The IPA 1989 Kiel Convention Workgroup 9 report: Computer Coding of IPA Symbols and Computer Representation of Individual Languages

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The IPA 1989 Kiel Convention Workgroup 9 report: Computer Coding of IPA Symbols and Computer Representation of Individual Languages

Declaration

The Association must define and communicate its officially accepted symbols to other organizations and professionals, including publishers, dictionary makers, computer-systems specialists, and programmers. Accordingly, it was decided that each accepted symbol or diacritic should be assigned a unique numerical equivalent, independent of computer-coding conventions, and a unique name which provides a mnemonic description of the character shape. Symbols that have been used in earlier versions of the IPA, but deleted in later revisions, should retain a number, and name, for reference purposes. The numerical equivalent (IPA Number) is to be regarded as a communication-interchange standard, to serve as a basis for creating computer-code translation tables from various phonetic-character-set software to the common IPA Number. This IPA Number is not implemented directly in computer format (for example, ASCII), but is expressed as a simple numerical directory of digit triples to serve as a unique reference. The IPA Number can also serve as a typesetter's guide to the Phonetic Symbol Chart. The systematic numerical listing represents the IPA symbols as presented in the Chart. Therefore, the first digit of the triple indicates the symbol category; 1nn for accepted IPA consonant symbols, 2nn for former IPA consonant symbols and non-IPA consonant symbols, 3nn for vowels, 4nn for segmental diacritics, 5nn for suprasegmental symbols; 6nn-8nn are reserved for future specification (e.g., for symbols for voice quality settings or for pathological speech). The digit triple 9nn has the function of an escape sequence from IPA-symbol mode into procedures definable for special applications (e.g., Roman, Greek, Cyrillic orthographies, "Comment" mode, etc.). It is suggested that 900-920 are reserved for standard definition by the Association (at a later date), and that 921-999 should be free for individual, non-standardized procedures. The listing cross-references each IPA symbol and diacritic with its IPA Number (digit triple), and its unique IPA Name. Translation tables can be developed to reference ASCII or other coding assignments of commonly used and accepted systems to IPA Numbers. The coding assignments of these systems will continue to be collected and disseminated, for purposes of information and comparison, through publication in the *Journal* and from the Association.

Computer representations of individual languages should employ the official IPA symbols. This guarantees the interchange of phonetic descriptions between institutions by means of the IPA Numbers. Symbols for the annotation of speech databases are to be selected according to agreed decisions on the phonemic (or even orthographic) representation for the given language. If extensive speech databases are given phonetic specifications, it is recommended to have at least two levels of transcription: a systematic (or broad) transcription identifying the spoken words within each utterance, and a detailed (or narrow) transcription specifying the actual phonetic realization. Thus, the given relationships between different levels of transcription on the one hand, as well as the relationship between the acoustic signal and these phonetic categories on the other, serve different purposes. For the advancement of speech technology, having two levels of distinction is a practical requirement. At the same time, it provides speech data in a form

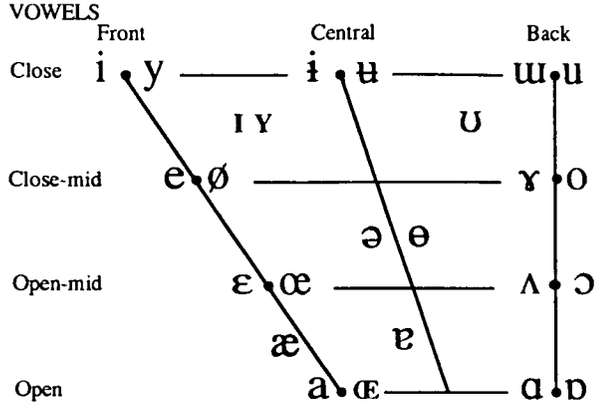
THE INTERNATIONAL PHONETIC ALPHABET (revised to 1989)

CONSONANTS

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k g	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap				ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			
Ejective stop	pʼ			tʼ		ʈʼ	cʼ	kʼ	qʼ		
Implosive	ɓ ɗ			ɗ			ʄ	ɠ	ʛ		

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

VOWELS



Where symbols appear in pairs, the one to the right represents a rounded vowel.

