ㅅ	ㅅ
	3134	3144	3154	HF	3174	3184		3204	3214	3264	3274		FFA4	FFB4	FFC4	FFD4
5	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ		(ㅁ)	(아)	ㅁ	아		ㅅ	ㅅ	ㅅ	ㅅ
	3135	3145	3155	3165	3175	3185		3205	3215	3265	3275		FFA5	FFB5	FFC5	FFD5
6	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ		(ㅅ)	(자)	ㅅ	자		ㅅ	ㅅ	ㅅ	ㅅ
	3136	3146	3156	3166	3176	3186		3206	3216	3266	3276		FFA6	FFB6	FFC6	FFD6
7	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ		(ㅇ)	(차)	ㅇ	차		ㅅ	ㅅ	ㅅ	ㅅ
	3137	3147	3157	3167	3177	3187		3207	3217	3267	3277		FFA7	FFB7	FFC7	FFD7
8	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ		(ㅅ)	(카)	ㅅ	카		ㅅ	ㅅ		
	3138	3148	3158	3168	3178	3188		3208	3218	3268	3278		FFA8	FFB8		
9	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ		(ㅅ)	(타)	ㅅ	타		ㅅ	ㅅ		
	3139	3149	3159	3169	3179	3189		3209	3219	3269	3279		FFA9	FFB9		
A	ㄹ	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ		(ㄱ)	(파)	ㄱ	파		ㄹ	ㅅ	ㅅ	ㅅ
	313A	314A	315A	316A	317A	318A		320A	321A	326A	327A		FFAA	FFBA	FFCA	FFDA
B	ㄹ	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ		(ㅅ)	(하)	ㅅ	하		ㄹ	ㅅ	ㅅ	ㅅ
	313B	314B	315B	316B	317B	318B		320B	321B	326B	327B		FFAB	FFBB	FFCB	FFDB
C	ㄹ	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ		(ㅅ)	(주)	ㅅ	참고		ㄹ	ㅅ	ㅅ	ㅅ
	313C	314C	315C	316C	317C	318C		320C	321C	326C	327C		FFAC	FFBC	FFCC	FFDC
D	ㄹ	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ		(ㅎ)	(오전)	ㅎ	주의		ㄹ	ㅅ	ㅅ	ㅅ
	313D	314D	315D	316D	317D	318D		320D	321D	326D	327D		FFAD	FFBD	FFCD	
E	ㄹ	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ		(가)	(오후)	가	우		ㄹ	ㅎ	ㅅ	ㅅ
	313E	314E	315E	316E	317E	318E		320E	321E	326E	327E		FFAE	FFBE	FFCE	
F	ㄹ	ㅅ	ㅅ	ㅅ	ㅅ	ㅅ		(나)		나	₩		ㄹ		ㅅ	ㅅ
	313F	314F	315F	316F	317F		320F		326F	327F		FFAF		FFCF		

Table A.3

부호	문자	명 칭	부호	문자	명 칭
3131	ㄱ	한글 글자 기역 HANGUL LETTER KIYEOK	3147	ㅇ	한글 글자 이응 HANGUL LETTER IEUNG
3132	ㄲ	한글 글자 쌍기역 HANGUL LETTER SSANGKIYEOK	3148	ㅈ	한글 글자 지읒 HANGUL LETTER CIEUC
3133	ㄳ	한글 글자 기역-시옷 HANGUL LETTER KIYEOK-SIOS	3149	ㅉ	한글 글자 쌍지읒 HANGUL LETTER SSANGCIEUC
3134	ㄴ	한글 글자 니은 HANGUL LETTER NIEUN	314A	ㅊ	한글 글자 치읓 HANGUL LETTER CHIEUCH
3135	ㄵ	한글 글자 니은-지읒 HANGUL LETTER NIEUN-CIEUC	314B	ㅋ	한글 글자 키읃 HANGUL LETTER KHIEUKH
3136	ㄺ	한글 글자 니은-히읃 HANGUL LETTER NIEUN-HIEUH	314C	ㅌ	한글 글자 티읓 HANGUL LETTER THIEUTH
3137	ㄻ	한글 글자 디귿 HANGUL LETTER TIKEUT	314D	ㅍ	한글 글자 피읃 HANGUL LETTER PHIEUPH
3138	ㄼ	한글 글자 쌍디귿 HANGUL LETTER SSANGTIKEUT	314E	ㅎ	한글 글자 히읃 HANGUL LETTER HIEUH
3139	ㄽ	한글 글자 리을 HANGUL LETTER RIEUL	314F	ㅏ	한글 글자 아 HANGUL LETTER A
313A	ㄾ	한글 글자 리을-기역 HANGUL LETTER RIEUL-KIYEOK	3150	ㅑ	한글 글자 애 HANGUL LETTER AE
313B	ㄿ	한글 글자 리을-미음 HANGUL LETTER RIEUL-MIEUM	3151	ㅓ	한글 글자 야 HANGUL LETTER YA
313C	ㅀ	한글 글자 리을-비읍 HANGUL LETTER RIEUL-PIEUP	3152	ㅕ	한글 글자 얘 HANGUL LETTER YAE
313D	ㅁ	한글 글자 리을-시옷 HANGUL LETTER RIEUL-SIOS	3153	ㅗ	한글 글자 어 HANGUL LETTER EO
313E	ㅂ	한글 글자 리을-티읓 HANGUL LETTER RIEUL-THIEUTH	3154	ㅛ	한글 글자 예 HANGUL LETTER E
313F	ㅃ	한글 글자 리을-피읃 HANGUL LETTER RIEUL-PHIEUPH	3155	ㅜ	한글 글자 여 HANGUL LETTER YEO
3140	ㅄ	한글 글자 리을-히읃 HANGUL LETTER RIEUL-HIEUH	3156	ㅠ	한글 글자 예 HANGUL LETTER YE
3141	ㅅ	한글 글자 미음 HANGUL LETTER MIEUM	3157	ㅡ	한글 글자 오 HANGUL LETTER O
3142	ㅆ	한글 글자 비읍 HANGUL LETTER PIEUP	3158	ㅜ	한글 글자 와 HANGUL LETTER WA
3143	ㅈ	한글 글자 쌍비읍 HANGUL LETTER SSANGPIEUP	3159	ㅝ	한글 글자 왜 HANGUL LETTER WAE
3144	ㅊ	한글 글자 비읍-시옷 HANGUL LETTER PIEUP-SIOS	315A	ㅞ	한글 글자 외 HANGUL LETTER OE
3145	ㅋ	한글 글자 시옷 HANGUL LETTER SIOS	315B	ㅟ	한글 글자 요 HANGUL LETTER YO
3146	ㅌ	한글 글자 쌍시옷 HANGUL LETTER SSANGSIOS	315C	ㅠ	한글 글자 우 HANGUL LETTER U

