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. æ, ᴇ, ɷ, λ, etc.).
- Symbols used in the historical study of Indo-European languages (e.g. ꝥ, p, ƕ, ȥ, ь, ъ, and accents such as a̋, e̋, etc.).
- Symbols used in the phonetic description of languages in East Asia (e.g. ɿ, ʅ, ȡ, ȵ, ȶ, etc.).
- Diacritics used in 'extIPA Symbols for Disordered Speech' [4] and 'VoQS (Voice Quality Symbols)' [1] (e.g. ñ̪, f͈, ḿ, 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	Basic IPA symbols II							
'13x				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.

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 ɜ 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 'ɡ', 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.

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

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`

- 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: [ˌɛkspləˈneɪʃən]

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

Output 2: [ˌɛkspləˈneɪʃən]

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 ɬ ɮ

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, ma^{214}

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 ʛ 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

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

Table 6: Examples of the accent prefix `\|`

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

Output: *k̂m̥tóm *bhrā́tēr

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 2ε. 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\textsuperscript{bc}
a\textsuperscript{b\textsuperscript{c}}
```

Output 1: t^{h} k^{w} a^{bc} $a^{b^{c}}$

Input 2:
```
\textipa{t\super{h} k\super{w}
  a\super{bc} a\super{b\super{c}}}
```

Output 2: t^{h} k^{w} a^{bc} $a^{b^{c}}$

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, ǁ
3	30	æ, ʈ, ʙ, ɓ, etc.
5	1	ç
more than 5	7	ɞ, ʡ, 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 ɑβɕðɛɸɣ**

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: *ë̯́*

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 (ꞓ) 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. ȧ̂).

```
% 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: $\overset{\text{ə}}{\text{a}}$

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

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

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

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

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

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

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

7 ʌ Turned V[16], *IPA usage:* open-mid back unrounded vowel
Input1: `\textturnv`, *Input2:* `2`
'062 *Styles:* ʌ ʌ ʌ ʌ, *Sources: IPA '49–'93*

8 b Lower-case B, *IPA usage:* voiced bilabial plosive
Input: `b`
'142 *Styles:* b b b b, *Sources: IPA '49–'93*

9 ь Soft Sign, Usage: as in *OCS* ognь 'fire'.
Input: `\textsoftsign`
'272 *Styles:* ь ь ь ь, *Sources:*

10 ъ Hard Sign, Usage: as in *OCS* gradъ 'town'.
Input: `\texthardsign`
'273 *Styles:* ъ ъ ъ ъ, *Sources:*

11 ɓ Hooktop B, *IPA usage:* voiced bilabial implosive
Input1: `\texthtb`, *Input2:* `\!b`
'341 *Styles:* ɓ ɓ ɓ ɓ, *Sources: IPA '49–'93*

12 ʙ Small Capital B, *IPA usage:* voiced bilabial trill
Input1: `\textscb`, *Input2:* `\;B`
'340 *Styles:* ʙ ʙ ʙ ʙ, *Sources: IPA '89, '93*

13 ƀ Crossed B
Input: `\textcrb`
'240 *Styles:* ƀ ƀ ƀ ƀ, *Sources:*

14 b̵ Barred B
Input: `\textbarb`
Macro *Styles:* b̵ b̵ b̵ b̵, *Sources:*

15 β Beta, *IPA usage:* voiced bilabial fricative
Input1: `\textbeta`, *Input2:* `B`
'102 *Styles:* β β β β, *Sources: IPA '49–'93*

16 c Lower-case C, *IPA usage:* voiceless palatal plosive
Input: `c`
'143 *Styles:* c c c c, *Sources: IPA '49–'93*

17 ꞓ Barred C
Input: `\textbarc`
Macro *Styles:* ꞓ ꞓ ꞓ ꞓ, *Sources:*

18 ƈ Hooktop C, *IPA usage:* voiceless palatal implosive
Input: `\texthtc`
'301 *Styles:* ƈ ƈ ƈ ƈ, *Sources: IPA '89*

