

Information about the Revision of ISO/IEC 9995-3

Karl Pentzlin — karl-pentzlin@europatatur.de — 2009-09-16

This paper is no official SC35 document. All opinions presented in this paper are the personal opinions of the author.

~	- !		@	#	£	\$	€	&	↑	^	↓	&	←	*	→	(±)	™	-	;	+	~	Back Space
Tab	Q	W	E	R	T	Y	U	I	O	P	{	}		~										
Caps Lock	A	S	D	F	G	H	J	K	L	:	"	~	Enter											
Shift	Z	X	C	V	B	N	M	<	>	÷	?	~	Shift											
Ctrl	Win Key	Alt						ZWNJ	NNBSP	NBSP	Alt Gr	Win Key	Menu	Ctrl										

This picture shows the common secondary group (displayed in blue) applied to a US standard keyboard.

1. Introduction

The ISO/IEC JTC 1/SC 35/WG 1 has decided to revise the existing ISO/IEC 9995-3 "Complementary layouts of the alphanumeric zone of the alphanumeric section" substantially. (Also, for more extensive needs, a new work item "ISO/IEC 9995-9 Multilingual, multiscript keyboard group layouts" is initiated.)

The revision of ISO/IEC 9995-3 is currently to be circulated as FDIS (Final Draft International Standard) to the national bodies which will finally decide about it in the due process, which may result in a formal published standard out the first half of 2010.

All information presented here, based on a FDIS (Final Draft International Standard), is final in principle, as in the FDIS state only editorial changes still can be made. Thus, while formally there is no guarantee that the standard in fact will be adopted, the information contained in the FDIS document can be considered as final and reliable, as there was no "No" vote in the previous FCD (Final Committee Draft) ballot.

2. The present edition of ISO/IEC 9995-3

The present edition of ISO/IEC 9995-3 was published in 2002 and is entitled:

- Information technology — Keyboard layouts for text and office systems —
- Part 3: Complementary layouts of the alphanumeric zone of the alphanumeric section

The standard defines an "common secondary group layout", which is a mapping of characters to the unshifted and shifted positions (and, in one case, also to a third level beyond unshifted/shifted) of the 48 alphanumeric keys of a standard PC keyboard to be reached by a "group selector" (which could be a special key working similar to the "Right Alt" or "AltGr" key of some keyboards, but the exact mechanism is not subject of the standard). Such characters then can be engraved on the right halves of the keytops.

("PC keyboard" here is informally used instead of the terms defined in ISO/IEC 9995-1 and 9995-2.)

The character set which can be entered this way is MES-1 (Multilingual European Subset 1).

It is conformant to implement a subset only (as has to be done if a keyboard has only 47 alphanumeric keys, like the US standard keyboard).

Additionally, the standard defines the way diacritical marks are to be entered (following the "dead key" principle, i.e. to be entered before the base letter).

Finally, the standard defines a "complementary Latin group" which resembles the usual QWERTY layout as far as letters and digits are concerned, to be applied to non-Latin PC keyboards to enable the entering of Latin letters in a standardized way.

Currently, only two national keyboard standards refer to ISO/IEC 9995-3: Sweden and Canada. While the Swedish standard did not gain widespread use (and in fact the recent work on this standard seems no longer to consider ISO/IEC 9995-3), the Canadian standard is in fact the only one which is complied by a significant number of keyboards really produced.

3. Goals of the ISO/IEC 9995-3 revision

The revised ISO/IEC 9995-3 is intended to fulfill the following goals:

1. All names (personal and organizational) and texts written in official main languages of all countries can be entered correctly (provided they use the Latin script).
2. All names and texts written in most "indigenous" or "aboriginal" languages can be entered correctly (provided they use the Latin script).
3. It enables users to write typographically correct at the character level (by supplying en-/em-dashes, different quote forms, non-breaking spaces and hyphens, etc.).
4. Standardized transliterations of geographical and personal names from non-Latin scripts into Latin are supported at least for widely used languages.
5. The Latin script variants Fraktur (Blackletter) and Gaelic (which have some contemporary use in spite of their "old fashioned" look) are supported (for Fraktur, see Appendix A).
6. Some symbols used commonly in business texts are provided, like € or ®.

Furthermore, it shall meet the following technical requirements:

- a. It shall be compliant to current encoding standards like ISO/IEC 10646 (Unicode).
- b. It shall be no longer Europe-centered (as the present version is by its explicit reference to the MES-1 character set).
- c. There shall be a compatibility path to users which adhere to the present version of ISO/IEC 9995-3.

