

# Representing IPA phonetics in ASCII

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This document describes a standard scheme for representing IPA transcriptions in ASCII for use in Usenet articles and e-mail. It was developed by a collaboration of several participants of the alt.usage.english and sci.lang newsgroups in late 1991 and has served as a de facto standard since then.

When designing the transcription, the following guidelines were kept in mind:

- It should be usable for both phonemic and narrow phonetic transcription.
- It should be possible to represent *all* symbols and diacritics in the IPA.
- The previous guideline notwithstanding, it is expected that (as in the past) most use will be in transcribing English, so where tradeoffs are necessary, decisions should be made in favor of ease of representation of phonemes which are common in English.
- The representation should be readable.
- It should be possible to mechanically translate from the representation to a character set which includes IPA. The reverse would also be nice.

In order to be able to represent a wide range of segments while making common segments easy to type, we allow more than one representation for a given segment. Each segment has an “explicit” representation, which is a set of features between curly braces (“{“ and “}”). Each feature is represented as a three letter abbreviation taken from a standardized set. The phoneme /b/ (a voiced, bilabial stop) could be represented as **/vcd,blb,stp/**. A first cut at the feature set appears in appendix A below.

The word *tag* could thus be represented phonemically as

**/vls,alv,stp}{low,fnt,unr,vwl}{vcd,vel,stp/**

and phonetically (in my ideolect) as

**[vls,asp,alv,stp]{low,fnt,lng,unr,vwl}{unx,vcd,vel,stp}]**

This works, but it’s a bit of a pain. To simplify transcription, we allow an “implicit” representation for a segment, which consists of a (generally alphabetic) symbol followed by diacritics. Thus /b/ stands for **/vcd,blb,stp/**. Case is significant (/n/ and /N/ are different segments). The segment symbols are given in appendix B below. The word *tag* can thus be represented phonemically as **/t&g/**.

The diacritics for a segment are represented between angle brackets (“<” and “>”) and consist of symbols or features. (In the common case where the diacritic symbol is a single character which is not also used for a segment, the brackets may be omitted.) The features which the diacritics map to override the corresponding features of the segment being modified. The word *tag* thus becomes narrowly **[t<asp>&<lng>g<unx>]** or **[t<h>&<:>g<o>]** or, most commonly **[t<h>&<g<o>]**.

Some diacritic symbols encode more than one feature set. Which one is meant should be apparent from the context. For example “.” stands for **{rnd}** (round) when attached to a vowel, but **{rfx}** (retroflex) when attached to a consonant.

Clicks are common in many languages, especially in Africa, but there is no IPA diacritic that means “click”. Rather than use up several characters for clicks (which are infrequent in the languages most often discussed), we instead use the diacritic “!” after the homorganic unvoiced stop. Thus /t!/ (= /t<clk>/ = /{alv,clk}/) is IPA /ɽ/, the sound commonly written as *tsk* and used in English to show disapproval.

The complete set of diacritic symbols appears in appendix C below. Appendices D and E contain representations of segments more or less ordered by feature, appendix D in tabular form, appendix E as a list. Finally, appendix F summarizes the symbols typically used in transcribing English by presenting a table based on the “Guide to Pronunciation” from Merriam-Webster’s *Collegiate Dictionary*.

For transcription of any specific language, a group can, by convention, alter the character mappings. As an example, for Spanish, /R/ may be more useful if used to represent /{alv,trl}/ rather than /{mid,ent,rzd,vwl}/. An author may also press a little-used symbol (for the language under consideration) into service to highlight a distinction. Such an alteration should be made explicit to avoid confusion.

The diacritics “+” and “=” and the segment symbols “\$” and “%” are explicitly left unspecified so that they can be used to mark language-specific features that are otherwise cumbersome to mark. Such symbols can be assigned either by convention for a specific language or in an ad-hoc manner by an individual author.

Stress marks are prepended to the syllable they attach to. “’” signals primary stress; “,” signals secondary stress. Spaces should be employed as in IPA to separate words (except that cliticized words may be written unseparated). When discussing single words, it may be helpful to insert a space before each syllable that does not carry a stress marker.

