TIPA: a System for Processing Phonetic Symbols in LaTeX

FUKUI Rei *

Department of Asian and Pacific Linguistics
Faculty of Letters
University of Tokyo

June 24, 1996

1 Introduction

TIPA[1] is a system for processing IPA (International Phonetic Alphabet) symbols in LaTeX. It is based on TSIPA[2] but both METAFONT source codes and LaTeX macros have been thoroughly rewritten so that it can be considered as a new system.

Among many features of TIPA, the following are the new features as compared with TSIPA or any other existing systems for processing IPA symbols.

- A new 256 character encoding for phonetic symbols ('T3'), which includes all the symbols and diacritics found in the recent versions of IPA and some non-IPA symbols.

- Complete support of LaTeX 2_ε.

- Roman, slanted, bold, bold extended and sans serif font styles.

- Easy input method in the IPA environment.

- Extended macros for accents and diacritics.[3]

- A flexible system of macros for 'tone letters'.

**fkr@tooyoo.l.u-tokyo.ac.jp

[1] TIPA stands for *TeX IPA* or *Tokyo IPA*. The primary ftp site in which the latest version of TIPA is placed is `ftp://tooyoo.L.u-tokyo.ac.jp/pub/TeX/tipa`, and also it is mirrored onto the directory `fonts/tipa` of the CTAN archives.

[2] TSIPA was made in 1992 by Kobayashi Hajime, Fukui Rei and Shirakawa Shun. It is available from a CTAN archive.

One problem with TSIPA was that symbols already included in `OT1`, `T1` or Math fonts are excluded, because of the limitation of its 128 character encoding. As a result, a string of phonetic representation had to be often composed of symbols from different fonts, disabling the possibility of automatic inter-word kerning. And also too many symbols had to be realized as macros.

[3] These macros are now defined in a separate file called '`exaccent.sty`' in order for the authors of other packages to be able to make use of them. The idea of separating these macros from other ones was suggested by Frank Mittelbach.

- An optional package (`vowel.sty`) for drawing vowel diagrams.[4]
- A slightly modified set of fonts that go well when used with Times Roman and Helvetica fonts.

2 TIPA Encoding

2.1 Selection of symbols

The selection of TIPA phonetic symbols[5] was made based on the following works.

- *Phonetic Symbol Guide* [9] (henceforth abbreviated as *PSG*).
- The official IPA charts of '49, '79, '89 and '93 versions.
- Recent articles published in the *JIPA*[6], such as "Report on the 1989 Kiel Convention" [6], "Further report on the 1989 Kiel Convention" [7], "Computer Codes for Phonetic Symbols" [3], "Council actions on revisions of the IPA" [8], etc.
- An unpublished paper by J. C. Wells: "Computer-coding the IPA: a proposed extension of SAMPA" [10].
- Popular textbooks on phonetics.

More specifically, TIPA contains all the symbols, including diacritics, defined in the '79, '89 and '93 versions of IPA. And in the case of the '49 version of IPA, which is described in the *Principles* [5], there are too many obsolete symbols and only those symbols that had had some popularity at least for some time or for some group of people are included.

Besides IPA symbols, TIPA also contains symbols that are useful for the following areas of phonetics and linguistics.

- Symbols used in the American phonetics (e.g. œ, ɛ, ɷ, λ, etc.).
- Symbols used in the historical study of Indo-European languages (e.g. þ, ƥ, ƕ, ȥ, ƀ, ъ, and accents such as á̄, ĕ, etc.).
- Symbols used in the phonetic description of languages in East Asia (e.g. ɿ, ʮ, ȡ, ȵ, ʨ, etc.).
- Diacritics used in 'extIPA Symbols for Disordered Speech' [4] and 'VoQS (Voice Quality Symbols)' [1] (e.g. n̪͆, f̬, m̋, etc).

It should be also noted that TIPA includes all the necessary elements of 'tone letters', enabling all the theoretically possible combinations of the tone letter system. In the recent publication of the International Phonetic Association tone letters are admitted as an official way of representing tones but the treatment of tone letters is quite insufficient in that only a limited number of combination is allowed. This is apparently due to the fact that there has been no 'portable' way of combining symbols that can be used across various computer environments.

---

[4]This package (`vowel.sty`) can be used independently from the TIPA package. Documentation is also made separately in '`vowel.tex`' so that no further mention will be made here.

[5]In the case of TSIPA, the selection of symbols was based on "Computer coding of the IPA: Supplementary Report" [2].

[6]*Journal of the International Phonetic Association.*

	'0	'1	'2	'3	'4	'5	'6	'7
'00x								
'04x	Accents and diacritics							
'05x	Punctuation marks							
'06x	Basic IPA symbols I (vowels)							
'07x			Diacritics, etc.					
'10x								
'13x	Basic IPA symbols II			Diacritics, etc.				
'14x	Punct.	Basic IPA symbols III (lowercase letters)						
'17x								Diacritics
'20x								
'23x	Tone letters and other suprasegmentals							
'24x								
'27x	Old IPA, non-IPA symbols							
'30x	Extended IPA symbols							
'33x							Germanic	
'34x	Basic IPA symbols IV							
'37x							Germanic	

Table 1: Layout of the T3 encoding

Therefore TEX's productive system of macro is an ideal tool for handling a system like tone letters.

In the process of writing METAFONT source codes for TIPA phonetic symbols there have been many problems besides the one with the selection of symbols. One of such problems was that sometimes the exact shape of a symbol was unclear. For example, the shapes of the symbols such as ʗ (Stretched C), ʝ (Curly-tail J) differ according to sources. This is partly due to the fact that the IPA has been continuously revised for the past few decades, and partly due to the fact that different ways of computerizing phonetic symbols on different systems have resulted in the diversity of the shapes of phonetic symbols.

Although there is no definite answer to such a problem yet, it seems to me that it is a privilege of those working with METAFONT to have a systematic way of controlling the shapes of phonetic symbols.

3

2.2 Encoding

The 256 character encoding of TIPA is now officially called the 'T3' encoding.[7] In deciding this new encoding, care is taken to harmonize with existing other encodings, especially with the T1 encoding. Also the easiness of inputting phonetic symbols is taken into consideration in such a way that frequently used symbols can be input with small number of keystrokes.

Table 1 shows the layout of the T3 encoding.

The basic structure of the encoding found in the first half of the table (character codes '000–'177) is based on normal text encodings (ASCII, OT1 and T1) in that sectioning of this area into several groups such as the section for accents and diacritics, the section for punctuation marks, the section for numerals, the sections for uppercase and lowercase letters is basically the same with these encodings.

Note also that the T3 encoding contains not only phonetic symbols but also usual punctuation marks that are used with phonetic symbols, and in such cases the same codes are assigned as the normal text encodings. However it is a matter of trade-off to decide which punctuation marks are to be included. For example ':' and ';' might have been preserved in T3 but in this case ':' has been traditionally used as a substitute for the length mark 'ː' so that I decided to exclude ':' in favor of the easiness of inputting the length mark by a single keystroke.

The encoding of the section for accents and diacritics is closely related to T1 in that the accents commonly included in T1 and T3 have the same encoding.

The sections for numerals and uppercase letters are filled with phonetic symbols that are used frequently in many languages, because numerals and uppercase letters are usually not used as phonetic symbols. And the assignments made here are used as the 'shortcut characters', which will be explained in the section entitled "Ordinary phonetic symbols" (page 8).

As for the section for uppercase letters in the usual text encoding, a series of discussion among the members of the ling-tex mailing list revealed that there seem to be a certain amount of consensus on what symbols are to be assigned to each code. For example they were almost unanimous for the assignments such as ɑ for A, β for B, ð for D, ʃ for S, θ for T, etc. For more details, see table 2.

The encoding of the section for numerals was more difficult than the above case. One of the possibilities was to assign symbols based on the resemblance of shapes. One can easily think of assignments such as ʒ for 3 ɓ for 6, etc. But the resemblance of shape alone does not serve as a criteria for all the assignments. So I decided to assign basic vowel symbols to this section.[8] Fortunately the resemblance of shape is to some extent maintained as is shown in table 2.

The encoding of the section for lowercase letters poses no problem since they are all used as phonetic symbols. Only one symbol, namely 'g', needs some attention because its shape should be 'ɡ', rather than 'g', as a phonetic symbol.[9]

The second half of the table (character codes '200–'377) is divided into four sections. The first section is devoted to the elements of tone letters and other suprasegmental symbols.

---

[7] In a discussion with the LaTeX 2ε team it was suggested that the 128 character encoding used in WSUIPA would be refered to as the OT3 encoding.

[8] This idea was influenced by the above mentioned article by J. C. Wells [10].

[9] But the alternative shape 'g' is preserved in other section and can be used as \textg.

ASCII										
ASCII	:	;	"							
TIPA	ː	ˑ	ˈ							
ASCII	0	1	2	3	4	5	6	7	8	9
TIPA	ʉ	ɨ	ʌ	ɜ	ɥ	ʁ	ɒ	ɤ	ɵ	ɘ
ASCII	@	A	B	C	D	E	F	G	H	I
TIPA	ə	ɑ	β	ç	ð	ɛ	ɸ	ɣ	ɦ	ɪ
ASCII	J	K	L	M	N	O	P	Q	R	S
TIPA	ɟ	ʁ	ʎ	ɱ	ŋ	ɔ	ʔ	ʕ	ɾ	ʃ
ASCII	T	U	V	W	X	Y	Z	|			
TIPA	θ	ʊ	ʋ	ɯ	χ	ʏ	ʒ	|			

Table 2: TIPA shortcut characters

Among the remaining three sections the last section '340–'377 contains more basic symbols than the other two sections. This is a result of assigning the same character codes as latin-1 (ISO8859-1) and T1 encodings to the symbols that are commonly included in TIPA, latin-1 and T1 encoded fonts.[10] These are the cases of æ, ø, œ, ç and þ. And within each section symbols are arraneged largely in alphabetical order.

For a table of the T3 encoding, see Appendix C (page 41).

3 Installation

First, copy all the package and font description files (`tipa.sty`, `tone.sty`, `vowel.sty`, `*.fd`, `*.def`) to a directory which TeX programs can find. In an ordinary Unix environment, it is recommended to create a directory such as `/usr/local/lib/texmf/tex/tipa` and copy all these files into this directory.

```
mkdir /usr/local/lib/texmf/tex/tipa
cp tipa.sty tone.sty vowel.sty /usr/local/lib/texmf/tex/tipa
cp *.fd *.def /usr/local/lib/texmf/tex/tipa
```

Next, copy all the TFM files to a directory which TeX and device driver programs can find.

```
mkdir /usr/local/lib/texmf/fonts/public/tipa
mkdir /usr/local/lib/texmf/fonts/public/tipa/tfm
cp *.tfm /usr/local/lib/texmf/fonts/public/tipa/tfm
```

It is also recommended to copy all the METAFONT source files into an appropriate directory.

```
mkdir /usr/local/lib/texmf/fonts/public/tipa/src
cp *.mf /usr/local/lib/texmf/fonts/public/tipa/src
```

The final step of installation is that of PK font files. This procedure may differ according to the user's computer environment.

---

[10] This is based on a suggestion by Jörg Knappen.

Magnification	font name
(mag=1)	tipa8, tipa9, tipa10, tipa12,
	tipasl8, tipasl9, tipasl10, tipasl12,
	tipabx8, tipabx9, tipabx10, tipabx12,
	tipass8, tipass9, tipass10, tipass12
mag=5/8	tipa8, tipasl8, tipabx8, tipass8
mag=6/8	tipa8, tipasl8, tipabx8, tipass8
mag=7/8	tipa8, tipasl8, tipabx8, tipass8
mag=magstep.5	tipa10, tipasl10, tipabx10, tipass10
mag=magstep1	tipa12, tipasl12, tipabx12, tipass12
mag=magstep2	tipa12, tipasl12, tipabx12, tipass12
mag=magstep3	tipa12, tipasl12, tipabx12, tipass12
mag=magstep4	tipa12, tipasl12, tipabx12, tipass12

Table 3: Full set of TIPA fonts

For users unfamiliar with running METAFONT programs, it is possible to get pre-compiled PK font files from ftp sites. In this case, just copy them to an appropriate directory.

```
mkdir /usr/local/lib/texmf/fonts/public/tipa/pk
mkdir /usr/local/lib/texmf/fonts/public/tipa/pk/your_mode_name
cp *pk /usr/local/lib/texmf/fonts/public/tipa/pk/your_mode_name
```

If you make PK fonts by yourself, generate fonts shown in table 3 by the METAFONT program.

The bold font `tipab10` and fonts of `xipa` family are not included in this table. Make PK files for these fonts by yourself if you need them.

In the Unix environment, all these fonts can be automatically generated by running the shell script `makepk1.sh`. And a set of `xipa` family fonts can be generated by running the shell script `makepk2.sh`.

Also, if you are using `MakeTeXPK`, it is not necessary to generate all these size variations at once.

4   TIPA fonts

This version of TIPA includes two families of IPA fonts, `tipa` and `xipa`. The former family of fonts is for normal use with LaTeX, and the latter family is intended to be used with 'times.sty'(PSNFSS). They all have the same T3 encoding as explained in the previous section.

- `tipa`

  Roman: tipa8, tipa9, tipa10, tipa12, tipa17

  Slanted: tipasl8, tipasl9, tipasl10, tipasl12

  Bold extended: tipabx8, tipabx9, tipabx10, tipabx12

  Sans serif: tipass8, tipass9, tipass10, tipass12, tipass17

  Bold: tipab10

6

- xipa

  Roman: `xipa10`
  Slanted: `xipasl10`
  Bold: `xipab10`
  Sans serif: `xipass10`

All these fonts are made by METAFONT, based on the Computer Modern font series. In the case of the `xipa` series, parameters are adjusted so as to look fine when used with Times Roman (in the cases of `xipa10`, `xipasl10`, `xipab10`) and Helvetica (in the case of `xipass10`).

