# The Use of ASCII and its Adaptation for Multiple Alphabets and Keyboards. Frank W. Bell

## Introduction

The most extensive ASCII standard currently is ISO 8859-1. However it is only for Roman based alphabets. By the use of four characters, SO, SI, DC2 and DC4, a bank switching scheme is enabled. DC1 and DC3 are reserved for flow control. Also various keyboard layouts and other alphabets are considered so as to make a combination version. This is based on the Japanese keyboard which has a few more keys for other functions, which are also applied to other alphabets particularly Chinese.

The International Phonetic Alphabet, Greek and more mathematical and scientific characters are included. This adaptation is not for use in things like location codes, etc. where they may be copied for use elsewhere as data and the bank switching system may not function. So Romanization of other languages to use 7 bit ASCII with leading bit as 0 SHOULD be used for such purposes. The use of the bank switching is reset to the default ASCII at the beginning of every new line, this is to reduce problems of errors in use with other systems.

This document may have errors, and improvements may be desirable. Accordingly, any errors, suggentions, etc. should be sent to the author until such time as this is defined as a standard.

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## ASCII Code Table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ASCII char |  | ISO 8859-1 | ASCII uses, Greek, Hangul, IPA | Working Notes | Working Notes 2 | The first ^ is CTRL-, C use |
|  | &#00; | Unused | NUL null |  |  | ^@ \0 |
|  | &#01; |  | SOH start of header |  |  | ^A |
|  | &#02; |  | STX start of text | Text mode | Note 45 | ^B |
|  | &#03; |  | ETX end of text | Numeric mode | Note 45 | ^C |
|  | &#04; |  | EOT end of transmission |  |  | ^D |
|  | &#05; |  | ENQ enquiry |  |  | ^E |
|  | &#06; |  | ACK Acknowledgement |  |  | ^F |
|  | &#07; |  | BEL Bell or BEEP  Note 56 | Next item in row | e.g. matrix or | ^G \a |
|  | &#08; |  | BS backspace | Next row | determinant | ^H \b |
|  | &#09; | Horizontal tab | Horizontal tab |  |  | ^I \t |
|  | &#10; | Line feed | Line feed/New Line |  |  | ^J \n |
|  | &#11; | Unused | VT vertical tab |  |  | ^K \v |
|  | &#12; |  | NP or FF form feed |  |  | ^L \f |
|  | &#13; | Carriage Return | Carriage Return |  |  | ^M \f |
|  | &#14; | Unused | SO (IPA UC mostly) |  |  | ^N |
|  | &#15; |  | SI shift in (ASCII BASE) |  |  | ^O |
|  | &#16; |  | DLE data link escape |  |  | ^P |
|  | &#17; |  | DC1 XON |  |  | ^Q |
|  | &#18; |  | DC2 (shift in 2) (GREEK/HANGUL/IPA LC) |  |  | ^R |
|  | &#19; |  | DC3 XOFF |  |  | ^S |
|  | &#20; |  | DC4 (Unicode/other) |  |  | ^T |
|  | &#21; |  | NAK negative ACK |  |  | ^U |
|  | &#22; |  | SYN sync idle |  |  | ^V |
|  | &#23; |  | ETB end transmission block |  |  | ^W |
|  | &#24; |  | CAN cancel |  |  | ^X |
|  | &#25; |  | EM end of medium |  |  | ^Y |
|  | &#26; |  | SUBstitute |  |  | ^Z |
|  | &#27; |  | ESCape |  |  | ^[ |
|  | &#28; |  | FS file separator |  |  | ^\ |
|  | &#29; |  | GS group separator |  |  | ^] |
|  | &#30; |  | RS record separator |  |  | ^^ |
|  | &#31; |  | US unit separator |  |  | ^\_ |
|  | &#32; | Space (Em) |  | En space, no-break | Use CTRL- space | Note 52 for numbers |
| ! | &#33; | Exclamation mark |  | CTRL |  |  |
| " | &#34; | Quotation mark |  | ALT | ♭, flat note | Note 55 |
| # | &#35; | Number sign, pound | # | DEL | ♯, sharp note | Note 55 |
| $ | &#36; | Dollar sign |  | Fn | ∠ | Angle |
| % | &#37; | Percent sign |  | WIN/MAC | ∠A | Azimuth |
| & | &#38; | Ampersand |  | 0xA | ∠E | Elevation |
| ' | &#39; | Apostrophe |  | 0xB | ∠S | Solid |
| ( | &#40; | Left parenthesis |  | 0xC | ♫ | Music content note 55 |
| ) | &#41; | Right parenthesis |  | 0xD |  |  |
| \* | &#42; | Asterisk |  | 0xE |  |  |
| + | &#43; | Plus sign |  | 0xF |  |  |
| , | &#44; | Comma |  | Cursor up | CSV field delimiter | May display as triple digit separator, but not included as data. Decimal point not required in value.See ISO and no-break space. |
| - | &#45; | Hyphen |  | Cursor down |  |  |
| . | &#46; | Period (fullstop) |  | Cursor right |  | Decimal point. |
| / | &#47; | Solidus (slash) |  | Cursor left | Italic end |  |
| 0 | &#48; | Digit 0 | 0 | Italic start | F10 | REW |
| 1 | &#49; | Digit 1 | 1 | reserved | F1 |  |
| 2 | &#50; | Digit 2 | 2 | reserved | F2 | Record |
| 3 | &#51; | Digit 3 | 3 | reserved | F3 |  |
| 4 | &#52; | Digit 4 | 4 | reserved | F4 |  |
| 5 | &#53; | Digit 5 | 5 | reserved | F5 | Mark in |
| 6 | &#54; | Digit 6 | 6 | reserved | F6 | Mark out |
| 7 | &#55; | Digit 7 | 7 | reserved | F7 | Mute |
| 8 | &#56; | Digit 8 | 8 | Bold start | F8 | Vol- |
| 9 | &#57; | Digit 9 | 9 | Bold end | F9 | Vol+ |
| : | &#58; | Colon | Colon | Intersection | F11 | PLAY/PAUSE |
| ; | &#59; | Semi-colon | Semi-colon | Union | F12 | FFWD |
| < | &#60; | Less than | Less than | Less than or equal to |  |  |
| = | &#61; | Equals sign | Equals sign | Equivalent to |  |  |
| > | &#62; | Greater than | Greater than | Greater than or equal to |  |  |
| ? | &#63; | Question mark | Question mark | Right arrow |  |  |
| @ | &#64; | Commercial at | Commercial at | Not equal to |  |  |
| A | &#65 | A | ㅁ (m) | ↗ global rise |  |  |
| B | &#66 | B Voiced bilabial trill (b lower case) | ㅠ (yu) | ↘ global fall |  |  |
| C | &#67 | C Voiceless palatal plosive | ㅊ (ch) | ʘ | Bilabial click |  |
| D | &#68 | D | ㅇ (-/ng) | ǀ | Dental click |  |
| E | &#69 | E | ㄷ (d) | **ǃ** | (Post) alveolar click |  |
| F | &#70 | F Voiceless labio-dental fricative | ㄹ (l/r) | ǂ | Palatal- alveolar |  |
| G | &#71 | G | ㅎ (h) | ǁ | Alveolar  lateral click |  |
| H | &#72 | H | ㅗ (o) |  |  |  |
| I | &#73 | I | ㅑ (ya) | ɓ | Bilabial | Voiced  implosive |
| J | &#74 | J | ㅓ (eo) | ɓ | Bilabial | Voiced  implosive |
| K | &#75 | K | ㅏ (a) | ɗ | Dental /  alveolar | Voiced  implosive |
| L | &#76 | ʟ Voiced velar lateral approximant | ㅣ (i) | ɗ | Dental /  alveolar | Voiced  implosive |
| M | &#77 | M | ㅡ (eu) | ’ | Ejective |  |
| N | &#78 | N | ㅜ (u) |  |  |  |
| O | &#79 | O | ㅐ ( **æ** ) e.g hay | ʄ | Palatal | Voiced  implosive |
| P | &#80 | P | ㅔ (e) | ʄ | Palatal | Voiced  implosive |
| Q | &#81 | Q Voiced uvular plosive, | ㅂ (b) | ɠ | Velar | Voiced  implosive |
| R | &#82 | R | ㄱ (g) | ɠ | Velar | Voiced  implosive |
| S | &#83 | S | ㄴ (n) | ʛ | Uvular | Voiced  implosive |
| T | &#84 | T | ㅅ (s) | ʛ | Uvular | Voiced  implosive |
| U | &#85 | U | ㅕ (yeo) | ɽ | Voiced retroflex tap/flap |  |
| V | &#86 | V Voiced labio-dental fricative | ㅍ (p) | ɽ | Voiced retroflex tap/flap |  |
| W | &#87 | W | ㅈ (j) | ɬ | Voiceless alveolar lateral fricative |  |
| X | &#88 | X Voiceless velar fricative | ㅌ (t) | ɬ | Voiceless alveolar lateral fricative |  |
| Y | &#89 | Y | ㅛ (yo) | ɻ | Voiced retroflex approximant |  |
| Z | &#90 | Z | ㅋ (k) | ɻ | Voiced retroflex approximant |  |
| [ | &#91; | Left square bracket | Left square bracket |  |  |  |
| \ | &#92; | Reverse solidus (backslash) | Reverse solidus (backslash) |  |  | \\ |
| ] | &#93; | Right square bracket | Right square bracket |  |  |  |
| ^ | &#94; | Caret | Caret |  |  |  |
| \_ | &#95; | Horizontal bar (underscore) | Horizontal bar (underscore) | Overline start | Underline start |  |
| ` | &#96; | Acute accent | Acute accent | Overline end | Underline end |  |
| a - z | &#97; - &#122; | Letters a-z | Phonetic IPA |  | Hangul/other note |  |
| a | &#97 | a | m | M | ㅁ (m) | Voiced nasal bilabial |
| b | &#98 | b Voiced bilabial trill | **ʃ** | **∫**Sh(oe) | ㅠ (yu) unused | ju |
| c | &#99 | c Voiceless palative plosive, use C upper case | **ʒ** | **Ʒ** | ㅊ (ch) | Post-alveolar fricative |
| d | &#100 | d | ŋ | Ŋ | ㅇ (-/ng) | Voiced nasal velar |
| e | &#101 | e | d | D | ㄷ (d) | Voiced alveolar plosive |
| f | &#102 | f Voiceless labio-dental fricative, use F upper case | r | R | ㄹ (l/r), r only | Voiced uvular trill L/l for l |
| g | &#103 | g | h | H | ㅎ (h) | Glottal fricative |
| h | &#104 | h | o | O | ㅗ (o) |  |
| i | &#105 | i | l | L | ㅑ (ya) unused | ja alveola lateral approximant |
| j | &#106 | j | **ə** | **Ә** | ㅓ (eo) |  |
| k | &#107 | k | a | A | ㅏ (a) after /aːftə/ |  |
| l | &#108 | l Voiced velar lateral approximant | i | I | ㅣ (i) slip /sl**I**p/ |  |
| m | &#109 | m | ʋ | U | ㅡ (eu) | Voiced labio-dental approximant |
| n | &#110 | n | y | Y | ㅜ (u) |  |
| o | &#111 | o | **O æ** | **Æ** | ㅐ (ae) cat /kæt/ |  |
| p | &#112 | p | e | E | ㅔ (e) ten /ten/ |  |
| q | &#113 | q Voiced uvular plosive, use Q upper case | b | B | ㅂ (b) | Voiced bilabial plosive |
| r | &#114 | r | ɡ | G | ㄱ (g) | Voiced uvular plosive |
| s | &#115 | S | n | N | ㄴ (n) | Voiced alveolar nasal |
| t | &#116 | t | s | S | ㅅ (s) | Alveolar fricative |
| u | &#117 | U | z | Z Z(oo) | ㅕ (yeo) unused | Jo |
| v | &#118 | v Voiced labio-dental fricative, use V upper case (logical inclusive OR) | p | P | ㅍ (p) | Bilabial plosive |
| w | &#119 | w | ʝ | ℑ | ㅈ (j) | Voiced palatal fricative |
| x | &#120 | x Voiceless velar fricative, use X upper case | t | T | ㅌ (t) | Alveolar plosive |
| y | &#121 | y | j | J | ㅛ (yo) less o | Voiced palatal approximant |
| z | &#122 | z | k | K | ㅋ (k) | Velar plosive |
| { | &#123; | Left curly brace | Left curly brace | Stress 0 | No stress | Default |
| | | &#124; | Vertical bar | ǀ Minor (foot) break | ǁ Major (intonation) break |  |  |
| } | &#125; | Right curly brace | Right curly brace | Stress 1 | Primary stress |  |
| ~ | &#126; | Tilde (logical not) | Tilde | Stress 2 | Secondary stress |  |
|  | &#127; | DEL |  | Stress 3 | Soft or whisper | ^? When not phonetic CTRL- |
|  | &#128; | **€**  EURO SIGN  Left-ALT-4($) | **‚** | SINGLE LOW-9 QUOTATION MARK |  |  |
| ⊥ | &#129; | (contradiction or vertical) | **ƒ** | LATIN SMALL LETTER F WITH HOOK |  |  |
|  | &#130; | **‚** | **„** | DOUBLE LOW-9 QUOTATION MARK |  |  |
|  | &#131; | **Ƒ** | **…** | HORIZONTAL ELLIPSIS |  |  |
|  | &#132; | **„** | **†** | DAGGER |  |  |
|  | &#133; | **…** | **‡** | DOUBLE DAGGER |  |  |
|  | &#134; | **†** | **‰** | PER MILLE SIGN |  |  |
|  | &#135; | **‡** | **‹** | SINGLE LEFT-POINTING ANGLE QUOTATION MARK |  |  |
|  | &#136; | ˆ | **‘** | LEFT SINGLE QUOTATION MARK |  |  |
|  | &#137; | **‰** | **’** | RIGHT SINGLE QUOTATION MARK |  |  |
|  | &#138; | Š | **“** | LEFT DOUBLE QUOTATION MARK |  |  |
|  | &#139; | **‹** | **”** | RIGHT DOUBLE QUOTATION MARK |  |  |
|  | &#140; | Œ |  |  |  |  |
|  | &#141; | Start Superscript | **–** | EN DASH |  |  |
|  | &#142; | Ž | **—** | EM DASH |  |  |
|  | &#143; | Start Subscript | **™** | TRADE MARK SIGN |  |  |
|  | &#144; | End Superscript or Subscript most recently set and not ended, i.e. nesting is possible. Double character for all clear or see note 3. | **›** | SINGLE RIGHT-POINTING ANGLE QUOTATION MARK |  |  |
|  | &#145; | ‘ |  |  |  |  |
|  | &#146; | **’** | **΅** | GREEK DIALYTIKA TONOS |  |  |
|  | &#147; | “ | **Ά** | GREEK CAPITAL LETTER ALPHA WITH TONOS | ɲ | Voiced retroflex nasal |
|  | &#148; | ” | **£** | POUND SIGN |  |  |
|  | &#149; | • Bullet (logical AND) | **¤** | CURRENCY SIGN | Multiply scalar | Vector dot product abCosθ |
|  | &#150; | – |  |  | Reserved for e.g. Arabic |  |
|  | &#151; | — | **¦** | BROKEN BAR |  |  |
|  | &#152; | ˜ | **§** | SECTION SIGN |  |  |
|  | &#153; | ™ | **¨** | DIAERESIS | SGCI (XXX in Unicode) | Single Graphic Character Introducer |
| ⇔ | &#154; | (material equivalence) | **©** | COPYRIGHT SIGN |  |  |
|  | &#155; | **›** | **«** | LEFT-POINTING DOUBLE ANGLE QUOTATION MARK |  |  |
| ∃ | &#156; | (there exists) | **¬** | NOT SIGN |  |  |
| ⊃ | &#157; | (if..then) | **­** | SOFT HYPHEN | SHY or Optional Hyphen | A location to break a word at line end. CTRL- in Word. |
| ⊕ | &#158; | (XOR, exclusive or) | **®** | REGISTERED SIGN | ⟳ | - Rotate, clockwise |
| ⇒ | &#159; | (material implication) | **―** | HORIZONTAL BAR | ⟲ | + rotatate |
|  | &#160; | No-break Em Space | **°** | DEGREE SIGN |  | ^BS |
| ¡ | &#161; | Inverted exclamation  Right-ALT-1(!) | **±** | PLUS-MINUS SIGN |  |  |
| ¢ | &#162; | Cent sign  Right-ALT&shift-4($) | **²** | SUPERSCRIPT TWO | ≡ | Equivalent |
| £ | &#163; | Pound sterling  Left&right-ALT-4($) | **³** | SUPERSCRIPT THREE | ∵ | Because |
| ¤ | &#164; | General currency sign  Left-ALT&shift-4($) | **΄** | GREEK TONOS | ∴ | Therefore |
| ¥ | &#165; | **¥**  YEN & Yuan/Renmimbi SIGN  Right-ALT-4($) | **µ** | MICRO SIGN | ∈ | Includes |
| ¦ | &#166; | Broken vertical bar | **¶** | PILCROW SIGN |  |  |
| § | &#167; | Section sign | **·**  MIDDLE DOT | . syllable break |  |  |
| ¨ | &#168; | Umlaut (dieresis) | **Έ** | GREEK CAPITAL LETTER EPSILON WITH TONOS | ʢ | voiced  epiglottal fricative |
| © | &#169; | Copyright | **Ή** | GREEK CAPITAL LETTER ETA WITH TONOS | ɧ | simultaneous x and ʃ |
| ª | &#170; | Feminine ordinal | **Ί** | GREEK CAPITAL LETTER IOTA WITH TONOS | ɕ | Voiceless  alveolo-palatal fricative |
| « | &#171; | Left angle quote, guillemotleft | **»** | RIGHT-POINTING DOUBLE ANGLE QUOTATION MARK | ɔ bored /bɔːd/ |  |
| ¬ | &#172; | Not sign  Right-ALT-\_ | **Ό** | GREEK CAPITAL LETTER OMICRON WITH TONOS | ɕ | Voiceless  alveolo-palatal fricative |
| ­ | &#173; | Soft hyphen ~-  Or left-ALT-- | **½** | VULGAR FRACTION ONE HALF |  |  |
| ® | &#174; | Registered trademark  Left-ALT-R | **Ύ** | GREEK CAPITAL LETTER UPSILON WITH TONOS | ɥ | Voiced labial-palatal approximant |
| ¯ | &#175; | Macron accent  Left&right-ALT-- | **Ώ** | GREEK CAPITAL LETTER OMEGA WITH TONOS | ʍ | Voiceless  labial-velar approximant |
| ° | &#176; | Degree sign ^~  Or left-ALT-0 | **ΐ** | GREEK SMALL LETTER IOTA WITH DIALYTIKA AND TONOS | ɹ | Voiced alveolar approximant |
| ± | &#177; | Plus or minus  Left-ALT-+ | **Α** | GREEK CAPITAL LETTER ALPHA | ɑː |  |
| ² | &#178; | Superscript two ^!  Or right-ALT-2 | **Β** | GREEK CAPITAL LETTER BETA | β Voiced bilabial fricative | German β |
| ³ | &#179; | Superscript three  Right-ALT-3 | **Γ** | GREEK CAPITAL LETTER GAMMA | ɾ Voiced alveolar tap/flap |  |
| ´ | &#180; | Acute accent | **Δ** | GREEK CAPITAL LETTER DELTA | ð Voiced dental fricative |  |
| µ | &#181; | Micro sign  Left-Alt-m | **Ε** | GREEK CAPITAL LETTER EPSILON | sleep /sliːp/ |  |
| ¶ | &#182; | Paragraph sign | **Ζ** | GREEK CAPITAL LETTER ZETA | ʐ voiced retroflex fricative |  |
| · | &#183; | Middle dot ^+  Right-ALT-. | **Η** | GREEK CAPITAL LETTER ETA | ɦ glottal voiced fricative |  |
| ¸ | &#184; | Cedilla | **Θ** | GREEK CAPITAL LETTER THETA | θ Voiceless dental fricative |  |
| ¹ | &#185; | Superscript one  Left-ALT-1 | **Ι** | GREEK CAPITAL LETTER IOTA | ɭ Voiced retroflex lateral approximant |  |
| º | &#186; | Masculine ordinal | **Κ** | GREEK CAPITAL LETTER KAPPA | ɟ voiced palatal plosive |  |
| » | &#187; | Right angle quote, guillemotright  Left-ALT-“ | **Λ** | GREEK CAPITAL LETTER LAMDA | ʎ Voiced palatal lateral approximant |  |
| ¼ | &#188; | Fraction one-fourth  Left-ALT-1 | **Μ** | GREEK CAPITAL LETTER MU | ɰ velar voiced approximant |  |
| ½ | &#189; | Fraction one-half  Left-ALT-2 | **Ν** | GREEK CAPITAL LETTER NU | ɳ retroflex voiced nasal |  |
| ¾ | &#190; | Fraction three-fourths  Left-ALT-3 | **Ξ** | GREEK CAPITAL LETTER XI | Voiced labio-dental tap/flap |  |
| ¿ | &#191; | Inverted question mark ~B  Or right-ALT-? | **Ο** | GREEK CAPITAL LETTER OMICRON | ɮ | Voiced alveolar lateral fricative |
| À | &#192; | Capital A, grave accent  Left-ALT&shift-A | **Π** | GREEK CAPITAL LETTER PI | Aspirated voiced P |  |
| Á | &#193; | Capital A, acute accent  Right-ALT&shift-A | **Ρ** | GREEK CAPITAL LETTER RHO | ʁ Uvular voiced fricative |  |
| Â | &#194; | Capital A, circumflex accent  right-ALT&leftshift-A | **Σ** | GREEK CAPITAL LETTER SIGMA | ɣ Voiced velar fricative |  |
| Ã | &#195; | Capital A, tilde  left-ALT&rightshift-A | **Τ** | GREEK CAPITAL LETTER TAU | ɖ voiced retroflex plosive |  |
| Ä | &#196; | Capital A, dieresis or umlaut mark.  Left&right-ALT-A | **Υ** | GREEK CAPITAL LETTER UPSILON | boot /buːt/ |  |
| Å | &#197; | Capital A, ring  right-ALT&shift+leftshift-A | **Φ** | GREEK CAPITAL LETTER PHI | ɸ voiceless bilabial fricative |  |
| Æ | &#198; | Capital AE diphthong (ligature)  left-ALT&shift+rightshift-A | **Χ** | GREEK CAPITAL LETTER CHI | χ Voiceless uvular fricative |  |
| Ç | &#199; | Capital C, cedilla  Left-ALT-C | **Ψ** | GREEK CAPITAL LETTER PSI | ʂ voiceless retroflex fricative |  |
| È | &#200; | Capital E, grave accent  Left-ALT-E | **Ω** | GREEK CAPITAL LETTER OMEGA | ɜ bird /bɜːd/ |  |
| É | &#201; | Capital E, acute accent  Right-ALT-E | **Ϊ** | GREEK CAPITAL LETTER IOTA WITH DIALYTIKA | ʡ | Epiglottal plosive |
| Ê | &#202; | Capital E, circumflex accent  Right-ALT&leftshift-E | **Ϋ** | GREEK CAPITAL LETTER UPSILON WITH DIALYTIKA | ɥ | Voiced labial-palatal approximant |
| Ë | &#203; | Capital E, dieresis or umlaut mark  Left&right-ALT-E | **ά** | GREEK SMALL LETTER ALPHA WITH TONOS | ʑ | Voiced  alveolo-palatal fricative |
| Ì | &#204; | Capital I, grave accent  Left-ALT-I | **έ** | GREEK SMALL LETTER EPSILON WITH TONOS | ʢ | voiced  epiglottal fricative |
| Í | &#205; | Capital I, acute accent  Right-ALT-I | **ή** | GREEK SMALL LETTER ETA WITH TONOS | ɧ | simultaneous x and ʃ |
| Î | &#206; | Capital I, circumflex accent  Right-ALT&leftshift-I | **ί** | GREEK SMALL LETTER IOTA WITH TONOS | ɕ | Voiceless  alveolo-palatal fricative |
| Ï | &#207; | Capital I, dieresis or umlaut mark  Left&right-ALT-I | **ΰ** | GREEK SMALL LETTER UPSILON WITH DIALYTIKA AND TONOS | ʑ | Voiced  alveolo-palatal fricative |
| Ð | &#208; | Capital Eth, Icelandic  ESC left-ALT-D | **α** | GREEK SMALL LETTER ALPHA | ɑː car  / cɑːr/ |  |
| Ñ | &#209; | Capital N, tilde  Left-ALT&rightshift-N | **β** | GREEK SMALL LETTER BETA | β Voiced bilabial fricative | German β |
| Ò | &#210; | Capital O, grave accent  Left-ALT-O | **γ** | GREEK SMALL LETTER GAMMA | ɾ Voiced alveolar tap/flap |  |
| Ó | &#211; | Capital O, acute accent  Right-ALT-O | **δ** | GREEK SMALL LETTER DELTA | ð Voiced dental fricative |  |
| Ô | &#212; | Capital O, circumflex accent  Right-ALT&leftshift-O | **ε** | GREEK SMALL LETTER EPSILON | sleep /sliːp/ |  |
| Õ | &#213; | Capital O, tilde  Left-ALT&rightshift-O | **ζ** | GREEK SMALL LETTER ZETA | ʐ voiced retroflex fricative |  |
| Ö | &#214; | Capital O, dieresis or umlaut mark  Left&right-ALT-O | **η** | GREEK SMALL LETTER ETA | ɦ glottal voiced fricative |  |
| × | &#215; | Multiply sign ^\*  Or left-ALT-X | **θ** | GREEK SMALL LETTER THETA | θ voiceless dental fricative | Vector cross product abSinθ |
| Ø | &#216; | Capital O, slash  Right-ALT&rightshift-O | **ι** | GREEK SMALL LETTER IOTA | ɭ Voiced retroflex lateral approximant |  |
| Ù | &#217; | Capital U, grave accent  Left-ALT-U | **κ** | GREEK SMALL LETTER KAPPA | ɟ voiced palatal plosive |  |
| Ú | &#218; | Capital U, acute accent  Right-ALT-U | **λ** | GREEK SMALL LETTER LAMDA | ʎ Voiced palatal lateral approximant |  |
| Û | &#219; | Capital U, circumflex accent  Right-ALT&leftshift-U | **μ** | GREEK SMALL LETTER MU | ɰ velar voiced approximant |  |
| Ü | &#220; | Capital U, dieresis or umlaut mark  Left&right-ALT-U | **ν** | GREEK SMALL LETTER NU | ɳ retroflex voiced nasal |  |
| Ý | &#221; | Capital Y, acute accent  Right-ALT-Y | **ξ** | GREEK SMALL LETTER XI | Voiced labio-dental tap/flap |  |
| Þ | &#222; | Capital THORN, Icelandic  Left&right-ALT-B | **ο** | GREEK SMALL LETTER OMICRON | ɮ | Voiced alveolar lateral fricative |
| ß | &#223; | Small sharp s, German (sz ligature)  Left&right-ALT-Z | **π** | GREEK SMALL LETTER PI | Aspirated voiced P |  |
| à | &#224; | Small a, grave accent ~H | **ρ** | GREEK SMALL LETTER RHO | ʁ Uvular voiced fricative |  |
| á | &#225; | Small a, acute accent ~< | **ς** | GREEK SMALL LETTER FINAL SIGMA | ç Voiceless palatal fricative |  |
| â | &#226; | Small a, circumflex accent ~@ | **σ** | GREEK SMALL LETTER SIGMA | ɣ Voiced velar fricative |  |
| ã | &#227; | Small a, tilde ~! | **τ** | GREEK SMALL LETTER TAU | ɖ voiced retroflex plosive |  |
| ä | &#228; | Small a, dieresis or umlaut mark ~S | **υ** | GREEK SMALL LETTER UPSILON | boot /buːt/ |  |
| å | &#229; | Small a, ring ~W | **φ** | GREEK SMALL LETTER PHI | ɸ Voiceless bilabial fricative |  |
| æ | &#230; | Small ae diphthong (ligature) ~Z | **χ** | GREEK SMALL LETTER CHI | χ Voiceless uvular fricative |  |
| ç | &#231; | Small c, cedilla ~C | **Ψ** | GREEK SMALL LETTER PSI | ʂ voiceless retroflex fricative |  |
| è | &#232; | Small e, grave accent ~> | **ω** | GREEK SMALL LETTER OMEGA | ʊ book /bʊk/ |  |
| é | &#233; | Small e, acute accent ~( | **Ϊ** | GREEK SMALL LETTER IOTA WITH DIALYTIKA | ʡ | Epiglottal plosive |
| ê | &#234; | Small e, circumflex accent ~D | **Ϋ** | GREEK SMALL LETTER UPSILON WITH DIALYTIKA | ɲ | Voiced retroflex nasal |
| ë | &#235; | Small e, dieresis or umlaut mark ~+ | **Ό** | GREEK SMALL LETTER OMICRON WITH TONOS | ɕ | Voiceless  alveolo-palatal fricative |
| ì | &#236; | Small i, grave accent ~I | **Ύ** | GREEK SMALL LETTER UPSILON WITH TONOS | ɹ | Voiced alveolar approximant |
| í | &#237; | Small i, acute accent ~V | **ώ** | GREEK SMALL LETTER OMEGA WITH TONOS | ʍ | Voiceless  labial-velar approximant |
| î | &#238; | Small i, circumflex accent ^# | RESERVED for e.g. Arabic. | ĕ | Short duration example e |  |
| ï | &#239; | Small i, dieresis or umlaut mark ~~ | ↑ upstep |  | Half long |  |
| ð | &#240; | Small eth, Icelandic  Left&right-ALT-D | ɜ bird /bɜːd/ | ː | Long duration |  |
| ñ | &#241; | Small n, tilde ~N | ↓ downstep | e̋ | Extra high example |  |
| ò | &#242; | Small o, grave accent ~K | ʊ book /bʊk/ | É | High example |  |
| ó | &#243; | Small o, acute accent ~O | ɔ bored /bɔːd/ | Ē | Mid example |  |
| ô | &#244; | Small o, circumflex accent ~A | √ | È | Low example |  |
| õ | &#245; | Small o, tilde ~Q | ∞ infinity | ȅ | Extra low example |  |
| ö | &#246; | Small o, dieresis or umlaut mark ~L | ≈ | Ě | Rising example |  |
| ÷ | &#247; | Division sign ~?  Left-ALT-/ | Division sign | Ê | Falling example |  |
| ø | &#248; | Small o, slash ~X | ɒ hot /hɒt/ |  | High rising |  |
| ù | &#249; | Small u, grave accent ~P | **^**  cup / k^p/ |  | Low rising |  |
| ú | &#250; | Small u, acute accent ~U | ≥ |  | High falling |  |
| û | &#251; | Small u, circumflex accent ~I | ≤ | 2√ | Low falling |  |
| ü | &#252; | Small u, dieresis or umlaut mark ~J | W | n√ | Rising falling | If n has value, enter alt-numlock-number-enter |
| ý | &#253; | Small y, acute accent ~Y | ≠ |  | Falling rising |  |
| þ | &#254; | Small thorn, Icelandic  Left&right-ALT-P | ħ | Ħ Th(em) |  |  |
| ÿ | &#255; | Small y, dieresis or umlaut mark ~G | ≈ | ͝ | Linking, no break |  |

ASCII

## Other European Table

|  |  |  |  |
| --- | --- | --- | --- |
| 128 | 80 | **€** | EURO SIGN |
| 130 | 82 | **‚** | SINGLE LOW-9 QUOTATION MARK |
| 131 | 83 | **ƒ** | LATIN SMALL LETTER F WITH HOOK |
| 132 | 84 | **„** | DOUBLE LOW-9 QUOTATION MARK |
| 133 | 85 | **…** | HORIZONTAL ELLIPSIS |
| 134 | 86 | **†** | DAGGER |
| 135 | 87 | **‡** | DOUBLE DAGGER |
| 137 | 89 | **‰** | PER MILLE SIGN |
| 139 | 8B | **‹** | SINGLE LEFT-POINTING ANGLE QUOTATION MARK |
| 145 | 91 | **‘** | LEFT SINGLE QUOTATION MARK |
| 146 | 92 | **’** | RIGHT SINGLE QUOTATION MARK |
| 147 | 93 | **“** | LEFT DOUBLE QUOTATION MARK |
| 148 | 94 | **”** | RIGHT DOUBLE QUOTATION MARK |
| 149 | 95 | **•** | BULLET |
| 150 | 96 | **–** | EN DASH |
| 151 | 97 | **—** | EM DASH |
| 153 | 99 | **™** | TRADE MARK SIGN |
| 155 | 9B | **›** | SINGLE RIGHT-POINTING ANGLE QUOTATION MARK |
| 160 | A0 |  | NO-BREAK SPACE |
| 161 | A1 | **΅** | GREEK DIALYTIKA TONOS |
| 162 | A2 | **Ά** | GREEK CAPITAL LETTER ALPHA WITH TONOS |
| 163 | A3 | **£** | POUND SIGN |
| 164 | A4 | **¤** | CURRENCY SIGN |
| 165 | A5 | **¥** | YEN SIGN |
| 166 | A6 | **¦** | BROKEN BAR |
| 167 | A7 | **§** | SECTION SIGN |
| 168 | A8 | **¨** | DIAERESIS |
| 169 | A9 | **©** | COPYRIGHT SIGN |
| 171 | AB | **«** | LEFT-POINTING DOUBLE ANGLE QUOTATION MARK |
| 172 | AC | **¬** | NOT SIGN |
| 173 | AD | **­** | SOFT HYPHEN |
| 174 | AE | **®** | REGISTERED SIGN |
| 175 | AF | **―** | HORIZONTAL BAR |
| 176 | B0 | **°** | DEGREE SIGN |
| 177 | B1 | **±** | PLUS-MINUS SIGN |
| 178 | B2 | **²** | SUPERSCRIPT TWO |
| 179 | B3 | **³** | SUPERSCRIPT THREE |
| 180 | B4 | **΄** | GREEK TONOS |
| 181 | B5 | **µ** | MICRO SIGN |
| 182 | B6 | **¶** | PILCROW SIGN |
| 183 | B7 | **·** | MIDDLE DOT |
| 184 | B8 | **Έ** | GREEK CAPITAL LETTER EPSILON WITH TONOS |
| 185 | B9 | **Ή** | GREEK CAPITAL LETTER ETA WITH TONOS |
| 186 | BA | **Ί** | GREEK CAPITAL LETTER IOTA WITH TONOS |
| 187 | BB | **»** | RIGHT-POINTING DOUBLE ANGLE QUOTATION MARK |
| 188 | BC | **Ό** | GREEK CAPITAL LETTER OMICRON WITH TONOS |
| 189 | BD | **½** | VULGAR FRACTION ONE HALF |
| 190 | BE | **Ύ** | GREEK CAPITAL LETTER UPSILON WITH TONOS |
| 191 | BF | **Ώ** | GREEK CAPITAL LETTER OMEGA WITH TONOS |
| 192 | C0 | **ΐ** | GREEK SMALL LETTER IOTA WITH DIALYTIKA AND TONOS |
| 193 | C1 | **Α** | GREEK CAPITAL LETTER ALPHA |
| 194 | C2 | **Β** | GREEK CAPITAL LETTER BETA |
| 195 | C3 | **Γ** | GREEK CAPITAL LETTER GAMMA |
| 196 | C4 | **Δ** | GREEK CAPITAL LETTER DELTA |
| 197 | C5 | **Ε** | GREEK CAPITAL LETTER EPSILON |
| 198 | C6 | **Ζ** | GREEK CAPITAL LETTER ZETA |
| 199 | C7 | **Η** | GREEK CAPITAL LETTER ETA |
| 200 | C8 | **Θ** | GREEK CAPITAL LETTER THETA |
| 201 | C9 | **Ι** | GREEK CAPITAL LETTER IOTA |
| 202 | CA | **Κ** | GREEK CAPITAL LETTER KAPPA |
| 203 | CB | **Λ** | GREEK CAPITAL LETTER LAMDA |
| 204 | CC | **Μ** | GREEK CAPITAL LETTER MU |
| 205 | CD | **Ν** | GREEK CAPITAL LETTER NU |
| 206 | CE | **Ξ** | GREEK CAPITAL LETTER XI |
| 207 | CF | **Ο** | GREEK CAPITAL LETTER OMICRON |
| 208 | D0 | **Π** | GREEK CAPITAL LETTER PI |
| 209 | D1 | **Ρ** | GREEK CAPITAL LETTER RHO |
| 211 | D3 | **Σ** | GREEK CAPITAL LETTER SIGMA |
| 212 | D4 | **Τ** | GREEK CAPITAL LETTER TAU |
| 213 | D5 | **Υ** | GREEK CAPITAL LETTER UPSILON |
| 214 | D6 | **Φ** | GREEK CAPITAL LETTER PHI |
| 215 | D7 | **Χ** | GREEK CAPITAL LETTER CHI |
| 216 | D8 | **Ψ** | GREEK CAPITAL LETTER PSI |
| 217 | D9 | **Ω** | GREEK CAPITAL LETTER OMEGA |
| 218 | DA | **Ϊ** | GREEK CAPITAL LETTER IOTA WITH DIALYTIKA |
| 219 | DB | **Ϋ** | GREEK CAPITAL LETTER UPSILON WITH DIALYTIKA |
| 220 | DC | **ά** | GREEK SMALL LETTER ALPHA WITH TONOS |
| 221 | DD | **έ** | GREEK SMALL LETTER EPSILON WITH TONOS |
| 222 | DE | **ή** | GREEK SMALL LETTER ETA WITH TONOS |
| 223 | DF | **ί** | GREEK SMALL LETTER IOTA WITH TONOS |
| 224 | E0 | **ΰ** | GREEK SMALL LETTER UPSILON WITH DIALYTIKA AND TONOS |
| 225 | E1 | **α** | GREEK SMALL LETTER ALPHA |
| 226 | E2 | **β** | GREEK SMALL LETTER BETA |
| 227 | E3 | **γ** | GREEK SMALL LETTER GAMMA |
| 228 | E4 | **δ** | GREEK SMALL LETTER DELTA |
| 229 | E5 | **ε** | GREEK SMALL LETTER EPSILON |
| 230 | E6 | **ζ** | GREEK SMALL LETTER ZETA |
| 231 | E7 | **η** | GREEK SMALL LETTER ETA |
| 232 | E8 | **θ** | GREEK SMALL LETTER THETA |
| 233 | E9 | **ι** | GREEK SMALL LETTER IOTA |
| 234 | EA | **κ** | GREEK SMALL LETTER KAPPA |
| 235 | EB | **λ** | GREEK SMALL LETTER LAMDA |
| 236 | EC | **μ** | GREEK SMALL LETTER MU |
| 237 | ED | **ν** | GREEK SMALL LETTER NU |
| 238 | EE | **ξ** | GREEK SMALL LETTER XI |
| 239 | EF | **ο** | GREEK SMALL LETTER OMICRON |
| 240 | F0 | **π** | GREEK SMALL LETTER PI |
| 241 | F1 | **ρ** | GREEK SMALL LETTER RHO |
| 242 | F2 | **ς** | GREEK SMALL LETTER FINAL SIGMA |
| 243 | F3 | **σ** | GREEK SMALL LETTER SIGMA |
| 244 | F4 | **τ** | GREEK SMALL LETTER TAU |
| 245 | F5 | **υ** | GREEK SMALL LETTER UPSILON |
| 246 | F6 | **φ** | GREEK SMALL LETTER PHI |
| 247 | F7 | **χ** | GREEK SMALL LETTER CHI |
| 248 | F8 | **ψ** | GREEK SMALL LETTER PSI |
| 249 | F9 | **ω** | GREEK SMALL LETTER OMEGA |
| 250 | FA | **ϊ** | GREEK SMALL LETTER IOTA WITH DIALYTIKA |
| 251 | FB | **ϋ** | GREEK SMALL LETTER UPSILON WITH DIALYTIKA |
| 252 | FC | **ό** | GREEK SMALL LETTER OMICRON WITH TONOS |
| 253 | FD | **ύ** | GREEK SMALL LETTER UPSILON WITH TONOS |
| 254 | FE | **ώ** | GREEK SMALL LETTER OMEGA WITH TONOS |