19 č C Wedge, Usage: equivalent to IPA ʧ
Input: `\v{c}`
Macro *Styles:* č č č č, *Sources:*

20 ç C Cedilla, *IPA usage:* voiceless palatal fricative
Input: `\c{c}`
'347 *Styles:* ç ç ç ç, *Sources: IPA '49–'93*

21 ɕ Curly-tail C, *IPA usage:* voiceless alveolo-palatal fricative
Input1: `\textctc`, *Input2:* `C`
'103 *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 ʗ Stretched C[17], *IPA usage:* postalveolar click
Input: `\textstretchc`
'302 *Styles:* ʗ ʗ ʗ ʗ, *Sources: IPA '49, '79*

23 d Lower-case D, *IPA usage:* voiced dental/alveolar plosive
Input: `d`
'144 *Styles:* d d **d** d, *Sources: IPA '49–'93*

24 đ Crossed D
Input: `\textcrd`
'241 *Styles:* đ đ **đ** đ, *Sources:*

25 d̶ Barred D
Input: `\textbard`
Macro *Styles:* d̶ d̶ **d̶** d̶, *Sources:*

26 ɗ Hooktop D, *IPA usage:* voiced dental/alveolar implosive
Input1: `\texthtd`, *Input2:* `\!d`
'342 *Styles:* ɗ ɗ **ɗ** ɗ, *Sources: IPA '49–'93*

27 ɖ Right-tail D, *IPA usage:* voiced retroflex plosive
Input1: `\textrtaild`, *Input2:* `\:d`
'343 *Styles:* ɖ ɖ **ɖ** ɖ, *Sources: IPA '49–'93*

28 ȡ Curly-tail D, Usage: voiced alveolo-palatal plosive
Input: `\textctd`
'242 *Styles:* ȡ ȡ **ȡ** ȡ, *Sources:*

29 ʣ D-Z Ligature
Input: `\textdzlig`
Macro *Styles:* ʣ ʣ **ʣ** ʣ, *Sources:*

30 ʥ D-Curly-tail Z Ligature
Input: `\textdctzlig`
Macro *Styles:* ʥ ʥ **ʥ** ʥ, *Sources:*

31 ʤ D-Yogh Ligature, *IPA usage:* voiced alveolar lateral fricative
Input: `\textdyoghlig`
'303 *Styles:* ʤ ʤ **ʤ** ʤ, *Sources: IPA '49–'93*

32 ȡʑ Curly-tail D-Curly-tail Z Ligature
Input: `\textctdctzlig`
Macro *Styles:* ȡʑ ȡʑ **ȡʑ** ȡʑ, *Sources:*

33 ð Eth, *IPA usage:* voiced dental fricative
Input1: `\dh`, *Input2:* `D`
'104 *Styles:* ð ð **ð** ð, *Sources: IPA '49–'93*

34 e Lower-case E, *IPA usage:* colse-mid front unrounded vowel
Input: `e`
'145 *Styles:* e e **e** e, *Sources: IPA '49–'93*

35 ə Schwa, *IPA usage:* mid central unrounded vowel
Input1: `\textschwa`, *Input2:* `@`
'100 *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 ɚ Right-hook Schwa, *IPA usage:* r-colored ə
Input: `\textrhookschwa`
'304 *Styles:* ɚ ɚ ɚ ɚ, *Sources: IPA '49, '79*

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

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

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

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

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

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

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

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

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

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

47 ɡ̵ Crossed G
Input: `\textcrg`
Macro *Styles:* ɡ̵ ɡ̵ ɡ̵ ɡ̵, *Sources:*

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

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

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

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

52 ɣ Gamma, *IPA usage:* voiced velar fricative
Input1: `\textgamma`, *Input2:* `G`
'107 *Styles:* ɣ ɣ ɣ ɣ, *Sources: IPA '49–'93*

53 ɤ Baby Gamma, *IPA usage:* close-mid back unrounded vowel
Input: `\textbabygamma`
'310 *Styles:* ɤ ɤ ɤ ɤ, *Sources: IPA '49, '79*