5 Usage

5.1 Declaration of **TIPA** package

In order to use TIPA, first declare TIPA package at the preamble of a document.

```
\documentclass{article}
\usepackage{tipa}
```

5.2 Encoding options

The above declaration uses `OT1` as the default text encoding. If you want to use TIPA symbols with `T1`, specify the option 'T1'.

```
\documentclass{article}
\usepackage[T1]{tipa}
```

If you want to use a more complex form of encoding, declare the use of `fontenc` package by yourself and specify the option 'noenc'. In this case the option 'T3', which represents the TIPA encoding, must be included as an option to the `fontenc` package. For example, if you want to use TIPA and the University Washington Cyrillic (`OT2`) with the `T1` text encoding, the following command will do this.

```
\documentclass{article}
\usepackage[T3,OT2,T1]{fontenc}
\usepackage[noenc]{tipa}
```

By default, TIPA includes the `fontenc` package internally but the option `noenc` suppresses this.

5.3 Using **TIPA** with **PSNFSS**

In order to use TIPA with `times.sty`, declare the use of `times.sty` before declaring `tipa` packages.

```
\documentclass{article}
\usepackage{times}
\usepackage{tipa}
```

Font description files `T3ptm.fd` and `T3phv.fd` are automatically loaded by the above declaration.

5.4   Other options

TIPA can be extended by the options `tone`, `extra`.

If you want to use the optional package for 'tone letters', add '`tone`' option to the \usepackage command that declares `tipa` package.

    \usepackage[tone]{tipa}

And if you want to use diacritics for extIPA and VoQS, specify '`extra`' option.

    \usepackage[extra]{tipa}

Finally there is one more option called '`safe`', which is used to suppress definitions of some possibly 'dangerous' commands of TIPA.

    \usepackage[safe]{tipa}

More specifically, the following commands are suppressed by declaring the `safe` option. Explanation on the function of each command will be given later.

- \s (equivalent to \textsyllabic)
- * (already defined in plain TeX)
- \|, \:, \;, \! (already defined in LaTeX)

6   Input Commands for Phonetic Symbols

6.1   Ordinary phonetic symbols

TIPA phonetic symbols can be input by the following two ways.

(1) Input macro names in the normal text environment.

(2) Input macro names or *shortcut characters* within the follwoing groups or environment.

   - \textipa{...}[11]
   - {\tipaencoding ...}
   - \begin{IPA} ... \end{IPA}

   (These groups and environment will be henceforth refered to as the *IPA environment*.)

A shortcut character refers to a single character that is assigned to a specific phonetic symbol and that can be directly input by an ordinary keyboard. In TIPA fonts, the character codes for numerals and uppercase letters in the normal ASCII encoding are assigned to such shortcut characters, because numerals and uppercase letters are usually not used as phonetic symbols. And additional shortcut characters for symbols such as æ, œ, ø may also be used if you are using a T1 encoded font and an appropriate input system for it.

The following pair of examples show the same phonetic transcription of a English word that are input by the above mentioned two input methods.

---

[11]I personally prefer a slightly shorter name like \ipa rather than \textipa but this command was named after the general convention of LaTeX 2_ε. The same can be said to all the symbol names beginning with \text.

Symbol name	Macro name	Symbol
Turned A	\textturna	ɐ
Glottal Stop	\textglotstop	ʔ
Right-tail D	\textrtaild	ɖ
Small Capital G	\textscg	ɢ
Hooktop B	\texthtb	ɓ
Curly-tail C	\textctc	ɕ
Crossed H	\textcrh	ħ
Old L-Yogh Ligature	\textOlyoghlig	ɮ
Beta	\textbeta	β

Table 4: Naming of TIPA symbols

Input 1:   `[\textsecstress\textepsilon kspl\textschwa`
`\textprimstress ne\textsci\textesh\textschwa n]`

Output 1:   [ˌɛksplə'neɪʃən]

Input 2:   `\textipa{[""Ekspl@"neIS@n]}`

Output 2:   [ˌɛksplə'neɪʃən]

It is apparent that inputting in the IPA environment is far easier than in the normal text environment. Moreover, although the outputs of the above examples look almost the same, they are *not* identical, exactly speaking. This is because in the IPA environment automatic kerning between symbols is enabled, as is illustrated by the following pair of examples.

Input 1:   `v\textturnv v w\textsca w y\textturny y [\textesh]`

Output 1:   vʌv wᴀw yʎy [ʃ]

Input 2:   `\textipa{v2v w\textsca w yLy [S]}`

Output 2:   vʌv wᴀw yʎy [ʃ]

Table 2 shows most of the shortcut characters together with the corresponding characters in the ASCII encoding.

6.2   Naming of phonetic symbols

Every TIPA phonetic symbol has a unique symbol name, such as *Turned A, Hooktop B, Schwa*.[12] Also each symbol has a corresponding control sequence name, such as \textturna, \texthtb, \textschwa. The name used as a control sequence is usually an abbreviated form of the corresponding symbol name with a prefix \text. The conventions used in the abbreviation are as follows.

- Suffixes and endings such as '-ive', '-al', '-ed' are omitted.
- 'right', 'left' are abbreviated to r, l respectively.
- For 'small capital' symbols, prefix sc is added.

---

[12]The naming was made based on the literature listed in the section entitled "Selection of Symbols" (page 2). And users of TSIPA should be careful because TIPA's naming is slightly modified from that of TSIPA.

- A symbol with a hooktop is abbreviated as `ht`...
- A symbol with a curly-tail is abbreviated as `ct`...
- A 'crossed' symbol is abbreviated as `cr`...
- A ligature is abbreviated as ...`lig`.
- For an old version of a symbol, prefix `O` is added.

Note that the prefix `O` (old) should be given in uppercase letter.

Table 4 shows some examples of correspondence between symbol names and control sequence names.

6.3 Ligatures

Just like the symbols such as ", ", –, —, fi, ff are realized as ligatures by inputting `` `` ``, `` '' ``, `--`, `---`, `fi`, `ff` in TeX, two of the TIPA symbols, namely *Secondary Stress* and *Double Pipe*, and double quotation marks[13] can be input as ligatures in the IPA environment.

> *Input*: `\textipa{" "" | || `` ``}`
>
> *Output*: ˈ ˌ | ‖ " "

6.4 Special macros *, \;, \: and \!

TIPA defines `\*`, `\;`, `\:` and `\!` as special macros in order to easily input phonetic symbols that do not have a shortcut character explained above. Before explaining how to use these macros, it is necessary to note that these macros are primarily intended to be used by linguists who usually do not care about things in math mode. And they can be 'dangerous' in that they override existing LaTeX commands used in the math mode. So if you want to preserve the original meaning of these commands, daclare the option '`safe`' at the preamble.

The macro `\*` is used in three different ways. First, when this macro is followed by one of the letters f, k, r, t or w, it results in a turned symbol.[14]

> *Input*: `\textipa{\*f \*k \*r \*t \*w}`
>
> *Output*: ɟ ʞ ɹ ʇ ʍ

Secondly, when this macro is followed by one of the letters j, n, h, l or z, it results in a frequently used symbol that has otherwise no easy way to input.

> *Input*: `\textipa{\*j \*n \*h \*l \*z}`
>
> *Output*: ɟ ɲ ħ ɫ ʑ

Thirdly, when this macro is followed by letters other than the above cases, they are turned into the symbols of the default text font. This is useful in the IPA environment to select symbols temporarily from the normal text font.

> *Input*: `\textipa{\*A dOg, \*B k\ae{}t, ma\super{\*{214}}}`

---

[13] Although TIPA fonts do not include the symbols " and ", a negative value of kerning is automatically inserted between ' and ', ' and ', so that the same results can be obtained as in the case of the normal text font.

[14] This idea was pointed out by Jörg Knappen.

Output: A dɔg, B kæt, ma²¹⁴

The remaining macros \;, \: and \! are used to make small capital symbols, retroflex symbols, and implosives or clicks, respectively.

Input: \textipa{\;B \;E \;A \;H \;L \;R}

Output: ʙ ᴇ ᴀ ʜ ʟ ʀ

Input: \textipa{\:d \:l \:n \:r \:s \:z}

Output: ɖ ɭ ɳ ɽ ʂ ʐ

Input: \textipa{\!b \!d \!g \!j \!G \!o}

Output: ɓ ɗ ɠ ʄ ɢ ʘ

6.5   Punctuation marks

The following punctuation marks and text symbols that are normally included in the text encoding are also included in the T3 encoding so that they can be directly input in the IPA environment.

Input: \textipa{! ' ( ) * + , - .\ / = ?
             [ ] '}

Output: ! ' ( ) * + , - . / = ? [ ] '

All the other punctuation marks and text symbols that are not included in T3 need to be input with a prefix * explained in the last section when they appear in the IPA environment.

Input: \textipa{*; *: *@ *\# *\$ *\& *\% *\{ *\}}

Output: ; : @ # $ & % { }

6.6   Accents and diacritics

Table 5 shows how to input accents and diacritics in TIPA with some examples. Here again, there are two kinds of input methods; one for the normal text environment, and the other for the IPA environment.

In the IPA environment, most of the accents and diacritics can be input more easily than in the normal text environment, especially in the cases of subscript symbols that are normally placed over a symbol and in the cases of combined accents, as shown in the table.

As can be seen by the above examples, most of the accents that are normally placed over a symbol can be placed under a symbol by adding an * to the corresponding accent command in the IPA environment.

The advantage of IPA environment is further exemplified by the all-purpose accent \|, which is used as a macro prefix to provide shortcut inputs for the diacritics that otherwise have to be input by lengthy macro names. Table 6 shows examples of such accents. Note that the macro \| is also 'dangerous' in that it has been already defined as a math symbol of LaTeX. So if you want to preserve the original meaning of this macro, declare 'safe' option at the preamble.

Finally, examples of words with complex accents that are input in the IPA environment are shown below.

Input in the normal text environment	Input in the IPA environment	Output
\'a	\'a	á
\"a	\"a	ä
\ a	\~a	ã
\r{a}	\r{a}	å
\textsyllabic{m}	\s{m}	m̩
\textsubumlaut{a}	\"*a	a̤
\textsubtilde{a}	\~*a	a̰
\textsubring{a}	\r*a	ḁ
\textdotacute{e}	\.'e	ė́
\textgravedot{e}	\`.e	ė̀
\textacutemacron{a}	\'=a	ā́
\textcircumdot{a}	\^.a	â̇
\texttildedot{a}	\~.a	ã̇
\textbrevemacron{a}	\u=a	ā̆

Table 5: Examples of inputting accents

Input in the normal text environment	Input in the IPA environment	Output
\textsubbridge{t}	|[t	t̪
\textinvsubbridge{t}	|]t	t̺
\textsublhalfring{a}	|(a	a̹
\textsubrhalfring{a}	|)a	a̜
\textroundcap{k}	|c{k}	k̚
\textsubplus{o}	|+o	o̟
\textraising{e}	|'e	e̝
\textlowering{e}	|`e	e̞
\textadvancing{o}	|<o	o̟
\textretracting{a}	|>a	a̠
\textovercross{e}	|x{e}	e̽
\textsubw{k}	|w{k}	k̮
\textseagull{t}	|m{t}	t̼

Table 6: Examples of the accent prefix \|

Input:	\textipa{*|c{k}\r*mt\'om *bhr\'=at\=er}
Output:	*k̥m̥tóm *bhrátēr

For a full list of accents and diacritics, see Appendix A

6.7 Superscript symbols

In the normal text environment, superscript symbols can be input by a macro called \textsuperscript, which has been newly introduced in the recent version of LaTeX 2$_\varepsilon$. This macro takes one argument which can be either a symbol or a string of symbols, and can be nested.

Since the name of this macro is too long, TIPA provides an abbreviated form of this macro called \super.

Input 1:	t\textsuperscript h k\textsuperscript w
	a^{bc}
	a\textsuperscript{b^{c}}
Output 1:	t$^\text{h}$ k$^\text{w}$ a$^\text{bc}$ a$^\text{b}{}^\text{c}$
Input 2:	\textipa{t\super{h} k\super{w}
	a\super{bc} a\super{b\super{c}}}
Output 2:	t$^\text{h}$ k$^\text{w}$ a$^\text{bc}$ a$^\text{b}{}^\text{c}$

These macros automatically select the correct size of superscript font no matter what size of the text font is used.

6.8 Tone letters

TIPA provides a flexible system of macros for 'tone letters'. A tone letter is represented by a macro called '\tone', which takes one argument consisting of a string of numbers ranging from 1 to 5. These numbers denote pitch levels, 1 being the lowest and 5 the highest. Within this range, any combination is allowed and there is no limit in the length of combination.

As an example of the usage of tone letter macro, the four tones of Chinese are show below.

Input:	\tone{55}ma ``mother'', \tone{35}ma ``hemp'',
	\tone{214}ma ``horse'', \tone{51}ma ``scold''
Output:	˥ma "mother", ˧˥ma "hemp", ˨˩˦ma "horse", ˥˩ma "scold"

7   How easy to input phonetic symbols?

Let us briefly estimate here how much easy (or difficult) to input phonetic symbols with TIPA in terms of the number of keystrokes.

The following table shows statistics for all the phonetic symbols that appear in the '93 version of IPA chart (diacritics and symbols for suprasegmentals excluded). It is assumed here that each symbol is input within the IPA environment and the safe option is not specified.