## 

## IPA, the International Phonetic Alphabet

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Suprasegmentals | |  |  | Tones and word accents | | | |  |  |  |  |  |  |  |  |
| ˈ | Primary stress |  |  | Level tones | | |  | Contour tones | | | |  |  |  |  |
| ˌ | Secondary stress |  |  | e̋ | or | ˥ | Extra high | ě | or | ˩˥ | Rising | e᷇ | or | ˥˧ | High falling |
| eː | Long |  |  | é |  | ˦ | High | ê |  | ˥˩ | Falling | e᷆ |  | ˧˩ | Low falling |
| eˑ | Half-long |  |  | ē |  | ˧ | Mid | e |  | ˧˥ | High rising | e |  | ˧˥˧ | Rising falling |
| ĕ | Extra-short |  |  | è |  | ˨ | Low | e |  | ˩˧ | Low rising | e᷉ |  | ˧˩˧ | Falling rising |
| ǀ | Minor (foot) break |  |  | ȅ |  | ˩ | Extra low | ↑ | Upstep | |  | ↗ | Global rise | | |
| ǁ | Major (intonation) break | | |  |  |  |  | ↓ | Downstep | | | ↘ | Global fall | | |
| . | Syllable break |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ͝ | Linking (no break) | |  |  |  |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **International Phonetic Alphabet (IPA)** | | | | | | | | | | | | ˌɪntəˈnæʃnl fəˈnɛtɪk ˈælfəˌbɛt | | | | | | | | | | |
| Consonants (pulmonic) | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Bilabial | | Labio- dental | | Dental | | Alveolar | | Post- alveolar | | Retroflex | | Palatal | | Velar | | Uvular | | Pharyngeal | | Glottal | |
| Plosive | p | b |  |  |  |  | t | d |  |  | ʈ | ɖ | c | ɟ | k | ɡ | q | ɢ |  |  | ʔ |  |
| Nasal |  | m |  | ɱ |  |  |  | n |  |  |  | ɳ |  | ɲ |  | ŋ |  | ɴ |  |  |  |  |
| Trill |  | ʙ |  |  |  |  |  | r |  |  |  |  |  |  |  |  |  | ʀ |  |  |  |  |
| Tap or flap |  |  |  | ⱱ |  |  |  | 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 |  |  |  |  |  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Consonants (non-pulmonic) | | | |  | |  |
| Clicks | | Voiced  implosives | | Ejectives | | |
| ʘ | bilabial | ɓ | Bilabial | ’ | examples: | |
| ǀ | Dental | ɗ | Dental /  alveolar | p’ | Bilabial | |
| **ǃ** | (Post) alveolar | ʄ | Palatal | t’ | Dental / alveolar | |
| ǂ | Palatal- alveolar | ɠ | Velar | k’ | Velar | |
| ǁ | Alveolar  lateral | ʛ | Uvular | s’ | Alveolar fricative | |

|  |  |
| --- | --- |
| Other symbols | |
| ʍ w | Voiceless / voiced  labial-velar approximants |
| ɥ | Voiced labial-palatal approximant |
| ʜ ʢ | Voiceless / voiced  epiglottal fricatives |
| ʡ | Epiglottal plosive |
| ɕ ʑ | Voiceless / voiced  alveolo-palatal fricatives |
| ɧ | simultaneous x and ʃ |
| k͡p  t͜s | Affricatives and double articulations can be represented by two symbols and joined by a tie bar if necessary |
|

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Vowel** | | | | |
|  | ← Mouth wider horizontally | | Mouth narrower horizontally → | |
| Mouth  narrower  vertically | iː sleep /sliːp/ | **I**   slip /sl**I**p/ | ʊ book /bʊk/ | uː boot /buːt/ |
|  | e ten /ten/ | ə after /aːftə/ | ː  bird /bɜːd/ | ɔː  bored /bɔːd/ |
| Mouth  wider  vertically | æ cat /kæt/ | **^** cup / k^p/ | ɑː car  / cɑːr/ | ɒ hot /hɒt/ |

ɜ

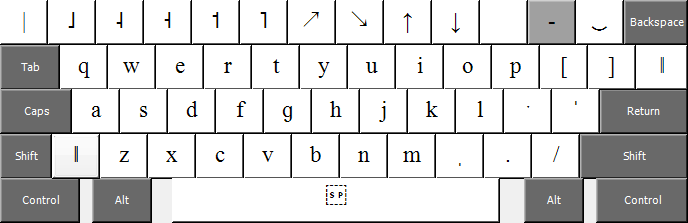
|  |  |  |
| --- | --- | --- |
| **Diphthongs** | | |
| **I**ə beer /b**I**ə/ | e**I**  say /se**I**/ |  |
| ʊə fewer /fjʊə/ | ɔ**I** boy /bɔ**I**/ | ə ʊ no /nəʊ/ |
| eə bear /beə/ | a**I**  high /ha**I**/ | aʊ cow /kaʊ/ |

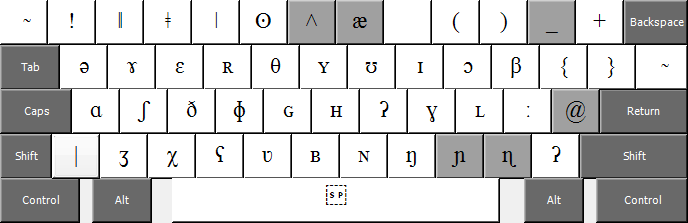
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Suprasegmentals | |  |  | Tones and word accents | | | |  |  |  |  |  |  |  |  |
| ˈ | Primary stress |  |  | Level tones | | |  | Contour tones | | | |  |  |  |  |
| ˌ | Secondary stress |  |  | e̋ | or | ˥ | Extra high | ě | or | ˩˥ | Rising | e᷇ | or | ˥˧ | High falling |
| eː | Long |  |  | é |  | ˦ | High | ê |  | ˥˩ | Falling | e᷆ |  | ˧˩ | Low falling |
| eˑ | Half-long |  |  | ē |  | ˧ | Mid | e |  | ˧˥ | High rising | e |  | ˧˥˧ | Rising falling |
| ĕ | Extra-short |  |  | è |  | ˨ | Low | e |  | ˩˧ | Low rising | e᷉ |  | ˧˩˧ | Falling rising |
| ǀ | Minor (foot) break |  |  | ȅ |  | ˩ | Extra low | ↑ | Upstep | |  | ↗ | Global rise | | |
| ǁ | Major (intonation) break | | |  |  |  |  | ↓ | Downstep | | | ↘ | Global fall | | |
| . | Syllable break |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ͝ | Linking (no break) | |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Hangul (Korean)

* 14 simple [consonant](http://en.wikipedia.org/wiki/Consonant) letters: 1. ㄱ (g); 2. ㄴ (n); 3. ㄷ (d); 4. ㄹ (l/r); 5. ㅁ (m); 6. ㅂ (b); 7. ㅅ (s); 8. ㅇ (-/ng); 9. ㅈ (j); 10. ㅊ (ch); 11. ㅋ (k); 12. ㅌ (t); 13.ㅍ (p); 14. ㅎ (h).
* 5 double letters (glottalized): 1. ㄲ (kk); 2. ㄸ (tt); 3. ㅃ (pp); 4. ㅆ (ss); 5. ㅉ (jj).
* 6 simple [vowel](http://en.wikipedia.org/wiki/Vowel) letters: 1. ㅏ (a); 2. ㅓ (eo); 3. ㅗ (o); 4. ㅜ (u); 5. ㅡ (eu); 6. ㅣ (i)
* 4 simple [iotized](http://en.wikipedia.org/wiki/Iotation) vowel letters (semi consonant-semi vowel): 1. ㅑ (ya); 2. ㅕ (yeo); 3. ㅛ (yo); 4. ㅠ (yu)
* 11 [diphthongs](http://en.wikipedia.org/wiki/Diphthong): 1. ㅐ (ae); 2. ㅒ (yae); 3. ㅔ (e); 4. ㅖ (ye); 5. ㅘ (wa); 6. ㅙ (wae); 7. ㅚ (oe); 8. ㅝ (weo); 9. ㅞ (we); 10. ㅟ (wi); 11. ㅢ (yi).

From http://www.rejc2.co.uk/ipakeyboard/





However these layouts do not provide for a lower/upper case system and a possible adoption in Korea has the phonetic characters in a different layout from the Hangul layout.

## Notes on Keyboard Alphabet Switching and other items.

An economical solution is proposed that uses all 8 bits of the keyboard display register and dual color LEDs.

1. Some phonetic characters are in the Greek alphabet, and are not separately listed in the phonetic alphabet. If IPA upper case is selected and a lower case Greek character is entered, then the corresponding Greek upper case character SHALL be transmitted.
2. Keyboard modification for multialphabet use. This requires dual color LEDs and additional circuitry;
   1. Modify the key caps to have multiple character sets, preferably color coded.
   2. Capslock, Numlock, Shift and ALT as below. A1, A2, A3 and A4 are Unicode alphabet sets.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Capslok | Off | Off | Off | Off | Green | Green | Green | Green |
| Numlok | Off | Off | Green | Green | Off | Off | Green | Green |
| Shift | Off | On | Off | On | Off | On | Off | On |
| select | lower | upper | Lwr&N | Up&N | upper | Lower | Up&N | Lwr&N |
|  | (1) | (2) | (1) Numlok | (2) Numlok | (2) | (1) | (2) Numlok | (1) Numlok |
| Capslok | Red | Red | Red | Red | Red | Red | Red | Red |
| Numlok | Off | Off | Off | Off | Green | Green | Green | Green |
| Shift | Off | On | Off | On | Off | On | Off | On |
| select | XAscii | XAsciiS | XAsciiS | XAscii | XAsccii+ | XAscci+S | XAscci+S | XAscii+ |
|  |  |  |  |  | Or ALT | Or ALT | Or ALT | Or ALT |
| Capslok | Red | Red | Red | Red | Red | Red | Red | Red |
| Numlok | Red | Red | Red | Red | Orange | Orange | Orange | Orange |
| Shift | Off | On | Off | On | Off | On | Off | On |
| select | Hangul | Hangul | Hangul | Hangul | Grk | GrkS | Grk | GrkS |
|  |  |  |  |  |  |  |  |  |
| Capslok | Orange | Orange | Orange | Orange | Orange | Orange | Orange | Orange |
| Numlok | Off | Off | Off | Off | Green | Green | Green | Green |
| Shift | Off | On | Off | On | Off | On | Off | On |
| select | IPA | IPAS | IPA | IPAS | IPA+ | IPA+S | IPA+ | IPA+S |
|  |  |  |  |  | Or ALT | Or ALT | Or ALT | Or ALT |
| Capslok | Orange | Orange | Orange | Orange | Orange | Orange | Orange | Orange |
| Numlok | Red | Red | Red | Red | Orange | Orange | Orange | Orange |
| Shift | Off | On | Off | On | Off | On | Off | On |
| select | A1 | A2 | A1 | A2 | A3 | A4 | A3 | A4 |
|  |  |  |  |  | Or ALT | Or ALT | Or ALT | Or ALT |

* 1. Scroll Lock Off Green Red Orange

Normal Scroll Lock Alt function keyboard Scroll Lock Alt Function Keyboard

The Alt Function keyboard is for custom applications e.g. video or graphics editing systems, or music.

As laptops lack the number pad area separate for additional character usage, some alternative is desirable. This should be invisible to the operating system by BIOS implementation.

Unicode provides for other alphabets, perhaps as an overlay with holes. The character(s) after DC4 indicate the section of Unicode that is to be used.

* 1. The shift key shall operate as normal, if the capslock is red or orange, the shift shall exchange the character case.
  2. The CTRL-Capslock, CTRL-Numlock and CTRL-Scroll lock shall reverse the selection one step back. Note that CTRL-Numlock- (i.e. with the – character) is reserved as an En dash.
  3. The IPA Caps provides for future uppercase IPA characters not in the base IPA set. The IPA characters to the right of C to Z are accessed by using CTRL- when in the IPA mode. If uppercase of those IPA characters becomes defined, then they shall be accessed as CTRL- when in the IPA Caps mode. Also for font and formatting string start and end characters which are optional and the whole string will not print but will display on a text, xml or hexadecimal editor. The definitions of the strings are not provided here.
  4. The IPA character e also represents the number. The Greek character π also represents the number. The IPA character ħ also represents the positive or hole electric charge. As + is normally associated with red, the + shape in the character may be highlighted in red, and the rest of the character some other color preferably except black. The electrical negative charge is also represented by the IPA character **Ә.** The – part of the character may be highlighted in black, The rest of the character some other character than red or black. The roman letters e, m, n, p, f, k, M, G, T, P, Y are with µ the magnitude characters where e is unity. E.g. 4e7 is a 4.7 value as the decimal point (or comma) is liable to be unreadable on component markings. The IPA characters i , j, k are the three axis imaginary operators. The Roman characters A, B, C, D, E, F also represent 10, 11,12, 13, 14, 15 to provide hexadecimal characters. The use of 0x at the beginning means that the number is hexadecimal even if A, B, C, D, E or F are not in the number.
  5. The Japanese keyboard key for Hirakana/Katakana, which is to the right of the spacebar, shall have a multicolor LED using the remaining two bits of the LED register. The assignment shall be OFF Normal ASCII/IPA/Hangul/Greek as noted above using extended ASCII. GREEN Hirakana (default) or green tagged overlay as assigned by user. ORANGE Katakana (default) or orange tagged overlay as assigned by user. RED Cyrillic using KOI8 or Devanagari ISCII in India (default) or red overlay as assigned by user, Arabic is recommended. See later for Esc-SI codes method.

1. Arabic has a MARC 8 binary code following. Hebrew has Unicode characters, but does not seem to have an ASCII equivalent. Both of these scripts are right to left.
2. The rule for subscripts and superscripts is that subscripts SHALL be before superscripts and can only go one step deep. They shall be followed by the end subscript/superscript. A superscript may immediately follow. An additional superscript may follow so the depth is not limited until the end subscript/superscript is sent which then refers to the end of all subscript or superscript for the base character. Mathematical expressions are provided for.
3. Characters to right of C to G currently have no provision for an uppercase form. They are all clicks. While this is not a problem with Hangul or some other national alphabet, this may sometime be desirable with IPA. While IPA currently does not have an uppercase system currently, the letters in Roman and Greek that they line up with have both cases and so the provision is there for suitable fonts to be developed. Sometimes it is not apparent which instance is upper case and which is lower case, the first instance shall be the upper case.
4. Alternatives to Hangul (which has 26 characters) for other national languages are being researched, but the character set is limited. The SO, DC2 and DC4 bank of numeric characters are reserved, they MAY also be used. This makes 56 characters available. This means that the use of IPA for international use more desirable, and this is now provided for in this extended ASCII. Sanskrit has 36-48 phoneme letters, Arabic has 28 letters, Cyrillic has 33 letters but only 20 are non-roman and Thai has 44 consonants plus 21 vowels. So for some, a Hangul substitution would be possible, but for others, only IPA has sufficient characters. Numerals in other than modern European are not provided for. Chinese and Japanese have many more characters. Japanese has kanji, which are originally Chinese characters, hiragana, which has 48 characters which may be modified with dakuten or handakuten, and katakana which also has 48 characters. Romaji is the name for ASCII ISO 8859-1 characters.
5. The DC4 character is followed by a string defining which Unicode version or other standard is to be used. The DC1-DC3 selection defines the end of such usage.
6. The CTRL, ALT, DEL reboot is preceded by DC2, followed by DC1 then either CR LF which reboots all cascaded serial (not other connected) devices. Or a numeral 0 to 9 which is decremented each pass through and if it reaches zero (or already is), that device reboots.
7. The F is preceded by a DC2 then followed by a DC1 then a numeral 0 to F (which represents the function key number) then a CR LF. Digits 0 to 9 are assumed to be hexadecimal when used for binary processing. The hexadecimal values 0xA to 0xF are not currently otherwise defined as font characters, but are always hexadecimal when used for binary processing.
8. The first character being ^ denotes CTRL- and being ~ denotes ALT- in character pairs for key entry.
9. Other standards such as KSC5601 (South Korea) and KPS9566-97 (North Korea) are two byte systems. This is basically incompatible with single byte systems but, like Unicode which is the preferred two byte system, they can be accommodated via the DC4 switch mechanism. Editing of text is more complex as the SO, SI, DC2 and DC4 characters must be found if present beforehand in the source and destination and incorporated with any switching required in the destination text. This proposal for a standard is assuming that there will be adoption of IPA as a worldwide alphabet. While two byte character sets are capable of large numbers of characters, it then becomes a problem of how to have keyboard entry for so many characters. The KPS and KSC sets includes scientific units. However, in the west, these are typed as individual characters.
10. The IPA ʋ in both lower and upper case are fitted to U because the IPA U key position in Hangul is used by ㅕ. Although there is no IPA equivalent, the Z key has another Hangul ㅋ which is IPA k or K. So instead, the ASCII U font shall be made to resemble IPA ʋ instead.
11. Although there is no required use of lower and upper case for all IPA characters, it is anticipated that font developers would be expected to extend in that direction. For this purpose at present, different size fonts are used instead.
12. The use of Unicode selections for other languages can be printed on the right of the key.

## Keyboard Layout Chart following

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ESC | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | F10 | F11 | F12 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  | **·** |  | XAscii+ |
| Ð | ɦ | ɭ | ɮ | ʁ | ʎ | ɰ | ɳ |  | ç | ɣ | ɖ | χ |  | IPAs |
| Ð | ɦ | ɭ | ɮ | ʁ | ʎ | ɰ | ɳ | × | ç | ɣ | ɖ | χ |  | IPA |
| ` ~ ï | 1 ! ã | 2 @ â | 3 # î | 4 $ **€** | 5 % **£** | 6 ^ **¥** | 7 & **¤** | 8 \* Bold | 9 (é | 0 ) Italic | - \_ \_\_ | = + ë | BS | ALT |
| ɔ | **γ Γ** | **δ Δ** | **ζ Ζ** | **η Η** | **θ Θ** | **λ Λ** | **μ Μ** | **ξ Ξ** | **π Π** | **ρ Ρ** | e̋ | ȅ | ě | Grk/IPA |
| ↑ | B ɠ | ℑɬ | D **ǃ** | G ɠ | S ʛ | J ɻ | Z ɽ | L ɓ | **Æ** ʄ | E ʄ | ɕ | ɹ | ʍ | IPA+ |
| ↓ | bㅂ | ʝㅈ | dㄷ | ɡㄱ | sㅅ | jㅛ | zㅕ | iㅑ | **æ**ㅐ | eㅔ | ɕ | ɹ | ʍ | Hangul |
|  | q | W |  | ʀ |  |  | u |  |  |  |  | ASCII | not | IPA |
| TAB | Q õ | W å | E | R | T | Y ý | U ú | I û | O ó | P ù | [ { | ] } | \ | | L-ALT-R |
|  | **ς Σ** | **σ Σ** | **τ Τ** | **φ Φ** | **ψ Ψ** | **ω Ω** | ɾ | ʑ | ɧ | ʊ | ≈ |  |  | Grk/IPA |
|  | M ↗ | N ʛ | Ŋ ǀ | R ǂ | H ǁ | O | **Ә** ɓ | A ɗ | I ɗ | ʡ ɒ | ɲ **^** |  | IPAs | IPA+ |
|  | mㅁ | nㄴ | ŋㅇ | rㄹ | hㅎ | oㅗ | **ə**ㅓ | aㅏ | iㅣ | ʡ ɒ | ɲ **^** |  | IPA | Hangul |
|  |  |  |  | f | ɢ |  | J |  | ʟ |  |  | ASCII | not | IPA |
| CAPS | A ô | S ä | D ê | F | G ÿ | H à | ʋ ü | K ò | L ö | ; : | ‘ “ | CRLF | Base | L-ALT-R |
|  | **±** | ≤ | ≥ | ≠ | √ | n√ | 2√ | **°** | **•** | ɜ |  |  |  | XAscii+ |
|  | K ɻ | T ɬ | **Ʒ** ʘ | P ɽ | **∫** ↘ | Y | u ’ | Ħ | ː | ͝ |  |  | IPAs | IPA+ |
|  | kㅋ | tㅌ | **ʒ**ㅊ | pㅍ | **ʃ**ㅠ | yㅜ | uㅡ | ħ |  | ʂ |  |  | IPA | Hangul |
|  |  | X | c | v |  |  |  |  |  |  |  | ASCII | not | IPA |
| SHIFT | Z æ | X ø | C ç | V í | B ¿ | N ñ | M | , < á | . > è | / ? ÷ | SHIFT |  | Base | ALT |
|  | Alpha-ALT | Or XAscii |  |  |  |  |  |  |  |  |  |  | Norm ASCII | ALT/ XAscii |

1. The yellow areas are information. The light green areas are information in a box of 4, of which the left half may be hidden by keys. Also the left and right apply to two characters on the same key. The light blue areas are information in a box of 2, of which the left half may be hidden by keys. Also the left and right apply to two characters on the same key and ALT may alternatively be entered in the XAscii mode.
2. The QWERTY layout was originally set to minimize typewriter keys jamming and is not ergonomic. The Hangul layout ignores this layout and is supposedly ergonomic. The IPA layout is initially based on the Hangul equivalent where applicable. The ergonomics of the IPA layout are unknown, and also presumably could have a different optimum layout varying by language. It may be an improvement to rearrange the non-Hangul IPA key assignments, but that is expected to be discussed as part of a standards definition process.
3. The Greek alphabet is only including characters that are not already in the ASCII alphabet. The primary purpose of including Greek is to provide for STEM (science, technology, engineering and math) usage.
4. An example key label would be as below. The underline of G indicates that it is also used as an IPA character. Space for Unicode assignment is to the right, Hirakana is bottom middle and katakana is top middle for Japanese use. Use A1 and A3 mode; Cyrillic is provided for later but not on the example below.

|  |
| --- |
| **ψ Ψ** キ |
| H ǁ |
| hㅎ |
| G ÿ き |

1. IPA characters without an extended ASCII upper case are some modifiers that are not base characters.
2. ツ and シ, ソand ン may be confused.
3. The use of upper and lower case “l” and “L” for two different IPA characters is unsuitable for use of lower and upper case. So instead of the serif (Times New Roman) font, a script (Lucida Calligraphy) font has been substituted, l L .
4. Japanese Keyboard;



1. The Caps Lock text is an English/Hirakana switch that is provided by the Caps/Num color switching scheme where Hirakana and Katakana are the A1 and A3 alphabets. As existing software is using the Caps Lock, that mode is accepted, but user information needs to be supplied with the keyboard.
2. The key to the left of “1” is small/normal size characters. This would be a preset default percentage point change.
3. The key to the left of space means no change to Chinese characters. The key to the right of shift means change to Chinese characters. So pinyin can entered as roman, or katakana or hirakana.
4. The next key to the right of the last one means select Katakana on top and select Hirakana below, and add select roman for normal or pinyin entry for Chinese use.
5. The character 『 on the “P” key means start horizontal text.
6. The character 』on the “+” key means end horizontal text.
7. The character 「 on the “[” key which is second right of the “P” key means start vertical text.
8. The character 」on the “]” key which is third right of the “L” key means end vertical text.
9. The bullet on the “?” key is a space symbol.
10. A “£” like symbol with an extra dash is on the key to the right of the “0”
11. A long dash for punctuation is on the 3rd key to the right of the “0”.
12. The 、。
13. The characters noted from 22) to here are to be included in the charts below, but a printable source that works in Word has yet to be found.
14. The unprinted character above へ is not obvious, but may be the タkatakana character.
15. The “**¥**” Yen or Yuan character is used on the “6” key as well as of the character on the 3rd key to the right of “0” in kana mode.
16. The “**¤**” currencysymbol may be replaced by the printing of other currency symbols as software may be configured. However such currency symbols shall be transmitted as “**¤**” when ASCII is used. The use of (ISO 10366-1 countryAbbreviation used by internet) after such a symbol shall be used.
17. *Command* ***ed****:* *Write LEDs*

This command is followed by a byte indicating the desired LEDs setting. Bits 7-3: unused, 0. Bit 2: 1: CapsLock LED on. Bit 1: 1: NumLock LED on. Bit 0: 1: ScrollLock LED on. When OK, both bytes are ACKed. If the second byte is recognized as a command, that command is ACKed and done instead. Otherwise a NACK is returned (and a keyboard enable may be needed). Based on this, assign bit 4 to be the red LED of capslock and bit 5 to be the red LED of numlock and bit 6 to be the red LED of scroll lock. Turning both red and green on produces orange. Bit 3 would be the green LED for the Normal/Katakana/Hirakana/Cyrillic key LED. Bit 7 would be the red LED for the Normal/Katakana/Hirakana/Cyrillic key LED.

1. One version of the Japanese Keyboard scancodes has “0” as 0C instead of 0B, “-“ as 0D instead of 0C, “=” as 7D instead of 0D, an additional key to the right of “=” with a scancode of 0E. However here, as in a normal keyboard, the Backspace is 0E, and the added button is below on the end and is assigned a scancode of 7D.
2. To provide mitigation of errors, [CR][LF] SHALL be used in pairs, and if one character is an error, the pair is assumed and regenerated. The initial bank selection SHALL be S0 and after each [CR][LF] pair, SO SHALL be assumed UNLESS SI, DC2 or DC4 is the next character. Applications SHOULD provide for user ability to correct bank selection errors if they appear to have occurred. Error correction may be also provided by other means appropriate to the application
3. From [www.acme.com](http://www.acme.com), another version of the IPA. Unicode IPA Extensions (96, 250-2af):

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| &#x250; ɐ | &#x251; ɑ | &#x252; ɒ | &#x253; ɓ | &#x254; ɔ | &#x255; ɕ | &#x256; ɖ | &#x257; ɗ |
| &#x258; ɘ | &#x259; ə | &#x25a; ɚ | &#x25b; ɛ | &#x25c; ɜ | &#x25d; ɝ | &#x25e; ɞ | &#x25f; ɟ |
| &#x260; ɠ | &#x261; ɡ | &#x262; ɢ | &#x263; ɣ | &#x264; ɤ | &#x265; ɥ | &#x266; ɦ | &#x267; ɧ |
| &#x268; ɨ | &#x269; ɩ | &#x26a; ɪ | &#x26b; ɫ | &#x26c; ɬ | &#x26d; ɭ | &#x26e; ɮ | &#x26f; ɯ |
| &#x270; ɰ | &#x271; ɱ | &#x272; ɲ | &#x273; ɳ | &#x274; ɴ | &#x275; ɵ | &#x276; ɶ | &#x277; ɷ |
| &#x278; ɸ | &#x279; ɹ | &#x27a; ɺ | &#x27b; ɻ | &#x27c; ɼ | &#x27d; ɽ | &#x27e; ɾ | &#x27f; ɿ |
| &#x280; ʀ | &#x281; ʁ | &#x282; ʂ | &#x283; ʃ | &#x284; ʄ | &#x285; ʅ | &#x286; ʆ | &#x287; ʇ |
| &#x288; ʈ | &#x289; ʉ | &#x28a; ʊ | &#x28b; ʋ | &#x28c; ʌ | &#x28d; ʍ | &#x28e; ʎ | &#x28f; ʏ |
| &#x290; ʐ | &#x291; ʑ | &#x292; ʒ | &#x293; ʓ | &#x294; ʔ | &#x295; ʕ | &#x296; ʖ | &#x297; ʗ |
| &#x298; ʘ | &#x299; ʙ | &#x29a; ʚ | &#x29b; ʛ | &#x29c; ʜ | &#x29d; ʝ | &#x29e; ʞ | &#x29f; ʟ |
| &#x2a0; ʠ | &#x2a1; ʡ | &#x2a2; ʢ | &#x2a3; ʣ | &#x2a4; ʤ | &#x2a5; ʥ | &#x2a6; ʦ | &#x2a7; ʧ |
| &#x2a8; ʨ | &#x2a9; ʩ | &#x2aa; ʪ | &#x2ab; ʫ | &#x2ac; ʬ | &#x2ad; ʭ | &#x2ae; ʮ | &#x2af; ʯ |

1. IPA extensions. Phonetic Extensions (128, 1d00-1d7f):

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| &#x1d00; ᴀ | &#x1d01; ᴁ | &#x1d02; ᴂ | &#x1d03; ᴃ | &#x1d04; ᴄ | &#x1d05; ᴅ | &#x1d06; ᴆ | &#x1d07; ᴇ |
| &#x1d08; ᴈ | &#x1d09; ᴉ | &#x1d0a; ᴊ | &#x1d0b; ᴋ | &#x1d0c; ᴌ | &#x1d0d; ᴍ | &#x1d0e; ᴎ | &#x1d0f; ᴏ |
| &#x1d10; ᴐ | &#x1d11; ᴑ | &#x1d12; ᴒ | &#x1d13; ᴓ | &#x1d14; ᴔ | &#x1d15; ᴕ | &#x1d16; ᴖ | &#x1d17; ᴗ |
| &#x1d18; ᴘ | &#x1d19; ᴙ | &#x1d1a; ᴚ | &#x1d1b; ᴛ | &#x1d1c; ᴜ | &#x1d1d; ᴝ | &#x1d1e; ᴞ | &#x1d1f; ᴟ |
| &#x1d20; ᴠ | &#x1d21; ᴡ | &#x1d22; ᴢ | &#x1d23; ᴣ | &#x1d24; ᴤ | &#x1d25; ᴥ | &#x1d26; ᴦ | &#x1d27; ᴧ |
| &#x1d28; ᴨ | &#x1d29; ᴩ | &#x1d2a; ᴪ | &#x1d2b; ᴫ | &#x1d2c; ᴬ | &#x1d2d; ᴭ | &#x1d2e; ᴮ | &#x1d2f; ᴯ |
| &#x1d30; ᴰ | &#x1d31; ᴱ | &#x1d32; ᴲ | &#x1d33; ᴳ | &#x1d34; ᴴ | &#x1d35; ᴵ | &#x1d36; ᴶ | &#x1d37; ᴷ |
| &#x1d38; ᴸ | &#x1d39; ᴹ | &#x1d3a; ᴺ | &#x1d3b; ᴻ | &#x1d3c; ᴼ | &#x1d3d; ᴽ | &#x1d3e; ᴾ | &#x1d3f; ᴿ |
| &#x1d40; ᵀ | &#x1d41; ᵁ | &#x1d42; ᵂ | &#x1d43; ᵃ | &#x1d44; ᵄ | &#x1d45; ᵅ | &#x1d46; ᵆ | &#x1d47; ᵇ |
| &#x1d48; ᵈ | &#x1d49; ᵉ | &#x1d4a; ᵊ | &#x1d4b; ᵋ | &#x1d4c; ᵌ | &#x1d4d; ᵍ | &#x1d4e; ᵎ | &#x1d4f; ᵏ |
| &#x1d50; ᵐ | &#x1d51; ᵑ | &#x1d52; ᵒ | &#x1d53; ᵓ | &#x1d54; ᵔ | &#x1d55; ᵕ | &#x1d56; ᵖ | &#x1d57; ᵗ |
| &#x1d58; ᵘ | &#x1d59; ᵙ | &#x1d5a; ᵚ | &#x1d5b; ᵛ | &#x1d5c; ᵜ | &#x1d5d; ᵝ | &#x1d5e; ᵞ | &#x1d5f; ᵟ |
| &#x1d60; ᵠ | &#x1d61; ᵡ | &#x1d62; ᵢ | &#x1d63; ᵣ | &#x1d64; ᵤ | &#x1d65; ᵥ | &#x1d66; ᵦ | &#x1d67; ᵧ |
| &#x1d68; ᵨ | &#x1d69; ᵩ | &#x1d6a; ᵪ | &#x1d6b; ᵫ | &#x1d6c; ᵬ | &#x1d6d; ᵭ | &#x1d6e; ᵮ | &#x1d6f; ᵯ |
| &#x1d70; ᵰ | &#x1d71; ᵱ | &#x1d72; ᵲ | &#x1d73; ᵳ | &#x1d74; ᵴ | &#x1d75; ᵵ | &#x1d76; ᵶ | &#x1d77; ᵷ |
| &#x1d78; ᵸ | &#x1d79; ᵹ | &#x1d7a; ᵺ | &#x1d7b; ᵻ | &#x1d7c; ᵼ | &#x1d7d; ᵽ | &#x1d7e; ᵾ | &#x1d7f; ᵿ |

1. More IPA extensions. Phonetic Extensions Supplement (64, 1d80-1dbf):

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| &#x1d80; ᶀ | &#x1d81; ᶁ | &#x1d82; ᶂ | &#x1d83; ᶃ | &#x1d84; ᶄ | &#x1d85; ᶅ | &#x1d86; ᶆ | &#x1d87; ᶇ |
| &#x1d88; ᶈ | &#x1d89; ᶉ | &#x1d8a; ᶊ | &#x1d8b; ᶋ | &#x1d8c; ᶌ | &#x1d8d; ᶍ | &#x1d8e; ᶎ | &#x1d8f; ᶏ |
| &#x1d90; ᶐ | &#x1d91; ᶑ | &#x1d92; ᶒ | &#x1d93; ᶓ | &#x1d94; ᶔ | &#x1d95; ᶕ | &#x1d96; ᶖ | &#x1d97; ᶗ |
| &#x1d98; ᶘ | &#x1d99; ᶙ | &#x1d9a; ᶚ | &#x1d9b; ᶛ | &#x1d9c; ᶜ | &#x1d9d; ᶝ | &#x1d9e; ᶞ | &#x1d9f; ᶟ |
| &#x1da0; ᶠ | &#x1da1; ᶡ | &#x1da2; ᶢ | &#x1da3; ᶣ | &#x1da4; ᶤ | &#x1da5; ᶥ | &#x1da6; ᶦ | &#x1da7; ᶧ |
| &#x1da8; ᶨ | &#x1da9; ᶩ | &#x1daa; ᶪ | &#x1dab; ᶫ | &#x1dac; ᶬ | &#x1dad; ᶭ | &#x1dae; ᶮ | &#x1daf; ᶯ |
| &#x1db0; ᶰ | &#x1db1; ᶱ | &#x1db2; ᶲ | &#x1db3; ᶳ | &#x1db4; ᶴ | &#x1db5; ᶵ | &#x1db6; ᶶ | &#x1db7; ᶷ |
| &#x1db8; ᶸ | &#x1db9; ᶹ | &#x1dba; ᶺ | &#x1dbb; ᶻ | &#x1dbc; ᶼ | &#x1dbd; ᶽ | &#x1dbe; ᶾ | &#x1dbf; ᶿ |

1. Diacritical Marks; Combining Diacritical Marks Supplement (64, 1dc0-1dff):

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| &#x1dc0; ᷀ | &#x1dc1; ᷁ | &#x1dc2; ᷂ | &#x1dc3; ᷃ | &#x1dc4; ᷄ | &#x1dc5; ᷅ | &#x1dc6; ᷆ | &#x1dc7; ᷇ |
| &#x1dc8; ᷈ | &#x1dc9; ᷉ | &#x1dca; ᷊ | &#x1dcb; ᷋ | &#x1dcc; ᷌ | &#x1dcd; ᷍ | &#x1dce; ᷎ | &#x1dcf; ᷏ |
| &#x1dd0; ᷐ | &#x1dd1; ᷑ | &#x1dd2; ᷒ | &#x1dd3; ᷓ | &#x1dd4; ᷔ | &#x1dd5; ᷕ | &#x1dd6; ᷖ | &#x1dd7; ᷗ |
| &#x1dd8; ᷘ | &#x1dd9; ᷙ | &#x1dda; ᷚ | &#x1ddb; ᷛ | &#x1ddc; ᷜ | &#x1ddd; ᷝ | &#x1dde; ᷞ | &#x1ddf; ᷟ |
| &#x1de0; ᷠ | &#x1de1; ᷡ | &#x1de2; ᷢ | &#x1de3; ᷣ | &#x1de4; ᷤ | &#x1de5; ᷥ | &#x1de6; ᷦ | &#x1de7; ᷧ |
| &#x1de8; ᷨ | &#x1de9; ᷩ | &#x1dea; ᷪ | &#x1deb; ᷫ | &#x1dec; ᷬ | &#x1ded; ᷭ | &#x1dee; ᷮ | &#x1def; ᷯ |
| &#x1df0; ᷰ | &#x1df1; ᷱ | &#x1df2; ᷲ | &#x1df3; ᷳ | &#x1df4; ᷴ | &#x1df5; ᷵ | &#x1df6; ᷶ | &#x1df7; ᷷ |
| &#x1df8; ᷸ | &#x1df9; ᷹ | &#x1dfa; ᷺ | &#x1dfb; ᷻ | &#x1dfc; ᷼ | &#x1dfd; ᷽ | &#x1dfe; ᷾ | &#x1dff; |

1. Text mode is the default. It may be transmitted after SI in bank 2 and is resumed after NL. Numeric mode shall be entered after an SI in bank 2. In numeric mode, commas are field delimiters and are not stored or transmitted, but while they may be displayed as triple digit separators the ISO standard is to use what looks like an n space. This SHOULD be in reality a no-break (En or Em) space. Also in numeric mode, U means units count (in rack units it is 1.75”, 43.82 mm), D or da deca, h hecto, k kilo, M Mega, G Giga, T Tera, P Peta, E Exa (when followed by a letter e.g. EB is exabytes), Z zetta, Y Yoda (or yotta), d deci, m milli, u or **µ** or mc micro (medicines may use mc in the USA), n nano, p pico, f femto, a atto, z zepto, y yocto. The letter may replace a decimal point, e.g. 10k5, or follow the numeric value after a no-break space. Phonetic *e* the value of *e*, π has the numeric value, E means the exponent is following a sign for floating point values. I.e. 9M5 = 9,500,000=9E5+6. So exponents are normally integer, though with a decimal point roots are also permitted. This presents a problem when the decimal is not exact e.g. for cube roots so the rounding number of digits must then be written for a computer to calculate to the required accuracy. It may be better to express in the exponent form in such cases. Functions are referred to as the three or four character upper case letter, display is right justified. Commas in text of numbers are not copied when a number is copied into a numeric item space. A comma transmitted after a tab is interpreted as a field delimiter for csv data which may be including text. Normal scientific units notation shall apply e.g. m for metres when preceded by a value letter or decimal point, or the exponent is in the number. If different units from mksA are used, conversion shall be to the resolution of the largest number of digits plus one with rounding. A numeric mode character or character sequence shall be transmitted by entering ALT+NUMLOCK. A text mode character or character sequence shall be transmitted by entering ESC then NUMLOCK. A no-break space SHOULD be between the numeric value and the multiplier letter, which may be followed by the scientific units of measure if not a count of items.
2. The Cyrillic keyboard layout is so different, compatibility of layout was not attempted. Also it was missing Cyrillic characters.
3. The Cyrillic binary code is often different from ASCII. So by switching the key entry on a modified Japanese keyboard to Cyrillic, this indicates to the Operating System that the different binary is to be used. In addition, there is some provision for some individual characters to be selected using an ESC-CTRL-character (with or without shift) on non-modified Japanese keyboards.
4. Dvorak key layout appears to have de-facto lost in the market. However ergonomic study and improved layout for the new assignments is worth researching.
5. IF a [CR][LF] IS NOT found as a pair, BUT either a < or a bank switch character is found next, then an error is assumed in either the [CR] or the [LF], and is reinserted.
6. A line MAY begin with { and be followed by 0-9 or A,B,C,D,E,or F. If so, this is the start of a checksum and line number format as four characters for two bytes using ISO 1155. This SHALL be followed by L# and character pairs, with a leading 0 if needed for a line number starting at the second line. The first line is referred to as 00. The maximum line couint is 000000, which SHALL be a new start for error correction. If an error in the message checksum count is detected, a reply messageconsisting of {LRnnnnnn} SHALL initiate retransmission at that line number where nnnnnn is the line count number. IF there are not a set of four characters 0-9 or A,B,C,D,E,or F THEN this is not a checksum total. IF it is a line number, the character after the last digit SHALL be }.
7. The ISO recommended format for larger numbers is the period for the decimal point and a space between a 3 digit group and another digit or more. An illustration is “1 234.456 7” and commas are not used. However as Word 2010 defaults to ¼ Em space, this is what is used in the second space example as others display larger. When binary or hexadecimal are used, the digits are in groups of 4 with no-break space. Word uses CTRL-SHIFT-SPACE to enter the no-break space character, the first in the example. ISO 2022 defines the ESC usage, but ESC-SPACE may be available. When you add characters before to make the illustration above move to another line, the second space can be the break to the next line, but the first space does not. A normal space is an Em space which is larger and is a string delimiter and is a normal character size depending on the font although the WYSIWYG of the word processor usually makes it look smaller. See Wikipedia “Space (punctuation)”, “No-break space” for the usage as a no-break space and use in SI, International System of Units. There SHALL be a no-break space between the last digit and the first character of the SI units designation. Then the whole value is a string. Because the no-break space would require a bank selection character before it, and normally would require a default ASCII character afterward, the bank switching SHALL take place back to default ASCII. In HTML the character is &#8239; and in Unicode is U+202F known as NNBSP. Excel 2010 has a symbol special character of no-break space, that can be manually inserted. Using CTRL-SHIFT-SPACE does not work. However it is not available as a menu format option for regular numbers or SI (not SI character) values. Also Excel arithmetic with such values that include no-break spaces yields a \*VALUE error. So ISO SI (not SI character) is not implemented whereas the units should be able to be included in the math with no-break spaces between the numbers and the units. A no-break-space SHALL NOT be considered a string delimiter, unlike a normal space, comma, tab, null, quote marks or maybe others in computer languages. The arithmetic of interacting units to determine the appropriate units of the answer would also be desirable. The default units system SHALL be mksAC or mksAK when Kelvin temperature is used. Also Excel does not include as a menu option the ISO preferred date format of YYYY-MM-DD. Another limitation is the non-provision of frames as used in video or movie timecode, though the frame rate meeds specification. There is a macro available to address this limitation, which could be included in Excel. As can be seen below, other units can be expressed in terms of the base units, and in an equation, the units of everything on one side, when calculated out, equal the units of everything on the other side. Torque is also N.m. but vector multiplication, which is provided for as dot and cross product above. Fixed space may also be used in equations to keep them as a single string when parsing. Another code problem that Excel and various people have is international phone numbers. An example is +CCCC(AAA)EEEEE-LLLLxPPPPP where + means international access, C is 1-4 digits country code, AAA is 1-3 digits area code (ocassionally more) EEEEE is 1-5 digits exchange code and LLLL is 4 digits local number (sometimes 3 or 2), PPPPP, if used is the 2-5 digit extension number. While this makes 15 digits for local number assignment, worldwide usage makes for less. Currently there is no definition as to when an area code is required prior to the EEEE-LLLL for local calls, but using {} instead of () may provide for this. Recognizing this pattern is not a fixed length is currently not in Excel. International caller ID does provide country code and national number does work from some countries. Wikipedia has more information. The U.S. and Canada have 1 as both the long distance access and the combined country code.