As an example, the sentence *I hear the secretary* for an American might be something like

**/ai hir D@ 'sEkrI,t&ri/**

while to an Englishman it might be more like

**/aI hi@ DI 'sEkrVtri/**

Numbers are used to transcribe tone. For register tone languages (e.g., Hausa, Navajo), numbers are used, with one being the lowest. Thus in Navajo, “1” is low tone and “2” is high. In Yoruba, “1” is low, “2” is mid, and “3” is high. The language’s “default” tone need not be specified. For contour tone languages (e.g., Mandarin, Thai), there is generally a numeric system in place (e.g., Mandarin: “1” is high, “2” is rising, “3” is fallin rising, “4” is falling). The tone indication should follow the syllable or vowel, whichever is more convenient.

The symbol “#” is used to represent a syllable or word boundary.

## Appendix A: Feature Abbreviations

vcd	voiced	nas	nasal	fnt	front
vls	voiceless	orl	oral	cnt	center
		apr	approximant	bck	back
blb	bilabial	vwl	vowel		
lbd	labio-dental	lat	lateral	unr	unrounded
dnt	dental	ctl	central	rnd	rounded
alv	alveolar	trl	trill		
rfl	retroflex	flp	flap	asp	aspirated
pla	palato-alveolar	clk	click	unx	unexploded
pal	palatal	ejc	ejective	syl	syllabic
vel	velar	imp	implosive	mrm	murmured
lbv	labio-velar			lng	long
uvl	uvular	hgh	high	vzd	velarized
phr	pharyngeal	smh	semi-high	lzd	labialized
glt	glottal	umd	upper-mid	pzd	palatalized
		mid	mid	rzd	rhoticized
stp	stop	lmd	lower-mid	nzd	nasalized
fric	fricative	low	low	fzd	pharyngealized

## Appendix B: Segment Symbols

This table lists the symbol, the IPA equivalent symbol, the associated feature set, and the Unicode character code and name for the corresponding IPA character. In some cases (e.g., /I/) there are multiple IPA characters in use for the segment. In this case all are listed. In some cases (e.g. /j/) the IPA symbol seems to be ambiguous (generally between an approximant and the homorganic voiced fricative).

Symbol	IPA	Features	Unicode Number	Unicode Name
<b>a</b>	<b>a</b>	low cnt unr vwl	0061	LATIN SMALL LETTER A
<b>b</b>	<b>b</b>	vcd blb stp	0062	LATIN SMALL LETTER B
<b>c</b>	<b>c</b>	vls pal stp	0063	LATIN SMALL LETTER C
<b>d</b>	<b>d</b>	vcd alv stp	0064	LATIN SMALL LETTER D
<b>e</b>	<b>e</b>	umd fnt unr vwl	0065	LATIN SMALL LETTER E
<b>f</b>	<b>f</b>	vls lbd frc	0066	LATIN SMALL LETTER F
<b>g</b>	<b>g</b>	vcd vel stp	0067	LATIN SMALL LETTER G
	<b>g</b>		0261	LATIN SMALL LETTER SCRIPT G
<b>h</b>	<b>h</b>	glt apr	0068	LATIN SMALL LETTER H
<b>i</b>	<b>i</b>	hgh fnt unr vwl	0069	LATIN SMALL LETTER I
<b>j</b>	<b>j</b>	pal apr	006A	LATIN SMALL LETTER J
		vcd pal frc		
<b>k</b>	<b>k</b>	vls vel stp	006B	LATIN SMALL LETTER K
<b>l</b>	<b>l</b>	vcd alv lat	006C	LATIN SMALL LETTER L
<b>m</b>	<b>m</b>	blb nas	006D	LATIN SMALL LETTER M
<b>n</b>	<b>n</b>	alv nas	006E	LATIN SMALL LETTER N
<b>o</b>	<b>o</b>	umd bck rnd vwl	006F	LATIN SMALL LETTER O
<b>p</b>	<b>p</b>	vls blb stp	0070	LATIN SMALL LETTER P
<b>q</b>	<b>q</b>	vls uv1 stp	0071	LATIN SMALL LETTER Q
<b>r</b>	<b>r</b>	alv apr	0279	LATIN SMALL LETTER TURNED R
<b>s</b>	<b>s</b>	vls alv frc	0073	LATIN SMALL LETTER S
<b>t</b>	<b>t</b>	vls alv stp	0074	LATIN SMALL LETTER T
<b>u</b>	<b>u</b>	hgh bck rnd vwl	0075	LATIN SMALL LETTER U