54 ɤ Ram's Horns, *IPA usage:* close-mid back unrounded vowel
Input1: `\textramshorns`, *Input2:* `7`
'067 *Styles:* ɤ ɤ ɤ ɤ, *Sources: IPA '89, '93*

55 h Lower-case H, *IPA usage:* voiceless glottal fricative
Input: `h`
'150 *Styles:* h *h* **h** h, *Sources: IPA '49–'93*

56 ƕ H-V Ligature, Usage: as in *Gothic* ƕas 'what'.
Input: `\texthvlig`
'377 *Styles:* ƕ *ƕ* **ƕ** ƕ, *Sources:*

57 ħ Crossed H, *IPA usage:* voiceless pharyngeal fricative
Input: `\textcrh`
'350 *Styles:* ħ *ħ* **ħ** ħ, *Sources: IPA '49–'93*

58 ɦ Hooktop H, *IPA usage:* voiced glottal fricative
Input1: `\texthth`, *Input2:* `H`
'110 *Styles:* ɦ *ɦ* **ɦ** ɦ, *Sources: IPA '49–'93*

59 ɧ Hooktop Heng, *IPA usage:* simultaneous ʃ and x
Input: `\texththeng`
'312 *Styles:* ɧ *ɧ* **ɧ** ɧ, *Sources: IPA '49–'93*

60 ɥ Turned H, *IPA usage:* voiced labial-palatal approximant
Input1: `\textturnh`, *Input2:* `4`
'064 *Styles:* ɥ *ɥ* **ɥ** ɥ, *Sources: IPA '49–'93*

61 ʜ Small Capital H, *IPA usage:* voiceless epiglottal fricative
Input1: `\textsch`, *Input2:* `\;H`
'313 *Styles:* ʜ *ʜ* **ʜ** ʜ, *Sources: IPA '89, '93*

62 i Lower-case I, *IPA usage:* close front unrounded vowel
Input: `i`
'151 *Styles:* i *i* **i** i, *Sources: IPA '49–'93*

63 ı Undotted I
Input: `\i`
'031 *Styles:* ı *ı* **ı** ı, *Sources:*

64 ɨ Barred I, *IPA usage:* close central unrounded vowel
Input1: `\textbari`, *Input2:* `1`
'061 *Styles:* ɨ *ɨ* **ɨ** ɨ, *Sources: IPA '49–'93*

65 ɩ Iota
Input: `\textiota`
'314 *Styles:* ɩ *ɩ* **ɩ** ɩ, *Sources: IPA '49, '79*

66 ɿ Left-hooktop I[18]
Input: `\textlhti`
'245 *Styles:* ɿ *ɿ* **ɿ** ɿ, *Sources:*

[18]The four symbols ɿ, ɿ, ʅ and ɩ 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 ɿ Left-hooktop Long I
Input: `\textlhtlongi`
'246 *Styles:* ɿ ɿ ɿ ɿ, *Sources:*

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

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

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

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

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

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

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

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

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

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

80 ƙ 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.

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

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

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

84 ƚ Barred L
Input: `\textbarl`
'252 *Styles:* ƚ ƚ ƚ ƚ, *Sources:*

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

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

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

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

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

90 λ Lambda
Input: `\textlambda`
'253 *Styles:* λ λ λ λ, *Sources:*

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

126 ɽ Right-tail R, *IPA usage:* retroflex tap or flap
Input1: `\textrtailr`, *Input2:* `\:r`
'363 *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 ɹ Turned R, *IPA usage:* alveolar approximant
Input1: `\textturnr`, *Input2:* `\*r`
'364 *Styles:* ɹ ɹ ɹ ɹ, *Sources: IPA '49–'93*

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

[23] See explanations in footnote 19.