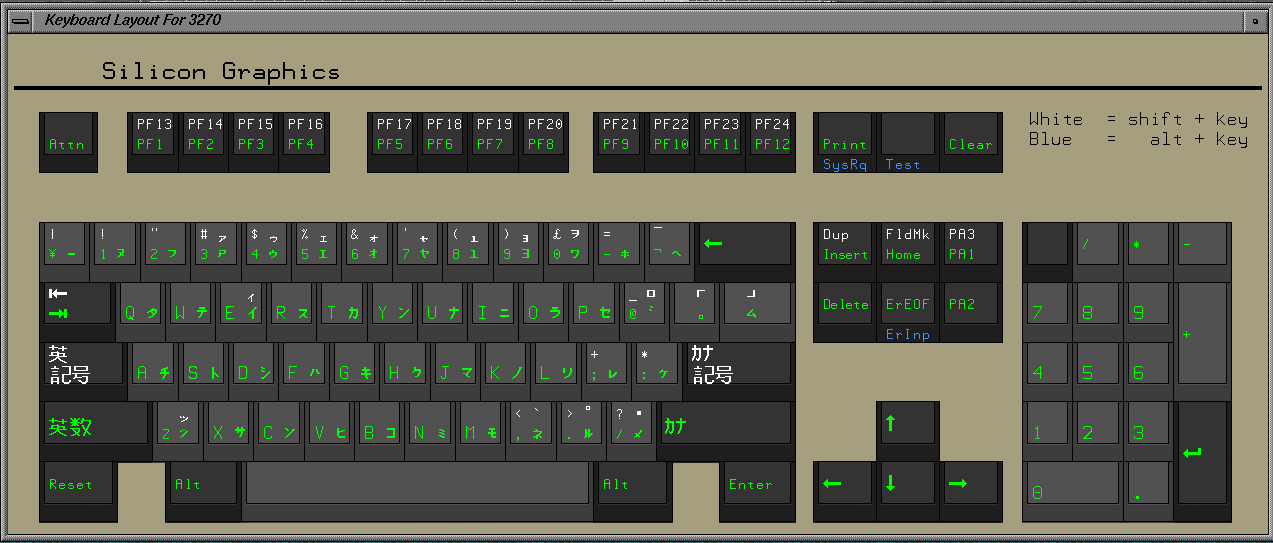
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Named units derived from**[**SI**](http://en.wikipedia.org/wiki/SI)**base units**[[31]](http://en.wikipedia.org/wiki/International_System_of_Units#cite_note-NIST330-35):3 | | | | |
| **Name** | [**Symbol**](http://en.wikipedia.org/wiki/Symbol) | [**Quantity**](http://en.wikipedia.org/wiki/Physical_quantity) | **Expressed in terms of other SI units** | **Expressed in terms of** [**SI base units**](http://en.wikipedia.org/wiki/SI_base_units) |
| [**radian**](http://en.wikipedia.org/wiki/Radian) | rad | [angle](http://en.wikipedia.org/wiki/Angle) |  | m⋅m−1 |
| [**steradian**](http://en.wikipedia.org/wiki/Steradian) | sr | [solid angle](http://en.wikipedia.org/wiki/Solid_angle) |  | m2⋅m−2 |
| [**hertz**](http://en.wikipedia.org/wiki/Hertz) | Hz | [frequency](http://en.wikipedia.org/wiki/Frequency) |  | s−1 |
| [**newton**](http://en.wikipedia.org/wiki/Newton_(unit)) | N | [force](http://en.wikipedia.org/wiki/Force), [weight](http://en.wikipedia.org/wiki/Weight) |  | kg⋅m⋅s−2 |
| [**pascal**](http://en.wikipedia.org/wiki/Pascal_(unit)) | Pa | [pressure](http://en.wikipedia.org/wiki/Pressure), [stress](http://en.wikipedia.org/wiki/Stress_(physics)) | N/m2 | kg⋅m−1⋅s−2 |
| [**joule**](http://en.wikipedia.org/wiki/Joule) | J | [energy](http://en.wikipedia.org/wiki/Energy), [work](http://en.wikipedia.org/wiki/Mechanical_work), [heat](http://en.wikipedia.org/wiki/Heat) | N⋅m | kg⋅m2⋅s−2 |
| [**watt**](http://en.wikipedia.org/wiki/Watt) | W | [power](http://en.wikipedia.org/wiki/Power_(physics)), [radiant flux](http://en.wikipedia.org/wiki/Radiant_flux) | J/s | kg⋅m2⋅s−3 |
| [**coulomb**](http://en.wikipedia.org/wiki/Coulomb) | C | [electric charge](http://en.wikipedia.org/wiki/Electric_charge) or [quantity of electricity](http://en.wikipedia.org/wiki/Quantity_of_electricity) |  | s⋅A |
| [**volt**](http://en.wikipedia.org/wiki/Volt) | V | [voltage](http://en.wikipedia.org/wiki/Voltage) ([electrical potential difference](http://en.wikipedia.org/wiki/Electrical_potential_difference)), [electromotive force](http://en.wikipedia.org/wiki/Electromotive_force) | W/A | kg⋅m2⋅s−3⋅A−1 |
| [**farad**](http://en.wikipedia.org/wiki/Farad) | F | [electric capacitance](http://en.wikipedia.org/wiki/Electric_capacitance) | C/V | kg−1⋅m−2⋅s4⋅A2 |
| [**ohm**](http://en.wikipedia.org/wiki/Ohm_(unit)) | Ω | [electric resistance](http://en.wikipedia.org/wiki/Electric_resistance), [impedance](http://en.wikipedia.org/wiki/Electrical_impedance), [reactance](http://en.wikipedia.org/wiki/Reactance_(electronics)) | V/A | kg⋅m2⋅s−3⋅A−2 |
| [**siemens**](http://en.wikipedia.org/wiki/Siemens_(unit)) | S | [electrical conductance](http://en.wikipedia.org/wiki/Electrical_conductance) | A/V | kg−1⋅m−2⋅s3⋅A2 |
| [**weber**](http://en.wikipedia.org/wiki/Weber_(unit)) | Wb | [magnetic flux](http://en.wikipedia.org/wiki/Magnetic_flux) | V⋅s | kg⋅m2⋅s−2⋅A−1 |
| [**tesla**](http://en.wikipedia.org/wiki/Tesla_(unit)) | T | [magnetic field](http://en.wikipedia.org/wiki/Magnetic_field) strength | Wb/m2 | kg⋅s−2⋅A−1 |
| [**henry**](http://en.wikipedia.org/wiki/Henry_(unit)) | H | [inductance](http://en.wikipedia.org/wiki/Inductance) | Wb/A | kg⋅m2⋅s−2⋅A−2 |
| [**degree Celsius**](http://en.wikipedia.org/wiki/Degree_Celsius) | °C | [temperature](http://en.wikipedia.org/wiki/Temperature) relative to 273.15 K |  | K |
| [**lumen**](http://en.wikipedia.org/wiki/Lumen_(unit)) | lm | [luminous flux](http://en.wikipedia.org/wiki/Luminous_flux) | cd⋅sr | cd |
| [**lux**](http://en.wikipedia.org/wiki/Lux) | lx | [illuminance](http://en.wikipedia.org/wiki/Illuminance) | lm/m2 | m−2⋅cd |
| [**becquerel**](http://en.wikipedia.org/wiki/Becquerel) | Bq | [radioactivity](http://en.wikipedia.org/wiki/Radioactivity) (decays per unit time) |  | s−1 |
| [**gray**](http://en.wikipedia.org/wiki/Gray_(unit)) | Gy | [absorbed dose](http://en.wikipedia.org/wiki/Absorbed_dose) (of [ionizing radiation](http://en.wikipedia.org/wiki/Ionizing_radiation)) | J/kg | m2⋅s−2 |
| [**sievert**](http://en.wikipedia.org/wiki/Sievert) | Sv | [equivalent dose](http://en.wikipedia.org/wiki/Equivalent_dose) (of [ionizing radiation](http://en.wikipedia.org/wiki/Ionizing_radiation)) | J/kg | m2⋅s−2 |
| [**katal**](http://en.wikipedia.org/wiki/Katal) | kat | [catalytic activity](http://en.wikipedia.org/wiki/Catalytic_activity) |  | s−1⋅mol |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [**Standard prefixes for the SI units of measure**](http://en.wikipedia.org/wiki/Metric_prefix#List_of_SI_prefixes) | | | | | | | | | | | | |
| **Multiples** | **Prefix name** |  | [**deca**](http://en.wikipedia.org/wiki/Deca-) | [**hecto**](http://en.wikipedia.org/wiki/Hecto) | [**kilo**](http://en.wikipedia.org/wiki/Kilo-) | [**mega**](http://en.wikipedia.org/wiki/Mega-) | [**giga**](http://en.wikipedia.org/wiki/Giga-) | [**tera**](http://en.wikipedia.org/wiki/Tera-) | [**peta**](http://en.wikipedia.org/wiki/Peta-) | [**exa**](http://en.wikipedia.org/wiki/Exa-) | [**zetta**](http://en.wikipedia.org/wiki/Zetta-) | [**yotta**](http://en.wikipedia.org/wiki/Yotta-) |
| **Prefix symbol** |  | da | h | k | M | G | T | P | E | Z | Y |
| **Factor** | 100 | 101 | 102 | 103 | 106 | 109 | 1012 | 1015 | 1018 | 1021 | 1024 |
|  | | | | | | | | | | | |  |
| **Fractions** | **Prefix name** |  | [**deci**](http://en.wikipedia.org/wiki/Deci-) | [**centi**](http://en.wikipedia.org/wiki/Centi-) | [**milli**](http://en.wikipedia.org/wiki/Milli-) | [**micro**](http://en.wikipedia.org/wiki/Micro-) | [**nano**](http://en.wikipedia.org/wiki/Nano-) | [**pico**](http://en.wikipedia.org/wiki/Pico-) | [**femto**](http://en.wikipedia.org/wiki/Femto-) | [**atto**](http://en.wikipedia.org/wiki/Atto-) | [**zepto**](http://en.wikipedia.org/wiki/Zepto-) | [**yocto**](http://en.wikipedia.org/wiki/Yocto-) |
| **Prefix symbol** |  | d | c | m | μ | n | p | f | a | z | Y |
| **Factor** | 100 | 10−1 | 10−2 | 10−3 | 10−6 | 10−9 | 10−12 | 10−15 | 10−18 | 10−21 | 10−24 |

1. The default mode is abcMode. If a phonetic only character is encountered, the mode SHALL switch to ipaMode. IF there are less than 8 alphabetic characters containing no phonetic only character entered prior to entering SHIFT-U, but one is in the first 8 including following alphabetic characters, the mode SHALL be switched to ipaMode. The mode change SHALL be retroactively applied to the use of “U”. In abcMode, lowercase “u” in shift SHOULD be uppercase “u” with a tail. In ipaMode, the lowercase “u” (entered as LEFT-ALT-U) SHALL be a serif or sanserif font upper case “U”(entered as LEFT-ALT-SHIFT-U) with no tail but depicted smaller, about 75% the point size. Uppercase remains the same, no tail. Note that this is not to be confused with the “ʋ” lowercase (entered as LEFT-ALT-J) and its “U” uppercase (entered as LEFT-ALT-SHIFT-J). When the keyboard mode is IPA or IPA-SHIFT, the J lowercase “u” in shift SHOULD be uppercase “u” with a tail The sizes are larger here. The abcMode and ipaMode are important for deciding the pronunciation in Text-To-Speech because they are different sounds.
2. Modern Greek has some added marks not included here. This is subject to further work. Such marks are not used outside of modern Greek unless there are some mathematicians using them that are not widely known. Some phonetic marks included here may be suitable substitutes.
3. Music may use MIDI or musicXML as serial data. Additional characters are part of those specifications and use Unicode characters. The ♫ symbol is used in Closed Captioning to denote musical content. A format for music content for people to see the tune written for singing as an addition to 708 Closed Captioning is: a) treble clef followed by optional speed (e.g. ASCII ¾ or 80 beats per minute) and loudness characters, then any sharp or flat characters, each followed by the ASCII upper case of the note and the octave it applies to, with a 9 representing all. Next is a string of 4 ASCII characters for the name of the chord, including spaces or tabs if needed. Then following are the Unicode note characters followed by the ASCII upper case of the note and the digit of the octave, sharps and flats are indicated at the beginning of the line. ASCII 4 character chords may follow each note, and be played simultaneously. Each bar character may be followed by 4 ASCII characters for chords. An end of line may then be followed by one or more languages as ASCII text line or lines for the words. The line MAY begin with <*lan>* where lan is the three letter ISO language code. This SHALL NOT display but SHALL result in a menu selection for one or more languages to display IF it is present on the first line. If a word spans multiple notes, one or more hyphen(s) SHALL be used. If there are multiple words to one note, there SHALL be a no-break Em or En space between these words. A tab is used to start at the next bar. As this is for singing, only single notes are normally provided for. Multiple notes are combined with parenthesis. Pauses are included. Music software provides for more complex arrangements and graphics.
4. The BEL may be followed by Unicode musical notation to play a tune, and end with a line feed.
5. The selection of ASCII chart MAY also be switched as follows. The selection MAY be displayed on a two or seven segment plus an 11 segment + decimal Point LED or LCD displays. This may double as the 8 bits assigned above for mode selection display with the decimal point indicating that the display is alphanumeric. Esc-SI-00 to 16 selects the ISO 8859 version, where 00 is the extended version of -1 described in this document. Two digits or one letter makes the coding simpler. Esc-SI-A selects Arabic Esc-SI-C selects Chinese with pinyin to character conversion Esc-SI-F selects Farsi/Persian Esc-SI-H selects Hebrew Esc-SI-I selects ISCII, India Esc-SI-J selects adapted ISCIJ above Esc-SI-K selects Khymer (Kampuchea) Esc-SI-M selects Myanmar Esc-SI-N selects Hirakana (Japan) Esc-SI-Q selects Katakana (Japan) The SI is the Hirakana-Katakana button on a Japanese keyboard and selecting either SHALL switch to the other subsequently until another mode is selected. Esc-SI-R selects Russian Cyrillic Esc-SI-L selects Sinhalese (Sri Lanka) Esc-SI-T selects Thai alphabet Esc-SI-Z selects the Dzongkha/Bhutan Unicode, further information is at http://www.dzongkha.gov.bt/IT/download/DzComputingTips.pdf. These are all 11 segment characters with T displayed without the left arm.
6. To be Continued, this is an entry placeholder.

## Japanese Keyboard Layout Chart

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ESC | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | F10 | F11 | F12 |  |  |
| ~  ` | ぬ | ふ | あ | う | え | お | や | ゆ | よ | わを | ほ= | **·**へ~^ |  | XAscii+ |
| ~  ` | ɦ | ɭ | ɮ | ʁ | ʎ | ɰ | ɳ |  | ç | ɣ | ɖ | χ |  | IPAs |
| ~  ` | ɦ | ɭ | ɮ | ʁ | ʎ | ɰ | ɳ | × | ç | ɣ | ɖ | χ |  | IPA |
| ~  ` | 1 ! ã | 2 @ â | 3 # î | 4 $ **€** | 5 % **£** | 6 ^ **¥** | 7 & **¤** | 8 \* | 9 (é | 0 ) | - \_ - | = + ë | BS | ALT |
| ɔ ɔ | **γ Γ** | **δ Δ** | **ζ Ζ** | **η Η** | **θ Θ** | **λ Λ** | **μ Μ** | **ξ Ξ** | **π Π** | **ρ Ρ** 『 | e̋ 、 | ȅ **°** | ě「 | Grk/IPA |
| ↑ | B | ℑ | D | G | S | J | Z | L | **Æ** | E | ɕ | ɹ | ʍ | IPA+ |
| ↓ | bㅂ | ʝㅈ | dㄷ | ɡㄱ | sㅅ | jㅛ | zㅕ | iㅑ | **æ**ㅐ | eㅔ | ɕ | ɹ | ʍ | Hangul |
|  | q た | Wて | い | ʀす | か | ん | uな | に | ら | せ |  | ASCII | not | IPA |
| TAB | Q õ | W å | E | R | T | Y ý | U ú | I û | O ó | P ù | [ { | ] } | \ | | ALT |
|  | **ς Σ** | **σ Σ** | **τ Τ** | **φ Φ** | **ψ Ψ** | **ω Ω** | ɾ | ʑ | ɧ | ʊ』 | ≈ | 」﹁ |  | Grk/IPA |
|  | M | N ʛ ʛ | Ŋ ǀ | R ǂ | H ǁ | Oɠ ɠ | **Ә** ɓ ɓ | Aɗ ɗ | I ʄ ʄ | ʡ ɒ | ɲ**^** | ð—**¥**︳ | IPAs | IPA+ |
|  | mㅁ | nㄴ | ŋㅇ | rㄹ | hㅎ | oㅗ | **ə**ㅓ | aㅏ | iㅣ | ʡ ɒ | ɲ **^** | ð | IPA | Hangul |
| Kana | ち | と | し | fは | ɢき | く | Jま | の | Lり | れ | け | む | not | IPA |
| CAPS | A ô | S ä | D ê | F | G ÿ | H à | ʋ ü | K ò | L ö | ; : | ‘ “ | ` ~ ï | CRLF | ALT |
|  | **±** | ≤ | ≥ | ≠ | √ | n√ | 2√ | 、 | **°** | **•** | ɜ ɜ |  |  | XAscii+ |
|  | K ɻ ɻ | T ɬɬ | **Ʒ** ʘ | P ɽ ɽ | **∫** ↘ ↗ | Y **ǃ** | u ’ | Ħ | ː | ʂ ͝ | ʊ |  | IPAs | IPA+ |
|  | kㅋ | tㅌ | **ʒ**ㅊ | pㅍ | **ʃ**ㅠ | yㅜ | uㅡ | ħ | 。 | ʂ | ʊ |  | IPA | Hangul |
|  | つ | さ | そ | ひ | こ | み | よ | ね | る | め | ろ | ASCII | not | IPA |
| SHIFT | Z æ | X ø | C ç | V í | B ¿ | N ñ | M | , < á | . > è | / ? ÷ |  | SHIFT | Base | ALT |
|  | Alpha-ALT | Or XAscii |  |  |  |  |  |  |  |  |  |  | Norm ASCII | ALT/ XAscii |



|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 01 | 3B | 3C | 3D | 3E | 3F | 40 | 41 | 42 | 43 | 44 | 57 | 58 |  |  |
| ESC | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | F10 | F11 | F12 |  |  |
| 29 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E |  |
|  | ぬ | ふ | あ | う | え | お | や | ゆ | よ | わを | ほ= | **·**へ~^ |  | XAscii+ |
| Jp.Small/  Normal  Reg/ext  Cyrillic | ɦヌ | ɭフ | ɮア | ʁウ | ʎエ | ɰオ | ɳヤ | ユ | çヨ | ɣワ | ɖホ | χヘ |  | IPAs |
|  | ɦ | ɭ | ɮ | ʁ | ʎ | ɰ | ɳ | × | ç | ɣ | ɖ | χ |  | IPA |
|  | 1 ! ã | 2 @ â | 3 # î | 4 $ **€** | 5 % **£** | 6 ^ **¥** | 7 & **¤** | 8 \* Bold | 9 (é | 0 ) Italic | - \_ \_\_ | = + ë | BS | ALT |
| 0F | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 1A | 1B | 7D |  |
| ɔ ɔ | **γ Γ** | **δ Δ** | **ζ Ζ** | **η Η** | **θ Θ** | **λ Λ** | **μ Μ** | **ξ Ξ** | **π Π** | **ρ Ρ** 』 | e̋ 、 | ȅ **°** | ě「 | Grk/IPA |
| ↑ | B タ | ℑテ | D イ | G ス | S カ | J ン | Z ナ | L ニ | **Æ** ラ | Eセ | ɕロ | ɹ | ʍム | IPA+ |
| ↓ | bㅂ | ʝㅈ | dㄷ | ɡㄱ | sㅅ | jㅛ | zㅕ | iㅑ | **æ**ㅐ | eㅔ | ɕ | ɹ | ʍ | Hangul |
|  | q た | Wて | い | ʀす | か | ん | uな | に | ら | せ |  | ASCII | not | IPA |
| TAB | q õ | W å | E | R | T | Y ý | U ú | I û | O ó | P ù | [ { | ] } | \ | | ALT |
| 3A | 1E | 1F | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 2B | 1C |  |
| See  Table | **ς Σ** チ | **σ Σ** ト | **τ Τ** シ | **φ Φ** ハ | **ψ Ψ** キ | **ω Ω** ク | ɾ ɾマ | ʑ ʑノ | ɧ ɧリ | ʊ ʊレ『 | ≈ケ | 」﹁ | CRLF Enter | Grk/IPA |
|  | M | N ʛ ʛ | Ŋ ǀ | R ǂ | H ǁ | Oɠ ɠ | **Ә** ɓ ɓ | Aɗ ɗ | I ʄ ʄ | ʡ ɒ | ɲ**^** | ð—**¥**︳ | IPAs | IPA+ |
|  | mㅁ | nㄴ | ŋㅇ | rㄹ | hㅎ | oㅗ | **ə**ㅓ | aㅏ | iㅣ | ʡ ɒ | ɲ **^** | ð | IPA | Hangul |
| Kana | ち | と | し | fは | ɢき | く | Jま | の | Lり | れ | け | む | not | IPA |
| CAPS | A ô | S ä | D ê | f | G ÿ | H à | ʋ ü | K ò | L ö | ; : | ‘ “ | ` ~ ï | CRLF | ALT |
| 2A | 2C | 2D | 2E | 2F | 30 | 31 | 32 | 33 | 34 | 35 | 73 | 36 |  |  |
|  | **±**ツ | ≤サ | ≥ン | ≠ヒ | √コ | n√ | 2√モ | ネ | ル | **•** | ɜ ɜ |  |  | XAscii+ |
|  | K ɻ ɻ | T ɬɬ | **Ʒ** ʘ | P ɽ ɽ | **∫** ↘ ↗ | Y **ǃ**ミ | u ’ | Ħ | ː | ʂ ͝メ | ʊ |  | IPAs | IPA+ |
|  | kㅋ | tㅌ | **ʒ**ㅊ | pㅍ | **ʃ**ㅠ | yㅜ | uㅡ | ħ、 | 。 | ʂ | ʊ |  | IPA | Hangul |
|  | つ | xさ | cそ | vひ | ʙこ | み | よ | ね | る | め | ろ | ASCII | not | IPA |
| SHIFT | Z æ | X ø | C ç | V í | B ¿ | N ñ | M | , < á | . > è | / ? ÷ |  | SHIFT | Base | ALT |
| Ctl 1D | Alpha-ALT | Or XAscii | WIN E0 5B | Alt 38 | 7B No change Chinese | SP  39 | 79  Change  Chinese | 70 kata  /hira/  Cyrillic | Alt E0 38 | WIN E0 5c | Menu E0 5d | Ctl E0 1D | Norm ASCII | ALT/ XAscii |

WITH VIDEO EDITING FOR ADOBE CS6

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 01 | 3B | 3C | 3D | 3E | 3F | 40 | 41 | 42 | 43 | 44 | 57 | 58 |  |  |
|  |  |  |  |  | Capture | Batch capture |  |  | Title design Shift, Edit Work space | Shift Effects Work Space | Shift Audio Work space |  |  | 2xLeft Click on project wksp, import |
| ESC | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | F10 | F11 | F12 |  |  |
| 29 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E |  |
|  | ぬ | ふ | あ | う | え | お | や | ゆ | よ | わを | ほ= | **·**へ~^ |  | XAscii+ |
| Jp.small/  Normal  Reg/ext  Cyrillic | ɦヌ | ɭフ | ɮア | ʁウ | ʎエ | ɰオ | ɳヤ | ユ | çヨ | ɣワ | ɖホ | χヘ |  | IPAs |
|  | ɦ | ɭ | ɮ | ʁ | ʎ | ɰ | ɳ | × | ç | ɣ | ɖ | χ |  | IPA |
|  |  |  |  |  |  |  |  |  |  |  | Zoom in | Zoom out |  |  |
|  | 1 ! ã | 2 @ â | 3 # î | 4 $ **€** | 5 % **£** | 6 ^ **¥** | 7 & **¤** | 8 \* Bold | 9 (é | 0 ) Italic | - \_ \_\_ | = + ë | BS | ALT |
|  |  |  |  |  |  |  |  | Un-numbered marker |  |  |  |  |  |  |
| 0F | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 1A | 1B | 7D |  |
| ɔ ɔ | **γ Γ** | **δ Δ** | **ζ Ζ** | **η Η** | **θ Θ** | **λ Λ** | **μ Μ** | **ξ Ξ** | **π Π** | **ρ Ρ** 』 | e̋ 、 | ȅ **°** | ě「 | Grk/IPA |
| ↑ | B タ | ℑテ | D イ | G ス | S カ | J ン | Z ナ | L ニ | **Æ** ラ | Eセ | ɕロ | ɹ | ʍム | IPA+ |
| ↓ | bㅂ | ʝㅈ | dㄷ | ɡㄱ | sㅅ | jㅛ | zㅕ | iㅑ | **æ**ㅐ | eㅔ | ɕ | ɹ | ʍ | Hangul |
|  | q た | Wて | い | ʀす | か | ん | uな | に | ら | せ |  | ASCII | not | IPA |
|  |  |  |  |  |  | Slip edit tool | Slide edit tool |  |  | Pen tool key frame |  |  |  |  |
| TAB | q õ | W å | E | R | T | Y ý | U ú | I û | O ó | P ù | [ { | ] } | \ | | ALT |
| 3A | 1E | 1F | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 2B | 1C |  |
| See  table | **ς Σ** チ | **σ Σ** ト | **τ Τ** シ | **φ Φ** ハ | **ψ Ψ** キ | **ω Ω** ク | ɾ ɾマ | ʑ ʑノ | ɧ ɧリ | ʊ ʊレ『 | ≈ケ | 」﹁ | CRLF Enter | Grk/IPA |
|  | M | N ʛ ʛ | Ŋ ǀ | R ǂ | H ǁ | Oɠ ɠ | **Ә** ɓ ɓ | Aɗ ɗ | I ʄ ʄ | ʡ ɒ | ɲ**^** | ð—**¥**︳ | IPAs | IPA+ |
|  | mㅁ | nㄴ | ŋㅇ | rㄹ | hㅎ | oㅗ | **ə**ㅓ | aㅏ | iㅣ | ʡ ɒ | ɲ **^** | ð | IPA | Hangul |
| Kana | ち | と | し | fは | ɢき | く | Jま | の | Lり | れ | け | む | not | IPA |
|  | Ctl SelAll CtlSft UnSelAll |  | Ctl Add default trans |  |  |  | Rev | Play | Fwd |  |  |  | Render | Left arrow, frame - |
| CAPS | A ô | S ä | D ê | f | G ÿ | H à | ʋ ü | K ò | L ö | ; : | ‘ “ | ` ~ ï | CRLF | ALT |
| 2A | 2C | 2D | 2E | 2F | 30 | 31 | 32 | 33 | 34 | 35 | 73 | 36 |  |  |
| End, GoTo End | **±**ツ | ≤サ | ≥ン | ≠ヒ | √コ | n√ | 2√モ | ネ | ル | **•** | ɜ ɜ |  | Home, GoTo Beginning | XAscii+ |
| PageUp Next Cut | K ɻ ɻ | T ɬɬ | **Ʒ** ʘ | P ɽ ɽ | **∫** ↘ ↗ | Y **ǃ**ミ | u ’ | Ħ | ː | ʂ ͝メ | ʊ |  | IPAs | IPA+ |
|  | kㅋ | tㅌ | **ʒ**ㅊ | pㅍ | **ʃ**ㅠ | yㅜ | uㅡ | ħ、 | 。 | ʂ | ʊ |  | IPA | Hangul |
| PgeDwn Prev. Cut | つ | xさ | cそ | vひ | ʙこ | み | よ | ね | る | め | ろ | ASCII | Not | IPA |
|  | Ctl Undo CtlSft Redo | Rate stretch tool Ctl Cut | Razor tool Ctl Copy | Sel Clip.  Shift, add to sel.  Ctl Paste | Ripple edit tool |  |  | Insert source | Overlay source |  |  |  | Right arrow, frame+ |  |
| SHIFT | Z æ | X ø | C ç | V í | B ¿ | N ñ | M | , < á | . > è | / ? ÷ |  | SHIFT | Base | ALT |
| L Ctl 1D Drag ripple | Alpha-ALT | Or XAscii | WIN E0 5B | L Alt 38 | 7B No change  Chinese | SP  39 Play /Stop | 79  Change Chinese | 70 kata  /hira/  Cyrillic | R Alt E0 38 Drag, unlink A/V | WIN E0 5c | Menu E0 5d | R Ctl E0 1D | Norm ASCII | ALT/ XAscii |

## Korean Hangul

the numbers are the pages in dictionaries, ignore them

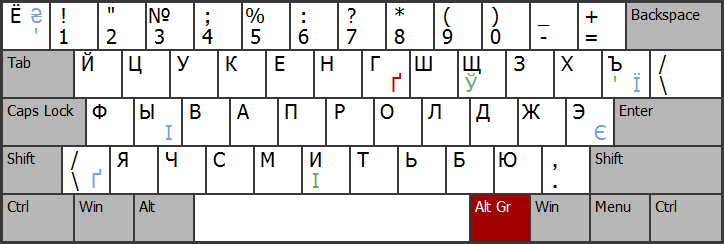
## Cyrillic

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Letters of the Cyrillic alphabet (see also [Cyrillic digraphs](http://en.wikipedia.org/wiki/Cyrillic_digraphs)) | | | | | | | | | | |
| [А A](http://en.wikipedia.org/wiki/A_(Cyrillic)) | [Б Be](http://en.wikipedia.org/wiki/Be_(Cyrillic)) | [В Ve](http://en.wikipedia.org/wiki/Ve_(Cyrillic)) | [Г Ge](http://en.wikipedia.org/wiki/Ge_(Cyrillic)) | [Ґ Ge upturn](http://en.wikipedia.org/wiki/Ge_with_upturn) | [Д De](http://en.wikipedia.org/wiki/De_(Cyrillic)) | [Ђ Dje](http://en.wikipedia.org/wiki/Dje) | [Ѓ Gje](http://en.wikipedia.org/wiki/Gje) | [Е Ye](http://en.wikipedia.org/wiki/Ye_(Cyrillic)) | [Ё Yo](http://en.wikipedia.org/wiki/Yo_(Cyrillic)) | [Є Yest](http://en.wikipedia.org/wiki/Ukrainian_Ye) | [Ж Zhe](http://en.wikipedia.org/wiki/Zhe_(Cyrillic)) |
| [З Ze](http://en.wikipedia.org/wiki/Ze_(Cyrillic)) | [З́ Zje](http://en.wikipedia.org/wiki/%D0%97%CC%81) | [Ѕ Dze](http://en.wikipedia.org/wiki/Dze) | [И I](http://en.wikipedia.org/wiki/I_(Cyrillic)) | [І Dotted I](http://en.wikipedia.org/wiki/Decimal_I_(Cyrillic)) | [Ї Yi](http://en.wikipedia.org/wiki/Yi_(Cyrillic)) | [Й Short I](http://en.wikipedia.org/wiki/Short_I) | [Ј Je](http://en.wikipedia.org/wiki/Je_(Cyrillic)) | [К Ka](http://en.wikipedia.org/wiki/Ka_(Cyrillic)) | [Л El](http://en.wikipedia.org/wiki/El_(Cyrillic)) | [Љ Lje](http://en.wikipedia.org/wiki/Lje) | [М Em](http://en.wikipedia.org/wiki/Em_(Cyrillic)) |
| [Н En](http://en.wikipedia.org/wiki/En_(Cyrillic)) | [Њ Nje](http://en.wikipedia.org/wiki/Nje) | [О O](http://en.wikipedia.org/wiki/O_(Cyrillic)) | [П Pe](http://en.wikipedia.org/wiki/Pe_(Cyrillic)) | [Р Er](http://en.wikipedia.org/wiki/Er_(Cyrillic)) | [С Es](http://en.wikipedia.org/wiki/Es_(Cyrillic)) | [С́ [ɕ]](http://en.wikipedia.org/wiki/%D0%A1%CC%81) | [Т Te](http://en.wikipedia.org/wiki/Te_(Cyrillic)) | [Ћ Tshe](http://en.wikipedia.org/wiki/Tshe) | [Ќ Kje](http://en.wikipedia.org/wiki/Kje) | [У U](http://en.wikipedia.org/wiki/U_(Cyrillic)) | [Ў Short U](http://en.wikipedia.org/wiki/Short_U_(Cyrillic)) |
| [Ф Ef](http://en.wikipedia.org/wiki/Ef_(Cyrillic)) | [Х Kha](http://en.wikipedia.org/wiki/Kha_(Cyrillic)) | [Ц Tse](http://en.wikipedia.org/wiki/Tse_(Cyrillic)) | [Ч Che](http://en.wikipedia.org/wiki/Che_(Cyrillic)) | [Џ Dzhe](http://en.wikipedia.org/wiki/Dzhe) | [Ш Sha](http://en.wikipedia.org/wiki/Sha) | [Щ Shcha](http://en.wikipedia.org/wiki/Shcha) | [Ъ Hard sign (Yer)](http://en.wikipedia.org/wiki/Yer) | [Ы Yery](http://en.wikipedia.org/wiki/Yery) | [Ь Soft sign (Yeri)](http://en.wikipedia.org/wiki/Soft_sign) | [Э E](http://en.wikipedia.org/wiki/E_(Cyrillic)) | [Ю Yu](http://en.wikipedia.org/wiki/Yu_(Cyrillic)) |
| [Я Ya](http://en.wikipedia.org/wiki/Ya_(Cyrillic)) |  |  |  |  |  |  |  |  |  |  |  |
| Cyrillic non-Slavic letters | | | | | | | | | | |  |
| [Ӏ Palochka](http://en.wikipedia.org/wiki/Palochka) | [Ә Cyrillic Schwa](http://en.wikipedia.org/wiki/Schwa_(Cyrillic)) | [Ғ Ayn](http://en.wikipedia.org/wiki/Ghayn) | [Ҙ Bashkir Dhe](http://en.wikipedia.org/wiki/Dhe_(Cyrillic)) | [Ҫ Bashkir The](http://en.wikipedia.org/wiki/The_(Cyrillic)) | [Ҡ Bashkir Qa](http://en.wikipedia.org/wiki/Bashkir_Qa) | [Қ Ka with descender](http://en.wikipedia.org/wiki/Ka_with_descender) | [Ң Ng](http://en.wikipedia.org/wiki/En_with_descender_(Cyrillic)) | [Ө Barred O](http://en.wikipedia.org/wiki/Oe_(Cyrillic)) | [Ү Straight U](http://en.wikipedia.org/wiki/Ue_(Cyrillic)) | [Ұ Straight U with stroke](http://en.wikipedia.org/wiki/Kazakh_Short_U) | [Һ He](http://en.wikipedia.org/wiki/Shha_(Cyrillic)) |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Cyrillic letters used in the past | | | | | | | | | | |  |
| [Ꙗ A iotified](http://en.wikipedia.org/wiki/A_iotified) | [Ѥ E iotified](http://en.wikipedia.org/wiki/E_iotified) | [Ѧ Yus small](http://en.wikipedia.org/wiki/Yus) | [Ѫ Yus big](http://en.wikipedia.org/wiki/Yus) | [Ѩ Yus small iotified](http://en.wikipedia.org/wiki/Yus) | [Ѭ Yus big iotified](http://en.wikipedia.org/wiki/Yus) | [Ѯ Ksi](http://en.wikipedia.org/wiki/Ksi_(Cyrillic)) | [Ѱ Psi](http://en.wikipedia.org/wiki/Psi_(Cyrillic)) | [Ѳ Fita](http://en.wikipedia.org/wiki/Fita) | [Ѵ Izhitsa](http://en.wikipedia.org/wiki/Izhitsa) | [Ѷ Izhitsa okovy](http://en.wikipedia.org/wiki/Izhitsa_okovy) | [Ҁ Koppa](http://en.wikipedia.org/wiki/Koppa_(Cyrillic)) |
| [Ѹ Uk](http://en.wikipedia.org/wiki/Uk_(Cyrillic)) | [Ѡ Omega](http://en.wikipedia.org/wiki/Omega_(Cyrillic)) | [Ѿ Ot](http://en.wikipedia.org/wiki/Ot_(Cyrillic)) | [Ѣ](http://en.wikipedia.org/wiki/Yat) |  |  |  |  |  |  |  |  |

Top of Form

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| **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| [**Ё**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | | [**1**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**2**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**3**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**4**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**5**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**6**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**7**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**8**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**9**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**0**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**-**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**+**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [delete](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | |
| [tab](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | | | [**Я**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Ж**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Е**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Р**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Т**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Ю**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**У**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**И**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**О**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**П**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Ь**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Ъ**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [.:](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | |
| [caps lock](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | | | | [**А**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**С**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Д**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Ф**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Г**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Х**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Й**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**К**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Л**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Ш**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Щ**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [return](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | | |
| [shift](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | | | | | [**З**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Ч**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Ц**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**В**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Б**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Н**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**М**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Э**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [**Ы**](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [,;](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [shift](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | | | | |
| [fn](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [control](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [option](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [command](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | | [space](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | | | | | | | | | | | | | [command](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | | [option](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | |  | | | [▲](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | |  | | |
| [◄](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [▼](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | | [►](http://www.cyrillic-keyboard.com/russian-keyboard.html) | | |

### Russian, Belarusian and Ukranian standard keyboards



Green color denotes differences between standard Russian and Belarusian layouts; blue color denotes differences between standard Russian layout and “Ukranian (Enhanced)” one (available in Windows Vista and above).