Symbol	IPA	Features	Unicode Number	Unicode Name
<b>v</b>	v	vcd lbd frc	0076	LATIN SMALL LETTER V
<b>w</b>	w	lby apr	0077	LATIN SMALL LETTER W
		vcd lby frc		
<b>x</b>	x	vls vel frc	0078	LATIN SMALL LETTER X
<b>y</b>	y	hgh fnt rnd vwl	0079	LATIN SMALL LETTER Y
<b>z</b>	z	vcd alv frc	007A	LATIN SMALL LETTER Z
<b>A</b>	a	low bck unr vwl	0251	LATIN SMALL LETTER SCRIPT A
<b>B</b>	β	vcd blb frc	03B2	GREEK SMALL LETTER BETA
<b>C</b>	ç	vls pal frc	00E7	LATIN SMALL LETTER C CEDILLA
<b>D</b>	ð	vcd dnt frc	00F0	LATIN SMALL LETTER ETH
<b>E</b>	ε	lmd fnt unr vwl	025B	LATIN SMALL LETTER EPSILON
<b>F</b>	UNUSED			
<b>G</b>	g	vcd uvl stp	0262	LATIN LETTER SMALL CAPITAL G
<b>H</b>	ħ	vls phr frc	0127	LATIN SMALL LETTER H BAR
<b>I</b>	ı	smh fnt unr vwl	026A	LATIN LETTER SMALL CAPITAL I
	ι		0269	LATIN SMALL LETTER IOTA
<b>J</b>	j	vcd pal stp	025F	LATIN SMALL LETTER DOTLESS J BAR
<b>K</b>	UNUSED			
<b>L</b>	ł	vcd vel lat	026B	LATIN SMALL LETTER L WITH MIDDLE TILDE
	l		029F	LATIN LETTER SMALL CAPITAL L
	ł	vls alv lat frc	026C	LATIN SMALL LETTER L BELT
<b>M</b>	ɱ	lbd nas	0271	LATIN SMALL LETTER M HOOK
<b>N</b>	ɳ	vel nas	014B	LATIN SMALL LETTER ENG
<b>O</b>	ɔ̞	lmd bck rnd vwl	0254	LATIN SMALL LETTER OPEN O
<b>P</b>	φ	vls blb frc	03A6	GREEK CAPITAL LETTER PHI
<b>Q</b>	ϣ	vcd vel frc	0263	LATIN SMALL LETTER GAMMA
<b>R</b>	ɶ	mid cnt rzd vwl	025A	LATIN SMALL LETTER SCHWA HOOL
	r	alv trl	0280	LATIN LETTER SMALL CAPITAL R

Symbol	IPA	Features	Unicode Number	Unicode Name
<b>S</b>	ʃ	vls pla frc	0283	LATIN SMALL LETTER ESH
<b>T</b>	θ	vls dnt frc	03B8	GREEK SMALL LETTER THETA
<b>U</b>	υ	smh bck rnd vwl	028A	LATIN SMALL LETTER UPSILON
	ω		0277	LATIN SMALL LETTER CLOSED OMEGA
<b>V</b>	ʌ	lmd bck unr vwl	028C	LATIN SMALL LETTER TURNED V
<b>W</b>	œ	lmd fnt rnd vwl	0153	LATIN SMALL LETTER O E
<b>X</b>	χ	vls uvl frc	03C7	GREEK SMALL LETTER CHI
<b>Y</b>	ø	umd fnt rnd vwl	0058	LATIN SMALL LETTER O SLASH
<b>Z</b>	ʒ	vcd pla frc	0292	LATIN SMALL LETTER YOGH
<b>?</b>	ʔ	glt stp	0294	LATIN LETTER GLOTTAL STOP
<b>@</b>	ə	mid cnt unr vwl	0259	LATIN SMALL LETTER SCHWA
<b>&amp;</b>	æ	low fnt unr vwl	00E6	LATIN SMALL LETTER A E
<b>*</b>	ɾ	vcd alv flp	027E	LATIN SMALL LETTER FISHHOOK R
<b>%</b>	AD HOC SEGMENT			
<b>\$</b>	AD HOC SEGMENT			