Roman	`\textipa{f@"nEtIks}`	fəˈnɛtɪks
Slanted	`\textipa{\slshape f@"nEtIks}`	*fəˈnɛtɪks*
or	`\textipa{\textsl{f@"nEtIks}`	*fəˈnɛtɪks*
or	`\textsl{\textipa{f@"nEtIks}`	*fəˈnɛtɪks*
Bold extended	`\textipa{\bfseries f@"nEtIks}`	**fəˈnɛtɪks**
or	`\textipa{\textbf{f@"nEtIks}`	**fəˈnɛtɪks**
or	`\textbf{\textipa{f@"nEtIks}`	**fəˈnɛtɪks**
Sans serif	`\textipa{\sffamily f@"nEtIks}`	fəˈnɛtɪks
or	`\textipa{\textsf{f@"nEtIks}`	fəˈnɛtɪks
or	`\textsf{\textipa{f@"nEtIks}`	fəˈnɛtɪks

Table 7: Examples of font switching

keystrokes	*number*	*examples*
1	65	a, b, ə, ɑ, β, etc.
2	2	ø, ‖
3	30	æ, ṭ, в, ɓ, etc.
5	1	ç
more than 5	7	ɞ, ʔ, ǂ, ɰ, etc.

As is shown in the table, about 92% of the symbols can be input within three keystrokes.

8   Changing font styles

This version of TIPA includes five styles of fonts, i.e. roman, slanted, bold, bold extended and sans serif. These styles can be switched in much the same way as in the normal text fonts (see table 7).

The bold fonts are usually not used within the standard LaTeX class packages so that if you want to use them, it is necessary to use low-level font selection commands of LaTeX 2_ε.

Input: `{\fontseries{b}\selectfont abcdefg \textipa{ABCDEFG}}`

Output: **abcdefg αβɕðɛɸɣ**

Note also that slanting of TIPA symbols should correctly work even in the cases of combined accents and in the cases of symbols made up by macros.

Input: `\textsl{\textipa{\'{\"{\u*{e}}}}}`

Output: ĕ́

Input: `\textsl{\textdoublebaresh}`

Output: ʃ (This symbol is composed by a macro.)

9   Internal commands

Some of the internal commands of TIPA are defined without the letter `@` in order to allow a user to extend the capability of TIPA.

9.1 \ipabar

Some TIPA symbols such as \textbarb ƀ, \textcrtwo ƻ are defined by using an internal macro command \ipabar. This command is useful when you want to make barred or crossed symbols not defined in TIPA.

This command requires the following five parameters to control the position of the bar.

- #1 the symbol to be barred
- #2 the height of the bar (in dimen)
- #3 bar width
- #4 left kern added to the bar
- #5 right kern added to the bar

Parameters #3, #4, #5 are to be given in a scaling factor to the width of the symbol, which is equal to 1 if the bar has the same width with the symbol in question. For example, the following command states a barred b (ƀ) of which the bar position in the y-coordinate is .5ex and the width of the bar is slightly larger than that of the letter b.

```
% Barred B
\newcommand\textbarb{%
  \ipabar{{\tipaencoding b}}{.5ex}{1.1}{}{}}
```

Note that the parameters #4 and #5 can be left blank if the value is equal to 0.

And the next example declares a barred c (ꞔ) of which the bar width is a little more than half as large as the letter c and it has the same size of kerning at the right.

```
% Barred C
\newcommand\textbarc{%
  \ipabar{{\tipaencoding c}}{.5ex}{.55}{}{.55}}
```

More complex examples with the \ipabar command are found in T3enc.def.

9.2 \tipaloweraccent, \tipaupperaccent

These two commands are used in the definitions of TIPA accents and diacritics. They are special forms of the commands \loweraccent and \upperaccent that are defined in exaccent.sty. The difference between the commands with the prefix tipa and the ones without it is that the former commands select accents from a T3 encoded font while the latter ones do so from the current text font.

These commands take two parameters, the code of the accent (in decimal, octal or hexadecimal number) and the symbol to be accented, as shown below.

Input: \tipaupperaccent{0}{a}

Output: à

Optionally, these commands can take a extra parameter to adjust the vertical position of the accent. Such an adjustment is sometimes necessary in the definition of a nested accent. The next example shows TIPA's definition of the 'Circumflex Dot Accent' (e.g. å).

```
% Circumflex Dot Accent
\newcommand\textcircumdot[1]{\tipaupperaccent[-.2ex]{2}%
   {\tipaupperaccent[-.1ex]{10}{#1}}}
```

This definition states that a dot accent is placed over a symbol thereby reducing the vertical distance between the symbol and the dot by `.1ex` and a circumflex accent is placed over the dot and the distance between the two accents is reduced by `.2ex`.

If you want to make a combined accent not included in TIPA, you can do so fairly easily by using these two commands together with the optional parameter. For more examples of these commands, see `tipa.sty` and `extraipa.sty`.

9.3 \tipaLoweraccent, \tipaUpperaccent

These two commands differ from the two commands explaind above in that the first parameter should be a symbol (or any other things, typically an \hbox), rather than the code of the accent. They are special cases of the commands \Loweraccent and \Upperaccent and the difference between the two pairs of commands is the same as before.

The next example makes a schwa an accent.

Input: \tipaUpperaccent[.2ex]%
        {\lower.8ex\hbox{\textipa{\super@}}}{a}

Output: å

10 Acknowledgments

First of all, many thanks are due to the co-authors of TSIPA, Kobayashi Hajime and Shirakawa Shun. Kobayashi Hajime was the main font designer of TSIPA. Shirakawa Shun worked very hard in deciding encoding, checking the shapes of symbols and writing the Japanese version of document. TIPA was impossible without TSIPA.

I would like to thank also Jörg Knappen whose insightful comments helped greatly in many ways the development of TIPA. I was also helped and encouraged by Christina Thiele, Martin Haase, Kirk Sullivan and many other members of the `ling-tex` mailing list.

At the last stage of the development of TIPA Frank Mittelbach gave me precious comments on how to incorporate various TIPA commands into the NFSS. I would like to thank also Barbara Beeton who kindly read over the preliminary draft of this document and gave me useful comments.

References

[1] Martin J. Ball, John Esling, and Craig Dickson. VoQS: Voice Quality Symbols. 1994, 1994.

[2] John Esling. Computer coding of the IPA: Supplementary report. *Journal of the International Phonetic Association*, 20(1):22–26, 1990.

[3] John H. Esling and Harry Gaylord. Computer codes for phonetic symbols. *Journal of the International Phonetic Association*, 23(2):83–97, 1993.

[4] ICPLA. extIPA Symbols for Disorderd Speech. 1994, 1994.

[5] IPA. *The Principles of the International Phonetic Association*, 1949.

[6] IPA. Report on the 1989 Kiel Convention. *Journal of the International Phonetic Association*, 19(2):67–80, 1989.

[7] IPA. Further report on the 1989 Kiel Convention. *Journal of the International Phonetic Association*, 20(2):22–24, 1990.

[8] IPA. Council actions on revisions of the IPA. *Journal of the International Phonetic Association*, 23(1):32–34, 1993.

[9] Geoffrey K. Pullum and William A. Ladusaw. *Phonetic Symbol Guide*. The University of Chicago Press, 1986.

[10] John C. Wells. Computer-coding the IPA: a proposed extension of SAMPA. Revised draft 1995 04 28, 1995.

Appendix

A Annotated List of **TIPA** Symbols

For each symbol, a large scale image of the symbol is displayed with a frame. Within the frame, horizontal lines that indicate `asc_height`, `x_height`, baseline, and `desc_depth` are also shown. At the left of a frame, two numbers are given. The one at the top of the symbol indicates serial number, and the other at the bottom is the octal code of the symbol in **TIPA** fonts.

Next, the following informations are shown at the right of each symbol in this order: (1) the name of the symbol, (2) explanation on its usage with some examples, (3) input method in typewriter style, (4) the shapes of the symbol in four **TIPA** styles in normal size (i.e. roman, slanted, bold extended, sans serif), and finally (5) sources or references.

Sometimes the input method is displayed in the form of *Input1: xxx, Input2: yyy*. In such cases *Input1* indicates the one used in the normal text environment and *Input2* the one used in the IPA environment.

The following abbreviations are used in the examples of usage and explanations in the footnote.

> *extIPA = extIPA Symbols for Disordered Speech*
> *VoQS = Voice Quality Symbols*
> *PSG = Phonetic Symbol Guide* [9]
> *JIPA = Journal of the International Phonetic Association*
> *IE Indo-European*
> *OHG Old High German*
> *OCS Old Church Slavic*

A.1 Vowels and Consonants

1
'141
Lower-case A, *IPA usage:* open front unrounded vowel
  Input: a
  Styles: a *a* **a** a, *Sources: IPA '49–'93*

2
'065
Turned A, *IPA usage:* open-mid–open central unrounded vowel
  Input1: \textturna, *Input2:* 5
  Styles: ɐ *ɐ* **ɐ** ɐ, *Sources: IPA '49–'93*

3
'101
Script A, *IPA usage:* open back unrounded vowel
  Input1: \textscripta, *Input2:* A
  Styles: ɑ *ɑ* **ɑ** ɑ, *Sources: IPA '49–'93*

4
'066
Turned Script A, *IPA usage:* open back rounded vowel
  Input1: \textturnscripta, *Input2:* 6
  Styles: ɒ *ɒ* **ɒ** ɒ, *Sources: IPA '49–'93*

5
'346
Ash, *IPA usage:* open-mid–open front unrounded vowel
  Input: \ae
  Styles: æ *æ* **æ** æ, *Sources: IPA '49–'93*

6
'300
Small Capital A[15], Usage: open central unrounded vowel
  Input1: \textsca, *Input2:* \;A
  Styles: ᴀ *ᴀ* **ᴀ** ᴀ, *Sources:*

---

[15]This symbol is fairly common among Chinese phoneticians.

18

7 '062	Λ	Turned V[16], *IPA usage:* open-mid back unrounded vowel *Input1:* \textturnv, *Input2:* 2 *Styles:* ʌ ʌ ʌ ʌ, *Sources: IPA '49–'93*
8 '142	b	Lower-case B, *IPA usage:* voiced bilabial plosive *Input:* b *Styles:* b b **b** b, *Sources: IPA '49–'93*
9 '272	Ь	Soft Sign, Usage: as in *OCS* ognь 'fire'. *Input:* \textsoftsign *Styles:* ь ь ь ь, *Sources:*
10 '273	Ъ	Hard Sign, Usage: as in *OCS* gradъ 'town'. *Input:* \texthardsign *Styles:* ъ ъ ъ ъ, *Sources:*
11 '341	ɓ	Hooktop B, *IPA usage:* voiced bilabial implosive *Input1:* \texthtb, *Input2:* \!b *Styles:* ɓ ɓ **ɓ** ɓ, *Sources: IPA '49–'93*
12 '340	ʙ	Small Capital B, *IPA usage:* voiced bilabial trill *Input1:* \textscb, *Input2:* \;B *Styles:* ʙ ʙ ʙ ʙ, *Sources: IPA '89, '93*
13 '240	ƀ	Crossed B *Input:* \textcrb *Styles:* ƀ ƀ ƀ ƀ, *Sources:*
14 Macro	ƀ	Barred B *Input:* \textbarb *Styles:* ƀ ƀ ƀ ƀ, *Sources:*
15 '102	β	Beta, *IPA usage:* voiced bilabial fricative *Input1:* \textbeta, *Input2:* B *Styles:* β β **β** β, *Sources: IPA '49–'93*
16 '143	c	Lower-case C, *IPA usage:* voiceless palatal plosive *Input:* c *Styles:* c c **c** c, *Sources: IPA '49–'93*
17 Macro	ȼ	Barred C *Input:* \textbarc *Styles:* ȼ ȼ ȼ ȼ, *Sources:*
18 '301	ƈ	Hooktop C, *IPA usage:* voiceless palatal implosive *Input:* \texthtc *Styles:* ƈ ƈ ƈ ƈ, *Sources: IPA '89*
19 Macro	č	C Wedge, Usage: equivalent to IPA ʧ *Input:* \v{c} *Styles:* č č č č, *Sources:*
20 '347	ç	C Cedilla, *IPA usage:* voiceless palatal fricative *Input:* \c{c} *Styles:* ç ç **ç** ç, *Sources: IPA '49–'93*
21 '103	ɕ	Curly-tail C, *IPA usage:* voiceless alveolo-palatal fricative *Input1:* \textctc, *Input2:* C *Styles:* ɕ ɕ **ɕ** ɕ, *Sources: IPA '49–'93*

---

[16]In *PSG* this symbol is called 'Inverted V' but it is apparently a mistake.