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

175 ʖ 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:* , *Sources: IPA '49*

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

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

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

180 ǂ 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:* $\neq$ $\neq$ $\neq$ $\neq$, *Sources:*

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

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

A.2 Suprasegmentals

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

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

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

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

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

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

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

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

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

A.3 Accents and Diacritics

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

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

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

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

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

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

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

202 ě Wedge, *IPA usage:* rising tone
Input: `\v{e}`
'007 *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 ĕ '010 Breve, *IPA usage:* extra short
Input: `\u{e}`
Styles: ĕ ĕ ĕ ĕ, *Sources: IPA '49–'93*

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

223 ă̇ *Macro* Dot Breve Accent
Input: `\textdotbreve{a}`
Styles: ă̇ *ă̇* **ă̇** ă̇, *Sources:*

224 t̪ *'021* Subscript Bridge, *IPA usage:* dental
Input1: `\textsubbridge{t}`, *Input2:* `\|[t`
Styles: t̪ *t̪* **t̪** t̪, *Sources: IPA '49–'93*

225 d̺ *'022* Inverted Subscript Bridge, *IPA usage:* apical
Input1: `\textinvsubbridge{d}`, *Input2:* `\|]t`
Styles: d̺ *d̺* **d̺** d̺, *Sources: IPA '89, '93*

226 n̻ *'023* Subscript Square, *IPA usage:* laminal
Input: `\textsubsquare{n}`
Styles: n̻ *n̻* **n̻** n̻, *Sources: IPA '89, '93*

227 o̹ *'024* Subscript Right Half-ring[25], *IPA usage:* more rounded
Input1: `\textsubrhalfring{o}`, *Input2:* `\|)o`
Styles: o̹ *o̹* **o̹** o̹, *Sources: IPA '49–'93*

228 o̜ *'025* Subscript Left Half-ring, *IPA usage:* less rounded
Input1: `\textsublhalfring{o}`, *Input2:* `\|(o`
Styles: o̜ *o̜* **o̜** o̜, *Sources: IPA '49–'93*

229 k̫ *'026* Subscript W, *IPA usage:* labialized
Input1: `\textsubw{k}`, *Input2:* `\|w{k}`
Styles: k̫ *k̫* **k̫** k̫, *Sources: IPA '79*

230 g̫ *'026* Over W, Usage: labialized
Input: `\textoverw{g}`
Styles: g *g* **g** g, *Sources:*

231 t̼ *'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{}]` [e˒].

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

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

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

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

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

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

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

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

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

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

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

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

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

245 m̩ Syllabicity Mark, *IPA usage:* syllabic
Input1: `\textsyllabic{m}`, *Input2:* `\s{m}`
'042 *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 ᵵ '046 Superimposed Tilde, *IPA usage:* velarized or pharyngealized
Input1: `\textsuperimposetilde{t}`, *Input2:* `\|~{t}`
Styles: ᵵ ᵵ ᵵ ᵵ, *Sources: IPA '49–'93*

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

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

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

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

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

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

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

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

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

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

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

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

259 ˛ '044 Right Hook
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
Input1: `p\textsuperscript{h}`, *Input2:* `p\super h`
Macro *Styles:* $\mathrm{p^h}$ p^h $\mathbf{p^h}$ $\mathsf{p^h}$, *Sources: IPA '49–'93*

262 Superscript W, *IPA usage:* labialized
Input1: `k\textsuperscript{w}`, *Input2:* `k\super w`
Macro *Styles:* $\mathrm{k^w}$ k^w $\mathbf{k^w}$ $\mathsf{k^w}$, *Sources: IPA '49–'93*

263 Superscript J, *IPA usage:* palatalized
Input1: `t\textsuperscript{j}`, *Input2:* `t\super j`
Macro *Styles:* $\mathrm{t^j}$ t^j $\mathbf{t^j}$ $\mathsf{t^j}$, *Sources: IPA '49–'93*

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

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

266 Superscript N, *IPA usage:* nasal release
Input1: `d\textsuperscript{n}`, *Input2:* `d\super n`
Macro *Styles:* $\mathrm{d^n}$ d^n $\mathbf{d^n}$ $\mathsf{d^n}$, *Sources: IPA '89, '93*

267 Superscript L, *IPA usage:* lateral release
Input1: `d\textsuperscript{l}`, *Input2:* `d\super l`
Macro *Styles:* $\mathrm{d^l}$ d^l $\mathbf{d^l}$ $\mathsf{d^l}$, *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
Input: `\tone{55}`
Macro *Styles:* ˥ ˥ ˥ ˥, *Sources: IPA '89, '93*

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

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

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

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

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

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

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

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

277 ˦˥˦ *Macro* High Rising Falling Tone
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}` s͎).