[Alt Gr] key is used in the Ukranian layout only, being responsible for the single letter “ge with upturn” [Ґґ], denoted here with red color.

These layouts are so incompatible with the ASCII layout that layout similarity is not attempted. Instead, non-ASCII characters are code entered for users and the use of binary converted in software when required. Not all characters in the list above are shown on the keyboard layouts. The backwards S (top left in Belorussian) appears to be infrequently used, so is not provided for.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **KOI8-U (see also KO17 following for 7 bit caps only)** | | | | | | | | | | | | | | | | |
|  | **\_0** | **\_1** | **\_2** | **\_3** | **\_4** | **\_5** | **\_6** | **\_7** | **\_8** | **\_9** | **\_A** | **\_B** | **\_C** | **\_D** | **\_E** | **\_F** |
| **0\_** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **1\_** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **2\_** | [SP](http://en.wikipedia.org/wiki/Space_character) 0020 ***32*** | [!](http://en.wikipedia.org/wiki/Exclamation_mark) 0021 ***33*** | ["](http://en.wikipedia.org/wiki/Quotation_mark) 0022 ***34*** | [#](http://en.wikipedia.org/wiki/Number_sign) 0023 ***35*** | [$](http://en.wikipedia.org/wiki/Dollar_sign) 0024 ***36*** | [%](http://en.wikipedia.org/wiki/Percent_sign) 0025 ***37*** | [&](http://en.wikipedia.org/wiki/Ampersand) 0026 ***38*** | ['](http://en.wikipedia.org/wiki/Apostrophe) 0027 ***39*** | [(](http://en.wikipedia.org/wiki/Bracket) 0028 ***40*** | [)](http://en.wikipedia.org/wiki/Bracket) 0029 ***41*** | [\*](http://en.wikipedia.org/wiki/Asterisk) 002A ***42*** | [+](http://en.wikipedia.org/wiki/Plus_and_minus_signs) 002B ***43*** | [,](http://en.wikipedia.org/wiki/Comma_(punctuation)) 002C ***44*** | [-](http://en.wikipedia.org/wiki/Plus_and_minus_signs) 002D ***45*** | [.](http://en.wikipedia.org/wiki/Full_stop) 002E ***46*** | [/](http://en.wikipedia.org/wiki/Slash_(punctuation)) 002F ***47*** |
| **3\_** | [0](http://en.wikipedia.org/wiki/0_(number)) 0030 ***48*** | [1](http://en.wikipedia.org/wiki/1_(number)) 0031 ***49*** | [2](http://en.wikipedia.org/wiki/2_(number)) 0032 ***50*** | [3](http://en.wikipedia.org/wiki/3_(number)) 0033 ***51*** | [4](http://en.wikipedia.org/wiki/4_(number)) 0034 ***52*** | [5](http://en.wikipedia.org/wiki/5_(number)) 0035 ***53*** | [6](http://en.wikipedia.org/wiki/6_(number)) 0036 ***54*** | [7](http://en.wikipedia.org/wiki/7_(number)) 0037 ***55*** | [8](http://en.wikipedia.org/wiki/8_(number)) 0038 ***56*** | [9](http://en.wikipedia.org/wiki/9_(number)) 0039 ***57*** | [:](http://en.wikipedia.org/wiki/Colon_(punctuation)) 003A ***58*** | [;](http://en.wikipedia.org/wiki/Semicolon) 003B ***59*** | [<](http://en.wikipedia.org/wiki/Angle_bracket) 003C ***60*** | [=](http://en.wikipedia.org/wiki/Equal_sign) 003D ***61*** | [>](http://en.wikipedia.org/wiki/Angle_bracket) 003E ***62*** | [?](http://en.wikipedia.org/wiki/Question_mark) 003F ***63*** |
| **4\_** | [@](http://en.wikipedia.org/wiki/@) 0040 ***64*** | [A](http://en.wikipedia.org/wiki/A) 0041 ***65*** | [B](http://en.wikipedia.org/wiki/B) 0042 ***66*** | [C](http://en.wikipedia.org/wiki/C) 0043 ***67*** | [D](http://en.wikipedia.org/wiki/D) 0044 ***68*** | [E](http://en.wikipedia.org/wiki/E) 0045 ***69*** | [F](http://en.wikipedia.org/wiki/F) 0046 ***70*** | [G](http://en.wikipedia.org/wiki/G) 0047 ***71*** | [H](http://en.wikipedia.org/wiki/H) 0048 ***72*** | [I](http://en.wikipedia.org/wiki/I) 0049 ***73*** | [J](http://en.wikipedia.org/wiki/J) 004A ***74*** | [K](http://en.wikipedia.org/wiki/K) 004B ***75*** | [L](http://en.wikipedia.org/wiki/L) 004C ***76*** | [M](http://en.wikipedia.org/wiki/M) 004D ***77*** | [N](http://en.wikipedia.org/wiki/N) 004E ***78*** | [O](http://en.wikipedia.org/wiki/O) 004F ***79*** |
| **5\_** | [P](http://en.wikipedia.org/wiki/P) 0050 ***80*** | [Q](http://en.wikipedia.org/wiki/Q) 0051 ***81*** | [R](http://en.wikipedia.org/wiki/R) 0052 ***82*** | [S](http://en.wikipedia.org/wiki/S) 0053 ***83*** | [T](http://en.wikipedia.org/wiki/T) 0054 ***84*** | [U](http://en.wikipedia.org/wiki/U) 0055 ***85*** | [V](http://en.wikipedia.org/wiki/V) 0056 ***86*** | [W](http://en.wikipedia.org/wiki/W) 0057 ***87*** | [X](http://en.wikipedia.org/wiki/X) 0058 ***88*** | [Y](http://en.wikipedia.org/wiki/Y) 0059 ***89*** | [Z](http://en.wikipedia.org/wiki/Z) 005A ***90*** | [[](http://en.wikipedia.org/wiki/Square_brackets) 005B ***91*** | [\](http://en.wikipedia.org/wiki/Backslash) 005C ***92*** | []](http://en.wikipedia.org/wiki/Square_brackets) 005D ***93*** | [^](http://en.wikipedia.org/wiki/Circumflex) 005E ***94*** | [\_](http://en.wikipedia.org/wiki/Underscore) 005F ***95*** |
| **6\_** | [`](http://en.wikipedia.org/wiki/Grave_accent) 0060 ***96*** | [a](http://en.wikipedia.org/wiki/A) 0061 ***97*** | [b](http://en.wikipedia.org/wiki/B) 0062 ***98*** | [c](http://en.wikipedia.org/wiki/C) 0063 ***99*** | [d](http://en.wikipedia.org/wiki/D) 0064 ***100*** | [e](http://en.wikipedia.org/wiki/E) 0065 ***101*** | [f](http://en.wikipedia.org/wiki/F) 0066 ***102*** | [g](http://en.wikipedia.org/wiki/G) 0067 ***103*** | [h](http://en.wikipedia.org/wiki/H) 0068 ***104*** | [i](http://en.wikipedia.org/wiki/I) 0069 ***105*** | [j](http://en.wikipedia.org/wiki/J) 006A ***106*** | [k](http://en.wikipedia.org/wiki/K) 006B ***107*** | [l](http://en.wikipedia.org/wiki/L) 006C ***108*** | [m](http://en.wikipedia.org/wiki/M) 006D ***109*** | [n](http://en.wikipedia.org/wiki/N) 006E ***110*** | [o](http://en.wikipedia.org/wiki/O) 006F ***111*** |
| **7\_** | [p](http://en.wikipedia.org/wiki/P) 0070 ***112*** | [q](http://en.wikipedia.org/wiki/Q) 0071 ***113*** | [r](http://en.wikipedia.org/wiki/R) 0072 ***114*** | [s](http://en.wikipedia.org/wiki/S) 0073 ***115*** | [t](http://en.wikipedia.org/wiki/T) 0074 ***116*** | [u](http://en.wikipedia.org/wiki/U) 0075 ***117*** | [v](http://en.wikipedia.org/wiki/V) 0076 ***118*** | [w](http://en.wikipedia.org/wiki/W) 0077 ***119*** | [x](http://en.wikipedia.org/wiki/X) 0078 ***120*** | [y](http://en.wikipedia.org/wiki/Y) 0079 ***121*** | [z](http://en.wikipedia.org/wiki/Z) 007A ***122*** | [{](http://en.wikipedia.org/wiki/Braces_(punctuation)) 007B ***123*** | [|](http://en.wikipedia.org/wiki/Vertical_bar) 007C ***124*** | [}](http://en.wikipedia.org/wiki/Braces_(punctuation)) 007D ***125*** | [~](http://en.wikipedia.org/wiki/Tilde) 007E ***126*** |  |
| **8\_** | ─ 2500 ***128*** | │ 2502 ***129*** | ┌ 250C ***130*** | ┐ 2510 ***131*** | └ 2514 ***132*** | ┘ 2518 ***133*** | ├ 251C ***134*** | ┤ 2524 ***135*** | ┬ 252C ***136*** | ┴ 2534 ***137*** | ┼ 253C ***138*** | ▀ 2580 ***139*** | ▄ 2584 ***140*** | █ 2588 ***141*** | ▌ 258C ***142*** | ▐ 2590 ***143*** |
| **9\_** | ░ 2591 ***144*** | ▒ 2592 ***145*** | ▓ 2593 ***146*** | ⌠ 2320 ***147*** | ■ 25A0 ***148*** | ∙ 2219 ***149*** | √ 221A ***150*** | ≈ 2248 ***151*** | ≤ 2264 ***152*** | ≥ 2265 ***153*** | [NBSP](http://en.wikipedia.org/wiki/Non-breaking_space) 00A0 ***154*** | ⌡ 2321 ***155*** | [°](http://en.wikipedia.org/wiki/Degree_symbol) 00B0 ***156*** | [²](http://en.wikipedia.org/wiki/Square_(algebra)) 00B2 ***157*** | [·](http://en.wikipedia.org/wiki/Interpunct) 00B7 ***158*** | [÷](http://en.wikipedia.org/wiki/Obelus) 00F7 ***159*** |
| **A\_** | ═ 2550 ***160*** | ║ 2551 ***161*** | ╒ 2552 ***162*** | [ё](http://en.wikipedia.org/wiki/Yo_(Cyrillic)) 0451 ***163*** | [є](http://en.wikipedia.org/wiki/Ukrainian_Ye) 0454 ***164*** | ╔ 2554 ***165*** | [і](http://en.wikipedia.org/wiki/Ukrainian_I) 0456 ***166*** | [ї](http://en.wikipedia.org/wiki/Yi_(Cyrillic)) 0457 ***167*** | ╗ 2557 ***168*** | ╘ 2558 ***169*** | ╙ 2559 ***170*** | ╚ 255A ***171*** | ╛ 255B ***172*** | [ґ](http://en.wikipedia.org/wiki/Ghe_with_upturn) 0491 ***173*** | ╝ 255D ***174*** | ╞ 255E ***175*** |
| **B\_** | ╟ 255F ***176*** | ╠ 2560 ***177*** | ╡ 2561 ***178*** | [Ё](http://en.wikipedia.org/wiki/Yo_(Cyrillic)) 0401 ***179*** | [Є](http://en.wikipedia.org/wiki/Ukrainian_Ye) 0404 ***180*** | ╣ 2563 ***181*** | [І](http://en.wikipedia.org/wiki/Ukrainian_I) 0406 ***182*** | [Ї](http://en.wikipedia.org/wiki/Yi_(Cyrillic)) 0407 ***183*** | ╦ 2566 ***184*** | ╧ 2567 ***185*** | ╨ 2568 ***186*** | ╩ 2569 ***187*** | ╪ 256A ***188*** | [Ґ](http://en.wikipedia.org/wiki/Ghe_with_upturn) 0490 ***189*** | ╬ 256C ***190*** | [©](http://en.wikipedia.org/wiki/Copyright_symbol) 00A9 ***191*** |
| **C\_** | [ю](http://en.wikipedia.org/wiki/Yu_(Cyrillic)) 044E ***192*** | [а](http://en.wikipedia.org/wiki/A_(Cyrillic)) 0430 ***193*** | [б](http://en.wikipedia.org/wiki/Be_(Cyrillic)) 0431 ***194*** | [ц](http://en.wikipedia.org/wiki/Tse_(Cyrillic)) 0446 ***195*** | [д](http://en.wikipedia.org/wiki/De_(Cyrillic)) 0434 ***196*** | [е](http://en.wikipedia.org/wiki/Ye_(Cyrillic)) 0435 ***197*** | [ф](http://en.wikipedia.org/wiki/Ef_(Cyrillic)) 0444 ***198*** | [г](http://en.wikipedia.org/wiki/Ge_(Cyrillic)) 0433 ***199*** | [х](http://en.wikipedia.org/wiki/Ha_(Cyrillic)) 0445 ***200*** | [и](http://en.wikipedia.org/wiki/I_(Cyrillic)) 0438 ***201*** | [й](http://en.wikipedia.org/wiki/Short_I) 0439 ***202*** | [к](http://en.wikipedia.org/wiki/Ka_(Cyrillic)) 043A ***203*** | [л](http://en.wikipedia.org/wiki/El_(Cyrillic)) 043B ***204*** | [м](http://en.wikipedia.org/wiki/Em_(Cyrillic)) 043C ***205*** | [н](http://en.wikipedia.org/wiki/En_(Cyrillic)) 043D ***206*** | [о](http://en.wikipedia.org/wiki/O_(Cyrillic)) 043E ***207*** |
| **D\_** | [п](http://en.wikipedia.org/wiki/Pe_(Cyrillic)) 043F ***208*** | [я](http://en.wikipedia.org/wiki/Ya_(letter)) 044F ***209*** | [р](http://en.wikipedia.org/wiki/Er_(Cyrillic)) 0440 ***210*** | [с](http://en.wikipedia.org/wiki/Es_(Cyrillic)) 0441 ***211*** | [т](http://en.wikipedia.org/wiki/Te_(Cyrillic)) 0442 ***212*** | [у](http://en.wikipedia.org/wiki/U_(Cyrillic)) 0443 ***213*** | [ж](http://en.wikipedia.org/wiki/Zhe_(Cyrillic)) 0436 ***214*** | [в](http://en.wikipedia.org/wiki/Ve_(Cyrillic)) 0432 ***215*** | [ь](http://en.wikipedia.org/wiki/Soft_sign) 044C ***216*** | [ы](http://en.wikipedia.org/wiki/Yery) 044B ***217*** | [з](http://en.wikipedia.org/wiki/Ze_(Cyrillic)) 0437 ***218*** | [ш](http://en.wikipedia.org/wiki/Sha) 0448 ***219*** | [э](http://en.wikipedia.org/wiki/E_(Cyrillic)) 044D ***220*** | [щ](http://en.wikipedia.org/wiki/Shcha) 0449 ***221*** | [ч](http://en.wikipedia.org/wiki/Che_(Cyrillic)) 0447 ***222*** | [ъ](http://en.wikipedia.org/wiki/Hard_sign) 044A ***223*** |
| **E\_** | [Ю](http://en.wikipedia.org/wiki/Yu_(Cyrillic)) 042E ***224*** | [А](http://en.wikipedia.org/wiki/A_(Cyrillic)) 0410 ***225*** | [Б](http://en.wikipedia.org/wiki/Be_(Cyrillic)) 0411 ***226*** | [Ц](http://en.wikipedia.org/wiki/Tse_(Cyrillic)) 0426 ***227*** | [Д](http://en.wikipedia.org/wiki/De_(Cyrillic)) 0414 ***228*** | [Е](http://en.wikipedia.org/wiki/Ye_(Cyrillic)) 0415 ***229*** | [Ф](http://en.wikipedia.org/wiki/Ef_(Cyrillic)) 0424 ***230*** | [Г](http://en.wikipedia.org/wiki/Ge_(Cyrillic)) 0413 ***231*** | [Х](http://en.wikipedia.org/wiki/Ha_(Cyrillic)) 0425 ***232*** | [И](http://en.wikipedia.org/wiki/I_(Cyrillic)) 0418 ***233*** | [Й](http://en.wikipedia.org/wiki/Short_I) 0419 ***234*** | [К](http://en.wikipedia.org/wiki/Ka_(Cyrillic)) 041A ***235*** | [Л](http://en.wikipedia.org/wiki/El_(Cyrillic)) 041B ***236*** | [М](http://en.wikipedia.org/wiki/Em_(Cyrillic)) 041C ***237*** | [Н](http://en.wikipedia.org/wiki/En_(Cyrillic)) 041D ***238*** | [О](http://en.wikipedia.org/wiki/O_(Cyrillic)) 041E ***239*** |
| **F\_** | [П](http://en.wikipedia.org/wiki/Pe_(Cyrillic)) 041F ***240*** | [Я](http://en.wikipedia.org/wiki/Ya_(Cyrillic)) 042F ***241*** | [Р](http://en.wikipedia.org/wiki/Er_(Cyrillic)) 0420 ***242*** | [С](http://en.wikipedia.org/wiki/Es_(Cyrillic)) 0421 ***243*** | [Т](http://en.wikipedia.org/wiki/Te_(Cyrillic)) 0422 ***244*** | [У](http://en.wikipedia.org/wiki/U_(Cyrillic)) 0423 ***245*** | [Ж](http://en.wikipedia.org/wiki/Zhe_(Cyrillic)) 0416 ***246*** | [В](http://en.wikipedia.org/wiki/Ve_(Cyrillic)) 0412 ***247*** | [Ь](http://en.wikipedia.org/wiki/Soft_sign) 042C ***248*** | [Ы](http://en.wikipedia.org/wiki/Yery) 042B ***249*** | [З](http://en.wikipedia.org/wiki/Ze_(Cyrillic)) 0417 ***250*** | [Ш](http://en.wikipedia.org/wiki/Sha) 0428 ***251*** | [Э](http://en.wikipedia.org/wiki/E_(Cyrillic)) 042D ***252*** | [Щ](http://en.wikipedia.org/wiki/Shcha) 0429 ***253*** | [Ч](http://en.wikipedia.org/wiki/Che_(Cyrillic)) 0427 ***254*** | [Ъ](http://en.wikipedia.org/wiki/Hard_sign) 042A ***255*** |
|  | **\_0** | **\_1** | **\_2** | **\_3** | **\_4** | **\_5** | **\_6** | **\_7** | **\_8** | **\_9** | **\_A** | **\_B** | **\_C** | **\_D** | **\_E** | **\_F** |

In the table above, 20 is the regular SPACE character, and 9A is the NO-BREAK SPACE.

The difference with [KOI8-R](http://en.wikipedia.org/wiki/KOI8-R) consists of the positions 0xA4; 0xA6; 0xA7; 0xAD; and 0xB4; 0xB6; 0xB7; 0xBD; which consist of extra letters that don't exist in Russian.

Although [RFC 2319](http://tools.ietf.org/html/rfc2319) says that character 95 should be U+2219 (∙), it may also be U+2022 (•) to match the bullet character in [Windows-1251](http://en.wikipedia.org/wiki/Windows-1251).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **KOI7** | | | | | | | | | | | | | | | | |
|  | **—0** | **—1** | **—2** | **—3** | **—4** | **—5** | **—6** | **—7** | **—8** | **—9** | **—A** | **—B** | **—C** | **—D** | **—E** | **—F** |
| **0\_** | [NUL](http://en.wikipedia.org/wiki/Null_character) 0000 ***0*** | [SOH](http://en.wikipedia.org/wiki/Start_of_heading) 0001 ***1*** | [STX](http://en.wikipedia.org/wiki/Start_of_text) 0002 ***2*** | [ETX](http://en.wikipedia.org/wiki/End_of_text) 0003 ***3*** | [EOT](http://en.wikipedia.org/wiki/End_of_transmission_character) 0004 ***4*** | [ENQ](http://en.wikipedia.org/wiki/Enquiry_character) 0005 ***5*** | [ACK](http://en.wikipedia.org/wiki/Acknowledge_character) 0006 ***6*** | [BEL](http://en.wikipedia.org/wiki/Bell_character) 0007 ***7*** | [BS](http://en.wikipedia.org/wiki/Backspace) 0008 ***8*** | [HT](http://en.wikipedia.org/wiki/Horizontal_tab) 0009 ***9*** | [LF](http://en.wikipedia.org/wiki/Line_feed) 000A ***10*** | [VT](http://en.wikipedia.org/wiki/Vertical_tab) 000B ***11*** | [FF](http://en.wikipedia.org/wiki/Form_feed) 000C ***12*** | [CR](http://en.wikipedia.org/wiki/Carriage_return) 000D ***13*** | [SO](http://en.wikipedia.org/wiki/Shift_out) 000E ***14*** | [SI](http://en.wikipedia.org/wiki/Shift_in) 000F ***15*** |
| **1\_** | [DLE](http://en.wikipedia.org/wiki/Data_link_escape) 0010 ***16*** | [DC1](http://en.wikipedia.org/wiki/Device_Control_1) 0011 ***17*** | [DC2](http://en.wikipedia.org/wiki/Device_Control_2) 0012 ***18*** | [DC3](http://en.wikipedia.org/wiki/Device_Control_3) 0013 ***19*** | [DC4](http://en.wikipedia.org/wiki/Device_Control_4) 0014 ***20*** | [NAK](http://en.wikipedia.org/wiki/Negative_acknowledge_character) 0015 ***21*** | [SYN](http://en.wikipedia.org/wiki/Synchronous_idle) 0016 ***22*** | [ETB](http://en.wikipedia.org/wiki/End_of_transmission_block) 0017 ***23*** | [CAN](http://en.wikipedia.org/wiki/Cancel_character) 0018 ***24*** | [EM](http://en.wikipedia.org/wiki/End_of_medium) 0019 ***25*** | [SUB](http://en.wikipedia.org/wiki/Substitute_character) 001A ***26*** | [ESC](http://en.wikipedia.org/wiki/Escape_character) 001B ***27*** | [FS](http://en.wikipedia.org/wiki/File_separator) 001C ***28*** | [GS](http://en.wikipedia.org/wiki/Group_separator) 001D ***29*** | [RS](http://en.wikipedia.org/wiki/Record_separator) 001E ***30*** | [US](http://en.wikipedia.org/wiki/Unit_separator) 001F ***31*** |
| **2\_** | [SP](http://en.wikipedia.org/wiki/Space_character) 0020 ***32*** | [!](http://en.wikipedia.org/wiki/Exclamation_mark) 0021 ***33*** | ["](http://en.wikipedia.org/wiki/Quotation_mark) 0022 ***34*** | [#](http://en.wikipedia.org/wiki/Number_sign) 0023 ***35*** | [$](http://en.wikipedia.org/wiki/Dollar_sign) 0024 ***36*** | [%](http://en.wikipedia.org/wiki/Percent_sign) 0025 ***37*** | [&](http://en.wikipedia.org/wiki/Ampersand) 0026 ***38*** | ['](http://en.wikipedia.org/wiki/Apostrophe) 0027 ***39*** | [(](http://en.wikipedia.org/wiki/Bracket) 0028 ***40*** | [)](http://en.wikipedia.org/wiki/Bracket) 0029 ***41*** | [\*](http://en.wikipedia.org/wiki/Asterisk) 002A ***42*** | [+](http://en.wikipedia.org/wiki/%2B) 002B ***43*** | [,](http://en.wikipedia.org/wiki/Comma_(punctuation)) 002C ***44*** | [-](http://en.wikipedia.org/wiki/Hyphen-minus) 002D ***45*** | [.](http://en.wikipedia.org/wiki/Full_stop) 002E ***46*** | [/](http://en.wikipedia.org/wiki/Slash_(punctuation)) 002F ***47*** |
| **3\_** | [0](http://en.wikipedia.org/wiki/0_(number)) 0030 ***48*** | [1](http://en.wikipedia.org/wiki/1_(number)) 0031 ***49*** | [2](http://en.wikipedia.org/wiki/2_(number)) 0032 ***50*** | [3](http://en.wikipedia.org/wiki/3_(number)) 0033 ***51*** | [4](http://en.wikipedia.org/wiki/4_(number)) 0034 ***52*** | [5](http://en.wikipedia.org/wiki/5_(number)) 0035 ***53*** | [6](http://en.wikipedia.org/wiki/6_(number)) 0036 ***54*** | [7](http://en.wikipedia.org/wiki/7_(number)) 0037 ***55*** | [8](http://en.wikipedia.org/wiki/8_(number)) 0038 ***56*** | [9](http://en.wikipedia.org/wiki/9_(number)) 0039 ***57*** | [:](http://en.wikipedia.org/wiki/Colon_(punctuation)) 003A ***58*** | [;](http://en.wikipedia.org/wiki/Semicolon) 003B ***59*** | [<](http://en.wikipedia.org/wiki/Less-than_sign) 003C ***60*** | [=](http://en.wikipedia.org/wiki/Equal_sign) 003D ***61*** | [>](http://en.wikipedia.org/wiki/Greater-than_sign) 003E ***62*** | [?](http://en.wikipedia.org/wiki/Question_mark) 003F ***63*** |
| **4\_** | [@](http://en.wikipedia.org/wiki/@) 0040 ***64*** | [A](http://en.wikipedia.org/wiki/A) 0041 ***65*** | [B](http://en.wikipedia.org/wiki/B) 0042 ***66*** | [C](http://en.wikipedia.org/wiki/C) 0043 ***67*** | [D](http://en.wikipedia.org/wiki/D) 0044 ***68*** | [E](http://en.wikipedia.org/wiki/E) 0045 ***69*** | [F](http://en.wikipedia.org/wiki/F) 0046 ***70*** | [G](http://en.wikipedia.org/wiki/G) 0047 ***71*** | [H](http://en.wikipedia.org/wiki/H) 0048 ***72*** | [I](http://en.wikipedia.org/wiki/I) 0049 ***73*** | [J](http://en.wikipedia.org/wiki/J) 004A ***74*** | [K](http://en.wikipedia.org/wiki/K) 004B ***75*** | [L](http://en.wikipedia.org/wiki/L) 004C ***76*** | [M](http://en.wikipedia.org/wiki/M) 004D ***77*** | [N](http://en.wikipedia.org/wiki/N) 004E ***78*** | [O](http://en.wikipedia.org/wiki/O) 004F ***79*** |
| **5\_** | [P](http://en.wikipedia.org/wiki/P) 0050 ***80*** | [Q](http://en.wikipedia.org/wiki/Q) 0051 ***81*** | [R](http://en.wikipedia.org/wiki/R) 0052 ***82*** | [S](http://en.wikipedia.org/wiki/S) 0053 ***83*** | [T](http://en.wikipedia.org/wiki/T) 0054 ***84*** | [U](http://en.wikipedia.org/wiki/U) 0055 ***85*** | [V](http://en.wikipedia.org/wiki/V) 0056 ***86*** | [W](http://en.wikipedia.org/wiki/W) 0057 ***87*** | [X](http://en.wikipedia.org/wiki/X) 0058 ***88*** | [Y](http://en.wikipedia.org/wiki/Y) 0059 ***89*** | [Z](http://en.wikipedia.org/wiki/Z) 005A ***90*** | [[](http://en.wikipedia.org/wiki/Square_brackets) 005B ***91*** | [\](http://en.wikipedia.org/wiki/Backslash) 005C ***92*** | []](http://en.wikipedia.org/wiki/Square_brackets) 005D ***93*** | [^](http://en.wikipedia.org/wiki/Circumflex) 005E ***94*** | [\_](http://en.wikipedia.org/wiki/Underscore) 005F ***95*** |
| **6\_** | [Ю](http://en.wikipedia.org/wiki/Yu_(Cyrillic)) 042E ***96*** | [А](http://en.wikipedia.org/wiki/A_(Cyrillic)) 0410 ***97*** | [Б](http://en.wikipedia.org/wiki/Be_(Cyrillic)) 0411 ***98*** | [Ц](http://en.wikipedia.org/wiki/Tse_(Cyrillic)) 0426 ***99*** | [Д](http://en.wikipedia.org/wiki/De_(Cyrillic)) 0414 ***100*** | [Е](http://en.wikipedia.org/wiki/E_(Cyrillic)) 0415 ***101*** | [Ф](http://en.wikipedia.org/wiki/Ef_(Cyrillic)) 0424 ***102*** | [Г](http://en.wikipedia.org/wiki/Ge_(Cyrillic)) 0413 ***103*** | [Х](http://en.wikipedia.org/wiki/Ha_(Cyrillic)) 0425 ***104*** | [И](http://en.wikipedia.org/wiki/I_(Cyrillic)) 0418 ***105*** | [Й](http://en.wikipedia.org/wiki/Short_I) 0419 ***106*** | [К](http://en.wikipedia.org/wiki/Ka_(Cyrillic)) 041A ***107*** | [Л](http://en.wikipedia.org/wiki/El_(Cyrillic)) 041B ***108*** | [М](http://en.wikipedia.org/wiki/Em_(Cyrillic)) 041C ***109*** | [Н](http://en.wikipedia.org/wiki/En_(Cyrillic)) 041D ***110*** | [О](http://en.wikipedia.org/wiki/O_(Cyrillic)) 041E ***111*** |
| **7\_** | [П](http://en.wikipedia.org/wiki/Pe_(Cyrillic)) 041F ***112*** | [Я](http://en.wikipedia.org/wiki/Ya_(Cyrillic)) 042F ***113*** | [Р](http://en.wikipedia.org/wiki/Er_(Cyrillic)) 0420 ***114*** | [С](http://en.wikipedia.org/wiki/Es_(Cyrillic)) 0421 ***115*** | [Т](http://en.wikipedia.org/wiki/Te_(Cyrillic)) 0422 ***116*** | [У](http://en.wikipedia.org/wiki/U_(Cyrillic)) 0423 ***117*** | [Ж](http://en.wikipedia.org/wiki/Zhe_(Cyrillic)) 0416 ***118*** | [В](http://en.wikipedia.org/wiki/Ve_(Cyrillic)) 0412 ***119*** | [Ь](http://en.wikipedia.org/wiki/Soft_sign_(Cyrillic)) 042C ***120*** | [Ы](http://en.wikipedia.org/wiki/Yery_(Cyrillic)) 042B ***121*** | [З](http://en.wikipedia.org/wiki/Ze_(Cyrillic)) 0417 ***122*** | [Ш](http://en.wikipedia.org/wiki/Sha_(Cyrillic)) 0428 ***123*** | [Э](http://en.wikipedia.org/wiki/E_(Cyrillic)) 042D ***124*** | [Щ](http://en.wikipedia.org/wiki/Shcha_(Cyrillic)) 0429 ***125*** | [Ч](http://en.wikipedia.org/wiki/Che_(Cyrillic)) 0427 ***126*** | [DEL](http://en.wikipedia.org/wiki/Delete_character) 007F ***127*** |

The [dollar sign](http://en.wikipedia.org/wiki/Dollar_sign) character ("$" hex 24), however, was often replaced with the [universal currency sign](http://en.wikipedia.org/wiki/Currency_(typography)) "¤" in Soviet computers. A popular legend has it that this was to demonstrate independence of the American-dominated computer industry — which was ironic, since a significant number of Soviet computers were actually implementations of various American designs.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ASCII NOT CYRILLIC | ASSIGN |  |  | unassigned | secondary |  |  |
|  | А |  |  |  |  |  | a |
|  | А | [А](http://en.wikipedia.org/wiki/A_(Cyrillic)) |  |  | Ђ | Dje | A |
|  | В |  |  |  | Б |  | b |
|  | В | [В](http://en.wikipedia.org/wiki/Ve_(Cyrillic)) |  |  | Б | [Б](http://en.wikipedia.org/wiki/Be_(Cyrillic)) | B |
|  | С |  |  |  | Ч |  | c |
|  | С | [С](http://en.wikipedia.org/wiki/Es_(Cyrillic)) |  |  | Ч | [Ч](http://en.wikipedia.org/wiki/Che_(Cyrillic)) | C |
| d | Ь |  |  |  | Д |  |  |
| D | Ь | [Ь](http://en.wikipedia.org/wiki/Soft_sign) |  |  | Д | [Д](http://en.wikipedia.org/wiki/De_(Cyrillic)) |  |
|  | Е |  |  |  | Э |  | e |
|  | Е | [Е](http://en.wikipedia.org/wiki/Ye_(Cyrillic)) |  |  | Э | [Э](http://en.wikipedia.org/wiki/E_(Cyrillic)) | E |
| f | Є |  |  |  |  |  |  |
| F | Є | [Є](http://en.wikipedia.org/wiki/Ukrainian_Ye) |  |  | Ә | schwa |  |
| g | Г |  |  |  |  |  |  |
| G | Г | [Г](http://en.wikipedia.org/wiki/Ge_(Cyrillic)) |  |  | Ѓ | Gje |  |
| h | Н |  |  |  |  |  |  |
| H | Н | [Н](http://en.wikipedia.org/wiki/En_(Cyrillic)) |  |  | Һ | He |  |
|  | Ӏ | Or palochka |  |  |  |  | I |
|  | І | Dotted I |  |  | Ѕ | Dze | I |
| j | Ґ |  |  |  |  |  |  |
| J | Ґ | [Ґ](http://en.wikipedia.org/wiki/Ghe_with_upturn) |  |  | З́ | Zje |  |
| k | К | Or К |  |  |  |  |  |
| K | К | [К](http://en.wikipedia.org/wiki/Ka_(Cyrillic)) |  |  | Ќ | Kje |  |
| l | П |  |  |  |  |  |  |
| L | П | [п](http://en.wikipedia.org/wiki/Pe_(Cyrillic)) |  |  | Љ | Lje |  |
| m | М |  |  |  |  |  |  |
| M | М | [М](http://en.wikipedia.org/wiki/Em_(Cyrillic)) |  |  | Ң | Ng |  |
| n | И |  |  |  |  |  |  |
| N | И | [И](http://en.wikipedia.org/wiki/I_(Cyrillic)) |  |  | Њ | Nje |  |
|  | О |  |  |  |  |  | o |
|  | О | [О](http://en.wikipedia.org/wiki/O_(Cyrillic)) |  |  | Ө | Barred O | O |
|  | Р |  |  |  | Л |  | p |
|  | Р | [Р](http://en.wikipedia.org/wiki/Er_(Cyrillic)) |  |  | Л | [Л](http://en.wikipedia.org/wiki/El_(Cyrillic)) | P |
| Q | Й |  |  |  | Ъ |  |  |
| Q | Й | [Й](http://en.wikipedia.org/wiki/Short_I) |  |  | Ъ | [Ъ](http://en.wikipedia.org/wiki/Hard_sign) |  |
| R | Я |  |  |  |  |  |  |
| R | Я | [Я](http://en.wikipedia.org/wiki/Ya_(Cyrillic)) |  |  | Ћ | Tshe |  |
| s | Ф |  |  |  | Щ |  |  |
| S | Ф | [Ф](http://en.wikipedia.org/wiki/Ef_(Cyrillic)) |  |  | Щ | [Щ](http://en.wikipedia.org/wiki/Shcha) |  |
| t | Т |  |  |  |  |  |  |
| T | Т | [Т](http://en.wikipedia.org/wiki/Te_(Cyrillic)) |  |  | Ҫ | Bashkir the |  |
| u | Ц |  |  |  | Ю |  |  |
| U | Ц | [Ц](http://en.wikipedia.org/wiki/Tse_(Cyrillic)) |  |  | Ю | [Ю](http://en.wikipedia.org/wiki/Yu_(Cyrillic)) |  |
| v | Ы |  |  |  | Ї |  |  |
| V | Ы | [Ы](http://en.wikipedia.org/wiki/Yery) |  |  | Ї | [Ї](http://en.wikipedia.org/wiki/Yi_(Cyrillic)) |  |
| w | Ш |  |  |  |  |  |  |
| W | Ш | [Ш](http://en.wikipedia.org/wiki/Sha) |  |  | Short u | Ў |  |
| x | Х | Or kha |  |  |  |  |  |
| X | Х | [Х](http://en.wikipedia.org/wiki/Ha_(Cyrillic)) |  |  | Ұ | Straight U  With stroke |  |
| y | У |  |  |  | Ё |  |  |
| Y | У | [У](http://en.wikipedia.org/wiki/U_(Cyrillic)) |  |  | Ё | [Ё](http://en.wikipedia.org/wiki/Yo_(Cyrillic)) |  |
| z | З |  |  |  | Ж |  |  |
| Z | З | [З](http://en.wikipedia.org/wiki/Ze_(Cyrillic)) |  |  | Ж | [Ж](http://en.wikipedia.org/wiki/Zhe_(Cyrillic)) |  |
|  |  |  |  |  |  |  |  |
| - |  |  |  |  | С́ | [ɕ] |  |
|  |  |  |  |  |  |  |  |
| ^ “= on US” |  |  |  |  | Џ | dzhe |  |
|  |  |  |  |  |  |  |  |
| [ |  |  |  |  | Ғ | ayn |  |
|  |  |  |  |  |  |  |  |
| ] |  |  |  |  | Ҙ | Bashkir dhe |  |
|  |  |  |  |  |  |  |  |
| \ |  |  |  |  | Ҡ | Bashkir oa |  |
|  |  |  |  |  |  |  |  |
| / “right of /? On US” |  |  |  |  | Қ | Ka with  descender |  |
| A quirk in Word is to | convert | the lower |  | letter | to | uppercase |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

Bottom of Form

### MARC 21 Specifications for Record Structure, Character Sets, and Exchange Media

## Code Table Basic Arabic

December 2007

The first column in this table contains the MARC-8 code (in hex) for the character as coming from the G0 graphic set, the second column contains the MARC-8 code (in hex) for the character as coming from the G1 graphic set, the third column contains the UCS/Unicode 16-bit code (in hex), the fourth column contains the UTF-8 code (in hex) for the UCS characters, the fifth column contains a representation of the character (where possible), the sixth column contains the MARC character name, followed by the UCS name. If the MARC name is the same as or very similar to the UCS name, only the UCS name is given.