22 ’302	**Stretched C**[17], *IPA usage:* postalveolar click *Input:* \textstretchc *Styles:* ꞎ ꞎ ꞎ ꞎ, *Sources: IPA '49, '79*
23 ’144	**Lower-case D**, *IPA usage:* voiced dental/alveolar plosive *Input:* d *Styles:* d d **d** d, *Sources: IPA '49–'93*
24 ’241	**Crossed D** *Input:* \textcrd *Styles:* đ đ **đ** đ, *Sources:*
25 Macro	**Barred D** *Input:* \textbard *Styles:* đ đ **đ** đ, *Sources:*
26 ’342	**Hooktop D**, *IPA usage:* voiced dental/alveolar implosive *Input1:* \texthtd, *Input2:* \!d *Styles:* ɗ ɗ **ɗ** ɗ, *Sources: IPA '49–'93*
27 ’343	**Right-tail D**, *IPA usage:* voiced retroflex plosive *Input1:* \textrtaild, *Input2:* \:d *Styles:* ɖ ɖ **ɖ** ɖ, *Sources: IPA '49–'93*
28 ’242	**Curly-tail D**, Usage: voiced alveolo-palatal plosive *Input:* \textctd *Styles:* ȡ ȡ **ȡ** ȡ, *Sources:*
29 Macro	**D-Z Ligature** *Input:* \textdzlig *Styles:* ʣ ʣ **ʣ** ʣ, *Sources:*
30 Macro	**D-Curly-tail Z Ligature** *Input:* \textdctzlig *Styles:* ʥ ʥ **ʥ** ʥ, *Sources:*
31 ’303	**D-Yogh Ligature**, *IPA usage:* voiced alveolar lateral fricative *Input:* \textdyoghlig *Styles:* ʤ ʤ **ʤ** ʤ, *Sources: IPA '49–'93*
32 Macro	**Curly-tail D-Curly-tail Z Ligature** *Input:* \textctdctzlig *Styles:* ʥ ʥ **ʥ** ʥ, *Sources:*
33 ’104	**Eth**, *IPA usage:* voiced dental fricative *Input1:* \dh, *Input2:* D *Styles:* ð ð **ð** ð, *Sources: IPA '49–'93*
34 ’145	**Lower-case E**, *IPA usage:* colse-mid front unrounded vowel *Input:* e *Styles:* e e **e** e, *Sources: IPA '49–'93*
35 ’100	**Schwa**, *IPA usage:* mid central unrounded vowel *Input1:* \textschwa, *Input2:* @ *Styles:* ə ə **ə** ə, *Sources: IPA '49–'93*

---

[17]The shape of this symbol differs according to the sources. In *PSG* and recent articles in *JIPA*, it is 'stretched' toward both the ascender and descender regions and the whole shape looks like a thick staple. In the old days, however, it was streched only toward the ascender and the whole shape looked more like a stretched c.

36
'304

Right-hook Schwa, *IPA usage:* r-colored ə
Input: `\textrhookschwa`
Styles: ɚ ɚ ɚ ɚ, *Sources: IPA '49, '79*

37
'071

Reversed E, *IPA usage:* close-mid central unrounded vowel
Input1: `\textreve`, *Input2:* 9
Styles: ɘ ɘ ɘ ɘ, *Sources: IPA '49–'93*

38
'243

Small Capital E
Input1: `\textsce`, *Input2:* `\;E`
Styles: ᴇ ᴇ ᴇ ᴇ, *Sources:*

39
'105

Epsilon, *IPA usage:* open-mid front unrounded vowel
Input1: `\textepsilon`, *Input2:* E
Styles: ɛ ɛ ɛ ɛ, *Sources: IPA '49–'93*

40
'305

Closed Epsilon, *IPA usage:* open-mid central rounded vowel
Input: `\textcloseepsilon`
Styles: ɞ ɞ ɞ ɞ, *Sources: IPA '93*

41
'063

Reversed Epsilon, *IPA usage:* open-mid central unrounded vowel
Input1: `\textrevepsilon`, *Input2:* 3
Styles: ɜ ɜ ɜ ɜ, *Sources: IPA '49–'93*

42
'307

Right-hook Reversed Epsilon, *IPA usage:* r colored ɜ
Input: `\textrhookrevepsilon`
Styles: ɝ ɝ ɝ ɝ, *Sources:*

43
'306

Closed Reversed Epsilon
Input: `\textcloserevepsilon`
Styles: ɞ ɞ ɞ ɞ, *Sources:*

44
'146

Lower-case F, *IPA usage:* voiceless labiodental fricative
Input: f
Styles: f f f f, *Sources: IPA '49–'93*

45
'147

Lower-case G, *IPA usage:* voiced velar plosive
Input1: `\textg`, *Input2:* g
Styles: ɡ ɡ ɡ ɡ, *Sources: IPA '49–'93*

46
Macro

Barred G
Input: `\textbarg`
Styles: ǥ ǥ ǥ ǥ, *Sources:*

47
Macro

Crossed G
Input: `\textcrg`
Styles: ǥ ǥ ǥ ǥ, *Sources:*

48
'344

Hooktop G, *IPA usage:* voiced velar implosive
Input1: `\texthtg`, *Input2:* `\!g`
Styles: ɠ ɠ ɠ ɠ, *Sources: IPA '49–'93*

49
'244

Text G
Input1: g, *Input2:* `\textg`
Styles: g g g g, *Sources:*

50
'345

Small Capital G, *IPA usage:* voiced uvular plosive
Input1: `\textscg`, *Input2:* `\;G`
Styles: ɢ ɢ ɢ ɢ, *Sources: IPA '49–'93*

51
'311

Hooktop Small Capital G, *IPA usage:* voiced uvular implosive
Input1: `\texthtscg`, *Input2:* `\!G`
Styles: ʛ ʛ ʛ ʛ, *Sources: IPA '89, '93*

52 '107		Gamma, *IPA usage:* voiced velar fricative *Input1:* \textgamma, *Input2:* G *Styles:* ɣ ɣ ɣ ɣ, *Sources: IPA '49–'93*
53 '310		Baby Gamma, *IPA usage:* close-mid back unrounded vowel *Input:* \textbabygamma *Styles:* ɤ ɤ ɤ ɤ, *Sources: IPA '49, '79*
54 '067		Ram's Horns, *IPA usage:* close-mid back unrounded vowel *Input1:* \textramshorns, *Input2:* 7 *Styles:* ɤ ɤ ɤ ɤ, *Sources: IPA '89, '93*
55 '150		Lower-case H, *IPA usage:* voiceless glottal fricative *Input:* h *Styles:* h h h h, *Sources: IPA '49–'93*
56 '377		H-V Ligature, Usage: as in *Gothic* hʋas 'what'. *Input:* \texthvlig *Styles:* ƕ ƕ ƕ ƕ, *Sources:*
57 '350		Crossed H, *IPA usage:* voiceless pharyngeal fricative *Input:* \textcrh *Styles:* ħ ħ ħ ħ, *Sources: IPA '49–'93*
58 '110		Hooktop H, *IPA usage:* voiced glottal fricative *Input1:* \texthth, *Input2:* H *Styles:* ɦ ɦ ɦ ɦ, *Sources: IPA '49–'93*
59 '312		Hooktop Heng, *IPA usage:* simultaneous ʃ and x *Input:* \texththeng *Styles:* ɧ ɧ ɧ ɧ, *Sources: IPA '49–'93*
60 '064		Turned H, *IPA usage:* voiced labial-palatal approximant *Input1:* \textturnh, *Input2:* 4 *Styles:* ɥ ɥ ɥ ɥ, *Sources: IPA '49–'93*
61 '313		Small Capital H, *IPA usage:* voiceless epiglottal fricative *Input1:* \textsch, *Input2:* \;H *Styles:* ʜ ʜ ʜ ʜ, *Sources: IPA '89, '93*
62 '151		Lower-case I, *IPA usage:* close front unrounded vowel *Input:* i *Styles:* i i i i, *Sources: IPA '49–'93*
63 '031		Undotted I *Input:* \i *Styles:* ı ı ı ı, *Sources:*
64 '061		Barred I, *IPA usage:* close central unrounded vowel *Input1:* \textbari, *Input2:* 1 *Styles:* ɨ ɨ ɨ ɨ, *Sources: IPA '49–'93*
65 '314		Iota *Input:* \textiota *Styles:* ɩ ɩ ɩ ɩ, *Sources: IPA '49, '79*
66 '245		Left-hooktop I[18] *Input:* \textlhti *Styles:* ᶖ ᶖ ᶖ ᶖ, *Sources:*

[18]The four symbols ᶖ, ᶘ, ᶖ and ᶅ are mainly used among Chinese linguists. These symbols are based on "det svenska landsmålsalfabetet" and introduced to China by Bernhard Karlgren. The original shapes of these symbols were in italic as was always the case with "det svenska landsmålsalfabetet". It seems that the Chinese linguists who wanted to continue to use these symbols in IPA changed their shapes upright.

67   Left-hooktop Long I
     Input: \textlhtlongi
'246   *Styles:* ɭ ɭ **ɭ** ɭ, *Sources:*

68   Viby I[19]
     Input: \textvibyi
'247   *Styles:* ɿ ɿ **ɿ** ɿ, *Sources:*

69   Raised Viby I
     Input: \textraisevibyi
Macro   *Styles:* ʅ ʅ **ʅ** ʅ, *Sources:*

70   Small Capital I, *IPA usage:* close–close-mid front unrounded vowel
     Input1: \textsci, *Input2:* I
'111   *Styles:* ɪ ɪ **ɪ** ɪ, *Sources: IPA '89, '93*

71   Lower-case J, *IPA usage:* voiced palatal approximant
     Input: j
'152   *Styles:* j j **j** j, *Sources: IPA '49–'93*

72   Undotted J
     Input: \j
'032   *Styles:* ȷ ȷ **ȷ** ȷ, *Sources:*

73   Curly-tail J[20], *IPA usage:* voiced palatal fricative
     Input1: \textctj, *Input2:* J
'112   *Styles:* ʝ ʝ **ʝ** ʝ, *Sources: IPA '89, '93*

74   Small Capital J
     Input1: \textscj, *Input2:* \;J
'250   *Styles:* ᴊ ᴊ **ᴊ** ᴊ, *Sources:*

75   J Wedge, Usage: equivalent to IPA ʤ
     Input: \v{\j}
Macro   *Styles:* ǰ ǰ **ǰ** ǰ, *Sources:*

76   Barred Dotless J, *IPA usage:* voiced palatal plosive
     Input: \textbardotlessj
'351   *Styles:* ɟ ɟ **ɟ** ɟ, *Sources: IPA '89, '93*

77   Old Barred Dotless J, *IPA usage:* voiced palatal plosive
     Input: \textObardotlessj
'315   *Styles:* ɟ ɟ **ɟ** ɟ, *Sources: IPA '49, '79*

78   Hooktop Barred Dotless J[21], *IPA usage:* voiced palatal implosive
     Input1: \texthtbardotlessj, *Input2:* \!j
'352   *Styles:* ʄ ʄ **ʄ** ʄ, *Sources: IPA '89, '93*

79   Lower-case K, *IPA usage:* voiceless velar plosive
     Input: k
'153   *Styles:* k k **k** k, *Sources: IPA '49–'93*

80   Hooktop K, *IPA usage:* voiceless velar inplosive
     Input: \texthtk
'316   *Styles:* ƙ ƙ **ƙ** ƙ, *Sources: IPA '89*

---

[19] I call this symbol 'Viby I', based on the following description by Bernhard Karlgren: "Une voyelle très analogue à ɿ se rencontre dans certains dial. suédois; on l'appelle 'i de Viby'."(*Études sur la phonologie chinoise*, 1915–26, p. 295)

[20] In the official IPA charts of '89 and '93, this symbol has a dish serif on top of the stem, rather than the normal sloped serif found in the letter j. I found no reason why it should have a dish serif here, so I changed it to a normal sloped serif.

[21] In *PSG* the shape of this symbol slightly differs. Here I followed the shape found in IPA '89, '93.

23

81

'251

Turned K
Input1: `\textturnk`, *Input2:* `\*k`
Styles: ʞ ʞ ʞ ʞ, *Sources:*

82

'154

Lower-case L, *IPA usage:* alveolar lateral approximant
Input: `l`
Styles: l *l* **l** l, *Sources: IPA '49–'93*

83

'353

L with Tilde
Input1: `\textltilde`, *Input2:* `\|~l`
Styles: ɫ ɫ ɫ ɫ, *Sources: IPA '49–'93*

84

'252

Barred L
Input: `\textbarl`
Styles: ł ł ł ł, *Sources:*

85

'354

Belted L, *IPA usage:* voiceless alveolar lateral fricative
Input: `\textbeltl`
Styles: ɬ ɬ ɬ ɬ, *Sources: IPA '49–'93*

86

'355

Right-tail L, *IPA usage:* retroflex lateral approximant
Input1: `\textrtaill`, *Input2:* `\:l`
Styles: ɭ ɭ ɭ ɭ, *Sources: IPA '49–'93*

87

'320

L-Yogh Ligature, *IPA usage:* voiced alveolar lateral fricative
Input: `\textlyoghlig`
Styles: ɮ ɮ ɮ ɮ, *Sources: IPA '89, '93*

88

'254

Old L-Yogh Ligature, *IPA usage:* voiced alveolar lateral fricative
Input: `\textOlyoghlig`
Styles: ƛ ƛ ƛ ƛ, *Sources: IPA '49, '79*

89

'317

Small Capital L, *IPA usage:* velar lateral approximant
Input1: `\textscl`, *Input2:* `\;L`
Styles: ʟ ʟ ʟ ʟ, *Sources: IPA '89, '93*

90

'253

Lambda
Input: `\textlambda`
Styles: λ *λ* **λ** λ, *Sources:*

91

Macro

Crossed Lambda
Input: `\textcrlambda`
Styles: ƛ ƛ ƛ ƛ, *Sources:*

92

'155

Lower-case M, *IPA usage:* bilabial nasal
Input: `m`
Styles: m *m* **m** m, *Sources: IPA '49–'93*

93

'115

Left-tail M (at right), *IPA usage:* labiodental nasal
Input1: `\textltailm`, *Input2:* `M`
Styles: ɱ ɱ ɱ ɱ, *Sources: IPA '49–'93*

94

'127

Turned M, *IPA usage:* close back unrounded vowel
Input1: `\textturnm`, *Input2:* `W`
Styles: ɯ ɯ ɯ ɯ, *Sources: IPA '49–'93*

95

'356

Turned M, Right Leg, *IPA usage:* velar approximant
Input: `\textturnmrleg`
Styles: ɰ ɰ ɰ ɰ, *Sources: IPA '79, '89, '93*

96

'156

Lower-case N, *IPA usage:* dental/alveolar nasal
Input: `n`
Styles: n *n* **n** n, *Sources: IPA '49–'93*