Regarding the goal 2, the means currently defined in ISO/IEC 9995-3 allow only a limited number of special letters in the secondary group. These are selected to accommodate primarily the current users of ISO/IEC 9995-3, i.e. Northern Europe and Canada, to enable Sami and most of the Canadian indigenous languages (and, in doing this, also these of the USA).

Also, regions of the world which use only a limited set of extra letters for their Latin written languages are served (like Europe including Turkey and Azerbaijan, Vietnam, the Pacific area including Hawai'i, South Africa's contemporary orthographies of its official languages, almost all languages of Central and South America, Australia).

However, some North American indigenous languages which use a special selection of extra letters, and many languages of Central Africa which rely on extra letters, are not supported at this time. Such orthographies are to be served in full by the upcoming ISO/IEC 9995-9.

On the other side, languages which rely on multiple diacritical marks (like Vietnamese, Navajo, or Yorùbá) are supported.

Regarding the goal 6, the means currently defined in ISO/IEC 9995-3 allow only a very basic set of symbols. Especially, currency symbols are limited to those being already in the present version (namely \$, ¥, £, €).

A more complete set, including (besides other things) all currency symbols in use, is left to the upcoming ISO/IEC 9995-9.

4. Summary of the revision

- a. The "common secondary group layout" is revised completely.
For compatibility reasons, all characters of MES-1 (which are not contained in the unchanged "complementary Latin group", and which are not included in the list of "peculiar characters" as described below) are retained.
By populating the "Level 3" (additional to the "unshifted" Level 1 and the "shifted" Level 2), and by including the Space key in addition to the 48 alphanumeric characters, this allows $49 \times 3 = 147$ character positions to fill.
This allows the inclusion of selected additional characters to fulfill the goals listed before.
- b. The characters included in the thus revised "common secondary group layout" are reordered:
 - Characters which are engraved on standard Canadian keyboards retain their position (as the Canadian Standard is currently the one referring to ISO/IEC 9995-3 which is considered in actually produced keyboards), leaving these Canadian keyboards compatible to the revised standard
 - The key at position B00 (near the "left shift key", which is lacking on US standard keyboards) is assigned to characters with questionable use which are only included for compatibility reasons, thus losing no value by implementing a subset not containing these characters for a 47-key keyboard
 - After having considered this, it was tried to optimize the ordering as far as possible to make it appear systematic as well as easy to grasp and to remember.
- c. The mechanism regarding diacritical marks is enhanced to allow sequences of them (as it is needed e.g. for Vietnamese). Additionally, besides marks appearing above or below of their base characters, overstriking diacritics are allowed.

The description of diacritical marks is expanded to comply with the encoding principles of ISO/IEC 10646 (Unicode), by supplying the name as combining characters as well as a spacing character when applied to Space.

- d. A list of "peculiar characters" is supplied which are entered by special combinations of a diacritical mark with a second character. This list contains diacritical marks (like the double grave accent to be entered as a sequence of two grave accents) as well as letters. Especially, letters with a horizontal stroke (like Croat Đ/đ, Maltese Ħ/ħ, Sami G/g, Comanche Ǯ/ǯ) are entered by the "horizontal stroke" diacritical mark followed by the appropriate base letter.
- e. For compatibility reasons, the revised "common secondary group layout" is called the "current" one, while the one contained in the present version of ISO/IEC 9995-3 is retained (with some clarifications) and called the "outdated" one. Any application which has to be compatible with the present version of ISO/IEC 9995-3 can accomplish this by explicitly referring to the "outdated" version of the "common secondary group layout" in the compliance statement.
- f. The "complementary Latin group" is left unchanged.

More information is supplied in the tables below in the Appendixes:

- Appendix C: The revised "current common secondary Group layout"
- Appendix E: List of diacritical marks
- Appendix F: List of peculiar characters

Appendix A: Notes on the Latin script variant "Fraktur" (Blackletter)

It is possible to enter Fraktur (Blackletter) when using a correctly designed Unicode compliant Fraktur font (unfortunately, almost all Fraktur fonts currently available are not Unicode compliant). The two characters needed beyond the usual Latin letters are ſ (the long s) and the "Tironian et" (U+204A; used only in the abbreviation ꝛ. "etc."; the "Tironian et" is often misnamed "r rotunda" as in Fraktur it has developed a form similar to that historic letter form).