Table A.3

부호	문자	명칭	부호	문자	명칭
315D	겨	한글 글자 위 HANGUL LETTER WEO	3173	비	한글 글자 비읍-디귄 HANGUL LETTER PIEUP-TIKEUT
315E	계	한글 글자 웨 HANGUL LETTER WE	3174	비시	한글 글자 비읍-시옷-기역 HANGUL LETTER PIEUP-SIOS-KIYEOK
315F	기	한글 글자 위 HANGUL LETTER WI	3175	비씨	한글 글자 비읍-시옷-디귄 HANGUL LETTER PIEUP-SIOS-TIKEUT
3160	ㅠ	한글 글자 유 HANGUL LETTER YU	3176	비즈	한글 글자 비읍-지읒 HANGUL LETTER PIEUP-CIEUC
3161	ㅡ	한글 글자 으 HANGUL LETTER EU	3177	비테	한글 글자 비읍-티을 HANGUL LETTER PIEUP-THIEUTH
3162	기	한글 글자 의 HANGUL LETTER YI	3178	빙	한글 글자 가벼운비읍 HANGUL LETTER KAPYEOUNPIEUP
3163	ㅣ	한글 글자 이 HANGUL LETTER I	3179	빙	한글 글자 가벼운쌍비읍 HANGUL LETTER KAPYEOUNSSANGPIEUP
3164	HF	한글 채움 HANGUL FILLER	317A	시	한글 글자 시옷-기역 HANGUL LETTER SIOS-KIYEOK
3165	ㄴ	한글 글자 쌍니은 HANGUL LETTER SSANGNIEUN	317B	시	한글 글자 시옷-니은 HANGUL LETTER SIOS-NIEUN
3166	ㄴ	한글 글자 니은-디귄 HANGUL LETTER NIEUN-TIKEUT	317C	시	한글 글자 시옷-디귄 HANGUL LETTER SIOS-TIKEUT
3167	시	한글 글자 니은-시옷 HANGUL LETTER NIEUN-SIOS	317D	시	한글 글자 시옷-비읍 HANGUL LETTER SIOS-PIEUP
3168	시	한글 글자 니은-반시옷 HANGUL LETTER NIEUN-PANSIOS	317E	시	한글 글자 시옷-지읒 HANGUL LETTER SIOS-CIEUC
3169	리	한글 글자 리을-기역-시옷 HANGUL LETTER RIEUL-KIYEOK-SIOS	317F	△	한글 글자 반시옷 HANGUL LETTER PANSIOS
316A	리	한글 글자 리을-디귄 HANGUL LETTER RIEUL-TIKEUT	3180	○○	한글 글자 쌍이응 HANGUL LETTER SSANGIEUNG
316B	리	한글 글자 리을-비읍-시옷 HANGUL LETTER RIEUL-PIEUP-SIOS	3181	○	한글 글자 옛이응 HANGUL LETTER YESIEUNG
316C	리	한글 글자 리을-반시옷 HANGUL LETTER RIEUL-PANSIOS	3182	이	한글 글자 옛이응-시옷 HANGUL LETTER YESIEUNG-SIOS
316D	리	한글 글자 리을-여린히을 HANGUL LETTER RIEUL-YEORINHIEUH	3183	이	한글 글자 옛이응-반시옷 HANGUL LETTER YESIEUNG-PANSIOS
316E	미	한글 글자 미음-비읍 HANGUL LETTER MIEUM-PIEUP	3184	풍	한글 글자 가벼운피읖 HANGUL LETTER KAPYEOUNPHIEUPH
316F	미	한글 글자 미음-시옷 HANGUL LETTER MIEUM-SIOS	3185	ㅎ	한글 글자 쌍히을 HANGUL LETTER
3170	미	한글 글자 미음-반시옷 HANGUL LETTER MIEUM-PANSIOS	3186	ㅎ	한글 글자 여린히을 HANGUL LETTER YEORINHIEUH
3171	몽	한글 글자 가벼운미음 HANGUL LETTER KAPYEOUNMIEUM	3187	파	한글 글자 요-야 HANGUL LETTER YO-YA
3172	비	한글 글자 비읍-기역 HANGUL LETTER PIEUP-KIYEOK	3188	패	한글 글자 요-애 HANGUL LETTER YO-YAE

Table A.3

부호	문자	명칭	부호	문자	명칭
3189	피	한글 글자 요-이 HANGUL LETTER YO-I	320F	(나)	괄호 안 한글 글자마디 나 PARENTHEZIZED HANGUL NIEUN-A
318A	겨	한글 글자 유-여 HANGUL LETTER YU-YEO	3210	(다)	괄호 안 한글 글자마디 다 PARENTHEZIZED HANGUL TIKIUT-A
318B	께	한글 글자 유-예 HANGUL LETTER YU-YE	3211	(라)	괄호 안 한글 글자마디 라 PARENTHEZIZED HANGUL RIEUL-A
318C	끼	한글 글자 유-이 HANGUL LETTER YU-I	3212	(마)	괄호 안 한글 글자마디 마 PARENTHEZIZED HANGUL MIEUM-A
318D	,	한글 글자 아래아 HANGUL LETTER ARAEA	3213	(바)	괄호 안 한글 글자마디 바 PARENTHEZIZED HANGUL PIEUP-A
318E	,]	한글 글자 아래아-이 HANGUL LETTER ARAEA-I	3214	(사)	괄호 안 한글 글자마디 사 PARENTHEZIZED HANGUL SIOS-A
3200	(ㄱ)	괄호 안 한글 낱자 기역 PARENTHEZIZED HANGUL KIYEOK	3215	(아)	괄호 안 한글 글자마디 아 PARENTHEZIZED HANGUL IEUNG-A
3201	(ㄴ)	괄호 안 한글 낱자 니은 PARENTHEZIZED HANGUL NIEUN	3216	(자)	괄호 안 한글 글자마디 자 PARENTHEZIZED HANGUL CIEUC-A
3202	(ㄷ)	괄호 안 한글 낱자 디귿 PARENTHEZIZED HANGUL TIKIUT	3217	(차)	괄호 안 한글 글자마디 차 PARENTHEZIZED HANGUL CHIEUCH-A
3203	(ㄹ)	괄호 안 한글 낱자 리을 PARENTHEZIZED HANGUL RIEUL	3218	(카)	괄호 안 한글 글자마디 카 PARENTHEZIZED HANGUL KHIEUKH-A
3204	(ㅁ)	괄호 안 한글 낱자 미음 PARENTHEZIZED HANGUL MIEUM	3219	(타)	괄호 안 한글 글자마디 타 PARENTHEZIZED HANGUL THIEUTH-A
3205	(ㅂ)	괄호 안 한글 낱자 비읍 PARENTHEZIZED HANGUL PIEUP	321A	(파)	괄호 안 한글 글자마디 파 PARENTHEZIZED HANGUL PHIEUPH-A
3206	(ㅅ)	괄호 안 한글 낱자 시옷 PARENTHEZIZED HANGUL SIOS	321B	(하)	괄호 안 한글 글자마디 하 PARENTHEZIZED HANGUL HIEUH-A
3207	(ㅇ)	괄호 안 한글 낱자 이응 PARENTHEZIZED HANGUL IEUNG	321C	(주)	"주식회사" 줄임표 PARENTHEZIZED HANGUL CIEUC-U
3208	(ㅈ)	괄호 안 한글 낱자 지읒 PARENTHEZIZED HANGUL CIEUC	321D	(오전)	"오전" 줄임표 PARENTHEZIZED KOREAN CHARACTER OJEON
3209	(ㅊ)	괄호 안 한글 낱자 치읓 PARENTHEZIZED HANGUL CHIEUCH	321E	(오후)	"오후" 줄임표 PARENTHEZIZED KOREAN CHARACTER OHU
320A	(ㅋ)	괄호 안 한글 낱자 키읓 PARENTHEZIZED HANGUL KHIEUKH			
320B	(ㅌ)	괄호 안 한글 낱자 티읓 PARENTHEZIZED HANGUL THIEUTH			
320C	(ㅍ)	괄호 안 한글 낱자 피읓 PARENTHEZIZED HANGUL PHIEUPH			
320D	(ㅎ)	괄호 안 한글 낱자 히읓 PARENTHEZIZED HANGUL HIEUH			
320E	(가)	괄호 안 한글 글자마디 가 PARENTHEZIZED HANGUL KIYEOK-A			