97 N, Right Leg
 '256
Input: \textnrleg
Styles: ŋ ŋ **ŋ** ŋ, *Sources: IPA '49*

98 N with Tilde
Macro
Input: \~n
Styles: ñ ñ **ñ** ñ, *Sources:*

99 Left-tail N (at left), *IPA usage:* palatal nasal
 '361
Input: \textltailn
Styles: ɲ ɲ **ɲ** ɲ, *Sources: IPA '49–'93*

100 Eng, *IPA usage:* velar nasal
 '116
Input1: \ng, *Input2:* N
Styles: ŋ ŋ **ŋ** ŋ, *Sources: IPA '49–'93*

101 Right-tail N, *IPA usage:* retroflex nasal
 '357
Input1: \textrtailn, *Input2:* \:n
Styles: ɳ ɳ **ɳ** ɳ, *Sources: IPA '49–'93*

102 Curly-tail N, *Usage:* alveolo-palatal nasal
 '255
Input: \textctn
Styles: ȵ ȵ **ȵ** ȵ, *Sources:*

103 Small Capital N, *IPA usage:* uvular nasal
 '360
Input1: \textscn, *Input2:* \;N
Styles: ɴ ɴ **ɴ** ɴ, *Sources: IPA '49–'93*

104 Lower-case O, *IPA usage:* close-mid back rounded vowel
 '157
Input: o
Styles: o o **o** o, *Sources: IPA '49–'93*

105 Bull's Eye, *IPA usage:* bilabial click
 '362
Input1: \textbullseye, *Input2:* \!o
Styles: ʘ ʘ **ʘ** ʘ, *Sources: IPA '79, '89, '93*

106 Barred O, *IPA usage:* close-mid central rounded vowel
 '070
Input1: \textbaro, *Input2:* 8
Styles: ɵ ɵ **ɵ** ɵ, *Sources: IPA '49–'93*

107 Slashed O, *IPA usage:* close-mid front rounded vowel
 '370
Input: \o
Styles: ø ø **ø** ø, *Sources: IPA '49–'93*

108 O-E Ligature, *IPA usage:* open-mid front rounded vowel
 '367
Input: \oe
Styles: œ œ **œ** œ, *Sources: IPA '49–'93*

109 Small Capital O-E Ligature, *IPA usage:* open front rounded vowel
 '327
Input1: \textscoelig, *Input2:* \OE
Styles: ɶ ɶ **ɶ** ɶ, *Sources: IPA '79, '89, '93*

110 Open O, *IPA usage:* open-mid back rounded vowel
 '117
Input1: \textopeno, *Input2:* O
Styles: ɔ ɔ **ɔ** ɔ, *Sources: IPA '49–'93*

111 Turned C(Open O)-E Ligature
 '257
Input: \textturncelig
Styles: ɞ ɞ **ɞ** ɞ, *Sources:*

112 Omega
 '260
Input: \textomega
Styles: ω ω **ω** ω, *Sources:*

113 **Small Capital Omega**
'261
Input: \textscomega
Styles: ꭥ ꭥ **ꭥ** ꭥ, *Sources:*

114 **Closed Omega**
'321
Input: \textcloseomega
Styles: ɷ ɷ **ɷ** ɷ, *Sources: IPA '49, '79*

115 **Lower-case P**, *IPA usage:* voiceless bilabial plosive
'160
Input: p
Styles: p p **p** p, *Sources: IPA '49–'93*

116 **Wynn**
'337
Input: \textwynn
Styles: ƿ ƿ **ƿ** ƿ, *Sources:*

117 **Thorn**
'376
Input1: \textthorn, *Input2:* \th
Styles: þ þ **þ** þ, *Sources:*

118 **Hooktop P**, *IPA usage:* voiceless bilabial implosive
'322
Input: \texthtp
Styles: ƥ ƥ **ƥ** ƥ, *Sources: IPA '89*

119 **Phi**, *IPA usage:* voiceless bilabial fricative
'106
Input1: \textphi, *Input2:* F
Styles: ɸ ɸ **ɸ** ɸ, *Sources: IPA '49–'93*

120 **Lower-case Q**, *IPA usage:* voiceless uvular plosive
'161
Input: q
Styles: q q **q** q, *Sources: IPA '49–'93*

121 **Hooktop Q**, *IPA usage:* voiceless uvular implosive
'323
Input: \texthtq
Styles: ʠ ʠ **ʠ** ʠ, *Sources: IPA '89*

122 **Small Capital Q**[22], Usage: voiceless pharyngeal plosive
'262
Input1: \textscq, *Input2:* \;Q
Styles: ꞯ ꞯ **ꞯ** ꞯ, *Sources:*

123 **Lower-case R**, *IPA usage:* alveolar trill
'162
Input: r
Styles: r r **r** r, *Sources: IPA '49–'93*

124 **Fish-hook R**, *IPA usage:* alveolar tap or flap
'122
Input1: \textfishhookr, *Input2:* R
Styles: ɾ ɾ **ɾ** ɾ, *Sources: IPA '49–'93*

125 **Long-leg R**, *IPA usage:* alveolar fricative trill
'324
Input: \textlonglegr
Styles: ɼ ɼ **ɼ** ɼ, *Sources: IPA '49, '79*

126 **Right-tail R**, *IPA usage:* retroflex tap or flap
'363
Input1: \textrtailr, *Input2:* \:r
Styles: ɽ ɽ **ɽ** ɽ, *Sources: IPA '49–'93*

---

[22]Suggested by Prof S. Tsuchida for Austronesian languages in Taiwan. In *PSG* 'Female Sign' and 'Uncrossed Female Sign'(pp. 110–111) are noted for pharyngeal stops, as proposed by Trager (1964). Also I'm not sure about the difference between an epiglottal plosive and a pharyngeal stop.

127
'364
Turned R, *IPA usage:* alveolar approximant
Input1: \textturnr, *Input2:* *r
Styles: ɹ ɹ ɹ ɹ, *Sources: IPA '49–'93*

128
'365
Turned R, Right Tail, *IPA usage:* retroflex approximant
Input1: \textturnrrtail, *Input2:* \:R
Styles: ɻ ɻ ɻ ɻ, *Sources: IPA '49–'93*

129
'325
Turned Long-leg R, *IPA usage:* alveolar lateral flap
Input: \textturnlonglegr
Styles: ɺ ɺ ɺ ɺ, *Sources: IPA '49–'93*

130
'366
Small Capital R, *IPA usage:* uvular trill
Input1: \textscr, *Input2:* \;R
Styles: ʀ ʀ ʀ ʀ, *Sources: IPA '49–'93*

131
'113
Inverted Small Capital R, *IPA usage:* voiced uvular fricative
Input1: \textinvscr, *Input2:* K
Styles: ʁ ʁ ʁ ʁ, *Sources: IPA '49–'93*

132
'163
Lower-case S, *IPA usage:* voiceless alveolar fricative
Input: s
Styles: s s s s, *Sources: IPA '49–'93*

133
Macro
S Wedge, Usage: equivalent to IPA ʃ
Input: \v{s}
Styles: š š š š, *Sources:*

134
'371
Right-tail S (at left), *IPA usage:* voiceless retroflex fricative
Input1: \textrtails, *Input2:* \:s
Styles: ʂ ʂ ʂ ʂ, *Sources: IPA '49–'93*

135
'123
Esh, *IPA usage:* voiceless postalveolar fricative
Input1: \textesh, *Input2:* S
Styles: ʃ ʃ ʃ ʃ, *Sources: IPA '49–'93*

136
Macro
Doube-barred Esh
Input: \textdoublebaresh
Styles: ɟ ɟ ɟ ɟ, *Sources:*

137
'263
Curly-tail Esh, *IPA usage:* palatalized ʃ
Input: \textctesh
Styles: ʆ ʆ ʆ ʆ, *Sources: IPA '49, '79*

138
'164
Lower-case T, *IPA usage:* voiceless dental/alveolar plosive
Input: t
Styles: t t t t, *Sources: IPA '49–'93*

139
'326
Hooktop T, *IPA usage:* voiceless dental/alveolar implosive
Input: \texthtt
Styles: ƭ ƭ ƭ ƭ, *Sources: IPA '89*

140
'264
Left-hook T, *IPA usage:* palatalized t
Input: \textlhookt
Styles: ƫ ƫ ƫ ƫ, *Sources:*

141
'372
Right-tail T, *IPA usage:* voiceless retroflex plosive
Input1: \textrtailt, *Input2:* \:t
Styles: ʈ ʈ ʈ ʈ, *Sources: IPA '49–'93*

142
Macro
T-Curly-tail C Ligature
Input: \texttctclig
Styles: ʨ ʨ ʨ ʨ, *Sources:*

27

143   T-S Ligature
'266   *Input:* \texttslig
      Styles: ʦ ʦ ʦ ʦ, *Sources:*

144   T-Esh Ligature
'331   *Input:* \textteshlig
      Styles: ʧ ʧ ʧ ʧ, *Sources: IPA '49–'93*

145   Turned T, *IPA usage:* dental click
'330   *Input1:* \textturnt, *Input2:* *t
      Styles: ⊥ ⊥ ⊥ ⊥, *Sources: IPA '49, '79*

146   Curly-tail T, Usage: voiceless alveolo-palatal plosive
'265   *Input:* \textctt
      Styles: ȶ ȶ ȶ ȶ, *Sources:*

147   Curly-tail T-Curly-tail C Ligature
Macro   *Input:* \textcttctclig
      Styles: ȶɕ ȶɕ ȶɕ ȶɕ, *Sources:*

148   Theta, *IPA usage:* voiceless dental fricative
'124   *Input1:* \texttheta, *Input2:* T
      Styles: θ θ θ θ, *Sources: IPA '49–'93*

149   Lower-case U, *IPA usage:* close back rounded vowel
'165   *Input:* u
      Styles: u u u u, *Sources: IPA '49–'93*

150   Barred U, *IPA usage:* close central rounded vowel
'060   *Input1:* \textbaru, *Input2:* 0
      Styles: ʉ ʉ ʉ ʉ, *Sources: IPA '49–'93*

151   Upsilon, *IPA usage:* close–close-mid back rounded vowel
'125   *Input1:* \textupsilon, *Input2:* U
      Styles: ʊ ʊ ʊ ʊ, *Sources: IPA '89, '93*

152   Small Capital U, Usage: equivalent to IPA ʊ
'366   *Input1:* \textscu, *Input2:* \;U
      Styles: ᴜ ᴜ ᴜ ᴜ, *Sources: IPA '49–'93*

153   Lower-case V, *IPA usage:* voiced labiodental fricative
'166   *Input:* v
      Styles: v v v v, *Sources: IPA '49–'93*

154   Script V, *IPA usage:* labiodental approximant
'126   *Input1:* \textscriptv, *Input2:* V
      Styles: ʋ ʋ ʋ ʋ, *Sources: IPA '49–'93*

155   Lower-case W, *IPA usage:* voiced labio-velar approximant
'167   *Input:* w
      Styles: w w w w, *Sources: IPA '49–'93*

156   Turned W, *IPA usage:* voiceless labio-velar approximant
'373   *Input1:* \textturnw, *Input2:* *w
      Styles: ʍ ʍ ʍ ʍ, *Sources: IPA '49–'93*

157   Lower-case X, *IPA usage:* voiceless velar fricative
'170   *Input:* x
      Styles: x x x x, *Sources: IPA '49–'93*

158   Chi, *IPA usage:* voiceless uvular fricative
'130   *Input1:* \textchi, *Input2:* X
      Styles: χ χ χ χ, *Sources: IPA '49–'93*

159 **Lower-case Y**, *IPA usage:* close front rounded vowel
'171   *Input:* y
  Styles: y *y* **y** y, *Sources: IPA '49–'93*

160 **Turned Y**, *IPA usage:* palatal lateral approximant
'114   *Input1:* \textturny, *Input2:* L
  Styles: ʎ *ʎ* **ʎ** ʎ, *Sources: IPA '49–'93*

161 **Small Capital Y**, *IPA usage:* close–close-mid front rounded vowel
'131   *Input1:* \textscy, *Input2:* Y
  Styles: ʏ *ʏ* **ʏ** ʏ, *Sources: IPA '49–'93*

162 **Viby Y**[23]
'267   *Input:* \textvibyy
  Styles: ɥ *ɥ* **ɥ** ɥ, *Sources:*

163 **Lower-case Z**, *IPA usage:* voiced alveolar fricative
'172   *Input:* z
  Styles: z *z* **z** z, *Sources: IPA '49–'93*

164 **Comma-tail Z**, Usage: as in *OHG* ëʐʐan 'to eat'.
'336   *Input:* \textcommatailz
  Styles: ʑ *ʑ* **ʑ** ʑ, *Sources:*

165 **Z Wedge**, Usage: equivalent to IPA ʒ
Macro   *Input:* \v{z}
  Styles: ž *ž* **ž** ž, *Sources:*

166 **Curly-tail Z**, *IPA usage:* voiced alveolo-palatal fricative
'375   *Input:* \textctz
  Styles: ʑ *ʑ* **ʑ** ʑ, *Sources: IPA '49–'93*

167 **Reversed Yogh**
'271   *Input:* \textrevyogh
  Styles: ƹ *ƹ* **ƹ** ƹ, *Sources:*

168 **Right-tail Z**, *IPA usage:* voiced retroflex fricative
'374   *Input1:* \textrtailz, *Input2:* \:z
  Styles: ʐ *ʐ* **ʐ** ʐ, *Sources: IPA '49–'93*

169 **Yogh**, *IPA usage:* voiced postalveolar fricative
'132   *Input1:* \textyogh, *Input2:* Z
  Styles: ʒ *ʒ* **ʒ** ʒ, *Sources: IPA '49–'93*

170 **Curly-tail Yogh**, *IPA usage:* palatalized ʒ
'270   *Input:* \textctyogh
  Styles: ʓ *ʓ* **ʓ** ʓ, *Sources: IPA '49, '79*

171 **Crossed 2**
Macro   *Input:* \textcrtwo
  Styles: ƻ *ƻ* **ƻ** ƻ, *Sources: IPA '49*

172 **Glottal Stop**
'120   *Input1:* \textglotstop, *Input2:* P
  Styles: ʔ *ʔ* **ʔ** ʔ, *Sources: IPA '49–'93*

173 **Superscript Glottal Stop**
'274   *Input:* \textraiseglotstop
  Styles: ˀ *ˀ* **ˀ** ˀ, *Sources:*

---

[23]See explanations in footnote 19.