Also, the hyphen - and the minus sign – have a definitely different appearance in Fraktur, and the "ASCII" hyphen-minus (U+002D, "dash") has to have the appearance of the hyphen - in Fraktur fonts due to its prevalent use, while the inclusion of the separate minus sign – (U+2212) is advisable for such fonts.

The German typesetting rules for Fraktur contain obligate ligatures, namely ſſ, ſſi, ſſl, ſſt, ſſu, ſſc, ſſi, ſſj, ſſt, ſſ. These ligatures may not be applied e.g. at the compound borders of compound words, e.g. in Brotzeit ("Brotzeit" = "bread time" = a kind of snack) the tz ligature ſſ is not allowed, while it is required in Katze ("Katze" = cat).

Correctly designed Unicode compliant Fraktur fonts generate such ligatures automatically (by OpenType or similar mechanisms) if the text contains the underlying character sequences, like it is mandatory anyway for other scripts like Arabic or Devanagari. As it is the case for these scripts, Unicode supplies the special invisible character ZWNJ (zero width non-joiner, U+200C) which is to be inserted at the places where ligating may not occur. Thus, for the example above, Brotzeit is to be typed "Brot[ZWNJ]zeit" (as long as no automatic spelling correction is active).

Note: The same applies also outside Fraktur, e.g. the German typesetting rules allow no "fi" ligature in "Schilfinsel" ("reed island") which therefore has to be entered as "Schilf[ZWNJ]insel" when using a "smart font".

As it is expected that such "smart fonts" become standard for Latin as they already are for Arabic and Devanagari, supplying separate characters for ligatures like fi and fl is considered obsolete anyway.

Appendix B: Summary of the character repertoire

This table lists the hexadecimal Unicode values of all characters which can be entered using the means defined in the revised ISO/IEC 9995-3.

0020-007E	0246-0249	0300-0304	1E2E-1E73	2122
00A0-0180	024C-024F	0306-0311	1E76-1E99	2126
018F	0259	0313	1E9B	214D
0197	0268	0315	1E9E	215B-215E
019A-019B	0272	031B	1EA0-1EF9	2190-2193
019D-01A1	0275	0323-0329	200C	219A-219B
01AF-01B0	027C	032D-032E	2011	2212
01B5-01B7	0289	0331-0332	2013-2015	2215
01CD-01DC	0292	0335	2018-201A	2260
01DE-01F0	0294	0338	201C-201E	2264-2265
01F4-01F5	02B7	0344	2026	226E-2271
01F8-021B	02B9-02BC	0347-0348	202F	2300
021E-0220	02BE-02C1	035C-0361	2032-2033	266A
0222-0223	02C7-02C8	1D7D	2039-203A	2C63
0226-0233	02CC-02CD	1DCD	204A	2C65-2C66
023A-023E	02D8-02DB	1E00-1E19	20A5	A788
0241-0244	02DD	1E1C-1E2B	20AC	A78B-A78C

Appendix C: The revised "current common secondary Group layout"

The background colors refer to Appendix D (Special considerations regarding the Canadian keyboard layout).