Table A.3

부호	문자	명 칭	부호	문자	명 칭
3260	㉠	동그라미 안 한글 낱자 기역 CIRCLED HANGUL KIYEOK	3276	㉡	동그라미 안 한글 글자마디 자 CIRCLED HANGUL CIEUC-A
3261	㉢	동그라미 안 한글 낱자 니은 CIRCLED HANGUL NIEUN	3277	㉣	동그라미 안 한글 글자마디 차 CIRCLED HANGUL CHIEUCH-A
3262	㉤	동그라미 안 한글 낱자 디귤 CIRCLED HANGUL TIKIUT	3278	㉥	동그라미 안 한글 글자마디 카 CIRCLED HANGUL KHIEUKH-A
3263	㉦	동그라미 안 한글 낱자 리을 CIRCLED HANGUL RIEUL	3279	㉦	동그라미 안 한글 글자마디 타 CIRCLED HANGUL THIEUTH-A
3264	㉧	동그라미 안 한글 낱자 미음 CIRCLED HANGUL MIEUM	327A	㉧	동그라미 안 한글 글자마디 파 CIRCLED HANGUL PHIEUPH-A
3265	㉨	동그라미 안 한글 낱자 비읍 CIRCLED HANGUL PIEUP	327B	㉨	동그라미 안 한글 글자마디 하 CIRCLED HANGUL HIEUH-A
3266	㉩	동그라미 안 한글 낱자 시옷 CIRCLED HANGUL SIOS	327C	참고	"참고" 줄임표 CIRCLED KOREAN CHARACTER CHAMKO
3267	㉪	동그라미 안 한글 낱자 이응 CIRCLED HANGUL IEUNG	327D	주의	"주의" 줄임표 CIRCLED KOREAN CHARACTER JUEUI
3268	㉫	동그라미 안 한글 낱자 지읒 CIRCLED HANGUL CIEUC	327E	우	"우편번호" 줄임표 CIRCLED HANGUL IEUNG-U
3269	㉬	동그라미 안 한글 낱자 치읓 CIRCLED HANGUL CHIEUCH	327F	₩	케이에스표 KOREAN STANDARD SYMBOL
326A	㉭	동그라미 안 한글 낱자 키읓 CIRCLED HANGUL KHIEUKH			
326B	㉮	동그라미 안 한글 낱자 티읓 CIRCLED HANGUL THIEUTH			
326C	㉯	동그라미 안 한글 낱자 피읓 CIRCLED HANGUL PHIEUPH			
326D	㉺	동그라미 안 한글 낱자 히읓 CIRCLED HANGUL HIEUH			
326E	㉻	동그라미 안 한글 글자마디 가 CIRCLED HANGUL KIYEOK-A			
326F	㉼	동그라미 안 한글 글자마디 나 CIRCLED HANGUL NIEUN-A			
3270	㉽	동그라미 안 한글 글자마디 다 CIRCLED HANGUL TIKIUT-A			
3271	㉾	동그라미 안 한글 글자마디 라 CIRCLED HANGUL RIEUL-A			
3272	㉿	동그라미 안 한글 글자마디 마 CIRCLED HANGUL MIEUM-A			
3273	ㅁ	동그라미 안 한글 글자마디 바 CIRCLED HANGUL PIEUP-A			
3274	ㅂ	동그라미 안 한글 글자마디 사 CIRCLED HANGUL SIOS-A			
3275	ㅅ	동그라미 안 한글 글자마디 아 CIRCLED HANGUL IEUNG-A			

Table A.3

부호	문자	명 칭	부호	문자	명 칭
FFA0		반각 한글 채움 HALFWIDTH HANGUL FILLER	FFB5	ㅅ	반각 한글 글자 시읏 HALFWIDTH HANGUL LETTER SIOS
FFA1	ㄱ	반각 한글 글자 기역 HALFWIDTH HANGUL LETTER KIYEOK	FFB6	ㅆ	반각 한글 글자 쌍시읏 HALFWIDTH HANGUL LETTER SSANGSIOS
FFA2	ㅍ	반각 한글 글자 쌍기역 HALFWIDTH HANGUL LETTER SSANGKIYEOK	FFB7	ㅇ	반각 한글 글자 이응 HALFWIDTH HANGUL LETTER IEUNG
FFA3	ㄲ	반각 한글 글자 기역-시읏 HANGUL LETTER KIYEOK-SIOS	FFB8	ㅈ	반각 한글 글자 지읏 HALFWIDTH HANGUL LETTER CIEUC
FFA4	ㄴ	반각 한글 글자 니은 HALFWIDTH HANGUL LETTER NIEUN	FFB9	ㅊ	반각 한글 글자 쌍지읏 HALFWIDTH HANGUL LETTER SSANGCIEUC
FFA5	ㅇ	반각 한글 글자 니은-지읏 HANGUL LETTER NIEUN-CIEUC	FFBA	ㅊ	반각 한글 글자 치읏 HALFWIDTH HANGUL LETTER CHIEUCH
FFA6	ㅎ	반각 한글 글자 니은-히읏 HANGUL LETTER NIEUN-HIEUH	FFBB	ㅋ	반각 한글 글자 키읏 HALFWIDTH HANGUL LETTER KHIEUKH
FFA7	ㄷ	한글 글자 디귤 HANGUL LETTER TIKIUT	FFBC	ㅌ	반각 한글 글자 티읏 HALFWIDTH HANGUL LETTER THIEUTH
FFA8	ㅌ	한글 글자 쌍디귤 HANGUL LETTER SSANGTIKIEUT	FFBD	ㅍ	반각 한글 글자 피읏 HALFWIDTH HANGUL LETTER PHIEUPH
FFA9	ㄹ	반각 한글 글자 리읏 HALFWIDTH HANGUL LETTER RIEUL	FFBE	ㅎ	반각 한글 글자 히읏 HALFWIDTH HANGUL LETTER HIEUH
FFAA	ㄺ	반각 한글 글자 리읏-기역 HANGUL LETTER RIEUL-KIYEOK	FFBF		<예약됨> <reserved>
FFAB	ㄻ	반각 한글 글자 리읏-미음 HANGUL LETTER RIEUL-MIEUM	FFC0		<예약됨> <reserved>
FFAC	ㅍ	반각 한글 글자 리읏-비읍 HANGUL LETTER RIEUL-PIEUP	FFC1		<예약됨> <reserved>
FFAD	ㄺ	반각 한글 글자 리읏-시읏 HANGUL LETTER RIEUL-SIOS	FFC2	ㅏ	반각 한글 글자 아 HALFWIDTH HANGUL LETTER A
FFAE	ㅌ	반각 한글 글자 리읏-티읏 HANGUL LETTER RIEUL-THIEUTH	FFC3	ㅑ	반각 한글 글자 애 HALFWIDTH HANGUL LETTER AE
FFAF	ㅍ	반각 한글 글자 리읏-피읏 HANGUL LETTER RIEUL-PHIEUPH	FFC4	ㅓ	반각 한글 글자 야 HALFWIDTH HANGUL LETTER YA
FFB0	ㅎ	반각 한글 글자 리읏-히읏 HANGUL LETTER RIEUL-HIEUH	FFC5	ㅕ	반각 한글 글자 얘 HALFWIDTH HANGUL LETTER YAE
FFB1	ㅁ	반각 한글 글자 미음 HALFWIDTH HANGUL LETTER MIEUM	FFC6	ㅗ	반각 한글 글자 어 HALFWIDTH HANGUL LETTER EO
FFB2	ㅂ	반각 한글 글자 비읍 HALFWIDTH HANGUL LETTER PIEUP	FFC7	ㅛ	반각 한글 글자 예 HALFWIDTH HANGUL LETTER E
FFB3	ㅃ	반각 한글 글자 쌍비읍 HALFWIDTH HANGUL LETTER SSANGPIEUP	FFC8		<예약됨> <reserved>
FFB4	ㅃ	반각 한글 글자 비읍-시읏 HANGUL LETTER PIEUP-SIOS	FFC9		<예약됨> <reserved>

Table A.3

부호	문자	명 칭	부호	문자	명 칭
FFCA	ㄹ	반각 한글 글자 여 HALFWIDTH HANGUL LETTER YEO			
FFCB	ㅍ	반각 한글 글자 예 HALFWIDTH HANGUL LETTER YE			
FFCC	ㅊ	반각 한글 글자 오 HALFWIDTH HANGUL LETTER O			
FFCD	ㅋ	반각 한글 글자 와 HALFWIDTH HANGUL LETTER WA			
FFCE	ㅌ	반각 한글 글자 왜 HALFWIDTH HANGUL LETTER WAE			
FFCF	ㄴ	반각 한글 글자 외 HALFWIDTH HANGUL LETTER OE			
FFD0		<예약됨> <reserved>			
FFD1		<예약됨> <reserved>			
FFD2	ㅍ	반각 한글 글자 요 HALFWIDTH HANGUL LETTER YO			
FFD3	ㅊ	반각 한글 글자 우 HALFWIDTH HANGUL LETTER U			
FFD4	ㅋ	반각 한글 글자 위 HALFWIDTH HANGUL LETTER WEO			
FFD5	ㅌ	반각 한글 글자 웨 HALFWIDTH HANGUL LETTER WE			
FFD6	ㄴ	반각 한글 글자 위 HALFWIDTH HANGUL LETTER WI			
FFD7	ㅇ	반각 한글 글자 유 HALFWIDTH HANGUL LETTER YU			
FFD8		<예약됨> <reserved>			
FFD9		<예약됨> <reserved>			
FFDA	ㅡ	반각 한글 글자 으 HALFWIDTH HANGUL LETTER EU			
FFDB	ㅣ	반각 한글 글자 의 HALFWIDTH HANGUL LETTER YI			
FFDC	ㅣ	반각 한글 글자 이 HALFWIDTH HANGUL LETTER I			
FFDD		<예약됨> <reserved>			
FFDE		<예약됨> <reserved>			
FFDF		<예약됨> <reserved>			

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Annex B An Algorithm to process Normalization of Hangul

B.1 A Normalization of Hangul syllable blocks

In using two methods (i.e., Johab Hangul syllable blocks and Wanseong Hangul syllable blocks) defined in UCS to represent Hangul syllable blocks, for internal processing of software, it is possible to decompose and compose Hangul syllable blocks using a simple algorithm. An example of such an algorithm is given in this Section.