174   Barred Glottal Stop, *IPA usage:* epiglottal plosive
Input: \textbarglotstop
'334   *Styles:* ʔ ʔ ʔ ʔ, *Sources: IPA '89, '93*

175   Inverted Glottal Stop, *IPA usage:* alveolar lateral click
Input: \textinvglotstop
'333   *Styles:* ʖ ʖ ʖ ʖ, *Sources: IPA '49, '79*

176   Crossed Inverted Glottal Stop
Input: \textcrinvglotstop
Macro   *Styles:* ʖ ʖ ʖ ʖ, *Sources: IPA '49*

177   Reversed Glottal Stop, *IPA usage:* voiced pharyngeal fricative
Input1: \textrevglotstop, *Input2:* Q
'121   *Styles:* ʕ ʕ ʕ ʕ, *Sources: IPA '49–'93*

178   Barred Reversed Glottal Stop, *IPA usage:* voiced epiglottal fricative
Input: \textbarrevglotstop
'335   *Styles:* ʡ ʡ ʡ ʡ, *Sources: IPA '89, '93*

179   Pipe, *IPA usage:* dental click
Input1: \textpipe, *Input2:* |
'174   *Styles:* | | | |, *Sources: IPA '89, '93*

180   Double-barred Pipe, *IPA usage:* palatoalveolar click
Input: \textdoublebarpipe
'175   *Styles:* ǂ ǂ ǂ ǂ, *Sources: IPA '89, '93*

181   Double-barred Slash, Usage: a variant of ǂ
Input: \textdoublebarslash
Macro   *Styles:* ǂ ǂ ǂ ǂ, *Sources:*

182   Double Pipe, *IPA usage:* alveolar lateral click
Input1: \textdoublepipe, *Input2:* ||
'177   *Styles:* ‖ ‖ ‖ ‖, *Sources: IPA '89, '93*

183   Exclamation Point, *IPA usage:* (post)alveolar click
Input: !
'041   *Styles:* ! ! ! !, *Sources: IPA '89, '93*


A.2   Suprasegmentals

184   Vertical Stroke (Superior), *IPA usage:* primary stress
Input1: \textprimstress, *Input2:* "
'042   *Styles:* ' ' ' ', *Sources: IPA '49–'93*

185   Vertical Stroke (Inferior), *IPA usage:* secondary stress
Input1: \textsecstress, *Input2:* ""
'177   *Styles:* ˌ ˌ ˌ ˌ, *Sources: IPA '49–'93*

186   Length Mark, *IPA usage:* long
Input1: \textlengthmark, *Input2:* :
'072   *Styles:* ː ː ː ː, *Sources: IPA '49–'93*

187   Half-length Mark, *IPA usage:* half-long
Input1: \texthalflength, *Input2:* ;
'073   *Styles:* ˑ ˑ ˑ ˑ, *Sources: IPA '49–'93*

188   Vertical Line, *IPA usage:* minor (foot) group
Input: \textvertline
'222   *Styles:* | | | |, *Sources: IPA '89, '93*

189
'223
Double Vertical Line, *IPA usage:* major (intonation) group
Input: \textdoublevertline
Styles: ‖ ‖ ‖ ‖, *Sources: IPA '89, '93*

190
'074
Bottom Tie Bar, *IPA usage:* linking (absence of a break)
Input1: \textbottomtiebar, *Input2:* \t*{}
Styles: ‿‿‿, *Sources: IPA '89, '93*

191
'224
Downward Diagonal Arrow, *IPA usage:* global fall
Input: \textglobfall
Styles: ↘ ↘ ↘ ↘, *Sources: IPA '89, '93*

192
'225
Upward Diagonal Arrow, *IPA usage:* global rise
Input: \textglobrise
Styles: ↗ ↗ ↗ ↗, *Sources: IPA '89, '93*

193
'226
Down Arrow[24], *IPA usage:* downstep
Input: \textdownstep
Styles: ↓ ↓ ↓ ↓, *Sources: IPA '89, '93*

194
'227
Up Arrow, *IPA usage:* upstep
Input: \textupstep
Styles: ↑ ↑ ↑ ↑, *Sources: IPA '89, '93*

A.3 Accents and Diacritics

195
'000
Grave Accent, *IPA usage:* low tone
Input: \`e
Styles: è è **è** è, *Sources: IPA '49–'93*

196
'001
Acute Accent, *IPA usage:* high tone
Input: \'e
Styles: é é **é** é, *Sources: IPA '49–'93*

197
'002
Circumflex Accent, *IPA usage:* falling tone
*Input:* \^e
Styles: ê ê **ê** ê, *Sources: IPA '49–'93*

198
'003
Tilde, *IPA usage:* nasalized
Input: \~e
Styles: ẽ ẽ **ẽ** ẽ, *Sources: IPA '49–'93*

199
'004
Umlaut, *IPA usage:* centralized
Input: \"e
Styles: ë ë **ë** ë, *Sources: IPA '49–'93*

200
'005
Double Acute Accent, *IPA usage:* extra high tone
Input: \H{e}
Styles: e̋ e̋ **e̋** e̋, *Sources: IPA '89, '93*

201
'006
Ring
Input: \r{e}
Styles: e̊ e̊ **e̊** e̊, *Sources:*

202
'007
Wedge, *IPA usage:* rising tone
Input: \v{e}
Styles: ě ě **ě** ě, *Sources: IPA '49–'93*

---

[24]The shapes of \textdownstep and \textupstep differ according to sources. Here I followed the shapes found in the recent IPA charts.

203 **'010**
Breve, *IPA usage:* extra short
Input: \u{e}
Styles: ĕ ĕ **ĕ** ĕ, *Sources: IPA '49–'93*

204 **'011**
Macron
Input: \=e
Styles: ē ē **ē** ē, *Sources:*

205 **'012**
Dot
Input: \.e
Styles: ė ė **ė** ė, *Sources:*

206 **'013**
Cedille
Input: \c{e}
Styles: ȩ ȩ **ȩ** ȩ, *Sources:*

207 **'014**
Polish Hook (Ogonek Accent)
Input1: \textpolhook{e}, *Input2:* \k{e}
Styles: ę ę **ę** ę, *Sources:*

208 **'015**
Double Grave Accent, *IPA usage:* extra low tone
Input1: \textdoublegrave{e}, *Input2:* \H*e
Styles: ȅ ȅ **ȅ** ȅ, *Sources: IPA '89, '93*

209 **'016**
Subscript Grave Accent, *IPA usage:* low falling tone
Input1: \textsubgrave{e}, *Input2:* \`*e
Styles: ȩ ȩ **ȩ** ȩ, *Sources: IPA '49, '79*

210 **'017**
Subscript Acute Accent, *IPA usage:* low rising tone
Input1: \textsubacute{e}, *Input2:* \'*e
Styles: ḛ ḛ **ḛ** ḛ, *Sources: IPA '49, '79*

211 **Macro**
Subscript Circumflex Accent
Input1: \textsubcircum{e}, *Input2:* \^*e
Styles: ḙ ḙ **ḙ** ḙ, *Sources:*

212 **'020**
Round Cap
Input1: \textroundcap{g}, *Input2:* \|c{g}
Styles: ĝ ĝ **ĝ** ĝ, *Sources:*

213 **Macro**
Acute Accent with Macron
Input1: \textacutemacron{a}, *Input2:* \'=a
Styles: a̋ a̋ **a̋** a̋, *Sources:*

214 **'234**
Vertical Bar Accent
Input: \textvbaraccent{a}
Styles: a̍ a̍ **a̍** a̍, *Sources:*

215 **'235**
Double Vertical Bar Accent
Input: \textdoublevbaraccent{a}
Styles: a̎ a̎ **a̎** a̎, *Sources:*

216 **'236**
Grave Dot Accent
Input1: \textgravedot{e}, *Input2:* \`.e
Styles: ȅ ȅ **ȅ** ȅ, *Sources:*

217 **'237**
Dot Acute Accent
Input1: \textdotacute{e}, *Input2:* \'.e
Styles: ĕ ĕ **ĕ** ĕ, *Sources:*

218 *Macro*

Circumflex Dot Accent
Input1: `\textcircumdot{a}`, *Input2:* `\^.a`
Styles: â â **â** â, *Sources:*

219 *Macro*

Tilde Dot Accent
Input1: `\texttildedot{a}`, *Input2:* `\~.a`
Styles: ẫ ẫ **ẫ** ẫ, *Sources:*

220 *Macro*

Breve Macron Accent
Input1: `\textbrevemacron{a}`, *Input2:* `\u=a`
Styles: ǎ ǎ **ǎ** ǎ, *Sources:*

221 *Macro*

Ring Macron Accent
Input1: `\textringmacron{a}`, *Input2:* `\r=a`
Styles: å̄ å̄ **å̄** å̄, *Sources:*

222 *Macro*

Acute Wedge Accent
Input1: `\textacutewedge{s}`, *Input2:* `\v's`
Styles: ś̌ ś̌ **ś̌** ś̌, *Sources:*

223 *Macro*

Dot Breve Accent
Input: `\textdotbreve{a}`
Styles: a̐ a̐ **a̐** a̐, *Sources:*

224 *'021*

Subscript Bridge, *IPA usage:* dental
Input1: `\textsubbridge{t}`, *Input2:* `\|[t`
Styles: t̪ t̪ **t̪** t̪, *Sources:* IPA '49–'93

225 *'022*

Inverted Subscript Bridge, *IPA usage:* apical
Input1: `\textinvsubbridge{d}`, *Input2:* `\|]t`
Styles: d̺ d̺ **d̺** d̺, *Sources:* IPA '89, '93

226 *'023*

Subscript Square, *IPA usage:* laminal
Input: `\textsubsquare{n}`
Styles: n̻ n̻ **n̻** n̻, *Sources:* IPA '89, '93

227 *'024*

Subscript Right Half-ring[25], *IPA usage:* more rounded
Input1: `\textsubrhalfring{o}`, *Input2:* `\|)o`
Styles: o̜ o̜ **o̜** o̜, *Sources:* IPA '49–'93

228 *'025*

Subscript Left Half-ring, *IPA usage:* less rounded
Input1: `\textsublhalfring{o}`, *Input2:* `\|(o`
Styles: o̹ o̹ **o̹** o̹, *Sources:* IPA '49–'93

229 *'026*

Subscript W, *IPA usage:* labialized
Input1: `\textsubw{k}`, *Input2:* `\|w{k}`
Styles: k̫ k̫ **k̫** k̫, *Sources:* IPA '79

230 *'026*

Over W, Usage: labialized
Input: `\textoverw{g}`
Styles: g̫ g̫ **g̫** g̫, *Sources:*

231 *'027*

Seagull, *IPA usage:* linguolabial
Input1: `\textseagull{t}`, *Input2:* `\|m{t}`
Styles: t̼ t̼ **t̼** t̼, *Sources:* IPA '89, '93

---
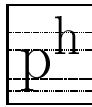
[25]Diacritics `\textsubrhalfring` and `\textsublhalfring` can be placed after a symbol by inputting, for example, `[e\textsubrhalfring{}]` [e̜].

232 **'030**

Over-cross, *IPA usage:* mid-centralized
Input1: \textovercross{\e}, *Input2:* \|x{e}
Styles: ĕ ĕ ĕ ĕ, *Sources: IPA '49–'93*

233 **'033**

Subscript Plus[26], *IPA usage:* advanced
Input1: \textsubplus{\textopeno}, *Input2:* \|+O
Styles: ɔ̟ ɔ̟ ɔ̟ ɔ̟, *Sources: IPA '49–'93*

234 **'034**

Raising Sign, *IPA usage:* raised
Input1: \textraising{\textepsilon}, *Input2:* \|'E
Styles: ɛ̝ ɛ̝ ɛ̝ ɛ̝, *Sources: IPA '49–'93*

235 **'035**

Lowering Sign, *IPA usage:* lowered
Input1: \textlowering{e}, *Input2:* \|`e
Styles: e̞ e̞ e̞ e̞, *Sources: IPA '49–'93*

236 **'036**

Advancing Sign, *IPA usage:* advanced tongue root
Input1: \textadvancing{u}, *Input2:* \|<u
Styles: u̘ u̘ u̘ u̘, *Sources: IPA '49–'93*

237 **'037**

Retracting Sign, *IPA usage:* retracted tongue root
Input1: \textretracting{\textschwa}, *Input2:* \|>@
Styles: ə̙ ə̙ ə̙ ə̙, *Sources: IPA '49–'93*

238 **'003**

Subscript Tilde, *IPA usage:* creaky voiced
*Input1:* \textsubtilde{e}, *Input2:* \~*e
Styles: ḛ ḛ ḛ ḛ, *Sources: IPA '89, '93*

239 **'004**

Subscript Umlaut, *IPA usage:* breathy voiced
Input1: \textsubumlaut{e}, *Input2:* \"*e
Styles: e̤ e̤ e̤ e̤, *Sources: IPA '79, '89, '93*

240 **'006**

Subscript Ring, *IPA usage:* voiceless
Input1: \textsubring{u}, *Input2:* \r*u
Styles: u̥ u̥ u̥ u̥, *Sources: IPA '49–'93*

241 **'007**

Subscript Wedge, *IPA usage:* voiced
Input1: \textsubwedge{e}, *Input2:* \v*e
Styles: e̬ e̬ e̬ e̬, *Sources: IPA '49–'93*

242 **'011**

Subscript Bar, *IPA usage:* retracted
Input1: \textsubbar{e}, *Input2:* \=*e
Styles: e̱ e̱ e̱ e̱, *Sources: IPA '49–'93*

243 **'012**

Subscript Dot, *Usage:* retroflex
Input1: \textsubdot{e}, *Input2:* \.*e
Styles: ẹ ẹ ẹ ẹ, *Sources:*

244 **'020**

Subscript Arch, *IPA usage:* non-syllabic
Input: \textsubarch{e}
Styles: e̯ e̯ e̯ e̯, *Sources:*

245 **'042**

Syllabicity Mark, *IPA usage:* syllabic
Input1: \textsyllabic{m}, *Input2:* \s{m}
Styles: m̩ m̩ m̩ m̩, *Sources: IPA '49–'93*

---

[26]The diacritics such as \textsubplus, \textraising, \textlowering \textadvancing and \textretracting can be placed after a symbol by inputting [e\textsubplus{}] [e₊], for example.