## Appendix C: Diacritics

Symbol	IPA	Features	Unicode Number	Unicode Name
~	̃	V: nzd	0303	NON-SPACING TILDE
	̄	C: vzd	0334	NON-SPACING TILDE OVERLAY
:	ː	lng	02D0	MODIFIER LETTER TRIANGULAR COLON
-		V: unr	NO EQUIVALENT	
	̵	C: syl	0329	NON-SPACING VERTICAL LINE BELOW
!		clk	NO EQUIVALENT	
.		V: rnd	NO EQUIVALENT	
	̣	C: rfx	0322	NON-SPACING RETROFLEX HOOK BELOW
	̤		0323	NON-SPACING DOT BELOW
,	̥	vls: ejc	02BC	MODIFIER LETTER APOSTROPHE
		vcd: imp	NO EQUIVALENT	
[	̦	dnt	032A	NON-SPACING BRIDGE BELOW
;	̧	pzd	02B2	MODIFIER LETTER SMALL J
	̨		0321	NON-SPACING PALATALIZED HOOK BELOW
"		V: cnt	NO EQUIVALENT	
		C: uvl	NO EQUIVALENT	
^		pal	NO EQUIVALENT	
+	AD HOC DIACRITIC			
=	AD HOC DIACRITIC			
<H>	̩	fzd	0334	NON-SPACING TILDE OVERLAY
<h>	̪	asp	02B0	MODIFIER LETTER SMALL H
<o>	̫	unx	02DA	SPACING RING ABOVE
	̬	vls	0325	NON-SPACING RING BELOW
<r>	̭	rzd	02B3	MODIFIER LETTER SMALL R
<w>	̮	lzd	02B7	MODIFIER LETTER SMALL W
	̯		032B	NON-SPACING INVERTED DOUBLE ARCH BELOW

Symbol	IPA	Features	Unicode Number	Unicode Name
<?>	o <sup>h</sup>	mrm	02B1	MODIFIER LETTER SMALL H HOOK
	o		0324	NON-SPACING DOUBLE DOT BELOW



## Appendix D: Segment Table

	blb		lbd		dnt		alv		rfx		pla		pal		vel		uvl	
nas		m		M		n[		n		n.				n^		N		n''
stp	p	b			t[	d[	t	d	t.	d.			c	J	k	g	q	G
frc	P	B	f	v	T	D	s	z	s.	z.	S	Z	C	C<vcd>	x	Q	X	g''
lat frc							s<lat>	z<lat>										
apr			r<lbd>		r[		r		r.				j		j<vel>		g''	
lat apr					l[		l		l.				l^		L			
trl	b<trl>						r<trl>											r''
flp								*	*									
lat flp								*<lat>										
ejc	p`				t[`		t`						c`		k`			
imp	b`				d`		d`						J`		g`	q`	G`	
clk	p!				t!		c!						c!		k!			
lat clk							l!											

	lbv		phr		glt
nas		n<lbv>			
stp	t<lbv>	d<lbv>			?
frc	w<vls>	w	H	H<vcd>	h<?>
apr	w				h

	unr			unr cnt rzd	rnd		
	fnt	cnt	bck		fnt	cnt	bck
hgh	i	i''	u-		y	u''	u
smh	I				U.		U
umd	e	@<umd>	o-	R<umd>	Y		o
mid		@		R		@.	
lmd	E	V''	V		W	O''	O
low	&	a	A		&.	a.	A.

## Appendix E: Segment List

Features	Symbol	IPA	Unicode Number	Unicode Name
<b>BILABIAL</b>				
blb nas	<b>m</b>	m	006D	LATIN SMALL LETTER M
vls blb stp	<b>p</b>	p	0070	LATIN SMALL LETTER P
vcd blb stp	<b>b</b>	b	0062	LATIN SMALL LETTER B
vls blb frc	<b>ϕ</b>	ϕ	03A6	GREEK CAPITAL LETTER PHI
vcd blb frc	<b>β</b>	β	03B2	GREEK SMALL LETTER BETA
blb trl	<b>b&lt;trl&gt;</b>	ɸ	0299	LATIN LETTER SMALL CAPITAL B
blb ejc	<b>p̣</b>	p̣		
blb imp	<b>ḅ</b>	ɸ	0253	LATIN SMALL LETTER B HOOK
blb clk	<b>p!</b>	⊙	0298	LATIN LETTER BULLSEYE
<b>LABIO-DENTAL</b>				
lbd nas	<b>M</b>	ɱ	0271	LATIN SMALL LETTER M HOOK
vls lbd frc	<b>f</b>	f	0066	LATIN SMALL LETTER F
vcd lbd frc	<b>v</b>	v	0076	LATIN SMALL LETTER V
lbd apr	<b>r&lt;lbd&gt;</b>	ɸ	028B	LATIN SMALL LETTER V HOOK
<b>DENTAL</b>				
dnt nas	<b>n[</b>	ɳ		
vls dnt stp	<b>t[</b>	ɽ		
vcd dnt stp	<b>d[</b>	ɽ		
vls dnt frc	<b>ϑ</b>	ϑ	03B8	GREEK SMALL LETTER THETA
vcd dnt frc	<b>Ð</b>	ð	00F0	LATIN SMALL LETTER ETH
dnt apr	<b>r[</b>	ɽ		
dnt lat	<b>l[</b>	ɽ		
dnt ejc	<b>ṭ</b>	ṭ		
dnt imp	<b>ḍ</b>	ɽ	0257	LATIN SMALL LETTER D HOOK
dnt clk	<b>t!</b>	ɽ	0287	LATIN SMALL LETTER TURNED T