Pos.	Level 1 (unshifted)	Level 2 (shifted)	Level 3 (extra)
E00	7 U+204A tironian sign et	U+00AD soft hyphen	U+007C vertical line
E01 [1]	¹ U+00B9 superscript one	¡ U+00A1 inverted exclamation mark	´ U+02B9 modifier letter prime
E02 [2]	² U+00B2 superscript two	¤ U+00A4 currency sign	″ U+02BA modifier letter double prime
E03 [3]	³ U+00B3 superscript three	£ U+00A3 pound sign	ˆ U+02BF modifier letter left half ring
E04 [4]	¹ / ₄ U+00BC vulgar fraction one quarter	€ U+20AC euro sign	˘ U+02BE modifier letter right half ring
E05 [5]	¹ / ₂ U+00BD vulgar fraction one half	↑ U+2191 upwards arrow	ʘ U+02C1 modifier letter reversed glottal stop
E06 [6]	³ / ₄ U+00BE vulgar fraction three quarters	↓ U+2193 downwards arrow	? U+02C0 modifier letter glottal stop
E07 [7]	¹ / ₈ U+215B vulgar fraction one eighth	← U+2190 leftwards arrow	{ U+007B left curly bracket
E08 [8]	³ / ₈ U+215C vulgar fraction three eighths	→ U+2192 rightwards arrow	} U+007D right curly bracket
E09 [9]	⁵ / ₈ U+215D vulgar fraction five eighths	± U+00B1 plus-minus sign	[U+005B left square bracket
E10 [0]	⁷ / ₈ U+215E vulgar fraction seven eighths	™ U+2122 trade mark sign] U+005D right square bracket
E11	\ U+005C reverse solidus	¿ U+00BF inverted question mark	ˆ U+02BB modifier letter turned comma
E12	◌̣ U+0327 combining cedilla	◌̣ U+0328 combining ogonek	¬ U+00AC not sign
D01 [Q]	ɀ U+0242 latin small letter glottal stop	Ɔ U+0241 latin capital letter glottal stop	◌̇ U+030D combining vertical line above
D02 [W]	^w U+02B7 modifier letter small w	Ω U+2126 ohm sign	◌̇ U+0307 combining dot above
D03 [E]	œ U+0153 latin small ligature oe	Œ U+0152 latin capital ligature oe	◌̆ U+0306 combining breve
D04 [R]	¶ U+00B6 pilcrow sign	® U+00AE registered sign	◌̂ U+0302 combining circumflex accent
D05 [T]	ˆ U+A78C latin small letter saltillo	ˆ U+A78B latin capital letter saltillo	◌̈ U+0308 combining diaeresis
D06 [Y]	ɀ U+027C latin small letter r with long leg	¥ U+00A5 yen sign	◌̆ U+0311 combining inverted breve
D07 [U]	ø U+0223 latin small letter ou	Ø U+0222 latin capital letter ou	◌̇ U+030C combining caron
D08 [I]	ı U+0131 latin small letter dotless i	Å U+214D aktieselskab	◌̇ U+0313 combining comma above
D09 [O]	ø U+00F8 latin small letter o with stroke	Ø U+00D8 latin capital letter o with stroke	◌̆ U+031B combining horn
D10 [P]	þ U+00FE latin small letter thorn	Þ U+00DE latin capital letter thorn	◌̆ U+0309 combining hook above
D11	ſ U+017F latin small letter long s	◌̇ U+030A combining ring above	◌̇ U+0300 combining grave accent
D12	◌̃ U+0303 combining tilde	◌̄ U+0304 combining macron	@ U+0040 commercial at
C01 [A]	æ U+00E6 latin small letter ae	Æ U+00C6 latin capital letter ae	◌̇ U+0329 combining vertical line below
C02 [S]	ß U+00DF latin small letter sharp s	§ U+00A7 section sign	◌̇ U+0323 combining dot below
C03 [D]	ð U+00F0 latin small letter eth	Ð U+00D0 latin capital letter eth	◌̆ U+032E combining breve below
C04 [F]	Ɔ U+0294 latin letter glottal stop	^a U+00AA feminine ordinal indicator	◌̂ U+032D combining circumflex accent below
C05 [G]	ŋ U+014B latin small letter eng	Ŋ U+014A latin capital letter eng	◌̆ U+0331 combining macron below
C06 [H]	ɥ U+0272 latin small letter h with left hook	Ɔ U+019D latin capital letter h with left hook	◌̆ U+0332 combining low line
C07 [J]	ij U+0133 latin small ligature ij	IJ U+0132 latin capital ligature ij	◌̇ U+0325 combining ring below
C08 [K]	Ɔ U+0138 latin small letter kra	◌̇ U+0325 combining comma below	◌̆ U+0335 combining short stroke overlay
C09 [L]	ł U+0142 latin small letter l with stroke	Ł U+0141 latin capital letter l with stroke	◌̆ U+0338 combining long solidus overlay
C10	◌̇ U+0301 combining acute accent	◌̈ U+030B combining double acute accent	° U+00B0 degree sign
C11	λ U+019B latin small letter lambda with stroke	ß U+1E9E latin capital letter sharp s	´ U+2032 prime
C12	ə U+0259 latin small letter schwa	Ə U+018F latin capital letter schwa	″ U+2033 double prime
B00	ˆ U+0149 latin small letter n preceded by apostrophe	ı U+00A6 broken bar	♪ U+266A eighth note
B01 [Z]	Ɔ U+0292 latin small letter ezh	Ɔ U+01B7 latin capital letter ezh	◌◌ U+00AB left-pointing double angle quotation mark