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

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

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

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

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

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

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

285 θs͢ Macro — Right Arrow, Usage: sliding articulation
Input: `\sliding{\ipa{Ts}}`
Styles: θs͢ *θs͢* **θs͢** θs͢, *Sources: extIPA '94*

286 m̃ Macro — Crossed tilde, Usage: denasal
Input: `\crtilde{m}`
Styles: m̃ *m̃* **m̃** m̃, *Sources: extIPA '94*

287 ȧ̃ Macro — Dotted Tilde, Usage: nasal escape
Input: `\dottedtilde{a}`
Styles: ȧ̃ *ȧ̃* **ȧ̃** ȧ̃, *Sources: extIPA '94*

288 s̃̃ Macro — Double Tilde, Usage: velopharyngeal friction
Input: `\doubletilde{s}`
Styles: s̃̃ *s̃̃* **s̃̃** s̃̃, *Sources: extIPA '94*

289 n₍̥₎ Macro — Parenthesis + Ring, Usage: partial voiceless
Input: `\partvoiceless{n}`
Styles: n₍̥₎ *n₍̥₎* **n₍̥₎** n₍̥₎, *Sources: extIPA '94*

290 n₍̥ Macro — Parenthesis + Ring, Usage: initial partial voiceless
Input: `\inipartvoiceless{n}`
Styles: n₍̥ *n₍̥* **n₍̥** n₍̥, *Sources: extIPA '94*

291 n̥₎ Macro — Parenthesis + Ring, Usage: final partial voiceless
Input: `\finpartvoiceless{n}`
Styles: n̥₎ *n̥₎* **n̥₎** n̥₎, *Sources: extIPA '94*

292 s₍̬₎ Macro — Parenthesis + Subwedge, Usage: partial voicing
Input: `\partvoice{s}`
Styles: s₍̬₎ *s₍̬₎* **s₍̬₎** s₍̬₎, *Sources: extIPA '94*

293 s₍̬ Macro — Parenthesis + Subwedge, Usage: initial partial voicing
Input: `\inipartvoice{s}`
Styles: s₍̬ *s₍̬* **s₍̬** s₍̬, *Sources: extIPA '94*

294 s̬₎ Macro — Parenthesis + Subwedge, Usage: final partial voicing
Input: `\finpartvoice{s}`
Styles: s̬₎ *s̬₎* **s̬₎** s̬₎, *Sources: extIPA '94*

295 J͔ '275 — Subscript Left Pointer, Usage: right offset jaw voice
Input: `\sublptr{J}`
Styles: J͔ *J͔* **J͔** J͔, *Sources: VoQS '94*

296 J͕ '276 — Subscript Right Pointer, Usage: left offset jaw voice
Input: `\subrptr{J}`
Styles: J͕ *J͕* **J͕** J͕, *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}{}{}`	ᵻ
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}{}{}`	ᵽ
Half-barred U	`\ipabar{u}{.5ex}{.5}{}{.5}`	ʉ
Barred Small Capital U	`\ipabar{\textscu}{.5ex}{1.1}{}{}`	ᵾ
Null Sign	`$\emptyset$`	$\emptyset$
Double Slash	`/\kern-.25em/`	//
Triple Slash	`/\kern-.25em/\kern-.25em/`	///
Pointer (Upward)	`k\super{\tiny$\wedge$}`	$k^{\wedge}$
Pointer (Downward)	`k\super{\tiny$\vee$}`	$k^{\vee}$
Superscript Arrow	`k\super{\super{$\leftarrow$}}`	$k^{\leftarrow}$