Features	Symbol	IPA	Unicode Number	Unicode Name
<b>ALVEOLAR</b>				
alv nas	<b>n</b>	n	006E	LATIN SMALL LETTER N
vls alv stp	<b>t</b>	t	0074	LATIN SMALL LETTER T
vcd alv stp	<b>d</b>	d	0064	LATIN SMALL LETTER D
vls alv frc	<b>s</b>	s	0073	LATIN SMALL LETTER S
vcd alv frc	<b>z</b>	z	007A	LATIN SMALL LETTER Z
vls alv lat frc	<b>s&lt;lat&gt;</b>	ʃ	026C	LATIN SMALL LETTER L BELT
vcd alv lat frc	<b>z&lt;lat&gt;</b>	ʒ	026E	LATIN SMALL LETTER L YOGH
alv apr	<b>r</b>	ɹ	0279	LATIN SMALL LETTER TURNED R
vcd alv lat	<b>l</b>	ɫ	006C	LATIN SMALL LETTER L
alv trl	<b>r&lt;trl&gt;</b>	ʀ	0280	LATIN LETTER SMALL CAPITAL R <sup>1</sup>
vcd alv flp	<b>*</b>	ɾ	027E	LATIN SMALL LETTER FISHHOOK R
vcd alv lat flp	<b>*&lt;lat&gt;</b>	ɽ	027A	LATIN SMALL LETTER TURNED R LONG LEG
alv ejc	<b>ṭ</b>	ṭʰ		
alv imp	<b>ḍ</b>	ḍ	0257	LATIN SMALL LETTER D HOOK
alv clk	<b>c!</b>	ç	0297	LATIN LETTER STRETCHED C
alv lat clk	<b>l!</b>	ɟ	0296	LATIN LETTER INVERTED GLOTTAL STOP
<b>RETROFLEX</b>				
rfx nas	<b>n.</b>	ɳ	0273	LATIN SMALL LETTER N RETROFLEX HOOK
		ɳ		
vls rfx stp	<b>t.</b>	ʈ	0288	LATIN SMALL LETTER T RETROFLEX HOOK
		ʈ		
vcd rfx stp	<b>d.</b>	ɖ	0256	LATIN SMALL LETTER D RETROFLEX HOOK
		ɖ		
vls rfx frc	<b>s.</b>	ʂ	0282	LATIN SMALL LETTER S HOOK
		ʂ		
vcd rfx frc	<b>z.</b>	ʐ	0290	LATIN SMALL LETTER Z RETROFLEX HOOK

<sup>1</sup> Perhaps [R].

Features	Symbol	IPA	Unicode Number	Unicode Name
		ɹ		
rfx apr	<b>r.</b>	ɹ	0256	LATIN SMALL LETTER TURNED R RETROFLEX HOOK
		ɹ		
rfx lat	<b>l.</b>	ɭ	026D	LATIN SMALL LETTER L RETROFLEX HOOK
		ɭ		
rfx flp	<b>*.</b>	ɽ	027D	LATIN SMALL LETTER R HOOK
		ɽ		
<b>PALATO-ALVEOLAR</b>				
vls pla frc	<b>S</b>	ʃ	0283	LATIN SMALL LETTER ESH
vcd pla frc	<b>Z</b>	ʒ	0292	LATIN SMALL LETTER YOGH
<b>PALATAL</b>				
pal nas	<b>n^</b>			
vls pal stp	<b>c</b>	ç	0063	LATIN SMALL LETTER C
vcd pal stp	<b>J</b>	ɟ	025F	LATIN SMALL LETTER DOTLESS J BAR
vls pal frc	<b>C</b>	ç	00E7	LATIN SMALL LETTER C CEDILLA
vcd pal frc	<b>C&lt;vcd&gt;</b>	ɟ̥	029d	LATIN SMALL LETTER CROSSED TAIL J <sup>2</sup>
pal apr	<b>j</b>	ɟ	006A	LATIN SMALL LETTER J
rnd pal apr	<b>j&lt;rnd&gt;</b>	ɟ̥	0265	LATIN SMALL LETTER TURNED H
pal lat	<b>l^</b>	ɭ	028E	LATIN SMALL LETTER TURNED Y
pal imp	<b>J̣</b>	ɟ̥	0284	LATIN SMALL LETTER DOTLESS J BAR HOOK
pal clk	<b>c!</b>	ç	0297	LATIN LETTER STRETCHED C
<b>VELAR</b>				
vel nas	<b>N</b>	ŋ	014B	LATIN SMALL LETTER ENG
vls vel stp	<b>k</b>	k	006B	LATIN SMALL LETTER K
vcd vel stp	<b>g</b>	g	0067	LATIN SMALL LETTER G
		g	0261	LATIN SMALL LETTER SCRIPT G
vls vel frc	<b>x</b>	x	0078	LATIN SMALL LETTER X