OTHER SYMBOLS

- ʍ Voiceless labial-velar fricative
- w Voiced labial -velar approximant
- ɥ Voiced labial-palatal approximant
- ʜ Voiceless epiglottal fricative
- ʢ Voiced epiglottal plosive
- ʡ Voiced epiglottal fricative
- ʃʒ Simultaneous ʃ and x
- ɜ Additional mid central vowel
- ʘ Bilabial click
- ǀ Dental click
- ǃ (Post)alveolar click
- ǂ Palatoalveolar click
- ǁ Alveolar lateral click
- ʖ Alveolar lateral flap
- ɕ ʑ Alveolo-palatal fricatives

Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary. k͡p t͡s

DIACRITICS

◌̥ Voiceless	n̥ d̥	◌̹ More rounded	ɔ̹	◌ʷ Labialized	tʷdʷ
◌̬ Voiced	s̬ t̬	◌̜ Less rounded	ɔ̜	◌ʲ Palatalized	tʲdʲ
◌ʰ Aspirated	tʰ dʰ	◌̟ Advanced	u̟	◌ˠ Velarized	tˠdˠ
◌̤ Breathy voiced	b̤ a̤	◌̠ Retracted	i̠	◌ˤ Pharyngealized	tˤdˤ
◌̰ Creaky voiced	b̰ a̰	◌̈ Centralized	ë	◌̴ Velarized or pharyngealized	ɫ
◌̼ Linguolabial	t̼ d̼	◌̽ Mid centralized	e̽	◌̝ Raised	e̝ ɪ̝ (ɪ̝ = voiced alveolar fricative)
◌̪ Dental	t̪ d̪	◌̘ Advanced Tongue root	e̘	◌̞ Lowered	e̞ β̞ (β̞ = voiced bilabial approximant)
◌̺ Apical	t̺ d̺	◌̙ Retracted Tongue Root	e̙	◌̃ Nasalized	ẽ
◌̻ Laminal	t̻ d̻	◌˞ Rhoticity	ɚ	◌ⁿ Nasal release	dⁿ
				◌ˡ Lateral release	dˡ
				◌̚ No audible release	d̚
				◌̩ Syllabic	ɬ̩
				◌̯ Non-syllabic	e̯

SUPRASEGMENTALS

- ˈ Primary stress ˌfoʊnəˈtɪʃən
- ˌ Secondary stress
- ː Long eː
- ˑ Half-long eˑ
- ◌̆ Extra-short ĕ
- . Syllable break ɹi.ækt
- | Minor (foot) group
- ‖ Major (intonation group)
- ‿ Linking (absence of a break)
- ↗ Global rise
- ↘ Global fall

LEVEL TONES

˝	or ˦	Extra-high
ˊ	˧	High
˗	˨	Mid
ˋ	˩	Low
̏	˩˩	Extra-low
↓		Downstep
↑		Upstep

CONTOUR TONES

˩˥	or ˧˥	rise
˥˩	˦˨	fall
˧˩˧		high rise
˩˧		low rise
˥˩˥		rise fall
		etc.

which allows the development and extension of phonetic knowledge, particularly if further, multiply transduced, physiological data are included in speech databases.

Explanatory remarks

The above declaration, if approved by the Council of the Association, is entended to form a section of the proposed *Handbook of the International Phonetic Association.* The following considerations underlie the formulation of the declaration.

1. The main decision, to provide a computer-independent numerical directory of digit triples, results from the following points of discussion:
 a) As an international advisory body, the Association cannot make recommendations for symbol coding that are biased towards one particular existing system. There are a number of coding systems that are used by more than one institution, but none of them has a dominant international position, and the differences in coding assignments between them are too great, or too subtle, to attempt a compromise or fusion.
 b) The recommendation of a 7-bit ASCII or 8-bit extended-ASCII coding system would be short-sighted in view of development towards 16-bit and 32-bit processors. In fact, any specific recommendations would tie the Association to a stage of technological development which is bound to be outdated long before the next revision of the handbook.
 c) The mnemonics of any concrete coding recommendations are keyboard specific and therefore internationally untenable.
 d) The computer-independent listing would serve also as an interchange standard and as a typesetter's guide.

2. The choice of a directory of three-digit numerical equivalents was made for reasons of economy, allowing some logical organization of the symbol types while keeping the digit string to a minimal length. A two-digit string (00-99), following the first digit which characterizes symbol type, is sufficient to represent all the individual symbols within each type. It was agreed that the two-digit string should first include the symbols recommended by the Association for use at present, but should then continue to include symbols not in current use.

3. The final three paragraphs of the Computer Group declaration are concerned with the assumed purposes to which computer representations of individual languages are to be put, namely: whether for speech technology applications or for basic research, the relation between the speech signal and the linguistic structure is of prime interest. The recommendation for (at least) two levels of annotation stems from the agreement that phonetic information, both in the form of phonetic symbols and in the quantitative specification of selected acoustic dimensions, needs to be related to a systematic (e.g., phonemic) representation. Thus, both the (segmented) acoustic signal and detailed transcription are directly relatable to the systematic transcription.

Note

A numerical listing organized according to the recommendations presented in the declaration has already been worked out based on the draft version of the new IPA Chart, and is ready to be presented once the revisions proposed at the Kiel Convention have been ratified by the Council of the Association.