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. b̸ 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	ᶏ
Slashed B	b̸
Slashed C	c̸
Slashed D	d̸

Small Capital Delta	ᴀ̸
Right-hook E	ᶒ
Right-hook Epsilon	ᶓ
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	`	´	ˆ	˜	¨	˝	˚	ˇ	″0x
´01x	˘	¯	˙	˒	˓	˵	ˋ	ˊ	
´02x	⁀	⊓	⊔	▫	ʾ	ʿ	ω	ᵔᵔ	″1x
´03x	×	ı	ȷ	˖	˔	˕	⊣	⊢	
´04x	´	!	ˈ	˞	˛	ʲ	∼	ʼ	″2x
´05x	(	)	*	+	,	-	.	/	
´06x	ʉ	ɨ	ʌ	ɜ	ɥ	ɐ	ɒ	ɤ	″3x
´07x	ɵ	ɘ	ː	ˑ	‿	=	⁀	?	
´10x	ə	ɑ	β	ɕ	ð	ɛ	ɸ	ɣ	″4x
´11x	ɦ	ɪ	ʝ	ʁ	ʎ	ɱ	ŋ	ɔ	
´12x	ʔ	ʕ	ɾ	ʃ	θ	ʊ	ʋ	ɯ	″5x
´13x	χ	ʏ	ʒ	[	ʿ	]	¬	⌐	
´14x	‘	a	b	c	d	e	f	ɡ	″6x
´15x	h	i	j	k	l	m	n	o	
´16x	p	q	r	s	t	u	v	w	″7x
´17x	x	y	z	ǁ	ǀ	ǂ	˜	ˌ	
´20x	_	\	\	\	\	/	/	/	″8x
´21x	/	_	\	\	\	\	/	/	
´22x	/	/	ǀ	ǁ	↓	↑	↗	↘	″9x
´23x	ˏ	ˎ	ˆ	˜	ˈ	"	`·	·´	
´24x	ƀ	đ	ȡ	ᴇ	g	ɿ	ʅ	ʅ	″Ax
´25x	ᴊ	ʞ	ƚ	λ	ɮ	ȵ	ƞ	æ	
´26x	ω	Ω	Q	ʆ	ȶ	ƫ	ʦ	ʮ	″Bx
´27x	ʓ	ɛ	ь	ъ	ˀ	˂	˃	▫	
´30x	ᴀ	Ƈ	ʗ	ʥ	ɚ	ʚ	ɞ	ɝ	″Cx
´31x	ɤ	ʛ	ɧ	ʜ	ɩ	ɟ	ƙ	ʟ	
´32x	ɮ	ɷ	ɓ	ʠ	ɼ	ɺ	ƭ	ɶ	″Dx
´33x	ʇ	ʧ	ᴜ	ʖ	ʡ	ʢ	ʐ	ƥ	
´34x	ʙ	ɓ	ɗ	ᶑ	ɠ	ɢ	æ	ç	″Ex
´35x	ħ	ɟ	ʄ	ɫ	ɬ	ɭ	ɰ	ɳ	
´36x	ɴ	ɲ	ʘ	ɽ	ɹ	ɻ	ʀ	œ	″Fx
´37x	ø	ʂ	ʈ	ʍ	ʐ	ʑ	þ	ƕ	
	″8	″9	″A	″B	″C	″D	″E	″F	