Not all characters display in all browsers. We have attempted to allow for font families that show each character set, but you must have one of these fonts on your computer. See the W3C site for a discussion of fonts: <http://www.w3.org/TR/REC-CSS2/fonts.html#generic-font-families>.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **MARC-8 as G0** | **MARC-8 as G1** | **UCS** | **UTF-8** | **CHAR** | **C?** | **NAME** |
| 21 | A1 | 0021 | 21 | ! |  | EXCLAMATION MARK |
| 22 | A2 | 0022 | 22 | " |  | QUOTATION MARK |
| 23 | A3 | 0023 | 23 | # |  | NUMBER SIGN |
| 24 | A4 | 0024 | 24 | $ |  | DOLLAR SIGN |
| 25 | A5 | 066A | D9AA | ٪ |  | PERCENT SIGN / ARABIC PERCENT SIGN |
| 26 | A6 | 0026 | 26 | & |  | AMPERSAND |
| 27 | A7 | 0027 | 27 | ' |  | APOSTROPHE |
| 28 | A8 | 0028 | 28 | ( |  | OPENING PARENTHESIS / LEFT PARENTHESIS |
| 29 | A9 | 0029 | 29 | ) |  | CLOSING PARENTHESIS / RIGHT PARENTHESIS |
| 2A | AA | 066D | D9AD | ٭ |  | ASTERISK / ARABIC FIVE POINTED STAR |
| 2B | AB | 002B | 2B | + |  | PLUS SIGN |
| 2C | AC | 060C | D88C | ، |  | ARABIC COMMA |
| 2D | AD | 002D | 2D | - |  | HYPHEN-MINUS |
| 2E | AE | 002E | 2E | . |  | PERIOD, DECIMAL POINT / FULL STOP |
| 2F | AF | 002F | 2F | / |  | SLASH / SOLIDUS |
| 30 | B0 | 0660 | D9A0 | ٠ |  | ARABIC-INDIC DIGIT ZERO |
| 31 | B1 | 0661 | D9A1 | ١ |  | ARABIC-INDIC DIGIT ONE |
| 32 | B2 | 0662 | D9A2 | ٢ |  | ARABIC-INDIC DIGIT TWO |
| 33 | B3 | 0663 | D9A3 | ٣ |  | ARABIC-INDIC DIGIT THREE |
| 34 | B4 | 0664 | D9A4 | ٤ |  | ARABIC-INDIC DIGIT FOUR |
| 35 | B5 | 0665 | D9A5 | ٥ |  | ARABIC-INDIC DIGIT FIVE |
| 36 | B6 | 0666 | D9A6 | ٦ |  | ARABIC-INDIC DIGIT SIX |
| 37 | B7 | 0667 | D9A7 | ٧ |  | ARABIC-INDIC DIGIT SEVEN |
| 38 | B8 | 0668 | D9A8 | ٨ |  | ARABIC-INDIC DIGIT EIGHT |
| 39 | B9 | 0669 | D9A9 | ٩ |  | ARABIC-INDIC DIGIT NINE |
| 3A | BA | 003A | 3A | : |  | COLON |
| 3B | BB | 061B | D89B | ؛ |  | ARABIC SEMICOLON |
| 3C | BC | 003C | 3C | < |  | LESS-THAN SIGN |
| 3D | BD | 003D | 3D | = |  | EQUALS SIGN |
| 3E | BE | 003E | 3E | > |  | GREATER-THAN SIGN |
| 3F | BF | 061F | D89F | ؟ |  | ARABIC QUESTION MARK |
| 41 | C1 | 0621 | D8A1 | ء |  | HAMZAH / ARABIC LETTER HAMZA |
| 42 | C2 | 0622 | D8A2 | آ |  | ARABIC LETTER ALEF WITH MADDA ABOVE |
| 43 | C3 | 0623 | D8A3 | أ |  | ARABIC LETTER ALEF WITH HAMZA ABOVE |
| 44 | C4 | 0624 | D8A4 | ؤ |  | ARABIC LETTER WAW WITH HAMZA ABOVE |
| 45 | C5 | 0625 | D8A5 | إ |  | ARABIC LETTER ALEF WITH HAMZA BELOW |
| 46 | C6 | 0626 | D8A6 | ئ |  | ARABIC LETTER YEH WITH HAMZA ABOVE |
| 47 | C7 | 0627 | D8A7 | ا |  | ARABIC LETTER ALEF |
| 48 | C8 | 0628 | D8A8 | ب |  | ARABIC LETTER BEH |
| 49 | C9 | 0629 | D8A9 | ة |  | ARABIC LETTER TEH MARBUTA |
| 4A | CA | 062A | D8AA | ت |  | ARABIC LETTER THE |
| 4B | CB | 062B | D8AB | ث |  | ARABIC LETTER THEH |
| 4C | CC | 062C | D8AC | ج |  | ARABIC LETTER JEEM |
| 4D | CD | 062D | D8AD | ح |  | ARABIC LETTER HAH |
| 4E | CE | 062E | D8AE | خ |  | ARABIC LETTER KHAH |
| 4F | CF | 062F | D8AF | د |  | ARABIC LETTER DAL |
| 50 | D0 | 0630 | D8B0 | ذ |  | ARABIC LETTER THAL |
| 51 | D1 | 0631 | D8B1 | ر |  | ARABIC LETTER REH |
| 52 | D2 | 0632 | D8B2 | ز |  | ARABIC LETTER ZAIN |
| 53 | D3 | 0633 | D8B3 | س |  | ARABIC LETTER SEEN |
| 54 | D4 | 0634 | D8B4 | ش |  | ARABIC LETTER SHEEN |
| 55 | D5 | 0635 | D8B5 | ص |  | ARABIC LETTER SAD |
| 56 | D6 | 0636 | D8B6 | ض |  | ARABIC LETTER DAD |
| 57 | D7 | 0637 | D8B7 | ط |  | ARABIC LETTER TAH |
| 58 | D8 | 0638 | D8B8 | ظ |  | ARABIC LETTER ZAH |
| 59 | D9 | 0639 | D8B9 | ع |  | ARABIC LETTER AIN |
| 5A | DA | 063A | D8BA | غ |  | ARABIC LETTER GHAIN |
| 5B | DB | 005B | 5B | [ |  | OPENING SQUARE BRACKET / LEFT SQUARE BRACKET |
| 5D | DD | 005D | 5D | ] |  | CLOSING SQUARE BRACKET / RIGHT SQUARE BRACKET |
| 60 | E0 | 0640 | D980 | ـ |  | ARABIC TATWEEL |
| 61 | E1 | 0641 | D981 | ف |  | ARABIC LETTER FEH |
| 62 | E2 | 0642 | D982 | ق |  | ARABIC LETTER QAF |
| 63 | E3 | 0643 | D983 | ك |  | ARABIC LETTER KAF |
| 64 | E4 | 0644 | D984 | ل |  | ARABIC LETTER LAM |
| 65 | E5 | 0645 | D985 | م |  | ARABIC LETTER MEEM |
| 66 | E6 | 0646 | D986 | ن |  | ARABIC LETTER NOON |
| 67 | E7 | 0647 | D987 | ه |  | ARABIC LETTER HEH |
| 68 | E8 | 0648 | D988 | و |  | ARABIC LETTER WAW |
| 69 | E9 | 0649 | D989 | ى |  | ARABIC LETTER ALEF MAKSURA |
| 6A | EA | 064A | D98A | ي |  | ARABIC LETTER YEH |
| 6B | EB | 064B | D98B | ً | C | ARABIC FATHATAN |
| 6C | EC | 064C | D98C | ٌ | C | ARABIC DAMMATAN |
| 6D | ED | 064D | D98D | ٍ | C | ARABIC KASRATAN |
| 6E | EE | 064E | D98E | َ | C | ARABIC FATHA |
| 6F | EF | 064F | D98F | ُ | C | ARABIC DAMMA |
| 70 | F0 | 0650 | D990 | ِ | C | ARABIC KASRA |
| 71 | F1 | 0651 | D991 | ّ | C | ARABIC SHADDA |
| 72 | F2 | 0652 | D992 | ْ | C | ARABIC SUKUN |
| 73 | F3 | 0671 | D9B1 | ٱ |  | ARABIC LETTER ALEF WASLA |
| 74 | F4 | 0670 | D9B0 | ٰ |  | ARABIC LETTER SUPERSCRIPT ALEF |
| 78 | F8 | 066C | D9AC | ٬ |  | ARABIC THOUSANDS SEPARATOR |
| 79 | F9 | 201D | E2809D | ” |  | RIGHT DOUBLE QUOTATION MARK |
| 7A | FA | 201C | E2809C | “ |  | LEFT DOUBLE QUOTATION MARK |

## India, Devanagari

Indian languages have different keyboards, but ISCII is most common. The below is ISCII and ISCIJ is adapted for added Unicode characters. Windows 10 would not display the original version.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ISCII Devanagari** | | | | | | | | | | | | | | | | |
|  | **—0** | **—1** | **—2** | **—3** | **—4** | **—5** | **—6** | **—7** | **—8** | **—9** | **—A** | **—B** | **—C** | **—D** | **—E** | **—F** |
| **0\_** | [NUL](http://en.wikipedia.org/wiki/Null_character) 0000 ***0*** | [SOH](http://en.wikipedia.org/wiki/Start_of_heading) 0001 ***1*** | [STX](http://en.wikipedia.org/wiki/Start_of_text) 0002 ***2*** | [ETX](http://en.wikipedia.org/wiki/End_of_text) 0003 ***3*** | [EOT](http://en.wikipedia.org/wiki/End_of_transmission_character) 0004 ***4*** | [ENQ](http://en.wikipedia.org/wiki/Enquiry_character) 0005 ***5*** | [ACK](http://en.wikipedia.org/wiki/Acknowledge_character) 0006 ***6*** | [BEL](http://en.wikipedia.org/wiki/Bell_character) 0007 ***7*** | [BS](http://en.wikipedia.org/wiki/Backspace) 0008 ***8*** | [HT](http://en.wikipedia.org/wiki/Horizontal_tab) 0009 ***9*** | [LF](http://en.wikipedia.org/wiki/Line_feed) 000A ***10*** | [VT](http://en.wikipedia.org/wiki/Vertical_tab) 000B ***11*** | [FF](http://en.wikipedia.org/wiki/Form_feed) 000C ***12*** | [CR](http://en.wikipedia.org/wiki/Carriage_return) 000D ***13*** | [SO](http://en.wikipedia.org/wiki/Shift_out) 000E ***14*** | [SI](http://en.wikipedia.org/wiki/Shift_in) 000F ***15*** |
| **1\_** | [DLE](http://en.wikipedia.org/wiki/Data_link_escape) 0010 ***16*** | [DC1](http://en.wikipedia.org/wiki/Device_Control_1) 0011 ***17*** | [DC2](http://en.wikipedia.org/wiki/Device_Control_2) 0012 ***18*** | [DC3](http://en.wikipedia.org/wiki/Device_Control_3) 0013 ***19*** | [DC4](http://en.wikipedia.org/wiki/Device_Control_4) 0014 ***20*** | [NAK](http://en.wikipedia.org/wiki/Negative_acknowledge_character) 0015 ***21*** | [SYN](http://en.wikipedia.org/wiki/Synchronous_idle) 0016 ***22*** | [ETB](http://en.wikipedia.org/wiki/End_of_transmission_block) 0017 ***23*** | [CAN](http://en.wikipedia.org/wiki/Cancel_character) 0018 ***24*** | [EM](http://en.wikipedia.org/wiki/End_of_medium) 0019 ***25*** | [SUB](http://en.wikipedia.org/wiki/Substitute_character) 001A ***26*** | [ESC](http://en.wikipedia.org/wiki/Escape_character) 001B ***27*** | [FS](http://en.wikipedia.org/wiki/File_separator) 001C ***28*** | [GS](http://en.wikipedia.org/wiki/Group_separator) 001D ***29*** | [RS](http://en.wikipedia.org/wiki/Record_separator) 001E ***30*** | [US](http://en.wikipedia.org/wiki/Unit_separator) 001F ***31*** |
| **2\_** | [SP](http://en.wikipedia.org/wiki/Space_character) 0020 ***32*** | [!](http://en.wikipedia.org/wiki/Exclamation_mark) 0021 ***33*** | ["](http://en.wikipedia.org/wiki/Quotation_mark) 0022 ***34*** | [#](http://en.wikipedia.org/wiki/Number_sign) 0023 ***35*** | [$](http://en.wikipedia.org/wiki/Dollar_sign) 0024 ***36*** | [%](http://en.wikipedia.org/wiki/Percent_sign) 0025 ***37*** | [&](http://en.wikipedia.org/wiki/Ampersand) 0026 ***38*** | ['](http://en.wikipedia.org/wiki/Apostrophe) 0027 ***39*** | [(](http://en.wikipedia.org/wiki/Bracket) 0028 ***40*** | [)](http://en.wikipedia.org/wiki/Bracket) 0029 ***41*** | [\*](http://en.wikipedia.org/wiki/Asterisk) 002A ***42*** | [+](http://en.wikipedia.org/wiki/Plus_and_minus_signs) 002B ***43*** | [,](http://en.wikipedia.org/wiki/Comma_(punctuation)) 002C ***44*** | [-](http://en.wikipedia.org/wiki/Plus_and_minus_signs) 002D ***45*** | [.](http://en.wikipedia.org/wiki/Full_stop) 002E ***46*** | [/](http://en.wikipedia.org/wiki/Slash_(punctuation)) 002F ***47*** |
| **3\_** | [0](http://en.wikipedia.org/wiki/0_(number)) 0030 ***48*** | [1](http://en.wikipedia.org/wiki/1_(number)) 0031 ***49*** | [2](http://en.wikipedia.org/wiki/2_(number)) 0032 ***50*** | [3](http://en.wikipedia.org/wiki/3_(number)) 0033 ***51*** | [4](http://en.wikipedia.org/wiki/4_(number)) 0034 ***52*** | [5](http://en.wikipedia.org/wiki/5_(number)) 0035 ***53*** | [6](http://en.wikipedia.org/wiki/6_(number)) 0036 ***54*** | [7](http://en.wikipedia.org/wiki/7_(number)) 0037 ***55*** | [8](http://en.wikipedia.org/wiki/8_(number)) 0038 ***56*** | [9](http://en.wikipedia.org/wiki/9_(number)) 0039 ***57*** | [:](http://en.wikipedia.org/wiki/Colon_(punctuation)) 003A ***58*** | [;](http://en.wikipedia.org/wiki/Semicolon) 003B ***59*** | [<](http://en.wikipedia.org/wiki/Angle_bracket) 003C ***60*** | [=](http://en.wikipedia.org/wiki/Equal_sign) 003D ***61*** | [>](http://en.wikipedia.org/wiki/Angle_bracket) 003E ***62*** | [?](http://en.wikipedia.org/wiki/Question_mark) 003F ***63*** |
| **4\_** | [@](http://en.wikipedia.org/wiki/@) 0040 ***64*** | [A](http://en.wikipedia.org/wiki/A) 0041 ***65*** | [B](http://en.wikipedia.org/wiki/B) 0042 ***66*** | [C](http://en.wikipedia.org/wiki/C) 0043 ***67*** | [D](http://en.wikipedia.org/wiki/D) 0044 ***68*** | [E](http://en.wikipedia.org/wiki/E) 0045 ***69*** | [F](http://en.wikipedia.org/wiki/F) 0046 ***70*** | [G](http://en.wikipedia.org/wiki/G) 0047 ***71*** | [H](http://en.wikipedia.org/wiki/H) 0048 ***72*** | [I](http://en.wikipedia.org/wiki/I) 0049 ***73*** | [J](http://en.wikipedia.org/wiki/J) 004A ***74*** | [K](http://en.wikipedia.org/wiki/K) 004B ***75*** | [L](http://en.wikipedia.org/wiki/L) 004C ***76*** | [M](http://en.wikipedia.org/wiki/M) 004D ***77*** | [N](http://en.wikipedia.org/wiki/N) 004E ***78*** | [O](http://en.wikipedia.org/wiki/O) 004F ***79*** |
| **5\_** | [P](http://en.wikipedia.org/wiki/P) 0050 ***80*** | [Q](http://en.wikipedia.org/wiki/Q) 0051 ***81*** | [R](http://en.wikipedia.org/wiki/R) 0052 ***82*** | [S](http://en.wikipedia.org/wiki/S) 0053 ***83*** | [T](http://en.wikipedia.org/wiki/T) 0054 ***84*** | [U](http://en.wikipedia.org/wiki/U) 0055 ***85*** | [V](http://en.wikipedia.org/wiki/V) 0056 ***86*** | [W](http://en.wikipedia.org/wiki/W) 0057 ***87*** | [X](http://en.wikipedia.org/wiki/X) 0058 ***88*** | [Y](http://en.wikipedia.org/wiki/Y) 0059 ***89*** | [Z](http://en.wikipedia.org/wiki/Z) 005A ***90*** | [[](http://en.wikipedia.org/wiki/Square_brackets) 005B ***91*** | [\](http://en.wikipedia.org/wiki/Backslash) 005C ***92*** | []](http://en.wikipedia.org/wiki/Square_brackets) 005D ***93*** | [^](http://en.wikipedia.org/wiki/Circumflex) 005E ***94*** | [\_](http://en.wikipedia.org/wiki/Underscore) 005F ***95*** |
| **6\_** | ` 0060 ***96*** | a 0061 ***97*** | b 0062 ***98*** | c 0063 ***99*** | d 0064 ***100*** | e 0065 ***101*** | f 0066 ***102*** | g 0067 ***103*** | h 0068 ***104*** | i 0069 ***105*** | j 006A ***106*** | k 006B ***107*** | l 006C ***108*** | m 006D ***109*** | n 006E ***110*** | o 006F ***111*** |
| **7\_** | p 0070 ***112*** | q 0071 ***113*** | r 0072 ***114*** | s 0073 ***115*** | t 0074 ***116*** | u 0075 ***117*** | v 0076 ***118*** | w 0077 ***119*** | x 0078 ***120*** | y 0079 ***121*** | z 007A ***122*** | { 007B ***123*** | [|](http://en.wikipedia.org/wiki/Vertical_bar) 007C ***124*** | } 007D ***125*** | [~](http://en.wikipedia.org/wiki/Tilde) 007E ***126*** | [DEL](http://en.wikipedia.org/wiki/Delete_character) 007F ***127*** |
| **8\_** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **9\_** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **A\_** |  | ँ 0901 ***161*** | ं 0902 ***162*** | ः 0903 ***163*** | अ 0905 ***164*** | आ 0906 ***165*** | इ 0907 ***166*** | ई 0908 ***167*** | उ 0909 ***168*** | ऊ 090A ***169*** | ऋ 090B ***170*** | ऎ 090E ***171*** | ए 090F ***172*** | ऐ 0910 ***173*** | ऍ 090D ***174*** | ऒ 0912 ***175*** |
| **B\_** | ओ 0913 ***176*** | औ 0914 ***177*** | ऑ 0911 ***178*** | क 0915 ***179*** | ख 0916 ***180*** | ग 0917 ***181*** | घ 0918 ***182*** | ङ 0919 ***183*** | च 091A ***184*** | छ 091B ***185*** | ज 091C ***186*** | झ 091D ***187*** | ञ 091E ***188*** | ट 091F ***189*** | ठ 0920 ***190*** | ड 0921 ***191*** |
| **C\_** | ढ 0922 ***192*** | ण 0923 ***193*** | त 0924 ***194*** | थ 0925 ***195*** | द 0926 ***196*** | ध 0927 ***197*** | न 0928 ***198*** | ऩ 0929 ***199*** | प 092A ***200*** | फ 092B ***201*** | ब 092C ***202*** | भ 092D ***203*** | म 092E ***204*** | य 092F ***207*** | य़ 095F ***206*** | र 0930 ***205*** |
| **D\_** | ऱ 0931 ***208*** | ल 0932 ***209*** | ळ 0933 ***210*** | ऴ 0934 ***211*** | व 0935 ***212*** | श 0936 ***213*** | ष 0937 ***214*** | स 0938 ***215*** | ह 0939 ***216*** | INV  ***217*** | ा 093E ***218*** | ि 093F ***219*** | ी 0940 ***220*** | ु 0941 ***221*** | ू 0942 ***222*** | ृ 0943 ***223*** |
| **E\_** | ॆ 0946 ***224*** | े 0947 ***225*** | ै 0948 ***226*** | ॅ 0945 ***227*** | ॊ 094A ***228*** | ो 094B ***229*** | ौ 094C ***230*** | ॉ 0949 ***231*** | ् 094D ***232*** | ़ 093C ***233*** | । 0964 ***234*** |  |  |  |  | ATR  ***239*** |
| **F\_** | EXT  ***240*** | ० 0966 ***241*** | १ 0967 ***242*** | २ 0968 ***243*** | ३ 0969 ***244*** | ४ 096A ***245*** | ५ 096B ***246*** | ६ 096C ***247*** | ७ 096D ***248*** | ८ 096E ***249*** | ९ 096F ***250*** |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ISCIJ Devanagari Adapted from Unicode** | | | | | | | | | | | | | | | | |
|  | **—0** | **—1** | **—2** | **—3** | **—4** | **—5** | **—6** | **—7** | **—8** | **—9** | **—A** | **—B** | **—C** | **—D** | **—E** | **—F** |
| **0\_** | [NUL](http://en.wikipedia.org/wiki/Null_character) 0000 ***0*** | [SOH](http://en.wikipedia.org/wiki/Start_of_heading) 0001 ***1*** | [STX](http://en.wikipedia.org/wiki/Start_of_text) 0002 ***2*** | [ETX](http://en.wikipedia.org/wiki/End_of_text) 0003 ***3*** | [EOT](http://en.wikipedia.org/wiki/End_of_transmission_character) 0004 ***4*** | [ENQ](http://en.wikipedia.org/wiki/Enquiry_character) 0005 ***5*** | [ACK](http://en.wikipedia.org/wiki/Acknowledge_character) 0006 ***6*** | [BEL](http://en.wikipedia.org/wiki/Bell_character) 0007 ***7*** | [BS](http://en.wikipedia.org/wiki/Backspace) 0008 ***8*** | [HT](http://en.wikipedia.org/wiki/Horizontal_tab) 0009 ***9*** | [LF](http://en.wikipedia.org/wiki/Line_feed) 000A ***10*** | [VT](http://en.wikipedia.org/wiki/Vertical_tab) 000B ***11*** | [FF](http://en.wikipedia.org/wiki/Form_feed) 000C ***12*** | [CR](http://en.wikipedia.org/wiki/Carriage_return) 000D ***13*** | [SO](http://en.wikipedia.org/wiki/Shift_out) 000E ***14*** | [SI](http://en.wikipedia.org/wiki/Shift_in) 000F ***15*** |
| **1\_** | [DLE](http://en.wikipedia.org/wiki/Data_link_escape) 0010 ***16*** | [DC1](http://en.wikipedia.org/wiki/Device_Control_1) 0011 ***17*** | [DC2](http://en.wikipedia.org/wiki/Device_Control_2) 0012 ***18*** | [DC3](http://en.wikipedia.org/wiki/Device_Control_3) 0013 ***19*** | [DC4](http://en.wikipedia.org/wiki/Device_Control_4) 0014 ***20*** | [NAK](http://en.wikipedia.org/wiki/Negative_acknowledge_character) 0015 ***21*** | [SYN](http://en.wikipedia.org/wiki/Synchronous_idle) 0016 ***22*** | [ETB](http://en.wikipedia.org/wiki/End_of_transmission_block) 0017 ***23*** | [CAN](http://en.wikipedia.org/wiki/Cancel_character) 0018 ***24*** | [EM](http://en.wikipedia.org/wiki/End_of_medium) 0019 ***25*** | [SUB](http://en.wikipedia.org/wiki/Substitute_character) 001A ***26*** | [ESC](http://en.wikipedia.org/wiki/Escape_character) 001B ***27*** | [FS](http://en.wikipedia.org/wiki/File_separator) 001C ***2*** | [GS](http://en.wikipedia.org/wiki/Group_separator) 001D ***29*** | [RS](http://en.wikipedia.org/wiki/Record_separator) 001E ***30*** | [US](http://en.wikipedia.org/wiki/Unit_separator) 001F ***31*** |
| **2\_** | [SP](http://en.wikipedia.org/wiki/Space_character) 0020 ***32*** | [!](http://en.wikipedia.org/wiki/Exclamation_mark) 0021 ***33*** | ["](http://en.wikipedia.org/wiki/Quotation_mark) 0022 ***34*** | [#](http://en.wikipedia.org/wiki/Number_sign) 0023 ***35*** | [$](http://en.wikipedia.org/wiki/Dollar_sign) 0024 ***36*** | [%](http://en.wikipedia.org/wiki/Percent_sign) 0025 ***37*** | [&](http://en.wikipedia.org/wiki/Ampersand) 0026 ***38*** | ['](http://en.wikipedia.org/wiki/Apostrophe) 0027 ***39*** | [(](http://en.wikipedia.org/wiki/Bracket) 0028 ***40*** | [)](http://en.wikipedia.org/wiki/Bracket) 0029 ***41*** | [\*](http://en.wikipedia.org/wiki/Asterisk) 002A ***42*** | [+](http://en.wikipedia.org/wiki/Plus_and_minus_signs) 002B ***43*** | [,](http://en.wikipedia.org/wiki/Comma_(punctuation)) 002C ***44*** | [-](http://en.wikipedia.org/wiki/Plus_and_minus_signs) 002D ***45*** | [.](http://en.wikipedia.org/wiki/Full_stop) 002E ***46*** | [/](http://en.wikipedia.org/wiki/Slash_(punctuation)) 002F ***47*** |
| **3\_** | [0](http://en.wikipedia.org/wiki/0_(number)) 0030 ***48*** | [1](http://en.wikipedia.org/wiki/1_(number)) 0031 ***49*** | [2](http://en.wikipedia.org/wiki/2_(number)) 0032 ***50*** | [3](http://en.wikipedia.org/wiki/3_(number)) 0033 ***51*** | [4](http://en.wikipedia.org/wiki/4_(number)) 0034 ***52*** | [5](http://en.wikipedia.org/wiki/5_(number)) 0035 ***53*** | [6](http://en.wikipedia.org/wiki/6_(number)) 0036 ***54*** | [7](http://en.wikipedia.org/wiki/7_(number)) 0037 ***55*** | [8](http://en.wikipedia.org/wiki/8_(number)) 0038 ***56*** | [9](http://en.wikipedia.org/wiki/9_(number)) 0039 ***57*** | [:](http://en.wikipedia.org/wiki/Colon_(punctuation)) 003A ***58*** | [;](http://en.wikipedia.org/wiki/Semicolon) 003B ***59*** | [<](http://en.wikipedia.org/wiki/Angle_bracket) 003C ***60*** | [=](http://en.wikipedia.org/wiki/Equal_sign) 003D ***61*** | [>](http://en.wikipedia.org/wiki/Angle_bracket) 003E ***62*** | [?](http://en.wikipedia.org/wiki/Question_mark) 003F ***63*** |
| **4\_** | [@](http://en.wikipedia.org/wiki/@) 0040 ***64*** | [A](http://en.wikipedia.org/wiki/A) 0041 ***65*** | [B](http://en.wikipedia.org/wiki/B) 0042 ***66*** | [C](http://en.wikipedia.org/wiki/C) 0043 ***67*** | [D](http://en.wikipedia.org/wiki/D) 0044 ***68*** | [E](http://en.wikipedia.org/wiki/E) 0045 ***69*** | [F](http://en.wikipedia.org/wiki/F) 0046 ***70*** | [G](http://en.wikipedia.org/wiki/G) 0047 ***71*** | [H](http://en.wikipedia.org/wiki/H) 0048 ***72*** | [I](http://en.wikipedia.org/wiki/I) 0049 ***73*** | [J](http://en.wikipedia.org/wiki/J) 004A ***74*** | [K](http://en.wikipedia.org/wiki/K) 004B ***75*** | [L](http://en.wikipedia.org/wiki/L) 004C ***76*** | [M](http://en.wikipedia.org/wiki/M) 004D ***77*** | [N](http://en.wikipedia.org/wiki/N) 004E ***78*** | [O](http://en.wikipedia.org/wiki/O) 004F ***79*** |
| **5\_** | [P](http://en.wikipedia.org/wiki/P) 0050 ***80*** | [Q](http://en.wikipedia.org/wiki/Q) 0051 ***81*** | [R](http://en.wikipedia.org/wiki/R) 0052 ***82*** | [S](http://en.wikipedia.org/wiki/S) 0053 ***83*** | [T](http://en.wikipedia.org/wiki/T) 0054 ***84*** | [U](http://en.wikipedia.org/wiki/U) 0055 ***85*** | [V](http://en.wikipedia.org/wiki/V) 0056 ***86*** | [W](http://en.wikipedia.org/wiki/W) 0057 ***87*** | [X](http://en.wikipedia.org/wiki/X) 0058 ***88*** | [Y](http://en.wikipedia.org/wiki/Y) 0059 ***89*** | [Z](http://en.wikipedia.org/wiki/Z) 005A ***90*** | [[](http://en.wikipedia.org/wiki/Square_brackets) 005B ***91*** | [\](http://en.wikipedia.org/wiki/Backslash) 005C ***92*** | []](http://en.wikipedia.org/wiki/Square_brackets) 005D ***93*** | [^](http://en.wikipedia.org/wiki/Circumflex) 005E ***94*** | [\_](http://en.wikipedia.org/wiki/Underscore) 005F ***95*** |
| **6\_** | ` 0060 ***96*** | a 0061 ***97*** | b 0062 ***98*** | c 0063 ***99*** | d 0064 ***100*** | e 0065 ***101*** | f 0066 ***102*** | g 0067 ***103*** | h 0068 ***104*** | i 0069 ***105*** | j 006A ***106*** | k 006B ***107*** | l 006C ***108*** | m 006D ***109*** | n 006E ***110*** | o 006F ***111*** |
| **7\_** | p 0070 ***112*** | q 0071 ***113*** | r 0072 ***114*** | s 0073 ***115*** | t 0074 ***116*** | u 0075 ***117*** | v 0076 ***118*** | w 0077 ***119*** | x 0078 ***120*** | y 0079 ***121*** | z 007A ***122*** | { 007B ***123*** | [|](http://en.wikipedia.org/wiki/Vertical_bar) 007C ***124*** | } 007D ***125*** | [~](http://en.wikipedia.org/wiki/Tilde) 007E ***126*** | [DEL](http://en.wikipedia.org/wiki/Delete_character) 007F ***127*** |
| **8\_** | ह  0939  ***128*** | ९ 096F ***129*** | [ॐ](https://en.wikipedia.org/wiki/Om) 0950  ***130*** | २ 0968  ***131*** | ३ 0969  ***132*** | ***117*** | ***118*** | ***119*** | ***120*** | ***121*** | ***122*** | ***123*** | ***124*** | ***125*** | ***126*** | ***127*** |
| **9\_** | ी  0940  ***144*** | ु  0941  ***145*** | ू  0942  ***146*** | ृ  0943  ***147*** | ॄ  0944  ***148*** | ॅ  0945  ***149*** | ॆ  0946  ***150*** | े  0947  ***151*** | ै  0948  ***152*** | ॉ  0949  ***153*** | ॊ  094A  ***154*** | ो  094B  ***155*** | ौ  094C  ***156*** | ्  094D  ***157*** | [॰](https://en.wikipedia.org/wiki/%E0%A5%B0)  0970  ***158*** | ॱ  0971  ***159*** |
| **A\_** | ऀ 0900  ***160*** | [ँ](https://en.wikipedia.org/wiki/Chandrabindu)  0901  ***161*** | [ं](https://en.wikipedia.org/wiki/Anusvara)  0902  ***162*** | [ः](https://en.wikipedia.org/wiki/Visarga)  0903  ***163*** | ऄ 0904  ***164*** | अ  0905  ***165*** | आ  0906  ***166*** | इ  0907  ***167*** | ई  0908  ***168*** | उ  0909 ***169*** | ऊ  090A ***170*** | ऋ  090B ***171*** | ऌ  090C ***172*** | ऍ  090D ***173*** | ऎ  090E ***174*** | ए  090F ***175*** |
| **B\_** | ऐ  0910 ***176*** | ऑ  0911 ***177*** | ऒ  0912 ***178*** | ओ  0913 ***179*** | औ  0914 ***180*** | क  0915 ***181*** | ख  0916 ***182*** | ग  0917 ***183*** | घ  0918 ***184*** | ङ  0919 ***185*** | च  091A ***186*** | छ  091B ***187*** | ज  091C ***188*** | झ  091D ***189*** | ञ  091E ***190*** | ट  091F ***191*** |
| **C\_** | ठ  0920 ***192*** | ड  0921 ***193*** | ढ  0922 ***194*** | ण  0923 ***195*** | त  0924 ***196*** | थ  0925 ***197*** | द  0926 ***198*** | ध  0927 ***199*** | न  0928 ***200*** | ऩ  0929 ***201*** | प  092A ***202*** | फ  092B ***203*** | ब  092C ***204*** | भ  092D ***205*** | म  092E ***206*** | य  092F ***207*** |
| **D\_** | र  0930 ***208*** | ऱ  0931 ***209*** | ल  0932 ***210*** | ळ  0933 ***211*** | ऴ  0934 ***212*** | व  0935 ***213*** | श  0936 ***214*** | ष  0937 ***215*** | स  0938 ***216*** | **INV**  ***217*** | ऺ 093A ***218*** | ऻ 093B ***219*** | ़ 093C ***220*** | [ऽ](https://en.wikipedia.org/wiki/Avagraha) 093D ***221*** | ा 093E ***222*** | ि 093F ***223*** |
| **E\_** | ॠ 0960 ***224*** | ॡ 0961 ***225*** | ॢ 0962 ***226*** | ॣ 0963 ***227*** | । 0964 ***228*** | ॥ 0965 ***229*** | ० 0966 ***230*** | १ 0967 ***231*** | **Halant**  094D  ***232*** | **Nukta**  ***233*** | ४ 096A ***234*** | ५  096B ***235*** | ६  096C ***236*** | ७  096D ***237*** | ८  096E ***238*** | **ATR**  ***239*** |
| **F\_** | **EXT**  ***240*** | क़  0958 ***241*** | ख़  0959 ***242*** | ग़  095A ***243*** | ज़  095B ***244*** | ड़  095C ***245*** | ढ़  095D ***246*** | फ़  095D ***247*** | फ़  095E ***248*** | य़  095F ***249*** | ॲ  0972 ***250*** | ॻ  097B ***251*** | ॼ  097C ***252*** | ॽ  097D ***253*** | ॾ  097E ***254*** | ॿ  097F ***255*** |

## Special code points

ii

INV character—code point D9 (217)

The INV character is used as a pseudo-consonant to display combining elements in isolation. For example, क (ka) +  ् (halant) + INV = क् (half ka). The Unicode equivalent is no break space 00A0 or dotted circle ◌ 25CC.

ATR character—code point EF (239)

The ATR character followed by a byte code is used to switch to a different font attribute (such as bold) or language (such as Bengali), up to the next ATR sequence or the end of the line. This has no direct Unicode equivalent, as font attributes are not part of Unicode, and each script has a distinct set of code points.

EXT character—code point F0 (240)

The EXT character followed by a byte code indicates a Vedic accent. This has no direct Unicode equivalent, as Vedic accents are assigned to distinct code points.