246 | Superimposed Tilde, *IPA usage:* velarized or pharyngealized
'046 | *Input1:* `\textsuperimposetilde{t}`, *Input2:* `\|~{t}`
| *Styles:* ᵵ *ᵵ* **ᵵ** ᵵ, *Sources: IPA '49–'93*

247 | Corner, *IPA usage:* no audible release
'136 | *Input:* `t\textcorner`
| *Styles:* t˥ *t˥* **t˥** t˥, *Sources: IPA '89, '93*

248 | Open Corner, Usage: release/burst
'137 | *Input:* `t\textopencorner`
| *Styles:* t˞ *t˞* **t˞** t˞, *Sources:*

249 | Rhoticity, *IPA usage:* rhoticity
'176 | *Input:* `\textschwa\rhoticity`
| *Styles:* ɚ *ɚ* **ɚ** ɚ, *Sources: IPA '89, '93*

250 | Celtic Palatalization Mark, Usage: as in *Irish* b′an 'woman'.
'040 | *Input:* `b\textceltpal`
| *Styles:* b′ *b′* **b′** b′, *Sources:*

251 | Left Pointer
'275 | *Input:* `k\textlptr`
| *Styles:* k˂ *k˂* **k˂** k˂, *Sources:*

252 | Right Pointer
'276 | *Input:* `k\textrptr`
| *Styles:* k˃ *k˃* **k˃** k˃, *Sources:*

253 | Rectangle[27], Usage: equivalent to IPA ˥ (Corner)
'277 | *Input:* `p\textrectangle`
| *Styles:* p▫ *p▫* **p▫** p▫, *Sources:*

254 | Top Tie Bar, *IPA usage:* affricates and double articulations
'076 | *Input1:* `\texttoptiebar{gb}`, *Input2:* `\t{gb}`
| *Styles:* g͡b *g͡b* **g͡b** g͡b, *Sources:*

255 | Apostrophe, *IPA usage:* ejective
'047 | *Input:* `'`
| *Styles:* ' *'* **'** ', *Sources: IPA '49–'93*

256 | Reversed Apostrophe, *IPA usage:* aspirated
'134 | *Input:* `\textrevapostrophe`
| *Styles:* ' *'* **'** ', *Sources: IPA '49, '79*

257 | Period, *IPA usage:* syllable break as in [ɹi.ækt]
'056 | *Input:* `.`
| *Styles:* . *.* **.** ., *Sources: IPA '89, '93*

258 | Hooktop
'043 | *Input:* `\texthooktop`
| *Styles:* ˓ *˓* **˓** ˓, *Sources:*

259 | Right Hook
'044 | *Input:* `\textrthook`
| *Styles:* ˻ *˻* **˻** ˻, *Sources:*

---

[27]This symbol is used among Japanese linguists as a diacritical symbol indicating no audible release (IPA ˥), because the symbol ˥ is used to indicate pitch accent in Japanese.

260 Palatalization Hook
'045 *Input:* \textpalhook
Styles: ˕ ˕ ˕ ˕, *Sources:*

261 Superscript H, *IPA usage:* aspirated
Macro *Input1:* p^{h}, *Input2:* p\super h
Styles: pʰ *pʰ* **pʰ** pʰ, *Sources: IPA '49–'93*

262 Superscript W, *IPA usage:* labialized
Macro *Input1:* k^{w}, *Input2:* k\super w
Styles: kʷ *kʷ* **kʷ** kʷ, *Sources: IPA '49–'93*

263 Superscript J, *IPA usage:* palatalized
Macro *Input1:* t^{j}, *Input2:* t\super j
Styles: tʲ *tʲ* **tʲ** tʲ, *Sources: IPA '49–'93*

264 Superscript Gamma, *IPA usage:* velarized
Macro *Input1:* t^{\textgamma}, *Input2:* t\super G
Styles: tˠ *tˠ* **tˠ** tˠ, *Sources: IPA '89, '93*

265 Superscript Reversed Glottal Stop, *IPA usage:* pharyngealized
Macro *Input1:* d^{\textrevglotstop}, *Input2:* d\super Q
Styles: dˤ *dˤ* **dˤ** dˤ, *Sources: IPA '89, '93*

266 Superscript N, *IPA usage:* nasal release
Macro *Input1:* d^{n}, *Input2:* d\super n
Styles: dⁿ *dⁿ* **dⁿ** dⁿ, *Sources: IPA '89, '93*

267 Superscript L, *IPA usage:* lateral release
Macro *Input1:* d^{l}, *Input2:* d\super l
Styles: dˡ *dˡ* **dˡ** dˡ, *Sources: IPA '89, '93*

A.4 Tone letters

The tones illustrated here are only a representative sample of what is possible. For more details see the section entitled "Tone Letters" (page 13).

268 Extra High Tone
Macro *Input:* \tone{55}
Styles: ˥ ˥ ˥ ˥, *Sources: IPA '89, '93*

269 High Tone
Macro *Input:* \tone{44}
Styles: ˦ ˦ ˦ ˦, *Sources: IPA '89, '93*

270 Mid Tone
Macro *Input:* \tone{33}
Styles: ˧ ˧ ˧ ˧, *Sources: IPA '89, '93*

271 Low Tone
Macro *Input:* \tone{22}
Styles: ˨ ˨ ˨ ˨, *Sources: IPA '89, '93*

272 Extra Low Tone
Macro *Input:* \tone{11}
Styles: ˩ ˩ ˩ ˩, *Sources: IPA '89, '93*

273   Falling Tone
Macro   *Input:* \tone{51}
      Styles: ꜜ ꜜ ꜜ ꜜ, *Sources: IPA '89, '93*

274   Rising Tone
Macro   *Input:* \tone{15}
      Styles: ꜛ ꜛ ꜛ ꜛ, *Sources: IPA '89, '93*

275   High Rising Tone
Macro   *Input:* \tone{45}
      Styles: ꜓ ꜓ ꜓ ꜓, *Sources: IPA '89, '93*

276   Low Rising Tone
Macro   *Input:* \tone{12}
      Styles: ꜖ ꜖ ꜖ ꜖, *Sources: IPA '89, '93*

277   High Rising Falling Tone
Macro   *Input:* \tone{454}
      Styles: ꜔ ꜔ ꜔ ꜔, *Sources: IPA '89, '93*

A.5   Diacritics for extIPA, VoQS

In order to use diacritics listed in this section, it is necessary to specify the option 'extra' at the preamble (See the section entitled "Other options" on page 8). Note also that some of the diacritics are defined by using symbols from fonts other than TIPA so that they may not look quite satisfactory and/or may not be slanted (e.g. \whistle{s} s̩).

278   Left Right Arrow, Usage: labial spreading
Macro   *Input:* \spreadlips{s}
      Styles: s̫ s̫ s̫ s̫, *Sources: extIPA '94*

279   Overbridge, Usage: dentolabial
Macro   *Input:* \overbridge{v}
      Styles: v̪ v̪ v̪ v̪, *Sources: extIPA '94*

280   Bibridge, Usage: interdental/bidental
Macro   *Input:* \bibridge{n}
      Styles: n̪ n̪ n̪ n̪, *Sources: extIPA '94*

281   Subscript Double Bar, Usage: alveolar
Macro   *Input:* \subdoublebar{t}
      Styles: t̳ t̳ t̳ t̳, *Sources: extIPA '94*

282   Subscript Double Vertical Line, Usage: strong articulation
Macro   *Input:* \subdoublevert{f}
      Styles: f̎ f̎ f̎ f̎, *Sources: extIPA '94*

283   Subscript Corner, Usage: weak articulation
Macro   *Input:* \subcorner{v}
      Styles: v̬ v̬ v̬ v̬, *Sources: extIPA '94*

284   Up Arrow, Usage: whistled Articulation
Macro   *Input:* \whistle{s}
      Styles: s̩ s̩ s̩ s̩, *Sources: extIPA '94*

285 Macro	Right Arrow, Usage: sliding articulation *Input:* `\sliding{\ipa{Ts}}` *Styles:* θs θs **θs** θs, *Sources: extIPA '94*
286 Macro	Crossed tilde, Usage: denasal *Input:* `\crtilde{m}` *Styles:* m̷̃ m̷̃ **m̷̃** m̷̃, *Sources: extIPA '94*
287 Macro	Dotted Tilde, Usage: nasal escape *Input:* `\dottedtilde{a}` *Styles:* ȧ̃ ȧ̃ **ȧ̃** ȧ̃, *Sources: extIPA '94*
288 Macro	Double Tilde, Usage: velopharyngeal friction *Input:* `\doubletilde{s}` *Styles:* s̿ s̿ **s̿** s̿, *Sources: extIPA '94*
289 Macro	Parenthesis + Ring, Usage: partial voiceless *Input:* `\partvoiceless{n}` *Styles:* n n **n** n, *Sources: extIPA '94*
290 Macro	Parenthesis + Ring, Usage: initial partial voiceless *Input:* `\inipartvoiceless{n}` *Styles:* n n **n** n, *Sources: extIPA '94*
291 Macro	Parenthesis + Ring, Usage: final partial voiceless *Input:* `\finpartvoiceless{n}` *Styles:* n n **n** n, *Sources: extIPA '94*
292 Macro	Parenthesis + Subwedge, Usage: partial voicing *Input:* `\partvoice{s}` *Styles:* s s **s** s, *Sources: extIPA '94*
293 Macro	Parenthesis + Subwedge, Usage: initial partial voicing *Input:* `\inipartvoice{s}` *Styles:* s s **s** s, *Sources: extIPA '94*
294 Macro	Parenthesis + Subwedge, Usage: final partial voicing *Input:* `\finpartvoice{s}` *Styles:* s s **s** s, *Sources: extIPA '94*
295 '275	Subscript Left Pointer, Usage: right offset jaw voice *Input:* `\sublptr{J}` *Styles:* J J **J** J, *Sources: VoQS '94*
296 '276	Subscript Right Pointer, Usage: left offset jaw voice *Input:* `\subrptr{J}` *Styles:* J J **J** J, *Sources: VoQS '94*

B   Symbols not included in **TIPA**

There are about 40 symbols that appear in *PSG* but are not included or defined in **TIPA** (ordinary capital letters, Greek letters and punctuation marks excluded). Most of such symbols are the ones that have been proposed by someone but never or rarely been followed by other people.

Some of such symbols can be realized by writing appropriate macros, while some others cannot be realized without resorting to the Metafont.

This section discusses these problems by classifying such symbols into three categories, as shown below.

(1) Symbols that can be realized by TEX's macro level and/or by using symbols from other fonts.

(2) Symbols that can be imitated by TEX's macro level and/or by using symbols from other fonts (but may not look quite satisfactory).

(3) Symbols that cannot be realized at all, without creating a new font.

The following table shows symbols that belong to the first category. For each symbol, an example of input method and its output is also given. Note that barred or crossed symbols can be easily made by **TIPA**'s \ipabar macro.

Script Lowe-case F	`{\itshape f}`	*f*
Barred Small Capital I	`\ipabar{\textsci}{.5ex}{1.1}{}{}`	ɪ̶
Barred J	`\ipabar{j}{.5ex}{1.1}{}{}`	ɉ
Crossed K	`\ipabar{k}{1.2ex}{.6}{}{.4}`	ꝁ
Barred Open O	`\ipabar{\textopeno}{.5ex}{.6}{.4}{}`	ɔ̶
Barred Small Capital Omega	`\ipabar{\textscomega}{.5ex}{1.1}{}{}`	ꭥ̶
Barred P	`\ipabar{p}{.5ex}{1.1}{}{}`	ꝑ
Half-barred U	`\ipabar{u}{.5ex}{.5}{}{.5}`	ꞟ
Barred Small Capital U	`\ipabar{\textscu}{.5ex}{1.1}{}{}`	ᴜ̶
Null Sign	`$\emptyset$`	∅
Double Slash	`/\kern-.25em/`	//
Triple Slash	`/\kern-.25em/\kern-.25em/`	///
Pointer (Upward)	`k\super{\tiny$\wedge$}`	kˆ
Pointer (Downward)	`k\super{\tiny$\vee$}`	kˇ
Superscript Arrow	`k\super{\super{$\leftarrow$}}`	k←

Symbols that belong to the second category are shown below. Note that slashed symbols can be in fact easily made by a macro. For example, a slashd b i.e. ƀ can be made by \ipaclap{b}{/}. The reason why slashed symbols are not included in **TIPA** is as follows: first, a simple overlapping of a symbol and a slash does not always result in a good shape, and secondly, it doesn't seem significant to devise fine-tuned macros for symbols which were created essentialy for typewriters.