C.2 tipasl10

	´0	´1	´2	´3	´4	´5	´6	´7	
´00x	`	´	ˆ	˜	¨	˝	˚	ˇ	″0x
´01x	˘	¯	˙	̡	˛	̏	ˎ	ˏ	
´02x	̑	⊓	⊔	▫	˒	˓	̼	᷍	″1x
´03x	̽	ı	ȷ	˖	˔	˕	⊣	⊢	
´04x	⁄	!	ˈ	˞	̢	̡	∼	’	″2x
´05x	(	)	*	+	,	-	.	/	
´06x	ʉ	ɨ	ʌ	ɜ	ɥ	ɐ	ɒ	ɤ	″3x
´07x	ɵ	ɘ	ː	ˑ	‿	=	⁀	?	
´10x	ə	ɑ	β	ɕ	ð	ɛ	ɸ	ɣ	″4x
´11x	ɦ	ɪ	ʝ	ʁ	ʎ	ɱ	ŋ	ɔ	
´12x	ʔ	ʕ	ɾ	ʃ	θ	ʊ	ʋ	ɯ	″5x
´13x	χ	ʏ	ʒ	[	ʿ	]	˥	⌐	
´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	﹨	\	\	ˏ	⁄	/	″8x
´21x	/	˗	ˎ	\	\	|	ˏ	⁄	
´22x	/	/	|	‖	↓	↑	↗	↘	″9x
´23x	ˇ	ˋ	ˆ	˜	ˈ	″	˵	˶	
´24x	ƀ	đ	ɖ	ᴇ	ɡ	ɿ	ɿ	ʅ	″Ax
´25x	ᴊ	ʞ	ƚ	λ	ɮ	ȵ	ɳ	æ	
´26x	ω	ʊ	ꞯ	ʆ	ȶ	ʨ	ʦ	ɥ	″Bx
´27x	ʓ	ɛ̃	ь	ъ	ˀ	˂	˃	▫	
´30x	ᴀ	ƈ	ʗ	ʤ	ɚ	ɞ	ʚ	ɝ	″Cx
´31x	ɤ	ɠ	ʄ	ʜ	ɩ	ɟ	ƙ	ʟ	
´32x	ɮ	ɷ	ɓ	ʠ	ɼ	ɺ	ƭ	ɶ	″Dx
´33x	ɻ	ʧ	ᴜ	ʖ	ʡ	ʢ	ʐ	ƥ	
´34x	ʙ	ɓ	ɗ	ɖ	ɠ	ɢ	æ	ç	″Ex
´35x	ħ	ɟ	ʄ	ɬ	ɫ	ɭ	ɰ	ɳ	
´36x	ɴ	ɲ	ʘ	ɽ	ɹ	ɻ	ʀ	œ	″Fx
´37x	ø	ʂ	ʈ	ʍ	ʑ	ʐ	þ	ɧ	
	″8	″9	″A	″B	″C	″D	″E	″F	

C.3 tipabx10

	´0	´1	´2	´3	´4	´5	´6	´7	
´00x	`	´	ˆ	˜	¨	˝	˚	ˇ	″0x
´01x	˘	¯	˙	˒	˓	‟	ˋ	ˏ	
´02x	⌒	⌐	⌴	▫	˃	˂	̼	͌	″1x
´03x	˟	ı	ȷ	˖	˔	˕	˧	˫	
´04x	ˏ	!	ˈ	ʳ	̜	̹	͂	ʼ	″2x
´05x	(	)	*	+	,	-	.	/	
´06x	ʉ	ɨ	ʌ	ɜ	ɥ	ɐ	ɒ	ʏ	″3x
´07x	ɵ	ɘ	ː	ˑ	‿	=	⁀	?	
´10x	ə	ɑ	β	ɕ	ð	ɛ	ɸ	ɣ	″4x
´11x	ɦ	ɪ	ʝ	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	˷	ˌ	
´20x	ˍ	ˎ	ˎ	ˎ	ˎ	ˏ	ˏ	ˏ	″8x
´21x	/	ˍ	ˎ	ˎ	\	\	ˏ	ˏ	
´22x	/	/	|	‖	↓	↑	↗	↘	″9x
´23x	ˏ	ˎ	᷆	᷇	ˈ	˝	̤	̤	
´24x	ƀ	đ	ᶑ	ᴇ	ɡ	ɿ	ʅ	ʅ	″Ax
´25x	ᴊ	ʞ	ɬ	λ	ɮ	ɳ	ƞ	ɶ	
´26x	ω	ʊ	ᴏ	ʆ	ʨ	ƫ	ʦ	ɥ	″Bx
´27x	ʓ	ɜ	ь	ъ	ˀ	˂	˃	▫	
´30x	ᴀ	ƈ	ʗ	ʤ	ɚ	ɞ	ʚ	ɝ	″Cx
´31x	ɤ	ʛ	ɧ	ʜ	ɩ	ʄ	ƙ	ʟ	
´32x	ɮ	ɷ	ɓ	ƥ	ɼ	ɺ	ƭ	ɶ	″Dx
´33x	ɟ	ʧ	ᴜ	ʖ	ʡ	ʢ	ʐ	ƥ	
´34x	ʙ	ɓ	ɗ	ɖ	ɠ	ɢ	æ	ç	″Ex
´35x	ħ	ɟ	ʄ	ɬ	ɫ	ɭ	ɰ	ɳ	
´36x	ɴ	ɲ	ʘ	ɽ	ɹ	ɻ	ʀ	œ	″Fx
´37x	ø	ʂ	ʈ	ʍ	ʐ	ʑ	þ	ƕ	
	″8	″9	″A	″B	″C	″D	″E	″F	