Halant character **़**—code point E8 (232)

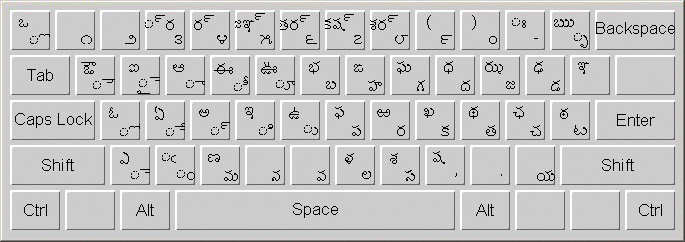
The halant character removes the implicit vowel from a consonant and is used between consonants to represent conjunct consonants. For example, क (ka) +  ् (halant) +  त (ta) =  क्त (kta). The sequence  ् (halant) +  ् (halant) displays a conjunct with an explicit halant, for example क (ka) +  ् (halant) +  ् (halant) +  त (ta) =  क्‌त. The sequence  ् (halant) +  ़ (nukta) displays a conjunct with half consonants, if available, for example  क (ka) +  ् (halant) +  ़ (nukta) +  त (ta) =  क्त.

|  |  |  |  |
| --- | --- | --- | --- |
| **ISCII** | | **Unicode** | |
| single halant | E8 | halant | 094D |
| halant + halant | E8 E8 | halant + [ZWNJ](http://en.wikipedia.org/wiki/Zero-width_non-joiner) | 094D 200C |
| halant + nukta | E8 E9 | halant + [ZWJ](http://en.wikipedia.org/wiki/Zero-width_joiner) | 094D 200D |

Nukta character **़**—code point E9 (233)

The [nukta](http://en.wikipedia.org/wiki/Nukta) character after another ISCII character is used for a number of rarer characters which don't exist in the main ISCII set. For example क  (ka) +  ़ (nukta) = क़ (qa). These characters have precomposed forms in Unicode, as shown in the following table.

|  |  |  |  |
| --- | --- | --- | --- |
| **ISCII code point** | **Original character** | **Character with nukta** | **Unicode code point** |
| A1 (161) | ँ | ॐ | 0950 |
| A6 (166) | इ | ऌ | 090C |
| A7 (167) | ऋ | ॡ | 0961 |
| AA (176) | ऋ | ॠ | 0960 |
| B3 (179) | ख | क़ | 0958 |
| B4 (180) | ख | ख़ | 0959 |
| B5 (181) | ग | ग़ | 095A |
| BA (186) | ज | ज़ | 095B |
| BF (191) | ड | ड़ | 095C |
| C0 (192) | ढ | ढ़ | 095D |
| C9 (201) | फ | फ़ | 095E |
| DB (219) | ि | ॢ | 0962 |
| DC (220) | ी | ॣ | 0963 |
| DF (223) | ृ | ॄ | 0944 |
| EA (234) | । | ऽ | 093D |







There are other keyboards for Benagli, Gujarati and others.

The use of IPA can be further researched e.g. google “IPA speech recognition”. One item there is the CMU dictionary which has a limited character set known as the ARPA phonetic alphabet. This is reproduced below courtesy of Wikipedia. The ARPA phonetic alphabet “Arpabet”, used in the CMU Dictionary is reproduced below. It has limited IPA character use.

## Code points for all Indian languages

Each alphabet is listed in the order of its ISCII code point. Code points with asterisks (\*) indicate the code point followed by nukta, e.g. क (ka) + ़ = क़ (qa); इ (i) + ़ = ऌ (ḷ). Each character is listed along with its Unicode code point.

|  |
| --- |
| **Code-set for all alphabets using ISCII** |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Hex** | **Official Listing** | [**ISO 15919**](https://en.wikipedia.org/wiki/ISO_15919) | [**Devanagari**](https://en.wikipedia.org/wiki/Devanagari) | | [**Bengali**](https://en.wikipedia.org/wiki/Bengali_script) | | [**Gurmukhi**](https://en.wikipedia.org/wiki/Gurmukhi_script) | | [**Gujarati**](https://en.wikipedia.org/wiki/Gujarati_script) | | [**Oriya**](https://en.wikipedia.org/wiki/Oriya_script) | | [**Tamil**](https://en.wikipedia.org/wiki/Tamil_script) | | [**Telugu**](https://en.wikipedia.org/wiki/Telugu_script) | | [**Kannada**](https://en.wikipedia.org/wiki/Kannada_script) | | [**Malayalam**](https://en.wikipedia.org/wiki/Malayalam_script) | | | **A0** | **Sign**[**OM**](https://en.wikipedia.org/wiki/Om) |  | **ॐ** | **0950** |  | |  | | **ૐ** | **0AD0** |  | |  | |  | |  | |  | | | **A1** | **Vowel-modifier** [**CHANDRABINDU**](https://en.wikipedia.org/wiki/Chandrabindu) |  | **ँ** | **0901** | **ঁ** | **0981** | **ਁ** | **0A01** | **ઁ** | **0A81** | **ଁ** | **0B01** |  | | **ఁ** | **0C01** |  | |  | | | **A2** | **Vowel-modifier** [**ANUSWAR**](https://en.wikipedia.org/wiki/Anusvara) | **ṁ** | **ं** | **0902** | **ং** | **0982** | **ਂ** | **0A02** | **ં** | **0A82** | **ଂ** | **0B02** | **ஂ** | **0B82** | **ం** | **0C02** | **ಂ** | **0C82** | **ം** | **0D02** | | **A3** | **Vowel-modifier** [**VISARG**](https://en.wikipedia.org/wiki/Visarga) | **ḥ** | **ः** | **0903** | **ঃ** | **0983** | **ਃ** | **0A03** | **ઃ** | **0A83** | **ଃ** | **0B03** | **ஃ** | **0B83** | **ః** | **0C03** | **ಃ** | **0C83** | **ഃ** | **0D03** | | **A4** | **Vowel A** | **a** | **अ** | **0905** | **অ** | **0985** | **ਅ** | **0A05** | **અ** | **0A85** | **ଅ** | **0B05** | **அ** | **0B85** | **అ** | **0C05** | **ಅ** | **0C85** | **അ** | **0D05** | | **A5** | **Vowel AA** | **ā** | **आ** | **0906** | **আ** | **0986** | **ਆ** | **0A06** | **આ** | **0A86** | **ଆ** | **0B06** | **ஆ** | **0B86** | **ఆ** | **0C06** | **ಆ** | **0C86** | **ആ** | **0D06** | | **A6** | **Vowel I** | **i** | **इ** | **0907** | **ই** | **0987** | **ਇ** | **0A07** | **ઇ** | **0A87** | **ଇ** | **0B07** | **இ** | **0B87** | **ఇ** | **0C07** | **ಇ** | **0C87** | **ഇ** | **0D07** | | **A6\*** | **Vowel LI (Sanskrit)** | **ḷ** | **ऌ** | **090C** | **ঌ** | **098C** |  | | **ઌ** | **0A8C** | **ଌ** | **0B0C** |  | | **ఌ** | **0C0C** | **ಌ** | **0C8C** | **ഌ** | **0D0C** | | **A7** | **Vowel II** | **ī** | **ई** | **0908** | **ঈ** | **0988** | **ਈ** | **0A08** | **ઈ** | **0A88** | **ଈ** | **0B08** | **ஈ** | **0B88** | **ఈ** | **0C08** | **ಈ** | **0C88** | **ഈ** | **0D08** | | **A7\*** | **Vowel LII (Sanskrit)** | **ḹ** | **ॡ** | **0961** | **ৡ** | **09E1** |  | | **ૡ** | **0AE1** | **ୡ** | **0B61** |  | | **ౡ** | **0C61** | **ೡ** | **0CE1** | **ൡ** | **0D61** | | **A8** | **Vowel U** | **u** | **उ** | **0909** | **উ** | **0989** | **ਉ** | **0A09** | **ઉ** | **0A89** | **ଉ** | **0B09** | **உ** | **0B89** | **ఉ** | **0C09** | **ಉ** | **0C89** | **ഉ** | **0D09** | | **A9** | **Vowel UU** | **ū** | **ऊ** | **090A** | **ঊ** | **098A** | **ਊ** | **0A0A** | **ઊ** | **0A8A** | **ଊ** | **0B0A** | **ஊ** | **0B8A** | **ఊ** | **0C0A** | **ಊ** | **0C8A** | **ഊ** | **0D0A** | | **AA** | **Vowel RI** | **r̥** | **ऋ** | **090B** | **ঋ** | **098B** |  | | **ઋ** | **0A8B** | **ଋ** | **0B0B** |  | | **ఋ** | **0C0B** | **ಋ** | **0C8B** | **ഋ** | **0D0B** | | **AA\*** | **Vowel RII (Sanskrit)** | **ṝ** | **ॠ** | **0960** | **ৠ** | **09E0** |  | | **ૠ** | **0AE0** | **ୠ** | **0B60** |  | | **ౠ** | **0C60** | **ೠ** | **0CE0** | **ൠ** | **0D60** | | **AB** | **Vowel E (Southern Scripts)** | **e** | **ऎ** | **090E** |  | |  | |  | |  | | **எ** | **0B8E** | **ఎ** | **0C0E** | **ಎ** | **0C8E** | **എ** | **0D0E** | | **AC** | **Vowel EY** | **ē** | **ए** | **090F** | **এ** | **098F** | **ਏ** | **0A0F** | **એ** | **0A8F** | **ଏ** | **0B0F** | **ஏ** | **0B8F** | **ఏ** | **0C0F** | **ಏ** | **0C8F** | **ഏ** | **0D0F** | | **AD** | **Vowel AI** | **ai** | **ऐ** | **0910** | **ঐ** | **0990** | **ਐ** | **0A10** | **ઐ** | **0A90** | **ଐ** | **0B10** | **ஐ** | **0B90** | **ఐ** | **0C10** | **ಐ** | **0C90** | **ഐ** | **0D10** | | **AE** | **Vowel AYE (Devanagari Script)** | **ê** | **ऍ** | **090D** |  | |  | | **ઍ** | **0A8D** |  | |  | |  | |  | |  | | | **AF** | **Vowel O (Southern Scripts)** | **o** | **ऒ** | **0912** |  | |  | |  | |  | | **ஒ** | **0B92** | **ఒ** | **0C12** | **ಒ** | **0C92** | **ഒ** | **0D12** | | **B0** | **Vowel OW** | **ō** | **ओ** | **0913** | **ও** | **0993** | **ਓ** | **0A13** | **ઓ** | **0A93** | **ଓ** | **0B13** | **ஓ** | **0B93** | **ఓ** | **0C13** | **ಓ** | **0C93** | **ഓ** | **0D13** | | **B1** | **Vowel AU** | **au** | **औ** | **0914** | **ঔ** | **0994** | **ਔ** | **0A14** | **ઔ** | **0A94** | **ଔ** | **0B14** | **ஔ** | **0B94** | **ఔ** | **0C14** | **ಔ** | **0C94** | **ഔ** | **0D14** | | **B2** | **Vowel AWE (Devanagari Script)** | **ô** | **ऑ** | **0911** |  | |  | | **ઑ** | **0A91** |  | |  | |  | |  | |  | | | **B3** | **Consonant KA** | **k** | **क** | **0915** | **ক** | **0995** | **ਕ** | **0A15** | **ક** | **0A95** | **କ** | **0B15** | **க** | **0B95** | **క** | **0C15** | **ಕ** | **0C95** | **ക** | **0D15** | | **B3\*** | **Consonant QA (Urdu)** | **q** | **क़** | **0958** |  | |  | |  | |  | |  | |  | |  | |  | | | **B4** | **Consonant KHA** | **kh** | **ख** | **0916** | **খ** | **0996** | **ਖ** | **0A16** | **ખ** | **0A96** | **ଖ** | **0B16** |  | | **ఖ** | **0C16** | **ಖ** | **0C96** | **ഖ** | **0D16** | | **B4\*** | **Consonant KHHA (Urdu)** | **kh** | **ख़** | **0959** |  | | **ਖ਼** | **0A59** |  | |  | |  | |  | |  | |  | | | **B5** | **Consonant GA** | **g** | **ग** | **0917** | **গ** | **0997** | **ਗ** | **0A17** | **ગ** | **0A97** | **ଗ** | **0B17** |  | | **గ** | **0C17** | **ಗ** | **0C97** | **ഗ** | **0D17** | | **B5\*** | **Consonant GHHA (Urdu)** | **ġ** | **ग़** | **095A** |  | | **ਗ਼** | **0A5A** |  | |  | |  | |  | |  | |  | | | **B6** | **Consonant GHA** | **gh** | **घ** | **0918** | **ঘ** | **0998** | **ਘ** | **0A18** | **ઘ** | **0A98** | **ଘ** | **0B18** |  | | **ఘ** | **0C18** | **ಘ** | **0C98** | **ഘ** | **0D18** | | **B7** | **Consonant NGA** | **ṅ** | **ङ** | **0919** | **ঙ** | **0999** | **ਙ** | **0A19** | **ઙ** | **0A99** | **ଙ** | **0B19** | **ங** | **0B99** | **ఙ** | **0C19** | **ಙ** | **0C99** | **ങ** | **0D19** | | **B8** | **Consonant CHA** | **c** | **च** | **091A** | **চ** | **099A** | **ਚ** | **0A1A** | **ચ** | **0A9A** | **ଚ** | **0B1A** | **ச** | **0B9A** | **చ** | **0C1A** | **ಚ** | **0C9A** | **ച** | **0D1A** | | **B9** | **Consonant CHHA** | **ch** | **छ** | **091B** | **ছ** | **099B** | **ਛ** | **0A1B** | **છ** | **0A9B** | **ଛ** | **0B1B** |  | | **ఛ** | **0C1B** | **ಛ** | **0C9B** | **ഛ** | **0D1B** | | **BA** | **Consonant JA** | **j** | **ज** | **091C** | **জ** | **099C** | **ਜ** | **0A1C** | **જ** | **0A9C** | **ଜ** | **0B1C** | **ஜ** | **0B9C** | **జ** | **0C1C** | **ಜ** | **0C9C** | **ജ** | **0D1C** | | **BA\*** | **Consonant ZA (Urdu)** | **z** | **ज़** | **095B** |  | | **ਜ਼** | **0A5B** |  | |  | |  | |  | |  | |  | | | **BB** | **Consonant JHA** | **jh** | **झ** | **091D** | **ঝ** | **099D** | **ਝ** | **0A1D** | **ઝ** | **0A9D** | **ଝ** | **0B1D** |  | | **ఝ** | **0C1D** | **ಝ** | **0C9D** | **ഝ** | **0D1D** | | **BC** | **Consonant JNA** | **ñ** | **ञ** | **091E** | **ঞ** | **099E** | **ਞ** | **0A1E** | **ઞ** | **0A9E** | **ଞ** | **0B1E** | **ஞ** | **0B9E** | **ఞ** | **0C1E** | **ಞ** | **0C9E** | **ഞ** | **0D1E** | | **BD** | **Consonant Hard TA** | **ṭ** | **ट** | **091F** | **ট** | **099F** | **ਟ** | **0A1F** | **ટ** | **0A9F** | **ଟ** | **0B1F** | **ட** | **0B9F** | **ట** | **0C1F** | **ಟ** | **0C9F** | **ട** | **0D1F** | | **BE** | **Consonant Hard THA** | **ṭh** | **ठ** | **0920** | **ঠ** | **09A0** | **ਠ** | **0A20** | **ઠ** | **0AA0** | **ଠ** | **0B20** |  | | **ఠ** | **0C20** | **ಠ** | **0CA0** | **ഠ** | **0D20** | | **BF** | **Consonant Hard DA** | **ḍ** | **ड** | **0921** | **ড** | **09A1** | **ਡ** | **0A21** | **ડ** | **0AA1** | **ଡ** | **0B21** |  | | **డ** | **0C21** | **ಡ** | **0CA1** | **ഡ** | **0D21** | | **BF\*** | **Consonant Flapped DA** | **ṛ** | **ड़** | **095C** | **ড়** | **09DC** | **ੜ** | **0A5C** |  | | **ଡ଼** | **0B5C** |  | |  | |  | |  | | | **C0** | **Consonant Hard DHA** | **ḍh** | **ढ** | **0922** | **ঢ** | **09A2** | **ਢ** | **0A22** | **ઢ** | **0AA2** | **ଢ** | **0B22** |  | | **ఢ** | **0C22** | **ಢ** | **0CA2** | **ഢ** | **0D22** | | **C0\*** | **Consonant Flapped DHA** | **ṛh** | **ढ़** | **095D** | **ঢ়** | **09DD** |  | |  | | **ଢ଼** | **0B5D** |  | |  | |  | |  | | | **C1** | **Consonant Hard NA** | **ṇ** | **ण** | **0923** | **ণ** | **09A3** | **ਣ** | **0A23** | **ણ** | **0AA3** | **ଣ** | **0B23** | **ண** | **0BA3** | **ణ** | **0C23** | **ಣ** | **0CA3** | **ണ** | **0D23** | | **C2** | **Consonant Soft TA** | **t** | **त** | **0924** | **ত** | **09A4** | **ਤ** | **0A24** | **ત** | **0AA4** | **ତ** | **0B24** | **த** | **0BA4** | **త** | **0C24** | **ತ** | **0CA4** | **ത** | **0D24** | | **C3** | **Consonant Soft THA** | **th** | **थ** | **0925** | **থ** | **09A5** | **ਥ** | **0A25** | **થ** | **0AA5** | **ଥ** | **0B25** |  | | **థ** | **0C25** | **ಥ** | **0CA5** | **ഥ** | **0D25** | | **C4** | **Consonant Soft DA** | **d** | **द** | **0926** | **দ** | **09A6** | **ਦ** | **0A26** | **દ** | **0AA6** | **ଦ** | **0B26** |  | | **ద** | **0C26** | **ದ** | **0CA6** | **ദ** | **0D26** | | **C5** | **Consonant Soft DHA** | **dh** | **ध** | **0927** | **ধ** | **09A7** | **ਧ** | **0A27** | **ધ** | **0AA7** | **ଧ** | **0B27** |  | | **ధ** | **0C27** | **ಧ** | **0CA7** | **ധ** | **0D27** | | **C6** | **Consonant Soft NA** | **n** | **न** | **0928** | **ন** | **09A8** | **ਨ** | **0A28** | **ન** | **0AA8** | **ନ** | **0B28** | **ந** | **0BA8** | **న** | **0C28** | **ನ** | **0CA8** | **ന** | **0D28** | | **C7** | **Consonant NA (Tamil)** | **ṉ** | **ऩ** | **0929** |  | |  | |  | |  | | **ன** | **0BA9** |  | |  | |  | | | **C8** | **Consonant PA** | **p** | **प** | **092A** | **প** | **09AA** | **ਪ** | **0A2A** | **પ** | **0AAA** | **ପ** | **0B2A** | **ப** | **0BAA** | **ప** | **0C2A** | **ಪ** | **0CAA** | **പ** | **0D2A** | | **C9** | **Consonant PHA** | **ph** | **फ** | **092B** | **ফ** | **09AB** | **ਫ** | **0A2B** | **ફ** | **0AAB** | **ଫ** | **0B2B** |  | | **ఫ** | **0C2B** | **ಫ** | **0CAB** | **ഫ** | **0D2B** | | **C9\*** | **Consonant FA (Urdu)** | **f** | **फ़** | **095E** |  | | **ਫ਼** | **0A5E** |  | |  | |  | |  | | **ೞ** | **0CDE** |  | | | **CA** | **Consonant BA** | **b** | **ब** | **092C** | **ব** | **09AC** | **ਬ** | **0A2C** | **બ** | **0AAC** | **ବ** | **0B2C** |  | | **బ** | **0C2C** | **ಬ** | **0CAC** | **ബ** | **0D2C** | | **CB** | **Consonant BHA** | **bh** | **भ** | **092D** | **ভ** | **09AD** | **ਭ** | **0A2D** | **ભ** | **0AAD** | **ଭ** | **0B2D** |  | | **భ** | **0C2D** | **ಭ** | **0CAD** | **ഭ** | **0D2D** | | **CC** | **Consonant MA** | **m** | **म** | **092E** | **ম** | **09AE** | **ਮ** | **0A2E** | **મ** | **0AAE** | **ମ** | **0B2E** | **ம** | **0BAE** | **మ** | **0C2E** | **ಮ** | **0CAE** | **മ** | **0D2E** | | **CD** | **Consonant YA** | **y** | **र** | **092F** | **য** | **09AF** | **ਯ** | **0A2F** | **ય** | **0AAF** | **ଯ** | **0B2F** | **ய** | **0BAF** | **య** | **0C2F** | **ಯ** | **0CAF** | **യ** | **0D2F** | | **CE** | **Consonant JYA (Bengali, Assamese & Oriya)** | **ẏ** | **य़** | **095F** | **য়** | **09DF** |  | |  | | **ୟ** | **0B5F** |  | |  | |  | |  | | | **CF** | **Consonant RA** | **r̥** | **य** | **0930** | **র** | **09B0** | **ਰ** | **0A30** | **ર** | **0AB0** | **ର** | **0B30** | **ர** | **0BB0** | **ర** | **0C30** | **ರ** | **0CB0** | **ര** | **0D30** | | **D0** | **Consonant Hard RA (Southern Scripts)** | **ṟ** | **ऱ** | **0931** |  | |  | |  | |  | | **ற** | **0BB1** | **ఱ** | **0C31** | **ಱ** | **0CB1** | **റ** | **0D31** | | **D1** | **Consonant LA** | **l** | **ल** | **0932** | **ল** | **09B2** | **ਲ** | **0A32** | **લ** | **0AB2** | **ଲ** | **0B32** | **ல** | **0BB2** | **ల** | **0C32** | **ಲ** | **0CB2** | **ല** | **0D32** | | **D2** | **Consonant Hard LA** | **ḷ** | **ळ** | **0933** |  | | **ਲ਼** | **0A33** | **ળ** | **0AB3** | **ଳ** | **0B33** | **ள** | **0BB3** | **ళ** | **0C33** | **ಳ** | **0CB3** | **ള** | **0D33** | | **D3** | **Consonant ZHA (Tamil & Malayalam)** | **ḻ** | **ऴ** | **0934** |  | |  | |  | |  | | **ழ** | **0BB4** |  | |  | | **ഴ** | **0D34** | | **D4** | **Consonant VA** | **v** | **व** | **0935** | **ৱ** | **09F1** | **ਵ** | **0A35** | **વ** | **0AB5** | **ଵ** | **0B35** | **வ** | **0BB5** | **వ** | **0C35** | **ವ** | **0CB5** | **വ** | **0D35** | | **D5** | **Consonant SHA** | **ś** | **श** | **0936** | **শ** | **09B6** | **ਸ਼** | **0A36** | **શ** | **0AB6** | **ଶ** | **0B36** | **ஶ** | **0BB6** | **శ** | **0C36** | **ಶ** | **0CB6** | **ശ** | **0D36** | | **D6** | **Consonant Hard SHA** | **ṣ** | **ष** | **0937** | **ষ** | **09B7** |  | | **ષ** | **0AB7** | **ଷ** | **0B37** | **ஷ** | **0BB7** | **ష** | **0C37** | **ಷ** | **0CB7** | **ഷ** | **0D37** | | **D7** | **Consonant SA** | **s** | **स** | **0938** | **স** | **09B8** | **ਸ** | **0A38** | **સ** | **0AB8** | **ସ** | **0B38** | **ஸ** | **0BB8** | **స** | **0C38** | **ಸ** | **0CB8** | **സ** | **0D38** | | **D8** | **Consonant HA** | **h** | **ह** | **0939** | **হ** | **09B9** | **ਹ** | **0A39** | **હ** | **0AB9** | **ହ** | **0B39** | **ஹ** | **0BB9** | **హ** | **0C39** | **ಹ** | **0CB9** | **ഹ** | **0D39** | | **D9** | **Consonant INVISIBLE** |  |  | |  | |  | |  | |  | |  | |  | |  | |  | | | **DA** | **Vowel Sign AA** | **ā** | **ा** | **093E** | **া** | **09BE** | **ਾ** | **0A3E** | **ા** | **0ABE** | **ା** | **0B3E** | **ா** | **0BBE** | **ా** | **0C3E** | **ಾ** | **0CBE** | **ാ** | **0D3E** | | **DB** | **Vowel Sign I** | **i** | **ि** | **093F** | **ি** | **09BF** | **ਿ** | **0A3F** | **િ** | **0ABF** | **ି** | **0B3F** | **ி** | **0BBF** | **ి** | **0C3F** | **ಿ** | **0CBF** | **ി** | **0D3F** | | **DB\*** | **Vowel Sign LI (Sanskrit)** | **ḷ** | **ॢ** | **0962** | **ৢ** | **09E2** |  | | **ૢ** | **0AE2** | **ୢ** | **0B62** |  | | **ౢ** | **0C62** | **ೢ** | **0CE2** | **ൢ** | **0D62** | | **DC** | **Vowel Sign II** | **ī** | **ी** | **0940** | **ী** | **09C0** | **ੀ** | **0A40** | **ી** | **0AC0** | **ୀ** | **0B40** | **ீ** | **0BC0** | **ీ** | **0C40** | **ೀ** | **0CC0** | **ീ** | **0D40** | | **DC\*** | **Vowel Sign LII (Sanskrit)** | **ḹ** | **ॣ** | **0963** | **ৣ** | **09E3** |  | | **ૣ** | **0AE3** | **ୣ** | **0B63** |  | | **ౣ** | **0C63** | **ೣ** | **0CE3** | **ൣ** | **0D63** | | **DD** | **Vowel Sign U** | **u** | **ु** | **0941** | **ু** | **09C1** | **ੁ** | **0A41** | **ુ** | **0AC1** | **ୁ** | **0B41** | **ு** | **0BC1** | **ు** | **0C41** | **ು** | **0CC1** | **ു** | **0D41** | | **DE** | **Vowel Sign UU** | **ū** | **ू** | **0942** | **ূ** | **09C2** | **ੂ** | **0A42** | **ૂ** | **0AC2** | **ୂ** | **0B42** | **ூ** | **0BC2** | **ూ** | **0C42** | **ೂ** | **0CC2** | **ൂ** | **0D42** | | **DF** | **Vowel Sign RI** | **r̥** | **ृ** | **0943** | **ৃ** | **09C3** |  | | **ૃ** | **0AC3** | **ୃ** | **0B43** |  | | **ృ** | **0C43** | **ೃ** | **0CC3** | **ൃ** | **0D43** | | **DF\*** | **Vowel Sign RII (Sanskrit)** | **ṝ** | **ॄ** | **0944** | **ৄ** | **09C4** |  | | **ૄ** | **0AC4** | **ୄ** | **0B44** |  | | **ౄ** | **0C44** | **ೄ** | **0CC4** | **ൄ** | **0D44** | | **E0** | **Vowel Sign E (Southern Scripts)** | **e** | **ॆ** | **0946** |  | |  | |  | |  | | **ெ** | **0BC6** | **ె** | **0C46** | **ೆ** | **0CC6** | **െ** | **0D46** | | **E1** | **Vowel Sign EY** | **ē** | **े** | **0947** | **ে** | **09C7** | **ੇ** | **0A47** | **ે** | **0AC7** | **େ** | **0B47** | **ே** | **0BC7** | **ే** | **0C47** | **ೇ** | **0CC7** | **േ** | **0D47** | | **E2** | **Vowel Sign AI** | **ai** | **ै** | **0948** | **ৈ** | **09C8** | **ੈ** | **0A48** | **ૈ** | **0AC8** | **ୈ** | **0B48** | **ை** | **0BC8** | **ై** | **0C48** | **ೈ** | **0CC8** | **ൈ** | **0D48** | | **E3** | **Vowel Sign AYE (Devanagari Script)** | **ê** | **ॅ** | **0945** |  | |  | | **ૅ** | **0AC5** |  | |  | |  | |  | |  | | | **E4** | **Vowel Sign O (Southern Scripts)** | **o** | **ॊ** | **094A** |  | |  | |  | |  | | **ொ** | **0BCA** | **ొ** | **0C4A** | **ೊ** | **0CCA** | **ൊ** | **0D4A** | | **E5** | **Vowel Sign OW** | **ō** | **ो** | **094B** | **ো** | **09CB** | **ੋ** | **0A4B** | **ો** | **0ACB** | **ୋ** | **0B4B** | **ோ** | **0BCB** | **ో** | **0C4B** | **ೋ** | **0CCB** | **ോ** | **0D4B** | | **E6** | **Vowel Sign AU** | **au** | **ौ** | **094C** | **ৌ** | **09CC** | **ੌ** | **0A4C** | **ૌ** | **0ACC** | **ୌ** | **0B4C** | **ௌ** | **0BCC** | **ౌ** | **0C4C** | **ೌ** | **0CCC** | **ൌ** | **0D4C** | | **E7** | **Vowel Sign AWE (Devanagari Script)** | **ô** | **ॉ** | **0949** |  | |  | | **ૉ** | **0AC9** |  | |  | |  | |  | |  | | | **E8** | **Vowel Omission Sign (Halant)** |  | **्** | **094D** | **্** | **09CD** | **੍** | **0A4D** | **્** | **0ACD** | **୍** | **0B4D** | **்** | **0BCD** | **్** | **0C4D** | **್** | **0CCD** | **്** | **0D4D** | | **E9** | **Diacritic Sign (Nukta)** |  | **़** | **093C** | **়** | **09BC** | **਼** | **0A3C** | **઼** | **0ABC** | **଼** | **0B3C** |  | |  | | **಼** | **0CBC** |  | | | **EA** | **Full Stop (Viram, Northern Scripts)** |  | **।** | **0964** |  | |  | |  | |  | |  | |  | |  | |  | | | **EA\*** | **Vowel Stress Sign**[**AVAGRAH**](https://en.wikipedia.org/wiki/Avagraha) |  | **ऽ** | **093D** | **ঽ** | **09BD** |  | | **ઽ** | **0ABD** | **ଽ** | **0B3D** |  | | **ఽ** | **0C3D** | **ಽ** | **0CBD** | **ഽ** | **0D3D** | | **EB** | **Unused** | | | | | | | | | | | | | | | | | | | | | **EC** | **Unused** | | | | | | | | | | | | | | | | | | | | | **ED** | **Unused** | | | | | | | | | | | | | | | | | | | | | **EE** | **Unused** | | | | | | | | | | | | | | | | | | | | | **EF** | **Attribute Code** |  |  | |  | |  | |  | |  | |  | |  | |  | |  | | | **F0** | **Extension Code** |  |  | |  | |  | |  | |  | |  | |  | |  | |  | | | **F1** | **Digit 0** |  | **०** | **0966** | **০** | **09E6** | **੦** | **0A66** | **૦** | **0AE6** | **୦** | **0B66** | **௦** | **0BE6** | **౦** | **0C66** | **೦** | **0CE6** | **൦** | **0D66** | | **F2** | **Digit 1** |  | **१** | **0967** | **১** | **09E7** | **੧** | **0A67** | **૧** | **0AE7** | **୧** | **0B67** | **௧** | **0BE7** | **౧** | **0C67** | **೧** | **0CE7** | **൧** | **0D67** | | **F3** | **Digit 2** |  | **२** | **0968** | **২** | **09E8** | **੨** | **0A68** | **૨** | **0AE8** | **୨** | **0B68** | **௨** | **0BE8** | **౨** | **0C68** | **೨** | **0CE8** | **൨** | **0D68** | | **F4** | **Digit 3** |  | **३** | **0969** | **৩** | **09E9** | **੩** | **0A69** | **૩** | **0AE9** | **୩** | **0B69** | **௩** | **0BE9** | **౩** | **0C69** | **೩** | **0CE9** | **൩** | **0D69** | | **F5** | **Digit 4** |  | **४** | **096A** | **৪** | **09EA** | **੪** | **0A6A** | **૪** | **0AEA** | **୪** | **0B6A** | **௪** | **0BEA** | **౪** | **0C6A** | **೪** | **0CEA** | **൪** | **0D6A** | | **F6** | **Digit 5** |  | **५** | **096B** | **৫** | **09EB** | **੫** | **0A6B** | **૫** | **0AEB** | **୫** | **0B6B** | **௫** | **0BEB** | **౫** | **0C6B** | **೫** | **0CEB** | **൫** | **0D6B** | | **F7** | **Digit 6** |  | **६** | **096C** | **৬** | **09EC** | **੬** | **0A6C** | **૬** | **0AEC** | **୬** | **0B6C** | **௬** | **0BEC** | **౬** | **0C6C** | **೬** | **0CEC** | **൬** | **0D6C** | | **F8** | **Digit 7** |  | **७** | **096D** | **৭** | **09ED** | **੭** | **0A6D** | **૭** | **0AED** | **୭** | **0B6D** | **௭** | **0BED** | **౭** | **0C6D** | **೭** | **0CED** | **൭** | **0D6D** | | **F9** | **Digit 8** |  | **८** | **096E** | **৮** | **09EE** | **੮** | **0A6E** | **૮** | **0AEE** | **୮** | **0B6E** | **௮** | **0BEE** | **౮** | **0C6E** | **೮** | **0CEE** | **൮** | **0D6E** | | **FA** | **Digit 9** |  | **९** | **096F** | **৯** | **09EF** | **੯** | **0A6F** | **૯** | **0AEF** | **୯** | **0B6F** | **௯** | **0BEF** | **౯** | **0C6F** | **೯** | **0CEF** | **൯** | **0D6F** | | **FB** | **Unused** | | | | | | | | | | | | | | | | | | | | | **FC** | **Unused** | | | | | | | | | | | | | | | | | | | | | **FD** | **Unused** | | | | | | | | | | | | | | | | | | | | | **FE** | **Unused** | | | | | | | | | | | | | | | | | | | | | **FF** | **Unused** | | | | | | | | | | | | | | | | | | | | |

## Tibetan and Dzongkha (Bhutan)

|  |  |  |  |
| --- | --- | --- | --- |
| ཀ ka /ká/ | ཁ kha /kʰá/ | ག ga /kà, kʰà/ | ང nga /ŋà/ |
| ཅ ca /tʃá/ | ཆ cha /tʃʰá/ | ཇ ja /tʃà/ | ཉ nya /ɲà/ |
| ཏ ta /tá/ | ཐ tha /tʰá/ | ད da /tà, tʰà/ | ན na /nà/ |
| པ pa /pá/ | ཕ pha /pʰá/ | བ ba /pà, pʰà/ | མ ma /mà/ |
| ཙ tsa /tsá/ | ཚ tsha /tsʰá/ | ཛ dza /tsà/ | ཝ wa /wà/ (not originally part of the alphabet)[[5]](http://en.wikipedia.org/wiki/Tibetan_alphabet#cite_note-5) |
| ཞ zha /ʃà/[[6]](http://en.wikipedia.org/wiki/Tibetan_alphabet#cite_note-ReferenceA-6) | ཟ za /sà/ | འ 'a /hà/[[7]](http://en.wikipedia.org/wiki/Tibetan_alphabet#cite_note-7) |  |
| ཡ ya /jà/ | ར ra /rà/ | ལ la /là/ |  |
| ཤ sha /ʃá/[[6]](http://en.wikipedia.org/wiki/Tibetan_alphabet#cite_note-ReferenceA-6) | ས sa /sá/ | ཧ ha /há/[[8]](http://en.wikipedia.org/wiki/Tibetan_alphabet#cite_note-8) |  |
| ཨ a /á/ |  |  |  |

### Vowels

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [**Devanagari**](http://en.wikipedia.org/wiki/Devanagari) | [**IAST**](http://en.wikipedia.org/wiki/IAST) | **Tibetan** | **Dependent vowel signs** |  | [**Devanagari**](http://en.wikipedia.org/wiki/Devanagari) | [**IAST**](http://en.wikipedia.org/wiki/IAST) | **Tibetan** | **Dependent vowel signs** |
| अ | a | ཨ |  | औ | au | ཨཽ | ཽ |
| आ | ā | ཨཱ | ཱ | ऋ | ṛ | རྀ | ྲྀ |
| इ | i | ཨི | ི | ॠ | ṝ | རཱྀ | ཷ |
| ई | ī | ཨཱི | ཱི | ऌ | ḷ | ལྀ | ླྀ |
| उ | u | ཨུ | ུ | ॡ | ḹ | ལཱྀ | ཹ |
| ऊ | ū | ཨཱུ | ཱུ | अं | aṃ | ཨཾ | ཾ |
| ए | e | ཨེ | ེ | अँ | ཨྃ | ྃ |
| ऐ | ai | ཨཻ | ཻ | अः | aḥ | ཨཿ | ཿ |
| ओ | o | ཨོ | ོ |  | | | |

### Consonants

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| [**Devanagari**](http://en.wikipedia.org/wiki/Devanagari) | [**IAST**](http://en.wikipedia.org/wiki/IAST) | **Tibetan** |  | [**Devanagari**](http://en.wikipedia.org/wiki/Devanagari) | [**IAST**](http://en.wikipedia.org/wiki/IAST) | **Tibetan** |
| क | ka | ཀ | द | da | ད |
| ख | kha | ཁ | ध | dha | དྷ |
| ग | ga | ག | न | na | ན |
| घ | gha | གྷ | प | pa | པ |
| ङ | ṅa | ང | फ | pha | ཕ |
| च | ca | ཙ | ब | ba | བ |
| छ | cha | ཚ | भ | bha | བྷ |
| ज | ja | ཛ | म | ma | མ |
| झ | jha | ཛྷ | य | ya | ཡ |
| ञ | ña | ཉ | र | ra | ར |
| ट | ṭa | ཊ | ल | la | ལ |
| ठ | ṭha | ཋ | व | va | ཝ |
| ड | ḍa | ཌ | श | śa | ཤ |
| ढ | ḍha | ཌྷ | ष | ṣa | ཥ |
| ण | ṇa | ཎ | स | sa | ས |
| त | ta | ཏ | ह | ha | ཧ |
| थ | tha | ཐ | क्ष | kṣa | ཀྵ |

The Sanskrit "cerebral" ([retroflex](http://en.wikipedia.org/wiki/Retroflex)) consonants ट ठ ड ण ष (ṭa, ṭha, ḍa, ṇa, ṣa) are represented by reversing the letters ཏ ཐ ད ན ཤ (ta, tha, da, na, sha) to give ཊ ཋ ཌ ཎ ཥ(Ta, Tha, Da, Na, Sa).

It is a classic rule to transliterate च छ ज झ (ca cha ja jha) to ཙ ཚ ཛ ཛྷ (tsa tsha dza dzha), respectively. Nowadays, ཅ ཆ ཇ ཇྷ (ca cha ja jha) can also be used.