B02 [X]	„ U+201E double low-9 quotation mark	, U+201A single low-9 quotation mark	» U+00BB right-pointing double angle quotation mark
B03 [C]	¢ U+00A2 cent sign	© U+00A9 copyright sign	— U+2015 horizontal bar
B04 [V]	“ U+201C left double quotation mark	‘ U+2018 left single quotation mark	◁ U+2039 single left-pointing angle quotation mark
B05 [B]	” U+201D right double quotation mark	’ U+2019 right single quotation mark	▷ U+203A single right-pointing angle quotation mark
B06 [N]	ŋ U+019E latin small letter n with long right leg	Ŋ U+0220 latin capital letter n with long right leg	— U+2013 en dash
B07 [M]	μ U+00B5 micro sign	º U+00BA masculine ordinal indicator	— U+2014 em dash
B08	… U+2026 horizontal ellipsis	× U+00D7 multiplication sign	\$ U+0024 dollar sign
B09	• U+00B7 middle dot	÷ U+00F7 division sign	# U+0023 number sign
B10	ł U+0140 latin small letter l with middle dot	Ł U+013F latin capital letter l with middle dot	- U+2011 non-breaking hyphen
A03	U+202F narrow no-break space	U+200C zero width non-joiner	U+00A0 no-break space

Appendix D: Special considerations regarding the Canadian standard keyboard

The meaning of the background colors in the previous table (Appendix D) is as follows, related to the present Canadian standard keyboard as those in fact sold are engraved:

already assigned to that key in the secondary group at the same level (unshifted/shifted)
already assigned to that key in the primary group at Level 3
another character is assigned to that key in the primary group at Level 3, while this character is assigned to another key in the primary group at Level 1 or 2 (i.e. at the ordinary unshifted or shifted level)
a similar looking character is assigned to that key in the secondary group at the same level (compatible with the engraving)
this character is also assigned to another key in the primary group at Level 1 or 2 (i.e. at the ordinary unshifted or shifted level)
a spacing variant of this diacritical mark is also assigned to another key in the primary group at Level 1 or 2
already assigned to that key in the secondary group at the same level (unshifted/shifted), while a spacing variant of this diacritical mark is also assigned to that key in the primary group at Level 3

By these assignments, the "common secondary group layout" is completely compatible to the engravings on the current Canadian keyboards (which use a Level 3 for the primary group but none for the secondary group, as such is not needed with the present version of ISO/IEC 9995-3).

It is even possible to map all Level 3 associations of the secondary group to the Level 3 associations of the primary group, as for all positions occupied by engravings in Level 3 of the primary group applies: The according position in Level 3 of the secondary group is either assigned to the same character [light red marking], or [dark red marking] it is assigned to a character which is already assigned to some place in the primary group at Level 1 or 2 (i.e. at the ordinary unshifted or shifted level); in the latter case, this character does not need to be duplicated in Level 3 of the secondary group.

Thus, the current common secondary group layout may be implemented in full without supplying any new special key combinations to access Level 3 of the secondary group.

Appendix E: List of diacritical marks

Name as combining character	Name when applied to space (if applicable)
◌́ U+0301 combining acute accent	´ U+00B4 acute accent
◌̃ U+0306 combining breve	˘ U+02D8 breve
◌̂ U+030C combining caron	ˇ U+02C7 caron
◌̣ U+0327 combining cedilla	¸ U+00B8 cedilla
◌̂ U+0302 combining circumflex accent	^ U+005E circumflex accent
◌̈ U+0308 combining diaeresis	¨ U+00A8 diaeresis
◌̇ U+0307 combining dot above	˙ U+02D9 dot above
◌̈́ U+030B combining double acute accent	˝ U+02DD double acute accent
◌̀ U+0300 combining grave accent	` U+0060 grave accent
◌̄ U+0304 combining macron	¯ U+00AF macron
◌̇ U+0328 combining ogonek	˛ U+02DB ogonek
◌̆ U+030A combining ring above	˚ U+02DA ring above