<sup>2</sup> Perhaps [j], same as {pal, apr}.

Features	Symbol	IPA	Unicode Number	Unicode Name
vcd vel frc	<b>Q</b>	ɣ	0263	LATIN SMALL LETTER GAMMA
vel apr	<b>j&lt;vel&gt;</b>	ɥ	0270	LATIN SMALL LETTER TURNED M LONG LEG
vcd vel lat	<b>L</b>	ɫ	026B	LATIN SMALL LETTER L WITH MIDDLE TILDE
		ɱ	029F	LATIN LETTER SMALL CAPITAL L
vls alv lat frc		ɭ	026C	LATIN SMALL LETTER L BELT
vel ejc	<b>k`</b>	kʰ		
vel imp	<b>g`</b>	ɡ̃	0260	LATIN SMALL LETTER G HOOK
vel vlk	<b>k!</b>	ɰ	029E	LATIN SMALL LETTER TURNED K
<b>LABIO-VELAR</b>				
lbv nas	<b>n&lt;lbv&gt;</b>			“ng” WITH U+2030 CHARACTER TIE
vls lbv stp	<b>t&lt;lbv&gt;</b>			“kp” WITH U+2030 CHARACTER TIE
vcd lbv stp	<b>n&lt;lbv&gt;</b>			“gb” WITH U+2030 CHARACTER TIE
vls lbv stp	<b>w&lt;vls&gt;</b>	ɹ	028D	LATIN SMALL LETTER TURNED W
vcd lbv frc	<b>w</b>	w	0077	LATIN SMALL LETTER W
lbv apr				
<b>UVULAR</b>				
uvl nas	<b>n''</b>	ɴ	0274	LATIN LETTER SMALL CAPITAL N
vls uvl stp	<b>q</b>	ɓ	0071	LATIN SMALL LETTER Q
vcd uvl stp	<b>G</b>	ɠ	0262	LATIN LETTER SMALL CAPITAL G
vls uvl frc	<b>X</b>	χ	03C7	GREEK SMALL LETTER CHI
vcd uvl frc	<b>g''</b>	ɠ	0281	LATIN LETTER SMALL CAPITAL INVERTED R
uvl apr				
uvl trl	<b>r''</b>	ʀ	0280	LATIN LETTER SMALL CAPITAL R
vls uvl imp	<b>q`</b>	ɟ	02A0	LATIN SMALL LETTER Q HOOK
vcd uvl imp	<b>G`</b>	ɢ	029B	LATIN LETTER SMALL CAPITAL G HOOK
<b>PHARYNGEAL</b>				
vls phr frc	<b>H</b>	ħ	0127	LATIN SMALL LETTER H BAR
vcd phr frc	<b>H&lt;vcd&gt;</b>	ʕ	0295	LATIN LETTER REVERSED GLOTTAL STOP
<b>GLOTTAL</b>				