B.1.1 Common Constants

Common Constants used in algorithms in the overall Annexes are defined as follows:

```
static int
  SBase = 0xAC00, LBase = 0x1100, VBase = 0x1161, TBase = 0x11A7,
  LCount = 19, VCount = 21, TCount = 28, TCountAll = 83,
  NCount = VCount * TCount, // 588
  SCount = LCount * NCount; // 11172
```

B.1.2 Common Functions

Common Functions used in algorithms in the overall Annexes are defined as follows:

```
public static class UChar
{
  // A Modern Hangul Syllable-Initial Letter?
  public static bool isModernChoseong(char L) {
    return (0x1100 <= L && L < 0x1112) ? true : false;
  }

  // A Hangul Syllable-Initial Letter?
  public static bool isChoseongJamo(char L) {
    return (0x1100 <= L && L <= 0x115F) || (0xA960 <= L && L <= 0xA97C) ? true : false;
  }

  // A Modern Hangul Syllable-Peak Letter?
  public static bool isModernJungseong(char V) {
    return (0x1160 < V && V <= 0x1175) ? true : false;
  }

  // A Hangul Syllable-Peak Letter?
  public static bool isJungseongJamo(char V) {
    return (0x1160 <= V && V <= 0x11A7) || (0xD7B0 <= V && V <= 0xD7C6) ? true : false;
  }

  // A Modern Hangul Syllable-Final Letter?
  public static bool isModernJongseong(char T) {
    return (0x11A8 <= T && T <= 0x11C2) ? true : false;
  }

  // A Old Hangul Syllable-Final Letter?
  public static bool isOldJongseong(char T) {
    return (0x11C3 <= T && T <= 0x11FF) || (0xD7CB <= T && T <= 0xD7FB) ? true : false;
  }
}
```

```

// A Hangul Syllable-Final Letter?
public static bool isJongseongJamo(char T) {
    return (0x11A8 <= T && T <= 0x11FF) || (0xD7CB <= T && T <= 0xD7FB) ? true : false;
}

// A Johab Hangul Letter?
public static bool isHangulJamo(char C) {
    return (0x1100 <= C && C <= 0x11FF) || (0xA960 <= C && C <= 0xA97C) ||
        (0xD7B0 <= C && C <= 0xD7C6) || (0xD7CB <= C && C <= 0xD7FB) ? true : false;
}

// A Halfwidth Hangul Letter?
public static bool isHalfwidthLetter(char C) {
    return (0xFFA0 <= C && C <= 0xFFDF) ? true : false;
}

// A Hangul Compatibility Letter?
public static bool isCompatibilityLetter(char C) {
    return (0x3131 <= C && C <= 0x318E) ? true : false;
}

// A Parenthesized Hangul Letter or a Syllable Block?
public static bool isParenthesizedLetter(char C) {
    return (0x3200 <= C && C <= 0x321F) ? true : false;
}

// A Circled Hangul Letter or a Syllable Block?
public static bool isCircledLetter(char C) {
    return (0x3260 <= C && C <= 0x327F) ? true : false;
}

// A Wanseong Hangul Syllable Block?
public static bool isPrecomposedSyllable(char S) {
    return (0xAC00 <= S && S <= 0xD7A3) ? true : false;
}

// A Hanguk-related character?
public static bool isHangulLetter(char S) {
    if (isPrecomposedSyllable(S)) return true;
    if (isHangulJamo(S)) return true;
    if (isCompatibilityLetter(S)) return true;
    if (isParenthesizedLetter(S)) return true;
    if (isCircledLetter(S)) return true;
    if (isHalfwidthLetter(S)) return true;
    return false;
}
}
}

```

B.1.3 Hangul Decomposition

This function returns a Johab Modern Hangul Syllable Block for the given Wanseong Modern Hangul Syllable Block.

```

public static String decomposeHangul(char S) {
    int SIndex = S - SBase;
    if (SIndex < 0 || SIndex >= SCount)
        return S.ToString();
}

```

```

StringBuilder result = new StringBuilder();
int L = LBase + SIndex / NCount;
int V = VBase + (SIndex % NCount) / TCount;
int T = TBase + SIndex % TCount;
result.Append((char)L);
result.Append((char)V);
if (T != TBase) result.Append((char)T);
return result.ToString();
}

```

B.1.4 Hangul Composition

This function returns a Wanseong Modern Hangul Syllable Block for the given Johab Modern Hangul Syllable Block. Even when a portion of an Old Hangul Syllable Block is a Modern Hangul Syllable Block, unlike UAX #15, that portion is not transformed to a Wanseong Modern Hangul Syllable Block.

```

public static String composeHangul(String source)
{
    int len = source.Length;
    if (len == 0) return "";
    StringBuilder result = new StringBuilder();
    char last = source[0]; // copy the first char
    result.Append(last);

    for (int i = 1; i < len; ++i) {
        char ch = source[i];

        // 1. check to see if two consecutive characters are Hangul Syllable-Initial and
        // Syllable-Peak Letters
        int LIndex = last - LBase;
        if (0 <= LIndex && LIndex < LCount) {
            int VIndex = ch - VBase;
            if (0 <= VIndex && VIndex < VCount) {
                // transform into a Hangul Syllable Block composed of
                // Hangul Syllable-Initial and Syllable-Peak Letters (LV)
                last = (char)(SBase + (LIndex * VCount + VIndex) * TCount);
                result[result.Length - 1] = last; // reset last
                continue; // discard ch
            }
        }

        // 2. check to see if two consecutive characters are a Wanseong Modern Hangul
        // Syllable Block and a Syllable-Final Letter.
        int SIndex = last - SBase;
        if (0 <= SIndex && SIndex < SCount && (SIndex % TCount) == 0) {
            int TIndex = ch - TBase;
            if (0 < TIndex && TIndex < TCount) {
                // transform into a Hangul Syllable Block composed of
                // Hangul Syllable-Initial, Syllable-Peak and Syllable-Final Letters (LVT)
                last += (char)TIndex;
                result[result.Length - 1] = last; // reset last
                continue; // discard ch
            }
        }

        // if a Syllable-Final Letter is an Old Hangul Letter (Jamo)
        if (UChar.isOldJongseong(ch)) {
            // decompose a Modern Hangul Syllable Block into a Syllable-Initial and
            // Syllable-Peak Letters (LV)

```

```

        int L = LBase + SIndex / NCount;
        int V = VBase + (SIndex % NCount) / TCount;
        result[result.Length - 1] = (char)L; // add L
        result.Append((char)V);
        result.Append(ch);
        continue; // discard ch
    }
}

last = ch;
result.Append(ch);
}
return result.ToString();
}

```

B.1.5 Hanguk Recomposition

If one uses a UAX #15 algorithm instead of the above compose2Hanguk function for normalization, an Old Hanguk Syllable Block can be decomposed into a Wanseong Modern Hanguk Syllable Block and Johab Hanguk Letter(s). In such cases, after applying, one can use the following recomposition algorithm to restore a character string in Normalization Form NFC or NFKC to an L V T format.

```

public static String recomposeHanguk(String source)
{
    int len = source.Length;
    if (len == 0) return "";
    StringBuilder result = new StringBuilder();
    char last = source[0]; // copy the first char
    result.Append(last);

    for (int i = 1; i < len; ++i) {
        char ch = source[i];
        // check to see if two consecutive characters are a Wanseong Modern Hanguk
        // Syllable Block and a Syllable-Final Letter.
        int SIndex = last - SBase;
        if (0 <= SIndex && SIndex < SCount && (SIndex % TCount) == 0) {
            // if a Syllable-Final Letter is an Old Hanguk Letter (Jamo)
            if (UChar.isOldJongseong(ch)) {
                // Decompose a Modern Hanguk Syllable Block into a Syllable-Initial and
                // Syllable-Peak Letters (LV)
                int L = LBase + SIndex / NCount;
                int V = VBase + (SIndex % NCount) / TCount;
                result[result.Length - 1] = (char)L; // add L
                result.Append((char)V);
                result.Append(ch);
                continue; // discard ch
            }
        }

        // if neither case was true, just add the character
        last = ch;
        result.Append(ch);
    }
    return result.ToString();
}

```

B.2 Normalization of Compatibility/Halfwidth Hangul Letters and Hangul-embedded symbols

Function NormalizeJamoKDKC (B.2.3) is an algorithm to transform Hangul Compatibility Letters, Halfwidth Hangul Letters, and Hangul-embedded symbols (actually Parenthesized/Circled Hangul Letters) to correct Incomplete Hangul syllable blocks by adding Filler characters.