◌̄ U+0331 combining macron below	◌̄ U+0331 combining macron below	◌̄ U+0347 combining equals sign below
◌̅ U+0332 combining low line	◌̅ U+0332 combining low line	◌̅◌̅ U+035F combining double macron below
◌̆ U+0335 combining short stroke overlay	b U+0062 latin small letter b	ḃ U+0180 latin small letter b with stroke
◌̆ U+0335 combining short stroke overlay	B U+0042 latin capital letter b	Ḃ U+0243 latin capital letter b with stroke
◌̆ U+0335 combining short stroke overlay	d U+0064 latin small letter d	ḏ U+0111 latin small letter d with stroke
◌̆ U+0335 combining short stroke overlay	D U+0044 latin capital letter d	Ḑ U+0110 latin capital letter d with stroke
◌̆ U+0335 combining short stroke overlay	g U+0067 latin small letter g	ḡ U+01E5 latin small letter g with stroke
◌̆ U+0335 combining short stroke overlay	G U+0047 latin capital letter g	Ḡ U+01E4 latin capital letter g with stroke
◌̆ U+0335 combining short stroke overlay	h U+0068 latin small letter h	ḣ U+0127 latin small letter h with stroke
◌̆ U+0335 combining short stroke overlay	H U+0048 latin capital letter h	Ḣ U+0126 latin capital letter h with stroke
◌̆ U+0335 combining short stroke overlay	i U+0069 latin small letter i	ḥ U+0268 latin small letter i with stroke
◌̆ U+0335 combining short stroke overlay	I U+0049 latin capital letter i	Ḧ U+0197 latin capital letter i with stroke
◌̆ U+0335 combining short stroke overlay	j U+006A latin small letter j	ḵ U+0249 latin small letter j with stroke
◌̆ U+0335 combining short stroke overlay	J U+004A latin capital letter j	Ḵ U+0248 latin capital letter j with stroke
◌̆ U+0335 combining short stroke overlay	l U+006C latin small letter l	ḷ U+019A latin small letter l with bar
◌̆ U+0335 combining short stroke overlay	L U+004C latin capital letter l	Ḷ U+023D latin capital letter l with bar
◌̆ U+0335 combining short stroke overlay	o U+006F latin small letter o	ɵ U+0275 latin small letter barred o
◌̆ U+0335 combining short stroke overlay	O U+004F latin capital letter o	Θ U+019F latin capital letter o with middle tilde
◌̆ U+0335 combining short stroke overlay	p U+0070 latin small letter p	ḹ U+01D7D latin small letter p with stroke
◌̆ U+0335 combining short stroke overlay	P U+0050 latin capital letter p	Ḹ U+02C63 latin capital letter p with stroke
◌̆ U+0335 combining short stroke overlay	r U+0072 latin small letter r	ṙ U+024D latin small letter r with stroke
◌̆ U+0335 combining short stroke overlay	R U+0052 latin capital letter r	Ṛ U+024C latin capital letter r with stroke
◌̆ U+0335 combining short stroke overlay	t U+0074 latin small letter t	ṛ U+0167 latin small letter t with stroke
◌̆ U+0335 combining short stroke overlay	T U+0054 latin capital letter t	Ṛ U+0166 latin capital letter t with stroke
◌̆ U+0335 combining short stroke overlay	u U+0075 latin small letter u	ṣ U+0289 latin small letter u bar
◌̆ U+0335 combining short stroke overlay	U U+0055 latin capital letter u	Ṫ U+0244 latin capital letter u bar
◌̆ U+0335 combining short stroke overlay	y U+0079 latin small letter y	ẏ U+024F latin small letter y with stroke
◌̆ U+0335 combining short stroke overlay	Y U+0059 latin capital letter y	Ỳ U+024E latin capital letter y with stroke
◌̆ U+0335 combining short stroke overlay	Z U+007A latin small letter z	Ẓ U+01B6 latin small letter z with stroke
◌̆ U+0335 combining short stroke overlay	Z U+005A latin capital letter z	Ẑ U+01B5 latin capital letter z with stroke
◌̇ U+0338 combining long solidus overlay	a U+0061 latin small letter a	ḁ U+02C65 latin small letter a with stroke
◌̇ U+0338 combining long solidus overlay	A U+0041 latin capital letter a	Ḃ U+023A latin capital letter a with stroke
◌̇ U+0338 combining long solidus overlay	c U+0063 latin small letter c	ḥ U+023C latin small letter c with stroke
◌̇ U+0338 combining long solidus overlay	C U+0043 latin capital letter c	Ḧ U+023B latin capital letter c with stroke
◌̇ U+0338 combining long solidus overlay	e U+0065 latin small letter e	ḵ U+0247 latin small letter e with stroke
◌̇ U+0338 combining long solidus overlay	E U+0045 latin capital letter e	Ḷ U+0246 latin capital letter e with stroke
◌̇ U+0338 combining long solidus overlay	l U+006C latin small letter l	ḷ U+0142 latin small letter l with stroke
◌̇ U+0338 combining long solidus overlay	L U+004C latin capital letter l	Ḹ U+0141 latin capital letter l with stroke
◌̇ U+0338 combining long solidus overlay	m U+006D latin small letter m	ṡ U+020A5 mill sign
◌̇ U+0338 combining long solidus overlay	o U+006F latin small letter o	ø U+00F8 latin small letter o with stroke
◌̇ U+0338 combining long solidus overlay	O U+004F latin capital letter o	Ø U+00D8 latin capital letter o with stroke
◌̇ U+0338 combining long solidus overlay	t U+0074 latin small letter t	ṛ U+02C66 latin small letter t with diagonal stroke
◌̇ U+0338 combining long solidus overlay	T U+0054 latin capital letter t	Ṛ U+023E latin capital letter t with diagonal stroke
◌̇ U+0338 combining long solidus overlay	= U+003D equals sign	≠ U+2260 not equal to
◌̇ U+0338 combining long solidus overlay	° U+00B0 degree sign	∅ U+2300 diameter sign