Features	Symbol	IPA	Unicode Number	Unicode Name
glt stp	?	ʔ	0294	LATIN LETTER GLOTTAL STOP
glt apr	h	h	0068	LATIN SMALL LETTER H
mrm glt frc	h<?>	ɦ	0266	LATIN SMALL LETTER H HOOK
FRONT				
hgh fnt unr vwl	i	i	0069	LATIN SMALL LETTER I
hgh fnt rnd vwl	y	ɣ	0079	LATIN SMALL LETTER Y
smh fnt unr vwl	I	I	026A	LATIN LETTER SMALL CAPITAL I
		ɪ	0269	LATIN SMALL LETTER IOTA
smh fnt rnd vwl	I.	ɣ	028F	LATIN LETTER SMALL CAPITAL Y
umd fnt unr vwl	e	e	0065	LATIN SMALL LETTER E
umd fnt rnd vwl	Y	ø	0058	LATIN SMALL LETTER O SLASH
lmd fnt unr vwl	E	ɛ	025B	LATIN SMALL LETTER EPSILON
lmd fnt rnd vwl	W	œ	0153	LATIN SMALL LETTER O E
low fnt unr vwl	&	æ	00E6	LATIN SMALL LETTER A E
low fnt rnd vwl	&.	œ	0276	LATIN LETTER SMALL CAPITAL O E
CENTRAL				
hgh cnt unr vwl	i''	ɨ	0268	LATIN SMALL LETTER BARRED I
hgh cnt rnd vwl	u''	ɥ	0289	LATIN SMALL LETTER U BAR
umd cnt unr vwl	@<umd>	ɘ	0258	LATIN SMALL LETTER REVERSED E
umd cnt rzd vwl	R<umd>	ɚ	025D	LATIN SMALL LETTER REVERSED EPSILON HOOK
mid cnt unr vwl	@	ə	0259	LATIN SMALL LETTER SCHWA
mid cnt rzd vwl	R	ɘ̣	025A	LATIN SMALL LETTER SCHWA HOOL
mid cnt rnd vwl	@.	ɵ	0275	LATIN SMALL LETTER BARRED O
lmd cnt unr vwl	V''	ɜ	025C	LATIN SMALL LETTER REVERSED EPSILON
lmd cnt rnd vwl	O''	ɞ	025E	LATIN SMALL LETTER CLOSED REVERSED EPSILON
low cnt unr vwl	a	a	0061	LATIN SMALL LETTER A
BACK				

Features	Symbol	IPA	Unicode Number	Unicode Name
hgh bck unr vwl	<b>u-</b>	ɯ	026F	LATIN SMALL LETTER TURNED M
hgh bck rnd vwl	<b>u</b>	u	0075	LATIN SMALL LETTER U
smh bck rnd vwl	<b>U</b>	ɯ	028A	LATIN SMALL LETTER UPSILON
		ɤ	0277	LATIN SMALL LETTER CLOSED OMEGA
umd bck unr vwl	<b>o-</b>	ɣ	0264	LATIN SMALL LETTER BABY GAMMA
umd bck rnd vwl	<b>o</b>	o	006F	LATIN SMALL LETTER O
lmd bck unr vwl	<b>V</b>	ʌ	028C	LATIN SMALL LETTER TURNED V
lmd bck rnd vwl	<b>O</b>	ɔ	0254	LATIN SMALL LETTER OPEN O
low bck unr vwl	<b>A</b>	ɑ	0251	LATIN SMALL LETTER SCRIPT A
low bck rnd vwl	<b>A.</b>	ɒ	0252	LATIN SMALL LETTER TURNED SCRIPT A

## Appendix F: Representation of Sounds in English

This table is based on the “Guide to Pronunciation” in Merriam-Webster’s *Collegiate Dictionary*.<sup>3</sup> The “traditional American” column represents my recollection from my elementary school days. For non-Americans, the main feature is the separation of vowels into “long vowels” (“those that say their own name”), marked with a macron and “short vowels”, marked with a breve. The order is as presented in that guide, roughly in alphabetical order based on the “MW” column.