B.2.1 Transformation of Hangul Compatibility Letters

In transforming to Normalization Forms NFKD and NFKC, we need to transform Hangul Compatibility Letters to Johab Hangul Letters. Transformation can be done referring to the following table.

Note. The following table is the same as the one in C.1.1.

```
// a transformation table from Hangul Compatibility Letters (0x3131 - 0x318E)
// to Johab Hangul Letters (0x1100 - 0x11FF)
uint[] CPJAMO = new uint[] {
    0x1100, 0x1101, 0x11AA, 0x1102, 0x11AC, 0x11AD, 0x1103, 0x1104, 0x1105, 0x11B0,
    0x11B1, 0x11B2, 0x11B3, 0x11B4, 0x11B5, 0x111A, 0x1106, 0x1107, 0x1108, 0x1121, 0x1109,
    0x110A, 0x110B, 0x110C, 0x110D, 0x110E, 0x110F, 0x1110, 0x1111, 0x1112, 0x1161, 0x1162,
    0x1163, 0x1164, 0x1165, 0x1166, 0x1167, 0x1168, 0x1169, 0x116A, 0x116B, 0x116C, 0x116D,
    0x116E, 0x116F, 0x1170, 0x1171, 0x1172, 0x1173, 0x1174, 0x1175, 0x1160, 0x1114, 0x1115,
    0x11C7, 0x11C8, 0x11CC, 0x11CE, 0x11D3, 0x11D7, 0x11D9, 0x111C, 0x11DD, 0x11DF, 0x111D,
    0x111E, 0x1120, 0x1122, 0x1123, 0x1127, 0x1129, 0x112B, 0x112C, 0x112D, 0x112E, 0x112F,
    0x1132, 0x1136, 0x1140, 0x1147, 0x114C, 0x11F1, 0x11F2, 0x1157, 0x1158, 0x1159, 0x1184,
    0x1185, 0x1188, 0x1191, 0x1192, 0x1194, 0x119E, 0x11A1,
};
```

B.2.2 Transformation of Halfwidth Hangul Letters

In transforming to Normalization Forms NFKD and NFKC, we need to transform Halfwidth Hangul Letters to Johab Hangul Letters. Transformation can be done referring to the following table.

Note. The following table is the same as the one in C.1.2.

```
// a transformation table from Halfwidth Hangul Letters (0xFFA0 - 0xFFDF)
// to Johab Hangul Letters (0x1100 - 0x11FF)
uint[] HWJAMO = new uint[] {
    0x1160, 0x1100, 0x1101, 0x11AA, 0x1102, 0x11AC, 0x11AD, 0x1103, 0x1104, 0x1105, 0x11B0,
    0x11B1, 0x11B2, 0x11B3, 0x11B4, 0x11B5, 0x111A, 0x1106, 0x1107, 0x1108, 0x1121, 0x1109,
    0x110A, 0x110B, 0x110C, 0x110D, 0x110E, 0x110F, 0x1110, 0x1111, 0x1112, 0xFFBF, 0xFFC0,
    0xFFC1, 0x1161, 0x1162, 0x1163, 0x1164, 0x1165, 0x1166, 0xFFC8, 0xFFC9, 0x1167, 0x1168,
    0x1169, 0x116A, 0x116B, 0x116C, 0xFFD0, 0xFFD1, 0x116D, 0x116E, 0x116F, 0x1170, 0x1171,
    0x1172, 0xFFD8, 0xFFD9, 0x1173, 0x1174, 0x1175, 0xFFDD, 0xFFDE, 0xFFDF,
};
```

B.2.3 Transformation of Hangul-embedded symbols

In transforming to Normalization Forms NFKD and NFKC, we need to transform Hangul-embedded symbols (actually Parenthesized/Circled Hangul Letters) to Johab Hangul Letters. Transformation can be done referring to the following table.

```
// a transformation table from Hangul-embedded Letters (0x3200 - 0x320D, 0x3260 - 0x326D)
// to Johab Hangul Letters (0x1100 - 0x11FF)
uint[] PCJAMO = new uint[] {
    0x1100, 0x1102, 0x1103, 0x1105, 0x1106, 0x1107, 0x1109, 0x110B, 0x110C, 0x110E, 0x110F,
```

```

    0x1110, 0x1111, 0x1112,
};

```

B.2.4 Function Normalizing Compatibility/Halfwidth Hangul Letters and Hangul-embedded symbols (NormalizeJamoKDKC)

```

public static String NormalizeJamoKDKC(String source)
{
    int PHBase = 0x3200, PHEnd = 0x320D;
    int CHBase = 0x3260, CHEnd = 0x326D;

    int len = source.Length;
    if (len == 0) return "";
    StringBuilder result = new StringBuilder();

    for (int i = 0; i < len; ++i) {
        int ch = source[i];
        int pf = 0;

        // 1. look up a table and transform a char into a Johab Hangul Letter
        if (UChar.isCompatibilityLetter(ch))
            ch = CPJAMO[ch - 0x3131];
        else if (PABase <= ch && ch <= PAEnd) {
            result.Append((char)0x0028);
            ch = PCJAMO [ch - PABase];
            pf = 0x0029;
        }
        else if (CHBase <= ch && ch <= CHEnd)
            ch = PCJAMO [ch - CHBase];
        else if (UChar.isHalfwidthLetter(ch))
            ch = HWJAMO[ch - 0xFFA0];
        else {
            result.Append((char)ch);
            continue;
        }

        // 2. Insert a Filler char (Jamo)
        if (LBase <= ch && ch < (LBase + LCount)) {
            result.Append((char)ch);
            result.Append((char)0x1160);
        }
        else if (VBase <= ch && ch < (VBase + VCount)) {
            result.Append((char)0x115F);
            result.Append((char)ch);
        }
        else if (TBase <= ch && ch < (TBase + TCount)) {
            result.Append((char)0x115F);
            result.Append((char)0x1160);
            result.Append((char)ch);
        }

        // 3. a special processing for parenthesized Hangul Letter
        if (pf != 0) result.Append((char)pf);
    }
    return result.ToString();
}

```

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Annex C A Hangul Sorting Algorithm

C.1 Preprocessing of Hangul Sorting

C.1.1 Transformation of Hangul Compatibility Letters

To sort Hangul Compatibility Letters together with Johab Hangul Letters and/or Hangul syllable blocks, we first need to transform Hangul Compatibility Letters to Johab Hangul Letters. Transformation can be done referring to the following table.