Appendix G: C++ code snippets (to be copied and pasted into a keyboard driver's source code)

```
enum Keypos { PDSundef, // Key positions according to ISO/IEC 9995-1
E99, E00, E01, E02, E03, E04, E05, E06, E07, E08, E09, E10, E11, E12, E13, E14,
D99, D00, D01, D02, D03, D04, D05, D06, D07, D08, D09, D10, D11, D12, D13, D14,
C99, C00, C01, C02, C03, C04, C05, C06, C07, C08, C09, C10, C11, C12, C13, C14,
B99, B00, B01, B02, B03, B04, B05, B06, B07, B08, B09, B10, B11, B12, B13, B14,
A99, A00, A01, A02, A03, A04, A05, A06, A07, A08, A09, A10, A11, A12, A13, A14};

class Entry1 { public: Keypos pp; wchar_t l1; wchar_t l2; wchar_t l3; };
static const Entry1 entry1[] = { // common secondary group of ISO/IEC 9995-3:2010 (FDIS)
#define key2( pp, l1, l2, l3) pp, 0x##l1, 0x##l2, 0x##l3,
key2 (E00, 204A, 00A0, 007C) // 1
key2 (E01, 0089, 00A1, 02B9) // 2
key2 (E02, 0082, 00A4, 02BA) // 3
key2 (E03, 0083, 00A3, 02BF) // 4
key2 (E04, 008C, 00A2, 02BE) // 5
key2 (E05, 0080, 2191, 02C1) // 6
key2 (E06, 008E, 2193, 02C0) // 7
key2 (E07, 2158, 2190, 007B) // 8
key2 (E08, 215C, 2192, 007D) // 9
key2 (E09, 215D, 0081, 005E) // 0
key2 (E10, 215E, 2122, 005D) // 0
key2 (E11, 005C, 008F, 02BB)
key2 (E12, 0127, 0126, 00AC)
key2 (D01, 0242, 0241, 0300) // Q
key2 (D02, 0287, 2126, 0307) // W
key2 (D03, 0153, 0152, 0306) // E
key2 (D04, 0086, 00A5, 0302) // R
key2 (D05, A78C, A78B, 0308) // T
key2 (D06, 027C, 00A5, 0311) // Y
key2 (D07, 0223, 0222, 030C) // U
key2 (D08, 0131, 2140, 0313) // I
key2 (D09, 00F8, 00A8, 0316) // O
key2 (D10, 00FE, 00DE, 0309) // P
key2 (D11, 017F, 030A, 0300)
key2 (D12, 0303, 0304, 00A0)
key2 (C01, 00E6, 00C6, 0329) // A
key2 (C02, 000F, 00A7, 0323) // S
key2 (C03, 00F9, 00D0, 032E) // D
key2 (C04, 0024, 00A4, 032D) // F
key2 (C05, 0148, 014A, 0331) // G
key2 (C06, 0272, 0190, 0332) // H
key2 (C07, 0133, 0132, 0335) // J
key2 (C08, 0138, 0326, 0335) // K
key2 (C09, 0142, 0141, 0338) // L
key2 (C10, 0301, 0308, 00A0)
key2 (C11, 0198, 1E9E, 2032)
key2 (C12, 0259, 018F, 2033) // on D13
key2 (B00, 0149, 00A6, 20A4) // on E13
key2 (B01, 0292, 0187, 00A8) // Z
key2 (B02, 201E, 201A, 00B0) // X
key2 (B03, 00A2, 00A9, 2015) // C
key2 (B04, 201C, 2018, 2039) // V
key2 (B05, 201D, 2019, 203A) // B
key2 (B06, 019E, 0120, 0315) // N
key2 (B07, 0085, 008A, 2014) // M
key2 (B08, 2026, 0007, 0024)
key2 (B09, 0007, 00F7, 0023)
key2 (B10, 0140, 013F, 2011)
key2 (A03, 202F, 200C, 00A0)
#undef csg
(Keypos) 0, 0, 0, 0 };

// diacritical marks and the characters when applied to SPACE
// #define dia( a, b) ... 0x##a, 0x##b, ...
dia (0301, 0084); // acute accent
dia (0306, 0208); // breve
dia (030C, 027C); // caron
dia (0327, 0088); // cedilla
dia (0302, 005E); // circumflex accent
dia (0308, 00A8); // diaeresis
dia (0307, 0209); // dot above
dia (0308, 020D); // double acute accent