## Arpabet Symbols

In Arpabet, every phoneme is represented by one or two capital letters. Digits are used as [stress](http://en.wikipedia.org/wiki/Stress_(linguistics)) indicators and are placed at the end of the stressed syllabic [vowel](http://en.wikipedia.org/wiki/Vowel). Punctuation marks are used like in the written language, to represent intonation changes at the end of [clauses](http://en.wikipedia.org/wiki/Clauses) and [sentences](http://en.wikipedia.org/wiki/Sentences). The stress values are:

### Stress

|  |  |
| --- | --- |
| **Value** | **Description** |
| 0 | [No stress](http://en.wikipedia.org/wiki/Unstressed_vowel) |
| 1 | [Primary stress](http://en.wikipedia.org/wiki/Primary_stress) |
| 2 | [Secondary stress](http://en.wikipedia.org/wiki/Secondary_stress) |

### Vowels

[Monophthongs](http://en.wikipedia.org/wiki/Monophthong)

|  |  |  |
| --- | --- | --- |
| **Arpabet** | [**IPA**](http://en.wikipedia.org/wiki/Wikipedia:IPA_for_English) | **Word examples** |
| AO | ɔ | off (AO1 F); fall (F AO1 L); frost (F R AO1 S T) |
| AA | ɑ | father (F AA1 DH ER), cot (K AA1 T) |
| IY | i | bee (B IY1); she (SH IY1) |
| UW | u | you (Y UW1); new (N UW1); food (F UW1 D) |
| EH | ɛ | red (R EH1 D); men (M EH1 N) |
| IH | ɪ | big (B IH1 G); win (W IH1 N) |
| UH | ʊ | should (SH UH1 D), could (K UH1 D) |
| AH | ʌ | but (B AH1 T), sun (S AH1 N) |
| ə | sofa (S OW1 F AH0), alone (AH0 L OW1 N) |
| AX | discus (D IH1 S K AX0 S); note distinction from discuss (D IH0 S K AH1 S) |
| AE | æ | at (AE1 T); fast (F AE1 S T) |

[Diphthongs](http://en.wikipedia.org/wiki/Diphthong)

|  |  |  |
| --- | --- | --- |
| **Arpabet** | [**IPA**](http://en.wikipedia.org/wiki/Wikipedia:IPA_for_English) | **Word Examples** |
| EY | eɪ | say (S EY1); eight (EY1 T) |
| AY | aɪ | my (M AY1); why (W AY1); ride (R AY1 D) |
| OW | oʊ | show (SH OW1); coat (K OW1 T) |
| AW | aʊ | how (HH AW1); now (N AW1) |
| OY | ɔɪ | boy (B OY1); toy (T OY1) |

[R-colored vowels](http://en.wikipedia.org/wiki/R-colored_vowel)

|  |  |  |
| --- | --- | --- |
| **Arpabet** | [**IPA**](http://en.wikipedia.org/wiki/Wikipedia:IPA_for_English) | **Word Examples** |
| ER | ɝ | her (HH ER0); bird (B ER1 D); hurt (HH ER1 T), nurse (N ER1 S) |
| AXR | ɚ | father (F AA1 DH ER); coward (K AW1 ER D) |
| EH R | ɛr | air (EH1 R); where (W EH1 R); hair (HH EH1 R) |
| UH R | ʊr | cure (K Y UH1 R); bureau (B Y UH1 R OW0), detour (D IH0 T UH1 R) |
| AO R | ɔr | more (M AO1 R); bored (B AO1 R D); chord (K AO1 R D) |
| AA R | ɑr | large (L AA1 R JH); hard (HH AA1 R D) |
| IH R *or* IY R | ɪr | ear (IY1 R); near (N IH1 R) |
| AW R | aʊr | *This seems to be a rarely used r-controlled vowel. In some dialects* flower (F L AW1 R; *in other dialects* F L AW1 ER0) |

### Consonants

[Stops](http://en.wikipedia.org/wiki/Stop_consonant)

|  |  |  |
| --- | --- | --- |
| **Arpabet** | [**IPA**](http://en.wikipedia.org/wiki/Wikipedia:IPA_for_English) | **Word Examples** |
| P | p | pay (P EY1) |
| B | b | buy (B AY1) |
| T | t | take (T EY1 K) |
| D | d | day (D EY1) |
| K | k | key (K IY1) |
| G | ɡ | go (G OW1) |

[Affricates](http://en.wikipedia.org/wiki/Affricate)

|  |  |  |
| --- | --- | --- |
| **Arpabet** | [**IPA**](http://en.wikipedia.org/wiki/Wikipedia:IPA_for_English) | **Word Examples** |
| CH | tʃ | chair (CH EH1 R) |
| JH | dʒ | just (JH AH1 S T); gym (JH IH1 M) |

[Fricatives](http://en.wikipedia.org/wiki/Fricative)

|  |  |  |
| --- | --- | --- |
| **Arpabet** | [**IPA**](http://en.wikipedia.org/wiki/Wikipedia:IPA_for_English) | **Word Examples** |
| F | f | for (F AO1 R) |
| V | v | very (V EH1 R IY0) |
| TH | θ | thanks (TH AE1 NG K S); Thursday (TH ER1 Z D EY2) |
| DH | ð | that (DH AE1 T); the (DH AH0); them (DH EH1 M) |
| S | s | say (S EY1) |
| Z | z | zoo (Z UW1) |
| SH | ʃ | show (SH OW1) |
| ZH | ʒ | measure (M EH1 ZH ER0); pleasure (P L EH1 ZH ER) |

[Nasals](http://en.wikipedia.org/wiki/Nasal_stop)

|  |  |  |
| --- | --- | --- |
| **Arpabet** | [**IPA**](http://en.wikipedia.org/wiki/Wikipedia:IPA_for_English) | **Word Examples** |
| M | m | man (M AE1 N) |
| EM | m̩ | keep 'em (K IY1 P EM) |
| N | n | no (N OW1) |
| EN | n̩ | button (B AH1 T EN) |
| NG | ŋ | sing (S IH1 NG) |
| ENG | ŋ̍ | Washington (W AO1 SH ENG T EN) |

[Liquids](http://en.wikipedia.org/wiki/Liquid_consonant)

|  |  |  |
| --- | --- | --- |
| **Arpabet** | [**IPA**](http://en.wikipedia.org/wiki/Wikipedia:IPA_for_English) | **Word Examples** |
| L | ɫ | late (L EY1 T) |
| EL | ɫ̩ | bottle (B AO1 DX EL) |
| R | r *or* ɹ | run (R AH1 N) |
| DX | ɾ | wetter (W EH1 DX AXR) |
| NX | ɾ̃ | wintergreen (W IY2 NX AXR G R IY1 N) |