Note. The following table is the same as the one in B.2.1.

```
// a transformation table from Hangul Compatibility Letters (0x3131 - 0x318E)
// to Johab Hangul Letters (0x1100 - 0x11FF)
uint[] CPJAMO = new uint[] {
    0x1100, 0x1101, 0x11AA, 0x1102, 0x11AC, 0x11AD, 0x1103, 0x1104, 0x1105, 0x11B0,
    0x11B1, 0x11B2, 0x11B3, 0x11B4, 0x11B5, 0x111A, 0x1106, 0x1107, 0x1108, 0x1121, 0x1109,
    0x110A, 0x110B, 0x110C, 0x110D, 0x110E, 0x110F, 0x1110, 0x1111, 0x1112, 0x1161, 0x1162,
    0x1163, 0x1164, 0x1165, 0x1166, 0x1167, 0x1168, 0x1169, 0x116A, 0x116B, 0x116C, 0x116D,
    0x116E, 0x116F, 0x1170, 0x1171, 0x1172, 0x1173, 0x1174, 0x1175, 0x1160, 0x1114, 0x1115,
    0x11C7, 0x11C8, 0x11CC, 0x11CE, 0x11D3, 0x11D7, 0x11D9, 0x111C, 0x11DD, 0x11DF, 0x111D,
    0x111E, 0x1120, 0x1122, 0x1123, 0x1127, 0x1129, 0x112B, 0x112C, 0x112D, 0x112E, 0x112F,
    0x1132, 0x1136, 0x1140, 0x1147, 0x114C, 0x11F1, 0x11F2, 0x1157, 0x1158, 0x1159, 0x1184,
    0x1185, 0x1188, 0x1191, 0x1192, 0x1194, 0x119E, 0x11A1,
};
```

After transformation, you can find the order of a letter in the Order Table of Johab Hangul Letters (C.2.2).

C.1.2 Transformation of Halfwidth Hangul Letters

To sort Halfwidth Hangul Letters together with Johab Hangul Letters and/or Hangul syllable blocks, we first need to transform Hangul Compatibility Letters to Johab Hangul Letters. Transformation can be done referring to the following table.

Note. The following table is the same as the one in B.2.2.

```
// a transformation table from Halfwidth Hangul Letters (0xFFA0 - 0xFFDF)
// to Johab Hangul Letters (0x1100 - 0x11FF)
uint[] HWJAMO = new uint[] {
    0x1160, 0x1100, 0x1101, 0x11AA, 0x1102, 0x11AC, 0x11AD, 0x1103, 0x1104, 0x1105, 0x11B0,
    0x11B1, 0x11B2, 0x11B3, 0x11B4, 0x11B5, 0x111A, 0x1106, 0x1107, 0x1108, 0x1121, 0x1109,
    0x110A, 0x110B, 0x110C, 0x110D, 0x110E, 0x110F, 0x1110, 0x1111, 0x1112, 0xFFBF, 0xFFC0,
    0xFFC1, 0x1161, 0x1162, 0x1163, 0x1164, 0x1165, 0x1166, 0xFFC8, 0xFFC9, 0x1167, 0x1168,
    0x1169, 0x116A, 0x116B, 0x116C, 0xFFD0, 0xFFD1, 0x116D, 0x116E, 0x116F, 0x1170, 0x1171,
    0x1172, 0xFFD8, 0xFFD9, 0x1173, 0x1174, 0x1175, 0xFFDD, 0xFFDE, 0xFFDF,
};
```

After transformation, you can find the order of a letter in the Order Table of Johab Hangul Letters (C.2.2).

C.1.3 A Transformation of Parenthesized Hangul Letters and Syllable Blocks

To sort Parenthesized Hangul Letters and Syllable Blocks together with Johab Hangul Letters and/or

Hangul syllable blocks, we first need to transform Parenthesized Hangul Letters and Syllable Blocks to Johab Hangul Letters or Wanseong Hangul syllable blocks. Transformation can be done referring to the following table.

```
// a transformation of Parenthesized Hangul Letters and syllable blocks (0x3200 - 0x321C)
// to Johab Hangul Letters (0x1100 - 0x11FF) or Wanseong Hangul syllable blocks
// (0xAC00 - 0xD7A3)
uint[] PACHAR = new uint[] {
    0x1100, 0x1102, 0x1103, 0x1105, 0x1106, 0x1107, 0x1109, 0x110B, 0x110C, 0x110E, 0x110F,
    0x1110, 0x1111, 0x1112, 0xAC00, 0xB098, 0xB2E4, 0xB77C, 0xB9C8, 0xBC14, 0xC0AC, 0xC544,
    0xC790, 0xCC28, 0xCE74, 0xD0C0, 0xD30C, 0xD558, 0xC8FC, 0x321D, 0x321E, 0x321F,
};
```

After transformation, you can find the order of a letter in the Order Table of Johab Hangul Letters (C.2.2).

C.1.4 A Transformation of Circled Hangul Letters and Syllable Blocks

To sort Circled Hangul Letters and Syllable Blocks together with Johab Hangul Letters and/or Hangul syllable blocks, we first need to transform Circled Hangul Letters and Syllable Blocks to Johab Hangul Letters or Wanseong Hangul syllable blocks. Transformation can be done referring to the following table.

```
// a transformation of Circled Hangul Letters and Syllable Blocks (0x3260 - 0x327B, 0x327E)
// to Johab Hangul Letters (0x1100 - 0x11FF) or Wanseong Hangul syllable blocks
// (0xAC00 - 0xD7A3)
uint[] CLCHAR = new uint[] {
    0x1100, 0x1102, 0x1103, 0x1105, 0x1106, 0x1107, 0x1109, 0x110B, 0x110C, 0x110E, 0x110F,
    0x1110, 0x1111, 0x1112, 0xAC00, 0xB098, 0xB2E4, 0xB77C, 0xB9C8, 0xBC14, 0xC0AC, 0xC544,
    0xC790, 0xCC28, 0xCE74, 0xD0C0, 0xD30C, 0xD558, 0x327C, 0x327D, 0xCB60, 0x326F,
};
```

After transformation, you can find the order of a letter in the Order Table of Johab Hangul Letters (C.2.2).

C.2 The order of Johab Hangul Letters

C.2.1 Determining the Order of Johab Hangul Letters

- 1) The order of Johab Hangul Consonant Letters in Hangul Jamo U+1100 ~ U+11FF, Hangul Jamo Extended-A U+A960 ~ U+A97F and Hangul Jamo Extended-B U+D7B0 ~ U+D7FF is shown in Table C.1. The order of consonant letters was determined by arranging syllable-initial and syllable-final letters based on their glyphs.
- 2) The order of Johab Hangul vowel letters in the same Hangul Jamo ranges is shown in Table C.2.

C.2.2 The Order Tables of Johab Hangul Letters to be used in programs

The order tables of Johab Hangul Letters to be used in programs, which are based on Tables C.1 and C.2, are as follows. To increase the lookup speed by decreasing the number of comparisons, tables are arranged separately for each of the UCS ranges, not in the order of syllable-initial letters, syllable-peak letters, and syllable-final letters.


```

// The order values for Johab Hangul Letters 0x1100 - 0x11FF
uint[] INDEX1100 = new uint[256] {
// 0 1 2 3 4 5 6 7 8 9 A B C D E F
// =====
1, 2, 12, 24, 26, 36, 70, 86, 93, 109, 118, 138, 161, 165, 171, 176,
177, 179, 185, 13, 14, 15, 17, 25, 41, 45, 66, 69, 77, 85, 87, 88,
89, 94, 95, 96, 97, 98, 99, 101, 102, 104, 105, 107, 108, 110, 111, 112,
113, 114, 115, 116, 122, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134,
135, 139, 140, 142, 143, 144, 145, 146, 147, 148, 149, 150, 152, 164, 167, 168,
169, 170, 172, 173, 174, 175, 180, 184, 191, 192, 4, 18, 20, 23, 28, 194,
0, 1, 5, 6, 10, 11, 15, 16, 20, 21, 22, 23, 33, 34, 43, 46,
48, 52, 54, 64, 71, 73, 2, 3, 7, 8, 12, 13, 14, 18, 19, 26,
27, 29, 30, 32, 37, 38, 40, 41, 42, 44, 45, 47, 50, 51, 55, 57,
58, 59, 60, 62, 63, 69, 70, 72, 74, 75, 80, 83, 85, 87, 88, 90,
92, 93, 94, 4, 9, 17, 24, 25, 1, 2, 7, 12, 20, 23, 24, 36,
37, 47, 51, 58, 64, 65, 66, 70, 86, 94, 109, 118, 138, 161, 171, 176,
177, 179, 185, 5, 8, 13, 15, 18, 19, 22, 25, 28, 39, 41, 42, 44,
45, 48, 49, 54, 56, 57, 59, 60, 63, 67, 71, 75, 77, 79, 80, 81,
83, 84, 85, 90, 105, 106, 107, 110, 112, 113, 115, 135, 153, 154, 158, 159,
152, 156, 157, 180, 184, 186, 187, 188, 189, 192, 3, 6, 9, 10, 11, 14,
};

// The order values for Johab Hangul Syllable-Initial Letters 0xA960 - 0xA97C
uint[] INDEXA960 = new uint[29] {
// 0 1 2 3 4 5 6 7 8 9 A B C D E F
// =====
29, 30, 31, 33, 37, 38, 42, 43, 47, 51, 53, 57, 58, 62, 63, 71,
74, 79, 100, 103, 106, 121, 141, 151, 166, 178, 183, 190, 193,
};

// The order values for Johab Hangul Syllable-Peak Letters 0xD7B0 - 0xD7C6
uint[] INDEXD7B0 = new uint[23] {
// 0 1 2 3 4 5 6 7 8 9 A B C D E F
// =====
28, 31, 35, 36, 39, 49, 53, 56, 61, 65, 66, 67, 68, 76, 77, 78,
79, 81, 82, 84, 86, 89, 91,
};

// The order values for Johab Hangul Syllable-Final Letters 0xD7CB - 0xD7FB
uint[] INDEXD7CB = new uint[49] {
// 0 1 2 3 4 5 6 7 8 9 A B C D E F
// =====
16, 21, 26, 27, 30,
31, 32, 33, 34, 35, 38, 40, 46, 50, 52, 55, 61, 68, 69, 72, 73,
76, 78, 82, 89, 91, 92, 93, 96, 101, 102, 114, 117, 119, 120, 123, 125,
126, 128, 130, 136, 137, 155, 160, 162, 163, 165, 181, 182,
};