C.4 tipass10

	´0	´1	´2	´3	´4	´5	´6	´7	
´00x	`	´	^	˜	¨	˝	˚	ˇ	″0x
´01x	˘	¯	˙	ˏ	˛	˵	ˋ	ˊ	
´02x	⌒	⊓	⊔	□	˒	˓	ω	ᵚ	″1x
´03x	×	ˈ	⌋	₊	˔	˕	˧	˫	
´04x	ˊ	!	ˈ	˞	ʻ	ʼ	~	ʼ	″2x
´05x	(	)	*	+	,	-	.	/	
´06x	ʉ	ɨ	ʌ	ɜ	ɥ	ɐ	ɒ	ɤ	″3x
´07x	ɵ	ɘ	ː	ˑ	‿	=	⁀	?	
´10x	ə	ɑ	β	ɕ	ð	ɛ	ɸ	ɣ	″4x
´11x	ɦ	ɪ	ʝ	ʁ	ʎ	ɱ	ŋ	ɔ	
´12x	ʔ	ʕ	ɾ	ʃ	θ	ʊ	ʋ	ɯ	″5x
´13x	χ	ʏ	ʒ	[	ʼ	]	˺	˹	
´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	ǁ	ǀ	ǂ	˷	ˌ	
´20x	_	ˎ	\	\	\	ˏ	/	/	″8x
´21x	/	_	ˎ	\	\	\	ˏ	/	
´22x	/	/	│	‖	↓	↑	↗	↘	″9x
´23x	ˏ	ˎ	ˆ	˜	ˈ	˝	˵	˶	
´24x	ƀ	đ	ɖ	ᴇ	ɡ	ɿ	ɿ	ʅ	″Ax
´25x	ᴊ	ʞ	ƚ	λ	ɮ	ȵ	η	ᴔ	
´26x	ω	Ω	Q	ʆ	ʨ	ʥ	ʦ	ʮ	″Bx
´27x	ʓ	ƹ	ƅ	ъ	ˀ	˂	˃	▫	
´30x	ᴀ	ƈ	ʗ	ʤ	ɚ	ʚ	ɞ	ɝ	″Cx
´31x	ɤ	ɠ	ɧ	ʜ	ɩ	ɟ	ƙ	ʟ	
´32x	ɮ	ɷ	ƥ	ʠ	ɼ	ɺ	ƭ	ɶ	″Dx
´33x	ɻ	ʧ	ᴜ	ʖ	ʡ	ʢ	ʐ	ƿ	
´34x	ʙ	ɓ	ɗ	ᶑ	ʛ	ɢ	æ	ç	″Ex
´35x	ħ	ɟ	ʄ	ɬ	ɫ	ɭ	ɰ	ɳ	
´36x	ɴ	ɲ	ʘ	ɽ	ɹ	ɻ	ʀ	œ	″Fx
´37x	ø	ʂ	ʈ	ʍ	ʐ	ʑ	þ	ꜧ	
	″8	″9	″A	″B	″C	″D	″E	″F	