dia (0306, 0060); // grave accent
dia (0304, 00AF); // macron
dia (0328, 0208); // ogonek
dia (030A, 02A1); // ring above
dia (0303, 007E); // tilde
dia (032E, 0000); // breve below
dia (0318, 0000); // carabaindu
dia (032D, A788); // circumflex accent below
dia (0313, 02BC); // comma above
dia (0315, 0000); // comma above right
dia (0326, 0000); // comma below
dia (0324, 0000); // diaeresis below
dia (0325, 0000); // dot below
dia (0320, 0000); // double breve
dia (035C, 0000); // double breve below
dia (030F, 0000); // double grave accent
dia (0361, 0000); // double inverted breve
dia (035E, 0000); // double macron
dia (035F, 0000); // double macron below
dia (0360, 0000); // double tilde
dia (030E, 0000); // double vertical line above
dia (0348, 0000); // double vertical line below
dia (0347, 0000); // equals sign below
dia (0309, 0000); // hook above
dia (0318, 0000); // horn
dia (0311, 0000); // inverted breve
dia (0338, 2215); // long solidus overlay
dia (0332, 0000); // low line
dia (0331, 02CD); // macron below
dia (0325, 0000); // ring below
dia (0335, 2212); // short stroke overlay
dia (0300, 02CC); // vertical line above
dia (0329, 02CC); // vertical line below

// peculiar characters
// #define pec( firstinput, secondinput, resultchar) ...
#define pec1( a, b, c) pec (0x##a, b, 0x##c)
#define pec2( a, b, c) pec (0x##a, 0x##b, 0x##c)
pecx (0300, 0300, 0300);
pecx (0302, 0302, 10CD);
pecx (0303, 0303, 0360);
pecx (0304, 0304, 035E);
pecx (0306, 0306, 035D);
pecx (0307, 0306, 0310);
pecx (0300, 0300, 0300);
pecx (0311, 0311, 0361);
pecx (0313, 0313, 0315);
pecx (0323, 0323, 0324);
pecx (0329, 0329, 0348);
pecx (032E, 032E, 035C);
pec1 (0331, 'c', 226A);
pec1 (0331, 'v', 2265);
pecx (0331, 0331, 0347);
pecx (0332, 0332, 035F);
pec1 (0335, 'b', 0180);
pec1 (0335, 'b', 0243);
pec1 (0335, 'd', 0111);
pec1 (0335, 'd', 0140);
pec1 (0335, 'g', 01E5);
pec1 (0335, 'g', 01E4);
pec1 (0335, 'h', 0127);
pec1 (0335, 'h', 0126);
pec1 (0335, 'i', 0268);
pec1 (0335, 'i', 0197);
pec1 (0335, 'j', 0249);
pec1 (0335, 'j', 0248);
pec1 (0335, 'l', 019A);
pec1 (0335, 'l', 023D);
pec1 (0335, 'o', 0275);
pec1 (0335, 'o', 0199);
pec1 (0335, 'p', 107D);
pec1 (0335, 'p', 2C63);
pec1 (0335, 'r', 02A0);
pec1 (0335, 'r', 024C);
pec1 (0335, 't', 0167);
pec1 (0335, 't', 0166);
pec1 (0335, 'u', 0289);
pec1 (0335, 'u', 0244);
pec1 (0335, 'y', 0247);
pec1 (0335, 'y', 0241);
pec1 (0335, 'z', 0186);
pec1 (0335, 'z', 0185);
pec1 (0338, 'a', 2C65);
pec1 (0338, 'A', 023A);
pec1 (0338, 'c', 023C);
pec1 (0338, 'c', 023B);
pec1 (0338, 'e', 0247);
pec1 (0338, 'e', 0246);
pec1 (0338, 'l', 0142);
pec1 (0338, 'l', 0141);
pec1 (0338, 'm', 20A5);
pec1 (0338, 'o', 00F8);
pec1 (0338, 'o', 0008);
pec1 (0338, 't', 2C66);
pec1 (0338, 't', 023A);
pec1 (0338, 'v', 2260);
pecx (0338, 0000, 2300);
```