```

C.3 Weights of Hangul Letters for Sorting

C.3.1 Determining Weights of Hangul Letters for Sorting

There are several problems to sort directly using code positions of Johab Hangul Letters in UCS. First, Modern and Old Hangul Letters are not arranged in the order of Letters. Second, Hangul Letters are arranged in a couple of blocks. Third, Wanseong Hangul syllable blocks and Johab Hangul syllable blocks are mixed. Therefore, after we determine a weight for each Hangul Letter or Hangul Syllable Block as follows, we need to compare.

Table C.3 Weights for each Hangul Letter or Syllable Block for sorting

An Order Value for a Syllable-Initial Letter	An Order Value for a Syllable-Peak Letter	An Order Value for a Syllable-Final Letter	A Type Value for Character Class
0 - 255	0 - 255	0 - 255	0 - 255

A Weight is a 32-bit unsigned integer as shown in Table C.3 and is composed of four values. The first byte is an order value for a Syllable-Initial Letter, the second byte is an order value for a Syllable-Peak Letter, and the third byte is an order value for a Syllable-Final Letter. The final (i.e., fourth) byte is used for ordering characters based on character types and, as shown in Section 8.4 of this Standard, is assigned the following values as an example.

- 1) 0 is assigned to a Johab Hangul Syllable Block or Wanseong Hangul Syllable Block.
- 2) 1 is assigned when there is only a Syllable-Final Letter.
- 3) 2 is assigned to a Halfwidth Hangul Letter.
- 4) 3 is assigned to a Hangul Compatibility Letter.
- 5) 4 is assigned to a Parenthesized Hangul Letter/Syllable Block.
- 6) 5 is assigned to a Circled Hangul Letter/Syllable Block.

C.3.2 Determining Weights for Johab Hangul syllable blocks for sorting

The following algorithm determines a weight for a Johab Hangul syllable block for sorting, when a Hangul syllable is decomposed into syllable-Initial, syllable-peak and syllable-final letters and then they are input to the algorithm. If there is no syllable-initial or syllable-peak letter, then the corresponding Filler character is input instead, and if there is no syllable-final letter, then 0 is input instead.

```
// for the Syllable-Initial, Syllable-Peak and Syllable-Final Letters,
// determine a weight.
public uint getHangulWeight(char L, char V, char T)
{
    uint weight = 0, type = 0;
    uint LW = 0, VW = 0, TW = 0;

    // a Hangul Syllable-Initial Letter?
    if (UChar.isChoseongJamo(L)) {
        // a Hangul Syllable-Peak Letter?
        if (UChar.isJungseongJamo(V)) {
            // a Hangul Syllable-Final Letter?
            if ((T == 0) || UChar.isJongseongJamo(T)) {
                // compute a weight
                LW = (L < 0x1200) ? INDEX1100[L - 0x1100] : INDEXA960[L - 0xA960];
                VW = (V < 0x1200) ? INDEX1100[V - 0x1100] : INDEXD7B0[V - 0xD7B0];
                if (T != 0)
                    TW = (T < 0x1200) ? INDEX1100[T - 0x1100] : INDEXD7CB[T - 0xD7CB];
                // If there is only a Hangul Syllable-Final Letter,
                // compute a weight as if it were a Syllable-Initial Letter.
                if (L == 0x115F && V == 0x1160 && T != 0)
                    weight = (TW << 24) + type;
            }
            else
                weight = (LW << 24) + (VW << 16) + (TW << 8) + type;
        }
    }
}
```

```

    }
  }
}
return weight;
}

```

C.3.3 Determining Weights for Wanseong Hangul Syllable Block and other Hangul Letters

The following algorithm determines a weight when a Wanseong Hangul Syllable, a Hangul Letter or Hangul-embedded Symbol is input. When a non-Hangul character is input, the algorithm returns value 0 as a weight. In other words, this algorithm does not consider comparing a Hangul character and a non-Hangul character.

```

// determine a weight for a Wanseong Hangul Syllable Block, a Hangul Letter or
// Hangul-embedded Symbol
public uint getHangulWeight(char hc)
{
  uint type = 0, index = hc, weight = 0;
  uint LW = 0, VW = 0, TW = 0;
  uint L = 0x115F, V = 0x1160, T = 0;

  // a Hangul Syllable-Final Letter?
  if (UChar.isJongseongJamo(hc)) {
    type = 1;
    T = hc;
  }
  // a Halfwidth Hangul Letter?
  else if (UChar.isHalfwidthLetter(hc)) {
    type = 2;
    index = HWJAMO[hc - 0xFFA0];
    if (index == hc) return 0; // Not a Hangul char
  }
  // a Hangul Compatibility Letter?
  else if (UChar.isCompatibilityLetter(hc)) {
    type = 3;
    index = CPJAMO[hc - 0x3131];
  }
  // a Parenthesized Hangul Letter/Syllable Block?
  else if (UChar.isParenthesizedLetter(hc)) {
    type = 4;
    index = PACHAR[hc - 0x3200];
    if (index == hc) return 0; // Not a Hangul char
  }
  // a Circled Hangul Letter/Syllable Block?
  else if (UChar.isCircledLetter(hc)) {
    type = 5;
    index = CLCHAR[hc - 0x3260];
    if (index == hc) return 0; // Not a Hangul char
  }

  // a Hangul Syllable-Initial Letter?
  if (UChar.isChoseongJamo(index))
    L = index;
}

```

```

// a Hangul Syllable-Peak Letter?
else if (UChar.isJongseongJamo(index))
    V = index;
// a Hangul Syllable-Final Letter?
else if (UChar.isJongseongJamo(index))
    T = index;
// If a Wanseong Hangul Syllable Block, transform it to a LVT
else if (UChar.isPrecomposedSyllable(index)) {
    uint SIndex = index - (uint)SBase;
    L = (uint)(LBase + SIndex / NCount);
    V = (uint)(VBase + (SIndex % NCount) / TCount);
    T = (uint)(TBase + SIndex % TCount);
    if (T == TBase) T = 0;
}
// a non-Hangul character
else return 0; // Not Hangul char

// compute a weight
LW = (L < 0x1200) ? INDEX1100[L - 0x1100] : INDEXA960[L - 0xA960];
VW = (V < 0x1200) ? INDEX1100[V - 0x1100] : INDEXD7B0[V - 0xA960];
if (T != 0)
    TW = (T < 0x1200) ? INDEX1100[T - 0x1100] : INDEXD7CB[T - 0xD7CB];

// If there is only a Hangul Syllable-Final Letter,
// compute a weight as if it were a Syllable-Initial Letter.
if (L == 0x115F && V == 0x1160 && T != 0)
    weight = (TW << 24) + type;
else
    weight = (LW << 24) + (VW << 16) + (TW << 8) + type;
































































































return weight;
}