Right-hook A	a̡
Slashed B	ƀ
Slashed C	ȼ
Slashed D	đ

Small Capital Delta	ᴅ
Right-hook E	e̗
Right-hook Epsilon	ɛ̗
Small Capital F	ꜰ
Female Sign	
Uncrossed Female Sign	
Right-hook Open O	
Slashed U	u̸
Slashed W	w̸

And finally, symbols that cannot be realized at all are as follows.

- Reversed Turned Script A
- A-O Ligature
- Inverted Small Capital A
- Small Capital A-O Ligature
- D with Upper-left Hook
- Hooktop H with Rightward Tail
- Heng
- Hooktop J
- Front-bar N
- Inverted Lower-case Omega
- Reversed Esh with Top Loop
- T with Upper Left Hook
- Turned Small Capital U
- Bent-tail Yogh
- Turned 2
- Turned 3

C   Layout of **TIPA** fonts

C.1   tipa10

	'0	'1	'2	'3	'4	'5	'6	'7	
'00x	`	´	^	~	¨	″	°	˘	"0x
'01x	˘	¯	·	ꞈ	꞊	̏	ˋ	ˊ	
'02x	̑	̚	̺	̻	˛	̔	̵	̃	"1x
'03x	×	ı	ȷ	꜔	꜖	꜕	꜒	꜓	
'04x	′	!	'	ʻ	̬	̭	˜	˒	"2x
'05x	(	)	*	+	,	-	.	/	
'06x	₦	ɨ	ʌ	ʒ	ɥ	ɐ	ɒ	ɤ	"3x
'07x	θ	ə	:	ˈ	‿	=	⁀	?	
'10x	ə	ɑ	β	ç	ð	ɛ	ɸ	ɣ	"4x
'11x	ɦ	ɪ	ɟ	ʁ	ʎ	ɱ	ŋ	ɔ	
'12x	ʔ	ʕ	ɾ	ʃ	θ	ʊ	ʋ	ɯ	"5x
'13x	χ	ʏ	ʒ	[	˴	]	˹	˺	
'14x	ʻ	a	b	c	d	e	f	g	"6x
'15x	h	i	j	k	l	m	n	o	
'16x	p	q	r	s	t	u	v	w	"7x
'17x	x	y	z	‖	|	ǂ	ˬ	ˌ	
'20x	˗	ˎ	ˏ	ˏ	ˏ	ˊ	ˊ	ˊ	"8x
'21x	ˊ	˗	ˎ	ˏ	ˏ	ˏ	ˊ	ˊ	
'22x	ˊ	ˊ	|	‖	↓	↑	↗	↘	"9x
'23x	�‿	ˬ	˷	˜	'	"	˵	˶	
'24x	ɓ	đ	ɖ	ᴇ	g	ɿ	ɭ	ɺ	"Ax
'25x	ᴊ	ʮ	ɬ	λ	ʙ	ɳ	ɲ	æ	
'26x	ω	Ω	Q	ʄ	ƫ	ƚ	ts	ʯ	"Bx
'27x	ʓ	ɜ	ʙ	ʚ	ˀ	˂	˃	˸	
'30x	ᴀ	c'	ꞓ	ʥ	ɚ	ᴆ	ɞ	ɝ	"Cx
'31x	ʌ	ɠ'	ʄ	ʜ	ɩ	ɟ	ƙ	ʟ	
'32x	ʠ	ɷ	ƥ	ɋ	ɼ	ɫ	ꞗ	Œ	"Dx
'33x	ⱳ	ʧ	ᴜ	ʂ	ʡ	ʢ	ʐ	ρ	
'34x	ʙ	ɓ	ɗ	ɖ	ɠ	ɢ	æ	ç	"Ex
'35x	ħ	ɟ	ʄ	ł	ɬ	ɭ	ɰ	ɳ	
'36x	ɴ	ɲ	⊙	ʈ	ɺ	ɻ	ʀ	œ	"Fx
'37x	ø	ʂ	ƫ	ʍ	ẓ	ʑ	þ	ɦʋ	
	"8	"9	"A	"B	"C	"D	"E	"F	

41

C.2 tipasl10

	´0	´1	´2	´3	´4	´5	´6	´7	
´00x	`	´	^	~	¨	˝	°	˘	
´01x	˘	¯	·	˛	‚	ˮ	`	´	˝0x
´02x	⌢	⊓	⊔	⊡	˒	˓	ω	∼	
´03x	˟	ɪ	J	+	⊥	⊤	⊣	⊢	˝1x
´04x	´	!	'	'	ˌ	ˌ	~	'	
´05x	(	)	*	+	,	-	.	/	˝2x
´06x	ʜ	ɨ	ʌ	ʒ	ɥ	ɐ	ɒ	ʏ	
´07x	ɵ	ɘ	ǃ	'	⌣	=	⌢	?	˝3x
´10x	ə	a	β	ç	ð	ɛ	ɸ	ɣ	
´11x	ɦ	ɪ	ʝ	ʁ	ʎ	ɱ	ŋ	ɔ	˝4x
´12x	ʔ	ʕ	ɾ	ʃ	θ	ʊ	ʋ	ɯ	
´13x	χ	ʏ	ʒ	[	'	]	˹	˺	˝5x
´14x	'	a	b	c	d	e	f	g	
´15x	h	i	j	k	l	m	n	o	˝6x
´16x	p	q	r	s	t	u	v	w	
´17x	x	y	z	‖	|	ǂ	ˬ	ˌ	˝7x
´20x	ˍ	ˋ	ˎ	ˏ	ː	ˊ	˴	˵	
´21x	˶	˗	ˎ	ˏ	ː	˴	ˊ	˵	˝8x
´22x	ˊ	ˊ	|	‖	↓	↑	↗	↘	
´23x	˘	˓	˷	˜	'	"	˵	˶	˝9x
´24x	ɓ	đ	ɗ	ᴇ	g	ɩ	ɟ	ɭ	
´25x	ᴊ	ʞ	ɫ	λ	ɓ	ɳ	ɲ	æ	˝Ax
´26x	ω	ɷ	ɋ	ʆ	ʈ	ƫ	ts	ɥ	
´27x	ʒ	ɜ	ь	ъ	ʔ	<	>	˻	˝Bx
´30x	ᴀ	ć	Ɛ	ʤ	ɚ	ɞ	ɞ	ɝ	
´31x	ɤ	ɡ	ɦ	ʜ	ɩ	ʝ	ƙ	ʟ	˝Cx
´32x	ƚ	ɷ	ƥ	ƈ	ɼ	ɿ	ƭ	Œ	
´33x	ɟ	tʃ	ᴜ	ɜ	ʡ	ʢ	ʐ	ρ	˝Dx
´34x	ʙ	ɓ	ɗ	ɖ	ɠ	ɢ	æ	ç	
´35x	ħ	ɟ	ʄ	ɬ	ɫ	ɭ	ɰ	ɳ	˝Ex
´36x	ɴ	ɲ	⊙	ɺ	ɹ	ɻ	ʀ	œ	
´37x	ø	ʂ	ʈ	ʍ	ẕ	ʑ	þ	ʋ	˝Fx
	˝8	˝9	˝A	˝B	˝C	˝D	˝E	˝F	

C.3 `tipabx10`

	´0	´1	´2	´3	´4	´5	´6	´7	
´00x	`	´	^	~	¨	˝	°	˘	"0x
´01x	˘	¯	·	˛	˛	˵	˶	ˊ	
´02x	⌢	⊓	⊔	□	˒	˓	⌣	~	"1x
´03x	˟	ɪ	ɟ	+	⊥	⊤	⊣	⊢	
´04x	´	!	'	˚	˳	˳	~	'	"2x
´05x	(	)	*	+	,	-	.	/	
´06x	ʉ	ɨ	ʌ	ɜ	ɥ	ɐ	ɒ	ʏ	"3x
´07x	ɵ	ə	ː	ˑ	‿	=	⁀	?	
´10x	ə	ɑ	β	ç	ð	ɛ	ɸ	ɣ	"4x
´11x	ﬁ	ɪ	ɟ	ʁ	ʎ	ɯ	ŋ	ɔ	
´12x	ʔ	ʕ	ɾ	ʃ	θ	ʊ	ʋ	ɯ	"5x
´13x	χ	ʏ	ʒ	[	ʼ	]	˺	˹	
´14x	'	a	b	c	d	e	f	g	"6x
´15x	h	i	j	k	l	m	n	o	
´16x	p	q	r	s	t	u	v	w	"7x
´17x	x	y	z	‖	∣	ǂ	̰	ˌ	
´20x	ˍ	ˎ	ˋ	ˎ	ˎ	˴	ˊ	ˊ	"8x
´21x	ˊ	ˍ	ˋ	ˎ	ˎ	ˎ	˴	ˊ	
´22x	ˊ	ˊ	∣	‖	↓	↑	↗	↘	"9x
´23x	˘	ˏ	⌣	~	'	"	˵	˶	
´24x	ɓ	ɗ	ɖ	ᴇ	g	ɿ	ɭ	ɺ	"Ax
´25x	ɹ	ʞ	ɬ	ƛ	ɮ	ȵ	ɳ	æ	
´26x	ω	Ω	ɋ	ʆ	ʈ	ʄ	ts	ɥ	"Bx
´27x	ʓ	ɛ	ь	ъ	ˀ	˂	˃	˳	
´30x	ʌ	ɕ	ɔ	ʤ	ɚ	ɘ	ɞ	ɝ	"Cx
´31x	ʁ	ɠ	ɧ	ʜ	ɩ	ʝ	ƙ	ʟ	
´32x	ʣ	ɷ	ƥ	ɋ	ɼ	ɪ	ƭ	Œ	"Dx
´33x	ɫ	ʧ	ᴜ	ɜ	ʡ	ʢ	ʐ	ρ	
´34x	ʙ	ɓ	ɗ	ɖ	ʄ	ɢ	æ	ç	"Ex
´35x	ħ	ɟ	ʃ	ɬ	ɫ	ɭ	ɰ	ɳ	
´36x	ɴ	ɲ	⊙	ɽ	ɹ	ɻ	ʀ	œ	"Fx
´37x	ø	ʂ	ʈ	ʍ	ʐ	ʑ	þ	ɦ	
	"8	"9	"A	"B	"C	"D	"E	"F	

C.4 `tipass10`

	´0	´1	´2	´3	´4	´5	´6	´7	
´00x	`	´	^	~	¨	″	°	ˇ	"0x
´01x	˘	¯	·		˒	˝	˵	˴	
´02x	^	˷	˵	˻	˒	˓	˷	˜	"1x
´03x	˟	ǀ	ɟ	˖	˔	˕	˗	˞	
´04x	´	¡	ˈ	ˌ	ˬ	˭	~	ˌ	"2x
´05x	(	)	*	+	,	-	.	/	
´06x	ʉ	ɨ	ʌ	ɜ	ɥ	ɞ	ɒ	ɤ	"3x
´07x	ɵ	ə	:	ʼ	˘	=	⁀	?	
´10x	ə	ɑ	β	ɕ	ð	ɛ	ɸ	ɣ	"4x
´11x	ɦ	ɪ	ɟ	ʁ	ʎ	ɱ	ŋ	ɔ	
´12x	ʔ	ʕ	ɾ	ʃ	θ	ʊ	ʋ	ɯ	"5x
´13x	χ	ʏ	ʒ	[	ʻ	]	˥	˩	
´14x	ʼ	a	b	c	d	e	f	g	"6x
´15x	h	i	j	k	l	m	n	o	
´16x	p	q	r	s	t	u	v	w	"7x
´17x	x	y	z	‖	ǀ	ǂ	˔	ˌ	
´20x	˗	ˎ	ˏ	ˊ	ˋ	ˎ	ˏ	ˊ	"8x
´21x	ˋ	˗	ˎ	ˏ	ˊ	ˋ	ˎ	ˏ	
´22x	ˊ	ˋ	∣	∥	↓	↑	↗	↘	"9x
´23x	ˌ	ˌ	˜	˜	ˈ	ˈ	˵	˵	
´24x	ƀ	đ	ɖ	ᴇ	g	ɺ	ɻ	ɭ	"Ax
´25x	ᴊ	ʞ	ɬ	λ	ɮ	ɳ	ɲ	æ	
´26x	ω	Ω	ɷ	ʆ	ʈ	ɫ	ʦ	ɥ	"Bx
´27x	ʓ	ʚ	ʙ	ʛ	ˀ	˂	˃	˳	
´30x	ᴀ	ƈ	ʗ	ʤ	ɚ	ɘ	ɞ	ɝ	"Cx
´31x	ʁ	ɠ	ɦ	ʜ	ɩ	ɟ	ƙ	ʟ	
´32x	ʬ	ɷ	ƥ	ɋ	ɾ	ɹ	ƫ	œ	"Dx
´33x	ɨ	ʧ	ʊ	ɔ	ʔ	ʕ	ʐ	ɸ	
´34x	ʙ	ɓ	ɗ	ɖ	ɠ	ɢ	æ	ç	"Ex
´35x	ħ	ɟ	ʃ	ɬ	ɫ	ɭ	ɰ	ɲ	
´36x	ɴ	ɲ	☉	ɽ	ɹ	ɺ	ʀ	œ	"Fx
´37x	ø	ʂ	ƭ	ʍ	ʐ	ʑ	þ	ʮ	
	"8	"9	"A	"B	"C	"D	"E	"F	

44