Symbol	IPA	MW	“Traditional American”	Representative words (per MWCD) [American pronunciation unless stated otherwise]
@	ə	ə	ə	<b>banana, collide, abut, humdrum</b>
n-	ŋ	ən		signifies that the following consonant is syllabic, as in <b>battle, cotton</b> , one pronunciation of <b>open</b> and of <b>and</b> .
<b>R</b>	ɚ	ər	er	<b>operation, further, urger</b>
<b>&amp;</b>	æ	a	ă	<b>mat, map, mad, gag, snap, patch</b>
<b>eI</b>	eɪ	ā	ā	<b>day, fade, date, aorta, drape, cape</b>
<b>A</b>	a	ă	ǒ	<b>bother, cot, and</b> , with most American speakers, <b>father, cart</b>
<b>A.</b>	ɒ	à		<b>father</b> as pronounced by speakers who do not rhyme it with <b>bother</b>
<b>aU</b>	aʊ	aù	ow	<b>now, loud, out</b>
<b>b</b>	b	b	b	<b>baby, rib</b>
<b>tS</b>	tʃ	ch	ch	<b>chin, nature</b>
<b>d</b>	d	d	d	<b>did, adder</b>
<b>E</b>	ɛ	e	ě	<b>bet, bed, peck</b>
<b>i</b>	i	ē	ē	<b>beat, nosebleed, evenly, easy, mealy</b>
<b>f</b>	f	f	f	<b>fifty, cuff</b>
<b>g</b>	g	g	g	<b>go, big, gift</b>
<b>h</b>	h	h	h	<b>hat, ahead</b>
<b>hw</b>	hw	hw	hw	<b>whale</b> as pronounced by those who do not have the same pronunciation for both <i>whale</i> and <i>wail</i> .
<b>I</b>	ɪ	i	ĩ	<b>tip, banish, active</b>
<b>aI</b>	aɪ	ī	ī	<b>site, side, buy, tripe</b>

<sup>3</sup> Specifically, the ninth edition.



Symbol	IPA	MW	“Traditional American”	Representative words (per MWCD) [American pronunciation unless stated otherwise]
<b>dZ</b>	dʒ	j	j	<b>job, gem, edge, join, judge</b>
<b>k</b>	k	k	k	<b>kin, cook, ache</b>
<b>X</b>	χ	k̥		German <b>Buch</b> , one pronunciation of English <b>loch</b>
<b>C</b>	ç			German <b>ich</b>
<b>l</b>	l	l	l	<b>lily, pool</b>
<b>m</b>	m	m	m	<b>murmer, dim, nymph</b>
<b>n</b>	n	n	n	<b>no, own</b>
<b>o~</b>	õ	o <sup>n</sup>		indicates that a preceding vowel or diphthong is pronounced with the nasal passages open as in the french <i>un bon vin blanc</i>
<b>N</b>	ŋ	ŋ	ng	<b>sing, singer, finger, ink</b>
<b>oU</b>	ou	ō	ō	<b>bone, know, beau</b>
<b>O</b>	ɔ	ó	aw	<b>saw, all, gnaw, caught</b>
<b>W</b>	œ	œ		French <b>bœuf</b> , German <b>Hölle</b>
<b>Y</b>	ø	œ̄		French <b>feu</b> , German <b>Höhle</b>
<b>OI</b>	ɔɪ	öi	oy	<b>coin, destroy</b>
<b>p</b>	p	p	p	<b>pepper, lip</b>
<b>r</b>	ɹ	r	r	<b>red, rarity, car</b>
<b>s</b>	s	s	s	<b>source, less</b>
<b>S</b>	ʃ	sh	sh	<b>shy, mission, machine, special</b>
<b>t</b>	t	t	t	<b>tie, attack, late, later, latter</b>
<b>T</b>	θ	th	th	<b>thin, ether</b>
<b>D</b>	ð	th̄	th	<b>then, either</b>
<b>u</b>	u	ü	ōō <sup>4</sup>	<b>rule, youth</b>
<b>ju</b>	ju	yü	ū	<b>youth, union, few</b>
<b>U</b>	ʊ	ú	öö <sup>5</sup>	<b>pull, wood, book, curable, fury</b>
<b>I.</b>	ɣ	ue <sup>6</sup>		German <b>füllen, hübsch</b>

<sup>4</sup> Traditionally, a single macron would go over both “o”s.

<sup>5</sup> Traditionally, a single breve would go over both “o”s

Symbol	IPA	MW	“Traditional American”	Representative words (per MWCD) [American pronunciation unless stated otherwise]
<b>y</b>	y	ūē <sup>7</sup>		French <b>rue</b> , German <b>fühlen</b>
<b>v</b>	v	v	v	<b>vivid</b> , <b>invite</b>
<b>w</b>	w	w	w	<b>we</b> , <b>away</b>
<b>j</b>	j	y	y	<b>yard</b> , <b>young</b> , <b>cue</b> , <b>curable</b> , <b>few</b> , <b>fury</b> , <b>union</b>
<b>t;</b>	tj	tʲ		modifies the preceding sound to make it more “y-ish”
<b>z</b>	z	z	z	<b>zone</b> , <b>raise</b>
<b>Z</b>	ʒ	zh	zh	<b>vision</b> , <b>azure</b>

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<sup>6</sup> As a ligature

<sup>7</sup> As a ligature with a single macron.