```

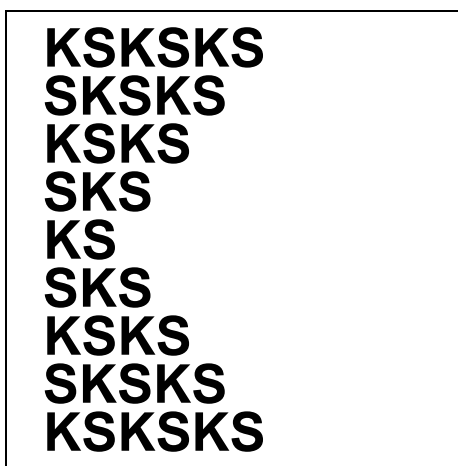
Table C.1 An Order Table for Johab Hangul Consonant Letters

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	ㄱ 115F	ㄴ 1100	ㄷ 1101		ㄹ 115A								ㄴ 1102	ㄷ 1113	ㄹ 1114	ㄷ 1115	
		ㄱ 11A8	ㄴ 11A9	ㄷ 11FA		ㄹ 11C3	ㄱ 11FB	ㄴ 11AA	ㄷ 11C4	ㄹ 11FC	ㄱ 11FD	ㄷ 11FE	ㄴ 11AB	ㄷ 11C5	ㄹ 11FF	ㄷ 11C6	
1		ㄴ 1116	ㄷ 115B		ㄹ 115C			ㄱ 115D	ㄷ 1103	ㄹ 1117	ㄱ 1104		ㄴ 115E	ㄷ A960	ㄹ A961	ㄷ A962	
	ㄴ D7CB		ㄷ 11C7	ㄹ 11C8	ㄱ 11AC	ㄷ D7CC	ㄹ 11C9	ㄱ 11AD	ㄷ 11AE	ㄹ 11CA	ㄱ D7CD	ㄷ D7CE	ㄴ 11CB		ㄹ D7CF	ㄷ D7D0	
2		ㄹ A963			ㄱ 1105	ㄷ A964	ㄹ A965			ㄴ 1118	ㄷ A966	ㄹ A967		ㄴ 1119		ㄹ A968	
	ㄷ D7D1	ㄹ D7D2	ㄱ D7D3	ㄷ D7D4	ㄹ 11AF	ㄱ 11B0	ㄷ D7D5	ㄹ 11CC	ㄱ D7D6	ㄷ 11CD	ㄹ 11CE		ㄴ 11CF	ㄷ 11D0	ㄹ D7D7	ㄱ 11B1	
3				ㄹ A969		ㄱ A96A				ㄴ A96B	ㄷ A96C				ㄹ A96D	ㄱ A96E	
	ㄹ 11D1	ㄱ 11D2	ㄷ D7D8	ㄹ 11B2	ㄱ D7D9		ㄷ 11D3	ㄹ D7DA	ㄱ 11D4	ㄷ 11D5	ㄹ 11B3	ㄱ 11D6	ㄷ 11D7	ㄹ D7DB		ㄱ 11D8	
4			ㄱ 111A			ㄷ 111B	ㄹ 1106	ㄱ A96F			ㄷ A970			ㄹ 111C		ㄱ A971	
	ㄷ 11B4	ㄹ 11B5	ㄱ 11B6	ㄷ 11D9	ㄹ D7DC	ㄱ D7DD	ㄷ 11B7	ㄹ 11DA	ㄱ D7DE	ㄷ D7DF		ㄹ 11DB	ㄱ D7E0	ㄷ 11DC	ㄹ D7E1	ㄱ 11DD	
5					ㄷ 111D	ㄹ 1107	ㄱ 111E	ㄷ 111F	ㄹ 1120					ㄴ 1108	ㄷ 1121	ㄹ 1122	
	ㄱ 11DE	ㄷ 11DF	ㄹ D7E2	ㄱ 11E0	ㄷ 11E1	ㄹ 11E2	ㄱ 11B8			ㄷ D7E3	ㄹ 11E3	ㄱ D7E4	ㄷ D7E5	ㄹ D7E6	ㄱ 11B9		
6	ㄷ 1123	ㄹ 1124	ㄱ 1125	ㄷ 1126	ㄹ A972	ㄱ 1127	ㄷ 1128	ㄹ A973	ㄱ 1129	ㄷ 112A	ㄹ A974	ㄱ 112B	ㄷ 112C	ㄹ 1109	ㄱ 112D	ㄷ 112E	
	ㄷ D7E7					ㄱ D7E8	ㄷ D7E9			ㄷ 11E4	ㄹ 11E5	ㄱ 11E6		ㄴ 11BA	ㄷ 11E7		
7	ㄱ 112F	ㄷ 1130	ㄹ 1131	ㄱ 1132	ㄷ 1133		ㄹ 110A			ㄱ A975	ㄷ 1134		ㄴ 1135	ㄷ 1136	ㄹ 1137	ㄱ 1138	
	ㄱ 11E8	ㄷ 11E9	ㄹ D7EA	ㄱ 11EA		ㄷ D7EB	ㄹ 11BB	ㄱ D7EC	ㄷ D7ED			ㄴ D7EE		ㄷ D7EF	ㄹ D7F0		
8	ㄷ 1139	ㄹ 113A	ㄱ 113B	ㄷ 113C	ㄹ 113D	ㄱ 113E	ㄷ 113F	ㄹ 1140				ㄴ 110B	ㄷ 1141	ㄹ 1142	ㄱ A976	ㄷ 1143	ㄹ 1144
	ㄷ D7F1		ㄹ D7F2					ㄱ 11EB	ㄷ D7F3	ㄹ D7F4	ㄴ 11BC						
9	ㄱ 1145	ㄷ 1146	ㄹ 1147	ㄱ 1148	ㄷ 1149	ㄹ 114A	ㄱ 114B	ㄷ A977	ㄹ 114C								
									ㄴ 11F0	ㄷ 11EC	ㄹ 11ED	ㄱ D7F5	ㄷ 11F1	ㄹ 11F2	ㄱ 11EE	ㄷ 11EF	
A		ㄱ 110C			ㄷ 114D	ㄹ 110D	ㄱ A978	ㄷ 114E	ㄹ 114F	ㄱ 1150	ㄷ 1151	ㄹ 110E	ㄱ 1152	ㄷ 1153	ㄹ 1154	ㄱ 1155	
	ㄱ D7F6	ㄷ 11BD	ㄹ D7F7	ㄱ D7F8		ㄷ D7F9						ㄴ 11BE					
B	ㄱ 110F	ㄷ 1110	ㄹ A979	ㄱ 1111	ㄷ 1156			ㄹ A97A	ㄱ 1157	ㄷ 1112					ㄱ A97B	ㄷ 1158	
	ㄱ 11BF	ㄷ 11C0		ㄹ 11C1	ㄱ 11F3	ㄷ D7FA	ㄹ D7FB		ㄱ 11F4	ㄷ 11C2	ㄹ 11F5	ㄱ 11F6	ㄷ 11F7	ㄹ 11F8			
C	ㄴ 1159	ㄷ A97C															
	ㄱ 11F9																

Table C.2 An Order Table for Johab Hangul Vowel Letters

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	 1160	 1161	 1176	 1177	 11A3	 1162	 1163	 1178	 1179	 11A4	 1164	 1165	 117A	 117B	 117C	 1166
1	 1167	 11A5	 117D	 117E	 1168	 1169	 116A	 116B	 11A6	 11A7	 117F	 1180	 D7B0	 1181	 1182	 D7B1
2	 1183	 116C	 116D	 D7B2	 D7B3	 1184	 1185	 D7B4	 1186	 1187	 1188	 116E	 1189	 118A	 116F	 118B
3	 1170	 D7B5	 118C	 118D	 1171	 D7B6	 1172	 118E	 D7B7	 118F	 1190	 1191	 1192	 D7B8	 1193	 1194
4	 1173	 D7B9	 D7BA	 D7BB	 D7BC	 1195	 1196	 1174	 1197	 1175	 1198	 1199	 D7BD	 D7BE	 D7BF	 D7C0
5	 119A	 D7C1	 D7C2	 119B	 D7C3	 119C	 D7C4	 119D	 119E	 D7C5	 119F	 D7C6	 11A0	 11A1	 11A2	

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