[Semivowels](http://en.wikipedia.org/wiki/Semivowel)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Arpabet** | [**IPA**](http://en.wikipedia.org/wiki/Wikipedia:IPA_for_English) | | | **Word Examples** | | |
| Y | j | yes (Y EH1 S) | | |
| W | w | way (W EY1) | | | |
| Q | ʔ | glottal stop (uh-oh - ʔʌʔoʊ) | | | |
| (missing) | hw *or* ʍ | "when" etc. in some dialects | | | |
| Chinese (in Wikipedia)  In each cell below, the bold letters indicate pinyin and the brackets enclose the symbol in the [International Phonetic Alphabet](http://en.wikipedia.org/wiki/International_Phonetic_Alphabet).   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | | [**Bilabial**](http://en.wikipedia.org/wiki/Bilabial_consonant) | | [**Labiodental**](http://en.wikipedia.org/wiki/Labiodental_consonant) | [**Alveolar**](http://en.wikipedia.org/wiki/Alveolar_consonant) | | [**Retroflex**](http://en.wikipedia.org/wiki/Retroflex_consonant) | | [**Alveolo-palatal**](http://en.wikipedia.org/wiki/Alveolo-palatal_consonant) | [**Velar**](http://en.wikipedia.org/wiki/Velar_consonant) | | [**Voiceless**](http://en.wikipedia.org/wiki/Voicelessness) | [**Voiced**](http://en.wikipedia.org/wiki/Voice_(phonetics)) | [**Voiceless**](http://en.wikipedia.org/wiki/Voicelessness) | [**Voiceless**](http://en.wikipedia.org/wiki/Voicelessness) | [**Voiced**](http://en.wikipedia.org/wiki/Voice_(phonetics)) | [**Voiceless**](http://en.wikipedia.org/wiki/Voicelessness) | [**Voiced**](http://en.wikipedia.org/wiki/Voice_(phonetics)) | [**Voiceless**](http://en.wikipedia.org/wiki/Voicelessness) | [**Voiceless**](http://en.wikipedia.org/wiki/Voicelessness) | | [**Nasal**](http://en.wikipedia.org/wiki/Nasal_consonant) | |  | [**m** [m]](http://en.wikipedia.org/wiki/Bilabial_nasal) |  |  | [**n** [n]](http://en.wikipedia.org/wiki/Alveolar_nasal) |  |  |  |  | | [**Plosive**](http://en.wikipedia.org/wiki/Plosive) | [**Unaspirated**](http://en.wikipedia.org/wiki/Aspirated_consonant) | [**b** [p]](http://en.wikipedia.org/wiki/Voiceless_bilabial_plosive) |  |  | [**d** [t]](http://en.wikipedia.org/wiki/Voiceless_alveolar_plosive) |  |  |  |  | [**g** [k]](http://en.wikipedia.org/wiki/Voiceless_velar_plosive) | | [**Aspirated**](http://en.wikipedia.org/wiki/Aspirated_consonant) | [**p** [pʰ]](http://en.wikipedia.org/wiki/Voiceless_bilabial_plosive) |  |  | [**t** [tʰ]](http://en.wikipedia.org/wiki/Voiceless_alveolar_plosive) |  |  |  |  | [**k** [kʰ]](http://en.wikipedia.org/wiki/Voiceless_velar_plosive) | | [**Affricate**](http://en.wikipedia.org/wiki/Affricate_consonant) | [**Unaspirated**](http://en.wikipedia.org/wiki/Aspirated_consonant) |  |  |  | [**z** [ts]](http://en.wikipedia.org/wiki/Voiceless_alveolar_affricate) |  | [**zh** [ʈʂ]](http://en.wikipedia.org/wiki/Voiceless_retroflex_affricate) |  | [**j** [tɕ]](http://en.wikipedia.org/wiki/Voiceless_alveolo-palatal_affricate) |  | | [**Aspirated**](http://en.wikipedia.org/wiki/Aspirated_consonant) |  |  |  | [**c** [tsʰ]](http://en.wikipedia.org/wiki/Voiceless_alveolar_affricate) |  | [**ch** [ʈʂʰ]](http://en.wikipedia.org/wiki/Voiceless_retroflex_affricate) |  | [**q** [tɕʰ]](http://en.wikipedia.org/wiki/Voiceless_alveolo-palatal_affricate) |  | | [**Fricative**](http://en.wikipedia.org/wiki/Fricative_consonant) | |  |  | [**f** [f]](http://en.wikipedia.org/wiki/Voiceless_labiodental_fricative) | [**s** [s]](http://en.wikipedia.org/wiki/Voiceless_alveolar_sibilant) |  | [**sh** [ʂ]](http://en.wikipedia.org/wiki/Voiceless_retroflex_sibilant) | [**r** [ʐ~ɻ]1](http://en.wikipedia.org/wiki/Voiced_retroflex_sibilant) | [**x** [ɕ]](http://en.wikipedia.org/wiki/Voiceless_alveolo-palatal_sibilant) | [**h** [x]](http://en.wikipedia.org/wiki/Voiceless_velar_fricative) | | [**Lateral**](http://en.wikipedia.org/wiki/Lateral_consonant) | |  |  |  |  | [**l** [l]](http://en.wikipedia.org/wiki/Alveolar_lateral_approximant) |  |  |  |  | | [**Approximant**](http://en.wikipedia.org/wiki/Approximant_consonant) | | **y3** [[j]](http://en.wikipedia.org/wiki/Palatal_approximant)/[[ɥ]](http://en.wikipedia.org/wiki/Labialized_palatal_approximant)2 and **w3** [[w]](http://en.wikipedia.org/wiki/Labio-velar_approximant) | | | | | | | | |   1 *r* may phonetically be [ʐ] (a [voiced retroflex fricative](http://en.wikipedia.org/wiki/Voiced_retroflex_fricative)) or [ɻ] (a [retroflex approximant](http://en.wikipedia.org/wiki/Retroflex_approximant)). This pronunciation varies among different speakers, and is not two different phonemes. 2 *y* is pronounced [ɥ] (a [labial-palatal approximant](http://en.wikipedia.org/wiki/Labial-palatal_approximant)) before *u*. 3 the letters *w* and *y* are not included in the table of initials in the official pinyin system. They are an orthographic convention for the medials *i, u* and *ü* when no initial is present. When *i, u* or *ü* are finals and no initial is present, they are spelled *yi*, *wu*, and *yu*, respectively. The conventional order (excluding *w* and *y*), derived from the zhuyin system, is:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **b  p  m  f** | **d  t  n  l** | **g  k  h** | **j  q  x** | **zh  ch  sh  r** | **z  c  s** |  Finals [**Standard Chinese vowels**](http://en.wikipedia.org/wiki/Chinese_vowel_diagram)**(with**[**IPA**](http://en.wikipedia.org/wiki/IPA)**and Pinyin)**   |  |  |  |  | | --- | --- | --- | --- | |  | **Front** | **Central** | **Back** | | **Close** | [Blank vowel trapezoid.svg](http://en.wikipedia.org/wiki/File:Blank_vowel_trapezoid.svg)  a  ɛ (ê)  ɚ (er)  ɤ (e) • o  u  ɨ (i)  i • y (ü) | | | | |  | | **Close-mid** | |  | | **Open-mid** | | **Open** | |  |   The following chart gives the combinations of medials and finals based on an analysis that assumes just two vowel nuclei, /a/ and /ə/;[[28]](http://en.wikipedia.org/wiki/Pinyin#cite_note-Hashimoto-28) various allophones result depending on phonetic context.  In each cell below, the first line indicates IPA, the second indicates pinyin for a standalone (no-initial) form, and the third indicates pinyin for a combination with an initial. Other than finals modified by an *-r*, which are omitted, the following is an exhaustive table of all possible finals.1[[29]](http://en.wikipedia.org/wiki/Pinyin#cite_note-29)  The only syllable-final consonants in Standard Chinese are *-n* and *-ng*, and *-r*, which is attached as a grammatical suffix. A Chinese syllable ending with any other consonant either is from a non-Mandarin language (a southern Chinese language such as Cantonese, or a minority language of China), or indicates the use of a non-pinyin romanization system (where final consonants may be used to indicate tones).   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Final** | **Nucleus** | /a/ | | | | | /ə/ | | | | | ∅ | | **Coda** | ∅ | /i/ | /u/ | /n/ | /ŋ/ | ∅ | /i/ | /u/ | /n/ | /ŋ/ | | **Medial** | ∅ | [ä] a -a | [aɪ̯] ai -ai | [ɑʊ̯] ao -ao | [än] an -an | [ɑŋ] ang -ang | [ɯ̯ʌ] e -e | [eɪ̯] ei -ei | [oʊ̯] ou -ou | [ən] en -en | [ɤŋ] eng -eng | [ɨ]  -i | | /i/ | [i̯ä] ya -ia |  | [i̯ɑʊ̯] yao -iao | [i̯ɛn] yan -ian | [i̯ɑŋ] yang -iang | [i̯ɛ] ye -ie |  | [i̯oʊ̯] you -iu | [in] yin -in | [iŋ] ying -ing | [i] yi -i | | /u/ | [u̯ä] wa -ua | [u̯aɪ̯] wai -uai |  | [u̯än] wan -uan | [u̯ɑŋ] wang -uang | [u̯ɔ] 3 wo -uo/-o | [u̯eɪ̯] wei -ui |  | [u̯ən] wen -un | [u̯ɤŋ], [ʊŋ] 4 weng -ong | [u] wu -u | | /y/ |  |  |  | [y̯ɛn] yuan -üan 2 |  | [y̯œ] yue -üe 2 |  |  | [yn] yun -ün 2 | [i̯ʊŋ] yong -iong | [y] yu -ü 2 |   1 [ɑɻ] is written *er*. For other finals formed by the suffix *-r,* pinyin does not use special orthography; one simply appends *r* to the final that it is added to, without regard for any sound changes that may take place along the way. For information on sound changes related to final *r*, please see [Erhua#Rules](http://en.wikipedia.org/wiki/Erhua#Rules). 2 *ü* is written as *u* after *j, q, x,* or *y.* 3 *uo* is written as *o* after *b, p, m,* or *f.* 4 *weng* is pronounced [ʊŋ] (written as *ong*) when it follows an initial.  Technically, *i, u, ü* without a following vowel are finals, not medials, and therefore take the tone marks, but they are more concisely displayed as above. In addition, *ê*[ɛ] (欸; 誒) and syllabic nasals *m* (呒, 呣), *n* (嗯, 唔), *ng* (嗯, 𠮾) are used as [interjections](http://en.wikipedia.org/wiki/Interjection). Rules given in terms of English pronunciation All rules given here in terms of English pronunciation are approximations, as several of these sounds do not correspond directly to sounds in English. Pronunciation of initials  |  |  |  |  | | --- | --- | --- | --- | | **Pinyin** | [**IPA**](http://en.wikipedia.org/wiki/Help:IPA) | **English approximation**[[30]](http://en.wikipedia.org/wiki/Pinyin#cite_note-30) | **Explanation** | | *B* | [[p](http://en.wikipedia.org/wiki/Voiceless_bilabial_stop)] | spit | unaspirated **p**, as in s**p**it | | *p* | [[pʰ](http://en.wikipedia.org/wiki/Aspirated_consonant)] | pay | strongly aspirated **p**, as in **p**it | | *M* | [[m](http://en.wikipedia.org/wiki/Bilabial_nasal)] | may | as in English **m**u**mm**y | | *F* | [[f](http://en.wikipedia.org/wiki/Voiceless_labiodental_fricative)] | fair | as in English **f**un | | *D* | [[t](http://en.wikipedia.org/wiki/Voiceless_alveolar_stop)] | stop | unaspirated **t**, as in s**t**op | | *T* | [[tʰ](http://en.wikipedia.org/wiki/Aspirated_consonant)] | take | strongly aspirated **t**, as in **t**op | | *N* | [[n](http://en.wikipedia.org/wiki/Alveolar_nasal)] | nay | as in English **n**it | | *L* | [[l](http://en.wikipedia.org/wiki/Alveolar_lateral_approximant)] | lay | as in English **l**ove | | *G* | [[k](http://en.wikipedia.org/wiki/Voiceless_velar_stop)] | skill | unaspirated **k**, as in s**k**ill | | *K* | [[kʰ](http://en.wikipedia.org/wiki/Aspirated_consonant)] | kay | strongly aspirated **k**, as in **k**ill | | *H* | [[x](http://en.wikipedia.org/wiki/Voiceless_velar_fricative)] | loch | roughly like the [Scots](http://en.wikipedia.org/wiki/Scots_language) **ch**. English **h** as in **h**ay or, more closely in some American dialects, **h**ero is an acceptable approximation. The best way to produce this sound is by very slowly making a "k" sound, pausing at the point where there is just restricted air flowing over the back of your tongue (after the release at the beginning of a "k") | | *J* | [[tɕ](http://en.wikipedia.org/wiki/Voiceless_alveolo-palatal_affricate)] | churchyard | No equivalent in English, but similar to an unaspirated "-chy-" sound when said quickly. Like *q,* but unaspirated. Not the **s** in A**s**ia, despite the common English pronunciation of "Beijing". The sequence "ji" word-initially is the same as the Japanese pronunciation of [じ](http://en.wikipedia.org/wiki/%E3%81%98)(ジ) *ji*. | | *Q* | [[tɕʰ](http://en.wikipedia.org/wiki/Aspirated_consonant)] | punch yourself | No equivalent in English. Like pun**ch y**ourself, with the lips spread wide with *ee*. Curl the tip of the tongue downwards to stick it at the back of the teeth and strongly aspirate. The sequence "qi" word-initially is the same as the Japanese pronunciation of [ち](http://en.wikipedia.org/wiki/%E3%81%A1)(チ) *chi*. | | *X* | [[ɕ](http://en.wikipedia.org/wiki/Voiceless_alveolo-palatal_sibilant)] | push yourself | No equivalent in English. Like **-sh y-**, with the lips spread and the tip of your tongue curled downwards and stuck to the back of teeth when you say *ee.* The sequence "xi" is the same as the Japanese pronunciation of [し](http://en.wikipedia.org/wiki/%E3%81%97)(シ) *shi*. | | *Zh* | [[tʂ](http://en.wikipedia.org/wiki/Voiceless_retroflex_affricate)] | junk | Rather like **ch** (a sound between **ch**oke, **j**oke, **tr**ue, and **dr**ew, tongue tip curled more upwards). Voiced in a toneless syllable. | | *Ch* | [[tʂʰ](http://en.wikipedia.org/wiki/Aspirated_consonant)] | church | as in **ch**in, but with the tongue curled upwards; very similar to nur**tu**re in American English, but strongly aspirated. | | *Sh* | [[ʂ](http://en.wikipedia.org/wiki/Voiceless_retroflex_sibilant)] | shirt | as in **sh**oe, but with the tongue curled upwards; very similar to mar**sh** in American English | | *R* | [[ʐ](http://en.wikipedia.org/wiki/Voiced_retroflex_sibilant)],[[ɻ](http://en.wikipedia.org/wiki/Retroflex_approximant)] | ray | Similar to the English **z** in a**z**ure and **r** in **r**educe, but with the tongue curled upwards, like a cross between English "r" and French "j". In[Cyrillised Chinese](http://en.wikipedia.org/wiki/Cyrillization_of_Chinese_from_pinyin) the sound is rendered with the letter "ж". | | *Z* | [[ts](http://en.wikipedia.org/wiki/Voiceless_alveolar_sibilant_affricate)] | reads | unaspirated **c**, similar to something between su**ds** and ca**ts**; as in su**ds** in a toneless syllable | | *C* | [[tsʰ](http://en.wikipedia.org/wiki/Aspirated_consonant)] | hats | like the English **ts** in ca**ts**, but strongly aspirated, very similar to the Czech, Polish and Slovak **c**. | | *s* | [[s](http://en.wikipedia.org/wiki/Voiceless_alveolar_sibilant)] | say | as in **s**un | | *W* | [[w](http://en.wikipedia.org/wiki/Labio-velar_approximant)] | way | as in **w**ater.\* | | *Y* | [[j](http://en.wikipedia.org/wiki/Palatal_approximant)],[[ɥ](http://en.wikipedia.org/wiki/Labial-palatal_approximant)] | yea | as in **y**es. Before a *u*, pronounce it with rounded lips.\* |   **\* Note on *y* and *w***  *Y* and *w* are equivalent to the [semivowel](http://en.wikipedia.org/wiki/Semivowel) medials *i, u,* and *ü* (see below). They are spelled differently when there is no initial consonant in order to mark a new syllable: *fanguan* is *fan-guan,* while *fangwan* is *fang-wan* (and equivalent to *\*fang-uan).* With this convention, an apostrophe only needs to be used to mark an initial*a, e,* or *o: Xi'an* (two syllables: [ɕi.an]) vs. *xian* (one syllable: [ɕi̯ɛn]). In addition, *y* and *w* are added to fully vocalic *i, u,* and *ü* when these occur without an initial consonant, so that they are written *yi, wu,* and *yu.* Some Mandarin speakers do pronounce a [j] or [w] sound at the beginning of such words—that is, *yi* [i] or [ji], *wu*[u] or [wu], *yu* [y] or [ɥy],—so this is an intuitive convention. See below for a few finals which are abbreviated after a consonant plus *w/u* or *y/i* medial: *wen* → C+*un,wei* → C+*ui,* *weng* → C+*ong,* and *you* → C+*iu.*  **\*\* Note on the apostrophe**  The [apostrophe](http://en.wikipedia.org/wiki/Apostrophe) (') is used before a syllable starting with a vowel (*a*, *o*, or *e*) in a multiple-syllable word when the syllable does not start the word (which is most commonly realized as [ɰ]), unless the syllable immediately follows a [hyphen](http://en.wikipedia.org/wiki/Hyphen) or other dash.[[31]](http://en.wikipedia.org/wiki/Pinyin#cite_note-apostrophes-31) This is done to remove ambiguity that could arise, as in [*Xi'an*](http://en.wikipedia.org/wiki/Xi%27an), which consists of the two syllables *xi* ("西") *an* ("安"), compared to such words as *xian* ("先"). (This ambiguity does not occur when tone marks are used: The two tone marks in *Xīān* unambiguously show that the word consists of two syllables. However, even with tone marks, the city is usually spelled with an apostrophe as *Xī'ān*.) Pronunciation of finals [http://upload.wikimedia.org/wikipedia/en/thumb/5/5a/IPA_vowel_chart_2005.png/220px-IPA_vowel_chart_2005.png](http://en.wikipedia.org/wiki/File:IPA_vowel_chart_2005.png)  This table may be a useful reference for IPA vowel symbols  The following is a list of finals in Standard Chinese, excepting most of those ending with *r*.  To find a given final:   1. Remove the initial consonant. *Zh, ch,* and *sh* count as initial consonants. 2. Change initial *w* to *u* and initial *y* to *i.* For *weng, wen, wei, you,* look under *ong, un, ui, iu.* 3. For *u* after *j, q, x,* or *y,* look under *ü.*  |  |  |  |  | | --- | --- | --- | --- | | **Pinyin** | [**IPA**](http://en.wikipedia.org/wiki/Help:IPA) | **Form with**[**zero initial**](http://en.wikipedia.org/wiki/Zero_initial) | **Explanation** | | *-i* | [[ɨ](http://en.wikipedia.org/wiki/Close_central_unrounded_vowel)], [[ɯ](http://en.wikipedia.org/wiki/Close_back_unrounded_vowel)] | (*n/a*) | -i is a buzzed continuation of the consonant following z-, c-, s-, zh-, ch-, sh- or r-.  (In all other cases, -i has the sound of b**ee**; this is listed below.) | | *A* | [[ä](http://en.wikipedia.org/wiki/Open_central_unrounded_vowel)] | **a** | like English "f**a**ther", but a bit more fronted | | *E* | [ɯ̯ʌ], [[ə](http://en.wikipedia.org/wiki/Mid-central_vowel)] | **e** | a diphthong consisting first of a back, unrounded semivowel (which can be formed by first pronouncing "w" and then spreading the lips without changing the position of the tongue) followed by a vowel similar to English "d**uh**". Many unstressed syllables in Chinese use the[schwa](http://en.wikipedia.org/wiki/Schwa) [ə] (ide**a**), and this is also written as *e*. | | *Ai* | [aɪ̯] | **ai** | like English "eye", but a bit lighter | | *Ei* | [eɪ̯] | **ei** | as in "h**ey**" | | *Ao* | [ɑʊ̯] | **ao** | approximately as in "c**ow**"; the *a* is much more audible than the *o* | | *Ou* | [oʊ̯] | **ou** | as in "s**o**" | | *An* | [än] | **an** | like British English "b**an**", but more central | | *En* | [ən] | **en** | as in "tak**en**" | | *Ang* | [ɑŋ] | **ang** | as in German *Angst* (starts with the vowel sound in f**a**ther and ends in the [velar nasal](http://en.wikipedia.org/wiki/Velar_nasal); like s**ong** in some dialects of American English) | | *Eng* | [ɤŋ] | **eng** | like *e* in *en* above but with ng added to it at the back | | *er* | [ɑɻ] | **er** | similar to the sound in "b**ar**" in American English | | **Finals beginning with i- (y-)** | | | | | *I* | [[i](http://en.wikipedia.org/wiki/Close_front_unrounded_vowel)] | **yi** | like English b**ee**. | | *Ia* | [i̯ä] | **ya** | as **i** + **a**; like English "**ya**rd" | | *Ie* | [i̯ɛ] | **ye** | as **i** + **ê**; but is very short; *e* (pronounced like *ê*) is pronounced longer and carries the main stress (similar to the initial sound **ye** in **yet**) | | *Iao* | [i̯ɑʊ̯] | **yao** | as **i** + **ao** | | *Iu* | [i̯oʊ̯] | **you** | as **i** + **ou** | | *Ian* | [i̯ɛn] | **yan** | as **i** + **ê** + **n**; like English **yen** | | *In* | [in] | **yin** | as **i** + **n** | | *Iang* | [i̯ɑŋ] | **yang** | as **i** + **ang** | | *Ing* | [iŋ] | **ying** | as **i** + **ng** | | **Finals beginning with u- (w-)** | | | | | *U* | [[u](http://en.wikipedia.org/wiki/Close_back_rounded_vowel)] | **wu** | like English "oo" | | *Ua* | [u̯ä] | **wa** | as **u** + **a** | | *uo*, *o* | [u̯ɔ] | **wo** | as **u** + **o** where the *o* (compare with the *o* interjection) is pronounced shorter and lighter (spelled as **o** after b, p, m or f). | | *Uai* | [u̯aɪ̯] | **wai** | as **u** + **ai** like as in **why** | | *Ui* | [u̯eɪ̯] | **wei** | as **u** + **ei**; | | *Uan* | [u̯än] | **wan** | as **u** + **an**; | | *Un* | [u̯ən] | **wen** | as **u** + **en**; like the *on* in the English *won*; | | *uang* | [u̯ɑŋ] | **wang** | as **u** + **ang**; | | *Ong* | [ʊŋ], [u̯ɤŋ] | **weng** | starts with the vowel sound in b**oo**k and ends with the velar nasal sound in si**ng**; as **u** + **eng** in zero initial. | | **Finals beginning with ü- (yu-)** | | | | | *u*, *ü* | [[y]](http://en.wikipedia.org/wiki/Help:IPA_for_Mandarin) ([http://upload.wikimedia.org/wikipedia/commons/thumb/2/21/Speaker_Icon.svg/13px-Speaker_Icon.svg.png](http://en.wikipedia.org/wiki/File:Close_front_rounded_vowel.ogg) [listen](http://upload.wikimedia.org/wikipedia/commons/e/ea/Close_front_rounded_vowel.ogg)) | **yu** | as in German "**ü**ber" or French "l**u**ne" (To pronounce this sound, say "ee" with rounded lips) | | *ue, üe* | [y̯œ] | **yue** | as **ü** + **ê**; the *ü* is short and light | | *uan* | [y̯ɛn] | **yuan** | as **ü** + **ê** + **n**; | | *Un* | [yn] | **yun** | as **ü** + **n**; | | *Iong* | [i̯ʊŋ] | **yong** | as **i** + **ong** | | **Interjections** | | | | | *Ê* | [[ɛ](http://en.wikipedia.org/wiki/Open-mid_front_unrounded_vowel)] | (*n/a*) | as in "b**e**t". | | *O* | [[ɔ](http://en.wikipedia.org/wiki/Open-mid_back_rounded_vowel)] | (*n/a*) | Approximately as in "**o**ffice" in British accent; the lips are much more rounded. | | *Io* | [i̯ɔ] | **yo** | as **i** + plain continental[[*clarification needed*](http://en.wikipedia.org/wiki/Wikipedia:Please_clarify)] "o". |  OrthographyLetters Pinyin differs from other romanizations in several aspects, such as the following:   * Syllables starting with *u* are written as *w* in place of *u* (e.g., *uan* is written as *wan*). Standalone *u* is written as *wu*. * Syllables starting with *i* are written as *y* in place of *i* (e.g., *ian* is written as *yan*). Standalone *i* is written as *yi*. * Syllables starting with *ü* are written as *yu* in place of *ü* (e.g., *üe* is written as *yue*). * *ü* is written as *u* when there is no ambiguity (such as *ju*, *qu*, and *xu*), but written as *ü* when there are corresponding *u* syllables (such as *lü* and *nü*). In such situations where there are corresponding *u* syllables, it is often replaced with *v* on a computer, making it easier to type on a standard keyboard. * When preceded by a consonant, *iou*, *uei*, and *uen* are simplified as *iu*, *ui*, and *un* (which do not represent the actual pronunciation). * As in zhuyin, what are actually pronounced as *buo*, *puo*, *muo*, and *fuo* are given a separate representation: *bo*, *po*, *mo*, and *fo*. * The [apostrophe](http://en.wikipedia.org/wiki/Apostrophe) (') is used before a syllable starting with a vowel (*a*, *o*, or *e*) in a multiple-syllable word when the syllable does not start the word (which is most commonly realized as [ɰ]), unless the syllable immediately follows a [hyphen](http://en.wikipedia.org/wiki/Hyphen) or other dash.[[31]](http://en.wikipedia.org/wiki/Pinyin#cite_note-apostrophes-31) This is done to remove ambiguity that could arise, as in [*Xi'an*](http://en.wikipedia.org/wiki/Xi%27an), which consists of the two syllables *xi* ("西") *an* ("安"), compared to such words as *xian* ("先"). (This ambiguity does not occur when tone marks are used: The two tone marks in "Xīān" unambiguously show that the word consists of two syllables. However, even with tone marks, the city is usually spelled with an apostrophe as "Xī'ān".) * *Eh* alone is written as *ê*; elsewhere as *e*. [Schwa](http://en.wikipedia.org/wiki/Schwa) is always written as *e*. * *zh*, *ch*, and *sh* can be abbreviated as *ẑ*, *ĉ*, and *ŝ* (*z*, *c*, *s* with a [circumflex](http://en.wikipedia.org/wiki/Circumflex)). However, the shorthands are rarely used due to difficulty of entering them on computers, and are confined mainly to [Esperanto](http://en.wikipedia.org/wiki/Esperanto) keyboard layouts. * *ng* has the uncommon shorthand of [*ŋ*](http://en.wikipedia.org/wiki/%C5%8A). * The letter *v* is unused (except in spelling foreign languages, languages of minority nationalities, and some dialects), despite a conscious effort to distribute letters more evenly than in Western languages. However, sometimes, for ease of typing into a computer, the *v* is used to replace a *ü*.   Most of the above are used to avoid ambiguity when writing words of more than one syllable in pinyin. For example *uenian* is written as *wenyan* because it is not clear which syllables make up *uenian*; *uen-ian*, *uen-i-an* and *u-en-i-an* are all possible combinations whereas *wenyan* is unambiguous because *we*, *nya*, etc. do not exist in pinyin. See the [pinyin table](http://en.wikipedia.org/wiki/Pinyin_table) article for a summary of possible pinyin syllables (not including tones). Word formation, capitalization, initialisms and punctuation Although Chinese characters represent single syllables, Mandarin Chinese is a [polysyllabic](http://en.wikipedia.org/wiki/Polysyllabic) language. Spacing in pinyin is based on whole words, not single syllables. However, there are often ambiguities in partitioning a word. *The Basic Rules of the Chinese Phonetic Alphabet Orthography* (汉语拼音正词法基本规则; 漢語拼音正詞法基本規則; *Hànyǔ Pīnyīn Zhèngcífǎ Jīběn Guīzé*) were put into effect in 1988 by the National Educational Commission (国家教育委员会; 國家教育委員會;*Guójiā Jiàoyù Wěiyuánhuì*) and the National Language Commission (国家语言文字工作委员会; 國家語言文字工作委員會; *Guójiā Yǔyán Wénzì Gōngzuò Wěiyuánhuì*).[[32]](http://en.wikipedia.org/wiki/Pinyin#cite_note-ortho-32) These rules became a Guobiao standard in 1996[[32]](http://en.wikipedia.org/wiki/Pinyin#cite_note-ortho-32) and were updated in 2012.[[33]](http://en.wikipedia.org/wiki/Pinyin#cite_note-33)   1. **General**    1. **Single meaning:** Words with a single meaning, which are usually set up of two characters (sometimes one, seldom three), are written together and not capitalized: *rén* (人, person); *péngyou* (朋友, friend); *qiǎokèlì* (巧克力, chocolate)    2. **Combined meaning (2 or 3 characters):** Same goes for words combined of two words to one meaning: *hǎifēng* (海风; 海風, sea breeze); *wèndá* (问答; 問答, question and answer); *quánguó* (全国; 全國, nationwide); *chángyòngcí* (常用词; 常用詞)    3. **Combined meaning (4 or more characters):** Words with four or more characters having one meaning are split up with their original meaning if possible: *wúfèng gāngguǎn* (无缝钢管; 無縫鋼管, seamless steel-tube); *huánjìng bǎohù guīhuà* (环境保护规划; 環境保護規劃, environmental protection planning); *gāoměngsuānjiǎ* (高锰酸钾; 高錳酸鉀, potassium permanganate) 2. **Duplicated words**    1. **AA:** Duplicated characters (AA) are written together: *rénrén* (人人, everybody), *kànkan* (看看, to have a look), *niánnián* (年年, every year)    2. **ABAB:** Two characters duplicated (ABAB) are written separated: *yánjiū yánjiū* (研究研究, to study, to research), *xuěbái xuěbái* (雪白雪白, white as snow)    3. **AABB:** Characters in the AABB schema are written together: *láiláiwǎngwǎng* (来来往往; 來來往往, come and go), *qiānqiānwànwàn* (千千万万; 千千萬萬, numerous) 3. **Prefixes** (前附成分; *qiánfù chéngfèn*) **and Suffixes** (后附成分; 後附成分; *hòufù chéngfèn*): Words accompanied by prefixes such as *fù* (副, vice), *zǒng* (总; 總, chief), *fēi* (非, non-), *fǎn* (反, anti-), *chāo* (超, ultra-), *lǎo* (老, old), *ā* (阿, used before names to indicate familiarity), *kě* (可, -able), *wú* (无; 無, -less) and *bàn*(半, semi-) and suffixes such as *zi* (子, noun suffix), *r* (儿; 兒, diminutive suffix), *tou* (头; 頭, noun suffix), *xìng* (性, -ness, -ity), *zhě* (者, -er, -ist), *yuán* (员; 員, person), *jiā* (家, -er, -ist), *shǒu* (手, person skilled in a field), *huà* (化, -ize) and *men* (总; 們, plural marker) are written together: *fùbùzhǎng* (副部长; 副部長, vice minister), *chéngwùyuán* (乘务员; 乘務員, conductor), *háizimen* (孩子们; 孩子們, children) 4. **Nouns and names** (名词; 名詞; *míngcí*)    1. Words of position are separated: *mén wài* (门外; 門外, outdoor), *hé li* (河里; 河裏, under the river), *huǒchē shàngmian* (火车上面; 火車上面, on the train), *Huáng Hé yǐnán* (黄河以南; 黃河以南, south of the Yellow River)       1. Exceptions are words traditionally connected: *tiānshang* (天上, in the sky or outerspace), *dìxia* (地下, on the ground), *kōngzhōng* (空中, in the air), *hǎiwài* (海外, overseas)    2. Surnames are separated from the given names, each capitalized: *Lǐ Huá* (李华; 李華), *Zhāng Sān* (张三; 張三). If the surname and/or given name consists of two syllables, it should be written as one: *Zhūgě Kǒngmíng* (诸葛孔明; 諸葛孔明).    3. Titles following the name are separated and are not capitalized: *Wáng bùzhǎng* (王部长; 王部長, Minister Wang), *Lǐ xiānsheng* (李先生, Mr. Li), *Tián zhǔrèn* (田主任, Director Tian), *Zhào tóngzhì* (赵同志; 趙同志, Comrade Zhao).    4. The forms of addressing people with suffixes such as *Lǎo* (老), *Xiǎo* (小), *Dà* (大) and *Ā* (阿) are capitalized: *Xiǎo Liú* (小刘; 小劉, [young] Ms./Mr. Liu),*Dà Lǐ* (大李, [great; elder] Mr. Li), *Ā Sān* (阿三, Ah San), *Lǎo Qián* (老钱; 老錢, [senior] Mr. [Qian](http://en.wikipedia.org/wiki/Qian_(disambiguation))), *Lǎo Wú* (老吴; 老吳, [senior] Mr. Wu)       1. Exceptions are: *Kǒngzǐ* (孔子, [Confucius](http://en.wikipedia.org/wiki/Confucius)), *Bāogōng* (包公, [Judge Bao](http://en.wikipedia.org/wiki/Bao_Zheng)), *Xīshī* (西施, [Xishi](http://en.wikipedia.org/wiki/Xi_Shi)), *Mèngchángjūn* (孟尝君; 孟嘗君, [Lord Mengchang](http://en.wikipedia.org/wiki/Lord_Mengchang)), among others    5. Geographical names of China: *Běijīng Shì* (北京市, city of [Beijing](http://en.wikipedia.org/wiki/Beijing)), *Héběi Shěng* (河北省, province of [Hebei](http://en.wikipedia.org/wiki/Hebei)), *Yālù Jiāng* (鸭绿江; 鴨綠江, [Yalu River](http://en.wikipedia.org/wiki/Yalu_River)),*Tài Shān* (泰山, [Mount Tai](http://en.wikipedia.org/wiki/Mount_Tai)), *Dòngtíng Hú* (洞庭湖, [Dongting Lake](http://en.wikipedia.org/wiki/Dongting_Lake)), *Táiwān Hǎixiá* (台湾海峡; 臺灣海峽, [Taiwan Strait](http://en.wikipedia.org/wiki/Taiwan_Strait))       1. Monosyllabic prefixes and suffixes are written together with their related part: *Dōngsì Shítiáo* (东四*十*条; 東四*十*條, Dongsi 10th Alley)       2. Common geographical nouns that have become part of proper nouns are written together: *Hēilóngjiāng* (黑龙江; 黑龍江, [Heilongjiang](http://en.wikipedia.org/wiki/Heilongjiang))    6. Chinese names of Non-Chinese names are written in Hanyu Pinyin: *Āpèi Āwàngjìnměi* (阿沛·阿旺晋美; 阿沛·阿旺晉美, [Ngapoi Ngawang Jigme](http://en.wikipedia.org/wiki/Ngapoi_Ngawang_Jigme));*Dōngjīng* (东京; 東京, [Tokyo](http://en.wikipedia.org/wiki/Tokyo)) 5. **Verbs** (动词; 動詞; *dòngcí*): Verbs and their suffixes *-zhe* (着; 著), *-le* (了) or *-guo* ((过; 過) are written as one: *kànzhe* (看着; 看著, seeing), *jìnxíngguo* (进行过;進行過, have been implemented). *Le* as it appears in the end of a sentence is separated though: *Huǒchē dào le.* (火车到了; 火車到了, The train [has] arrived).    1. Verbs and their objects are separated: *kàn xìn* (看信, read a letter), *chī yú* (吃鱼; 吃魚, eat fish), *kāi wánxiào* (开玩笑; 開玩笑, to be kidding).    2. If verbs and their complements are each monosyllabic, they are written together; if not, they are separated: *gǎohuài* (搞坏; 搞壞, to make broken), *dǎsǐ*(打死, hit to death), *huàwéi* (化为; 化為, to become), *zhěnglǐ hǎo* (整理好, to sort out), *gǎixiě wéi* (改写为; 改寫為, to rewrite as) 6. **Adjectives** (动词; 動詞; *xíngróngcí*): A monosyllabic adjective and its reduplication are written as one: *mēngmēngliàng* (矇矇亮, dim), *liàngtángtáng* (亮堂堂, shining bright)    1. Complements of size or degree such as *xiē* (些), *yīxiē* (一些), *diǎnr* (点儿; 點兒) and *yīdiǎnr* (一点儿; 一點兒) are written separated: *dà xiē* (大些), a little bigger), *kuài yīdiǎnr* (快一点儿; 快一點兒, a bit faster) 7. **Pronouns** (代词; 代詞; *dàicí*)    1. Personal pronouns and interrogative pronouns are separated from other words: *Wǒ ài Zhōngguó.* (我爱中国。; 我愛中國。, I love China); *Shéi shuō de?* (谁说的？; 誰說的？, Who said it?)    2. The demonstrative pronoun *zhè* (这; 這, this), *nà* (那, that) and the question pronoun *nǎ* (哪, which) are separated: *zhè rén* (这人; 這人, this person),*nà cì huìyì* (那次会议; 那次會議, that meeting), *nǎ zhāng bàozhǐ* (哪张报纸; 哪張報紙, which newspaper)       1. Exception—If *zhè*, *nà* or *nǎ* are followed by *diǎnr* (点儿; 點兒), *bān* (般), *biān* (边; 邊), *shí* (时; 時), *huìr* (会儿; 會兒), *lǐ* (里; 裏), *me* (么; 麼) or the general classifier*ge* (个; 個), they are written together: *nàlǐ* (那里; 那裏, there), *zhèbiān* (这边; 這邊, over here), *zhège* (这个; 這個, this) 8. **Numerals** (数词; 數詞; *shùcí*) **and measure words** (量词; 量詞; *liàngcí*)    1. Numbers and words like *gè* (各, each), *měi* (每, each), *mǒu* (某, any), *běn* (本, this), *gāi* (该; 該, that), *wǒ* (我, my, our) and *nǐ* (你, your) are separated from the measure words following them: *liǎng ge rén* (两个人; 兩個人, two people), *gè guó* (各国; 各國, every nation), *měi nián* (每年, every year), *mǒu gōngchǎng* (某工厂; 某工廠, a certain factory), *wǒ xiào* (我校, our school)    2. Numbers up to 100 are written as single words: *sānshísān* (三十三, thirty-three). Above that, the hundreds, thousands, etc. are written as separate words: *jiǔyì qīwàn èrqiān sānbǎi wǔshíliù* (九亿七万二千三百五十六; 九億七萬二千三百五十六, nine hundred million, seventy-two thousand, three hundred fifty-six). Arabic numerals are kept as Arabic numerals: *635 fēnjī* (635 分机; 635 分機, extension 635)    3. The *dì* (第) of [ordinal numerals](http://en.wikipedia.org/wiki/Ordinal_numeral) is hyphenated: *dì-yī* (第一, first), *dì-356* (第 356, 356th). The *chū* (初) in front of numbers one to ten is written together with the number: *chūshí* (初十, tenth day)    4. Numbers representing month and day are hyphenated: *wǔ-sì* (五四, [May fourth](http://en.wikipedia.org/wiki/May_Fourth_Movement)), *yīèr-jiǔ* (一二·九, [December ninth](http://en.wikipedia.org/wiki/December_9th_Movement))    5. Words of approximations such as *duō* (多), *lái* (来; 來) and *jǐ* (几; 幾) are separated from numerals and measure words: *yībǎi duō gè* (一百多个; 一百多個, around a hundred); *shí lái wàn gè* (十来万个; 十來萬個, around a hundred thousand); *jǐ jiā rén* (几家人; 幾家人, a few families)       1. *Shíjǐ* (十几; 十幾, more than ten) and *jǐshí* (几十; 幾十, tens) are written together: *shíjǐ gè rén* (十几个人; 十幾個人, more than ten people); *jǐshí*(几十根钢管; 幾十根鋼管, tens of steel pipes)    6. Approximations with numbers or units that are close together are hyphenated: *sān-wǔ tiān* (三五天, three to five days), *qiān-bǎi cì* (千百次, thousands of times) 9. Other **function words** (虚词; 虛詞; *xūcí*) are separated from other words, including:    1. Adverbs (副词; 副詞; *fùcí*): *hěn hǎo* (很好, very good), *zuì kuài* (最快, fastest), *fēicháng dà* (非常大, extremely big)    2. Prepositions (介词; 介詞; *jiècí*): *zài qiánmiàn* (在前面, in front)    3. Conjunctions (连词; 連詞; *liáncí*): *nǐ hé wǒ* (你和我, you and I/me), *Nǐ lái háishi bù lái?* (你来还是不来？; 你來還是不來？, Are you coming or not?)    4. "Constructive auxiliaries" (结构助词; 結構助詞; *jiégòu zhùcí*) such as *de* (的/地/得), *zhī* (之) and *suǒ* (所): *mànmàn de zou* (慢慢地走), go slowly)       1. A monosyllabic word can also be written together with *de* (的/地/得): *wǒ de shū* / *wǒde shū* (我的书; 我的書, my book)    5. Modal auxiliaries at the end of a sentence: *Nǐ zhīdào ma?* (你知道吗？; 你知道嗎？, Do you know?), *Kuài qù ba!* (快去吧！, Go quickly!)    6. Exclamations and interjections: *À! Zhēn měi!* (啊！真美！), Oh, that's so beautiful!)    7. Onomatopoeia: *mó dāo huòhuò* (磨刀霍霍, honing a knife), *hōnglōng yī shēng* (轰隆一声; 轟隆一聲, rumbling) 10. **Capitalization**     1. The first letter of the first word in a sentence is capitalized: *Chūntiān lái le.* (春天来了。; 春天來了。, Spring has arrived.)     2. The first letter of each line in a poem is capitalized.     3. The first letter of a proper noun is capitalized: *Beǐjīng* (北京, Beijing), *Guójì Shūdiàn* (国际书店; 國際書店, International Bookstore), *Guójiā Yǔyán Wénzì Gōngzuò Wěiyuánhuì* (国家语言文字工作委员会; 國家語言文字工作委員會, National Language Commission)        1. On some occasions, proper nouns can be written in [all caps](http://en.wikipedia.org/wiki/All_caps): *BĚIJĪNG*, *GUÓJÌ SHŪDIÀN*, *GUÓJIĀ YǓYÁN WÉNZÌ GŌNGZUÒ WĚIYUÁNHUÌ*     4. If a proper noun is written together with a common noun to make a proper noun, it is capitalized. If not, it is not capitalized: *Fójiào* (佛教, Buddhism),*Tángcháo* (唐朝, Tang dynasty), *jīngjù* (京剧; 京劇, Beijing opera), *chuānxiōng* (川芎, [Szechuan lovage](http://en.wikipedia.org/wiki/Ligusticum_wallichii)) 11. **Initialisms**     1. Single words are abbreviated by taking the first letter of each character of the word: ***B****eǐ****j****īng* (北京, Beijing) → *BJ*     2. A group of words are abbreviated by taking the first letter of each word in the group: ***g****uójiā****b****iāozhǔn* (国家标准; 國家標準, Guobiao standard) → *GB*     3. Initials can also be indicated using full stops: *Beǐjīng* → *B.J.*, *guójiā biāozhǔn* → *G.B.*     4. When abbreviating names, the surname is written fully (first letter capitalized or in all caps), but only the first letter of each character in the given name is taken, with full stops after each initial: *Lǐ Huá* (李华; 李華) → *Lǐ H.* or *LǏ H.*, *Zhūgě Kǒngmíng* (诸葛孔明; 諸葛孔明) → *Zhūgě K. M.* or *ZHŪGĚ K. M.* 12. **Line Wrapping**     1. Words can only be split by the character: *guāngmíng* (光明, bright) → *guāng- míng*, not *gu- āngmíng*     2. Initials cannot be split: *Wáng J. G.* (王建国; 王建國) → *Wáng J. G.*, not *Wáng J.- G.*     3. Apostrophes disappear in line wrapping: *Xī'ān* (西安, Xi'an) → *Xī- ān*, not *Xī'- ān*     4. When the original word has a hyphen, the hyphen is added at the beginning of the new line: *chēshuǐ-mǎlóng* (车水马龙; 車水馬龍, heavy traffic: "carriage, water, horse, dragon") → *chēshuǐ- -mǎlóng* 13. **Hyphenation**: In addition to the situations mentioned above, there are four situations where hyphens are used.     1. Coordinate and disjunctive compound words, where the two elements are conjoined or opposed, but retain their individual meaning: *gōng-jiàn* (弓箭, bow and arrow), *kuài-màn* (快慢, speed: "fast-slow"), *shíqī-bā suì* (十七八岁; 十七八歲, 17–18 years old), *dǎ-mà* (打骂; 打罵, beat and scold), *Yīng-Hàn*(英汉; 英漢, English-Chinese [dictionary]), *Jīng-Jīn* (京津, Beijing-Tianjin), *lù-hǎi-kōngjūn* (陆海空军; 陸海空軍, army-navy-airforce).     2. Abbreviated compounds (略语; 略語; *luèyǔ*): *gōnggòng guānxì* (公共关系; 公共關係, public relations) → *gōng-guān* (公关; 公關, PR), *chángtú diànhuà*(长途电话; 長途電話, long-distance calling) → *cháng-huà* (长话; 長話, LDC). Exceptions are made when the abbreviated term has become established as a word in its own right, as in *chūzhōng* (初中) for *chūjí zhōngxué* (初级中学; 初級中學, junior high school). Abbreviations of proper-name compounds, however, should always be hyphenated: *Běijīng Dàxué* (北京大学; 北京大學, [Peking University](http://en.wikipedia.org/wiki/Peking_University)) → *Běi-Dà* (北大, PKU).     3. [Four-syllable idioms](http://en.wikipedia.org/wiki/Chengyu): *fēngpíng-làngjìng* (风平浪静; 風平浪靜), calm and tranquil: "wind calm, waves down"), *huījīn-rútǔ* (挥金如土; 揮金如土, spend money like water: "throw gold like dirt"), *zhǐ-bǐ-mò-yàn* (纸笔墨砚; 紙筆墨硯, paper-brush-ink-inkstone [four coordinate words]). (The AA-BB reduplication above is an instance of this.)[[34]](http://en.wikipedia.org/wiki/Pinyin#cite_note-34)        1. Other idioms are separated according to the words that make up the idiom: *bēi hēiguō* (背黑锅; 背黑鍋, to be made a scapegoat: "to carry a black pot"), *zhǐ xǔ zhōuguān fànghuǒ, bù xǔ bǎixìng diǎndēng* (只许州官放火，不许百姓点灯; 只許州官放火，不許百姓點燈, Gods may do what cattle may not: "only the official is allowed to light the fire; the commoners are not allowed to light a lamp") 14. **Punctuation**     1. The Chinese full stop (。) is changed to a western full stop (.).     2. The hyphen is a half-width hyphen (-).     3. Ellipsis can be changed from 6 dots (……) to 3 dots (…).     4. The enumeration comma (、) is changed to a normal comma (,).     5. All other punctuation marks are the same as the ones used in normal texts.  Tones [http://upload.wikimedia.org/wikipedia/commons/thumb/5/58/Pinyin_Tone_Chart.svg/115px-Pinyin_Tone_Chart.svg.png](http://en.wikipedia.org/wiki/File:Pinyin_Tone_Chart.svg)  Relative pitch changes of the four tones  The pinyin system also uses [diacritics](http://en.wikipedia.org/wiki/Diacritic) to mark the four [tones of Mandarin](http://en.wikipedia.org/wiki/Standard_Chinese_phonology#Tones). The diacritic is placed over the letter that represents the [syllable nucleus](http://en.wikipedia.org/wiki/Syllable_nucleus), unless that letter is missing (see below). Many books printed in China use a mix of fonts, with vowels and tone marks rendered in a different font from the surrounding text, tending to give such pinyin texts a typographically ungainly appearance. This style, most likely rooted in early technical limitations, has led many to believe that pinyin's rules call for this practice and also for the use of a [Latin alpha](http://en.wikipedia.org/wiki/Latin_alpha) (*ɑ*) rather than the standard style of the letter (*a*) found in most fonts. The official rules of *Hanyu Pinyin,* however, specify no such practice.   1. The first tone (Flat or High Level Tone) is represented by a [macron](http://en.wikipedia.org/wiki/Macron) (ˉ) added to the pinyin vowel:   ā (ɑ̄) ē ī ō ū ǖ Ā Ē Ī Ō Ū Ǖ   1. The second tone (Rising or High-Rising Tone) is denoted by an [acute accent](http://en.wikipedia.org/wiki/Acute_accent) (ˊ):   á (ɑ́) é í ó ú ǘ Á É Í Ó Ú Ǘ   1. The third tone (Falling-Rising or Low Tone) is marked by a [caron](http://en.wikipedia.org/wiki/Caron)/háček (ˇ). It is not the rounded [breve](http://en.wikipedia.org/wiki/Breve) (˘), though a breve is sometimes substituted due to font limitations.   ǎ (ɑ̌) ě ǐ ǒ ǔ ǚ Ǎ Ě Ǐ Ǒ Ǔ Ǚ   1. The fourth tone (Falling or High-Falling Tone) is represented by a [grave accent](http://en.wikipedia.org/wiki/Grave_accent) (ˋ):   à (ɑ̀) è ì ò ù ǜ À È Ì Ò Ù Ǜ   1. The fifth tone (Neutral Tone) is represented by a normal vowel without any accent mark:   a (ɑ) e i o u ü A E I O U Ü  (In some cases, this is also written with a dot before the syllable; for example, ·ma.)[[*citation needed*](http://en.wikipedia.org/wiki/Wikipedia:Citation_needed)]  These tone marks normally are only used in Mandarin textbooks or in foreign learning texts, but they are essential for correct pronunciation of Mandarin syllables, as exemplified by the following classic example of five characters whose pronunciations differ only in their tones:   |  | | --- | | Traditional characters: | | Simplified characters: |   The words are "mother", "hemp", "horse", "scold" and a question particle, respectively. Numerals in place of tone marks Before the advent of computers, many typewriter fonts did not contain vowels with [macron](http://en.wikipedia.org/wiki/Macron) or [caron](http://en.wikipedia.org/wiki/Caron) diacritics. Tones were thus represented by placing a [tone number](http://en.wikipedia.org/wiki/Tone_number) at the end of individual syllables. For example, *tóng* is written *tong2.* The number used for each tone is as the order listed above, except the neutral tone, which is either not numbered, or given the number 0 or 5, e.g. *ma5* for 吗/嗎, an [interrogative](http://en.wikipedia.org/wiki/Interrogative) marker.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Tone** | **Tone Mark** | **Number added to end of syllable in place of tone mark** | **Example using tone mark** | **Example using number** | [**IPA**](http://en.wikipedia.org/wiki/Help:IPA) | | First | [macron](http://en.wikipedia.org/wiki/Macron) ( ¯ ) | 1 | mā | ma1 | mɑ˥ | | Second | [acute accent](http://en.wikipedia.org/wiki/Acute_accent) ( ´ ) | 2 | má | ma2 | mɑ˧˥ | | Third | [caron](http://en.wikipedia.org/wiki/Caron) ( ˇ ) | 3 | mǎ | ma3 | mɑ˨˩˦ | | Fourth | [grave accent](http://en.wikipedia.org/wiki/Grave_accent) ( ` ) | 4 | mà | ma4 | mɑ˥˩ | | "Neutral" | No mark or dot before syllable (·) | no number 5 0 | ma ·ma | ma ma5 ma0 | mɑ |  Rules for placing the tone mark Briefly, the tone mark should always be placed by the order—*a, o, e, i, u, ü*, with the only exception being *iu,* where the tone mark is placed on the *u* instead. Pinyin tone marks appear primarily above the [nucleus of the syllable](http://en.wikipedia.org/wiki/Syllable_nucleus), for example as in *kuài,* where *k* is the initial, *u* the medial, *a* the nucleus, and *i* the coda. The exception is syllabic nasals like /m/, where the nucleus of the syllable is a consonant, the diacritic will be carried by a written dummy vowel.  When the nucleus is /ə/ (written *e* or *o*), and there is both a medial and a coda, the nucleus may be dropped from writing. In this case, when the coda is a consonant*n* or *ng,* the only vowel left is the medial *i, u,* or *ü,* and so this takes the diacritic. However, when the coda is a vowel, it is the coda rather than the medial which takes the diacritic in the absence of a written nucleus. This occurs with syllables ending in *-ui* (from *wei*: (wèi → -uì) and in *-iu* (from *you: yòu → -iù.*) That is, in the absence of a written nucleus the finals have priority for receiving the tone marker, as long as they are vowels: if not, the medial takes the diacritic.  An algorithm to find the correct vowel letter (when there is more than one) is as follows:[[35]](http://en.wikipedia.org/wiki/Pinyin#cite_note-35)   1. If there is an *a* or an *e,* it will take the tone mark. 2. If there is an *ou,* then the *o* takes the tone mark. 3. Otherwise, the second vowel takes the tone mark.   Worded differently,   1. If there is an *a, e,* or *o,* it will take the tone mark; in the case of *ao,* the mark goes on the *a*. 2. Otherwise, the vowels are *-iu* or *-ui,* in which case the second vowel takes the tone mark.   If the tone is written over an *i*, the [tittle](http://en.wikipedia.org/wiki/Tittle) above the *i* is omitted, as in *yī.* Phonological intuition The placement of the tone marker, when more than one of the written letters *a, e, i, o,* and *u* appears, can also be inferred from the nature of the vowel sound in the medial and final. The rule is that the tone marker goes on the spelled vowel that is not a (near-)semi-vowel. The exception is that, for triphthongs that are spelled with only two vowel letters, both of which are the semi-vowels, the tone marker goes on the second spelled vowel.  Specifically, if the spelling of a [diphthong](http://en.wikipedia.org/wiki/Diphthong) begins with *i* (as in *ia*) or *u* (as in *ua*), which here serves as a near-[semi-vowel](http://en.wikipedia.org/wiki/Semi-vowel), this letter does not take the tone marker. Likewise, if the spelling of a diphthong ends with *o* or *u* representing a near-semi-vowel (as in *ao* or *ou*), this letter does not receive a tone marker. In a [triphthong](http://en.wikipedia.org/wiki/Triphthong)spelled with three of *a, e, i, o,* and *u* (with *i* or *u* replaced by *y* or *w* at the start of a syllable), the first and third letters coincide with near-semi-vowels and hence do not receive the tone marker (as in *iao* or *uai* or *iou*). But if no letter is written to represent a triphthong's middle (non-semi-vowel) sound (as in *ui* or *iu*), then the tone marker goes on the final (second) vowel letter. Using tone colors In addition to [tone number](http://en.wikipedia.org/wiki/Tone_number) and mark, tone color has been suggested as a visual aid for learning. Although there are no formal standards, there are a number of different color schemes in use.   * Dummitt's color scheme was one of the first to be used. It is tone 1 - red, tone 2 - orange, tone 3 - green, tone 4 - blue and neutral tone - black.[[36]](http://en.wikipedia.org/wiki/Pinyin#cite_note-36) * The Unimelb color scheme is tone 1 - blue, tone 2 - green, tone 3 - purple, tone 4 - red, neutral tone - grey * The Hanping color scheme is tone 1 - blue, tone 2 - green, tone 3 - orange, tone 4 - red, neutral tone - grey.[[37]](http://en.wikipedia.org/wiki/Pinyin#cite_note-37) * The Pleco color scheme is tone 1 - red, tone 2 - green, tone 3 - blue, tone 4 - purple, neutral tone - grey * The Thomas color scheme is tone 1 - green, tone 2 - blue, tone 3 - red, tone 4 - black, neutral tone - grey  Third tone exceptions In spoken Chinese, the third tone is often pronounced as a "half third tone," in which the pitch does not rise. Additionally, when two third tones appear consecutively, such as in 你好 (nǐhǎo, hello), the first syllable is pronounced with the second tone. In pinyin, words like "hello" are still written with two third tones (nǐhǎo). The *ü* sound An [umlaut](http://en.wikipedia.org/wiki/Diaeresis_(diacritic)) is placed over the letter *u* when it occurs after the initials *l* and *n* in order to represent the sound [y]. This is necessary in order to distinguish the front high rounded vowel in *lü* (e.g. 驴; 驢; "donkey") from the back high rounded vowel in *lu* (e.g. 炉; 爐; "oven"). Tonal markers are added on top of the umlaut, as in *lǘ*.  However, the *ü* is *not* used in the other contexts where it could represent a front high rounded vowel, namely after the letters *j*, *q*, *x* and *y*. For example, the sound of the word 鱼/魚 (fish) is transcribed in pinyin simply as *yú*, not as *yǘ*. This practice is opposed to [Wade-Giles](http://en.wikipedia.org/wiki/Wade-Giles), which always uses *ü*, and [*Tongyong Pinyin*](http://en.wikipedia.org/wiki/Tongyong_Pinyin)*,* which always uses *yu*. Whereas Wade-Giles needs to use the umlaut to distinguish between *chü* (pinyin *ju*) and *chu* (pinyin *zhu*), this ambiguity cannot arise with pinyin, so the more convenient form *ju* is used instead of *jü*. Genuine ambiguities only happen with *nu*/*nü* and *lu*/*lü*, which are then distinguished by an umlaut.  Many fonts or output methods do not support an umlaut for *ü* or cannot place tone marks on top of *ü*. Likewise, using *ü* in input methods is difficult because it is not present as a simple key on many keyboard layouts. For these reasons *v* is sometimes used instead by convention. For example, it is common for cellphones to use*v* instead of *ü*. Additionally, some stores in China use *v* instead of *ü* in the transliteration of their names. The drawback is that there are no tone marks for the letter *v*.  This also presents a problem in transcribing names for use on passports, affecting people with names that consist of the sound *lü* or *nü*, particularly people with the surname 吕 ([*Lǚ*](http://en.wikipedia.org/wiki/L%C3%BC_(surname))), a fairly common surname, particularly compared to the surname 陆 ([Lù](http://en.wikipedia.org/wiki/Lu_(surname_%E9%99%86))), 鲁 ([Lǔ](http://en.wikipedia.org/wiki/Lu_(surname_%E9%B2%81))), 卢 ([Lú](http://en.wikipedia.org/wiki/Lu_(surname_%E5%8D%A2))) and 路 ([Lù](http://en.wikipedia.org/wiki/Lu_(surname_%E8%B7%AF))). Previously, the practice varied among different passport issuing offices, with some transcribing as "LV" and "NV" while others used "LU" and "NU". On 10 July 2012, the [Ministry of Public Security](http://en.wikipedia.org/wiki/Ministry_of_Public_Security_of_the_People%27s_Republic_of_China)standardized the practice to use "LYU" and "NYU" in passports.[[38]](http://en.wikipedia.org/wiki/Pinyin#cite_note-38)[[39]](http://en.wikipedia.org/wiki/Pinyin#cite_note-39)  Although *nüe* written as *nue*, and *lüe* written as *lue* are not ambiguous, *nue* or *lue* are not correct according to the rules; *nüe* and *lüe* should be used instead. However, some Chinese input methods (e.g. [Microsoft Pinyin IME](http://en.wikipedia.org/wiki/Microsoft_Pinyin_IME)) support both *nve*/*lve* (typing *v* for *ü*) and *nue*/*lue*. Pinyin in Taiwan Taiwan ([Republic of China](http://en.wikipedia.org/wiki/Taiwan)) adopted [*Tongyong Pinyin*](http://en.wikipedia.org/wiki/Tongyong_Pinyin)*,* a modification of *Hanyu Pinyin,* as the official romanization system on the national level between October 2002 and January 2009, when it switched to *Hanyu Pinyin*. *Tongyong Pinyin* ("official phonetic"), a variant of pinyin developed in Taiwan, was designed to romanize languages and dialects spoken on the island in addition to Mandarin Chinese. The [Kuomintang](http://en.wikipedia.org/wiki/Kuomintang) (Chinese Nationalist Party) resisted its adoption, preferring the*Hanyu Pinyin* system used in [Mainland China](http://en.wikipedia.org/wiki/China) and in general use internationally. Romanization preferences quickly became associated with issues of national identity. Preferences split along party lines: the [Kuomintang](http://en.wikipedia.org/wiki/Kuomintang) and its affiliated parties in the pan-blue coalition supported the use of Hanyu Pinyin while the [Democratic Progressive Party](http://en.wikipedia.org/wiki/Democratic_Progressive_Party) and its affiliated parties in the pan-green coalition favored the use of Tongyong Pinyin.  *Tongyong Pinyin* was made the official system in an administrative order that allowed its adoption by local governments to be voluntary. A few localities with governments controlled by the [Kuomintang](http://en.wikipedia.org/wiki/Kuomintang) (KMT), most notably [Taipei](http://en.wikipedia.org/wiki/Taipei), [Hsinchu](http://en.wikipedia.org/wiki/Hsinchu), and [Kinmen County](http://en.wikipedia.org/wiki/Kinmen_County), overrode the order and converted to *Hanyu Pinyin* before the January 1, 2009 national-level switch,[[4]](http://en.wikipedia.org/wiki/Pinyin#cite_note-pinyin_tt-4)[[5]](http://en.wikipedia.org/wiki/Pinyin#cite_note-pinyin_cp-5) though with a slightly different capitalization convention than mainland China. Most areas of Taiwan adopted Tongyong Pinyin, consistent with the national policy. Many street signs in Taiwan today still display *Tongyong Pinyin* but some, especially in northern Taiwan, display *Hanyu Pinyin.* It is still not unusual to see spellings on street signs and buildings derived from the older [Wade-Giles](http://en.wikipedia.org/wiki/Wade-Giles), [MPS2](http://en.wikipedia.org/wiki/MPS2) and other systems.  The adoption of *Hanyu Pinyin* as the official romanization system in Taiwan does not preclude the official retention of earlier spellings. International familiarity has led to the retention of the spelling [*Taipei*](http://en.wikipedia.org/wiki/Taipei_City) ("Taibei" in pinyin systems) and even to its continuation in the name of [New Taipei](http://en.wikipedia.org/wiki/New_Taipei_City), a municipality created in 2010. Personal names on Taiwanese passports honor the choices of Taiwanese citizens, who often prefer the Wade-Giles romanization of their personal names. Transition to Hanyu Pinyin in official use is also necessarily gradual. Universities and other government entities retain earlier spellings in long-established names, budget restraints preclude widespread replacement of signage and stationery in every area, and questions remain about the ability of the national government to enforce the standard island-wide.[[40]](http://en.wikipedia.org/wiki/Pinyin#cite_note-40) Primary education in Taiwan continues to teach pronunciation using [*zhuyin*](http://en.wikipedia.org/wiki/Zhuyin) (MPS or Mandarin Phonetic Symbols). Comparison with other orthographies Pinyin is now used by foreign students learning Chinese as a second language.  Pinyin assigns some Latin letters sound values which are quite different from that of most languages. This has drawn some criticism as it may lead to confusion when uninformed speakers apply either native or English assumed pronunciations to words. However this is not a specific problem of pinyin, since many languages that use the Latin alphabet natively assign different values to the same letters. A recent study on Chinese writing and literacy concluded, "By and large, pinyin represents the Chinese sounds better than the Wade-Giles system, and does so with fewer extra marks."[[41]](http://en.wikipedia.org/wiki/Pinyin#cite_note-41)  Pinyin is purely a representation of the sounds of Mandarin, therefore it lacks the [semantic](http://en.wikipedia.org/wiki/Semantic) cues that [Chinese characters](http://en.wikipedia.org/wiki/Chinese_character) can provide. It is also unsuitable for transcribing some [Chinese spoken languages](http://en.wikipedia.org/wiki/Chinese_spoken_languages) other than Mandarin. Chart of comparison with other romanizations  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Vowels *a, e, o, i*** | | | | | | | | | | | | | | | | | | | | | [**IPA**](http://en.wikipedia.org/wiki/Help:IPA) | **ä** | **ɔ** | **ɛ** | **ɯʌ** | **aɪ** | **eɪ** | **ɑʊ** | **ou** | **än** | **ən** | **ɑŋ** | **ɤŋ** | **ɑɻ** | **i** | **iɛ** | **iou** | **iɛn** | **in** | **iŋ** | | **Pinyin** | a | o | ê | e | ai | ei | ao | ou | an | en | ang | eng | er | yi | ye | you | yan | yin | ying | | [Tongyong Pinyin](http://en.wikipedia.org/wiki/Tongyong_Pinyin) | a | o | e | e | ai | ei | ao | ou | an | en | ang | eng | er | yi | ye | you | yan | yin | ying | | [Wade–Giles](http://en.wikipedia.org/wiki/Wade%E2%80%93Giles) | a | o | eh | o/ê | ai | ei | ao | ou | an | ên | ang | êng | êrh | i | yeh | yu | yen | yin | ying | | [Zhuyin](http://en.wikipedia.org/wiki/Zhuyin) | ㄚ | ㄛ | ㄝ | ㄜ | ㄞ | ㄟ | ㄠ | ㄡ | ㄢ | ㄣ | ㄤ | ㄥ | ㄦ | ㄧ | ㄧㄝ | ㄧㄡ | ㄧㄢ | ㄧㄣ | ㄧㄥ | | example | 阿 | 哦 | 呗 | 俄 | 艾 | 黑 | 凹 | 偶 | 安 | 恩 | 昂 | 冷 | 二 | 一 | 也 | 又 | 言 | 音 | 英 |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Vowels *u, y*** | | | | | | | | | | | | | [**IPA**](http://en.wikipedia.org/wiki/Help:IPA) | **u** | **uɔ** | **ueɪ** | **uən** | **uɤŋ** | **ʊŋ** | **y** | **yœ** | **yɛn** | **yn** | **iʊŋ** | | **Pinyin** | wu | wo/o | wei | wen | weng | ong | yu | yue | yuan | yun | yong | | [Tongyong Pinyin](http://en.wikipedia.org/wiki/Tongyong_Pinyin) | wu | wo/o | wei | wun | wong | ong | yu | yue | yuan | yun | yong | | [Wade–Giles](http://en.wikipedia.org/wiki/Wade%E2%80%93Giles) | wu | wo/o | wei | wên | wêng | ung | yü | yüeh | yüan | yün | yung | | [Zhuyin](http://en.wikipedia.org/wiki/Zhuyin) | ㄨ | ㄨㄛ/ㄛ | ㄨㄟ | ㄨㄣ | ㄨㄥ | | ㄩ | ㄩㄝ | ㄩㄢ | ㄩㄣ | ㄩㄥ | | example | 五 | 我 | 位 | 文 | 翁 | 中 | 玉 | 月 | 元 | 云 | 用 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Non-sibilant consonants** | | | | | | | | | | | | | | | [**IPA**](http://en.wikipedia.org/wiki/Help:IPA) | **puɔ** | **pʰuɔ** | **muɔ** | **fɤŋ** | **tioʊ** | **tueɪ** | **tuən** | **tʰɯʌ** | **ny** | **ly** | **kɯʌɻ** | **kʰɯʌ** | **xɯʌ** | | **Pinyin** | bo | po | mo | feng | diu | dui | dun | te | nü | lü | ger | ke | he | | [Tongyong Pinyin](http://en.wikipedia.org/wiki/Tongyong_Pinyin) | bo | po | mo | fong | diou | duei | dun | te | nyu | lyu | ger | ke | he | | [Wade–Giles](http://en.wikipedia.org/wiki/Wade%E2%80%93Giles) | po | p'o | mo | fêng | tiu | tui | tun | t'ê | nü | lü | kêrh | k'o | ho | | [Zhuyin](http://en.wikipedia.org/wiki/Zhuyin) | ㄅㄛ | ㄆㄛ | ㄇㄛ | ㄈㄥ | ㄉㄧㄡ | ㄉㄨㄟ | ㄉㄨㄣ | ㄊㄜ | ㄋㄩ | ㄌㄩ | ㄍㄜㄦ | ㄎㄜ | ㄏㄜ | | example | 玻 | 婆 | 末 | 封 | 丟 | 兌 | 顿 | 特 | 女 | 旅 | 歌儿 | 可 | 何 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Sibilant consonants** | | | | | | | | | | | | | | | | | | | | | [**IPA**](http://en.wikipedia.org/wiki/Help:IPA) | **tɕiɛn** | **tɕiʊŋ** | **tɕʰin** | **ɕyɛn** | **ʈʂɯʌ** | **ʈʂɨ** | **ʈʂʰɯʌ** | **ʈʂʰɨ** | **ʂɯʌ** | **ʂɨ** | **ʐɯʌ** | **ʐɨ** | **tsɯʌ** | **tsuɔ** | **tsɯ** | **tsʰɯʌ** | **tsʰɯ** | **sɯʌ** | **sɯ** | | **Pinyin** | jian | jiong | qin | xuan | zhe | zhi | che | chi | she | shi | re | ri | ze | zuo | zi | ce | ci | se | si | | [Tongyong Pinyin](http://en.wikipedia.org/wiki/Tongyong_Pinyin) | jian | jyong | cin | syuan | jhe | jhih | che | chih | she | shih | re | rih | ze | zuo | zih | ce | cih | se | sih | | [Wade–Giles](http://en.wikipedia.org/wiki/Wade%E2%80%93Giles) | chien | chiung | ch'in | hsüan | chê | chih | ch'ê | ch'ih | shê | shih | jê | jih | tsê | tso | tzu | ts'ê | tz'u | sê | szu | | [Zhuyin](http://en.wikipedia.org/wiki/Zhuyin) | ㄐㄧㄢ | ㄐㄩㄥ | ㄑㄧㄣ | ㄒㄩㄢ | ㄓㄜ | ㄓ | ㄔㄜ | ㄔ | ㄕㄜ | ㄕ | ㄖㄜ | ㄖ | ㄗㄜ | ㄗㄨㄛ | ㄗ | ㄘㄜ | ㄘ | ㄙㄜ | ㄙ | | example | 件 | 窘 | 秦 | 宣 | 哲 | 之 | 扯 | 赤 | 社 | 是 | 惹 | 日 | 仄 | 左 | 字 | 策 | 次 | 色 | 斯 |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Tones** | | | | | | | [**IPA**](http://en.wikipedia.org/wiki/Help:IPA) | **mä˥˥** | **mä˧˥** | **mä˨˩˦** | **mä˥˩** | **mä** | | **Pinyin** | mā | má | mǎ | mà | ma | | [Tongyong Pinyin](http://en.wikipedia.org/wiki/Tongyong_Pinyin) | ma | má | mǎ | mà | må | | [Wade–Giles](http://en.wikipedia.org/wiki/Wade%E2%80%93Giles) | ma1 | ma2 | ma3 | ma4 | ma0 | | [Zhuyin](http://en.wikipedia.org/wiki/Zhuyin) | ㄇㄚ | ㄇㄚˊ | ㄇㄚˇ | ㄇㄚˋ | •ㄇㄚ | | example ([traditional](http://en.wikipedia.org/wiki/Traditional_Chinese_characters)/[simplified](http://en.wikipedia.org/wiki/Simplified_Chinese_characters)) | 媽/妈 | 麻/麻 | 馬/马 | 罵/骂 | 嗎/吗 | | | |  |  | |

## Braille

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Derivation of the 26 letters of the alphabet from the 10 numeric digits (black)** | | | | | | | | | |
| [Braille A1.svg](http://en.wikipedia.org/wiki/File:Braille_A1.svg) | [Braille B2.svg](http://en.wikipedia.org/wiki/File:Braille_B2.svg) | [Braille C3.svg](http://en.wikipedia.org/wiki/File:Braille_C3.svg) | [Braille D4.svg](http://en.wikipedia.org/wiki/File:Braille_D4.svg) | [Braille E5.svg](http://en.wikipedia.org/wiki/File:Braille_E5.svg) | [Braille F6.svg](http://en.wikipedia.org/wiki/File:Braille_F6.svg) | [Braille G7.svg](http://en.wikipedia.org/wiki/File:Braille_G7.svg) | [Braille H8.svg](http://en.wikipedia.org/wiki/File:Braille_H8.svg) | [Braille I9.svg](http://en.wikipedia.org/wiki/File:Braille_I9.svg) | [Braille J0.svg](http://en.wikipedia.org/wiki/File:Braille_J0.svg) |
| [a](http://en.wikipedia.org/wiki/A)/[1](http://en.wikipedia.org/wiki/1_(number)) | [b](http://en.wikipedia.org/wiki/B)/[2](http://en.wikipedia.org/wiki/2_(number)) | [c](http://en.wikipedia.org/wiki/C)/[3](http://en.wikipedia.org/wiki/3_(number)) | [d](http://en.wikipedia.org/wiki/D)/[4](http://en.wikipedia.org/wiki/4_(number)) | [e](http://en.wikipedia.org/wiki/E)/[5](http://en.wikipedia.org/wiki/5_(number)) | [f](http://en.wikipedia.org/wiki/F)/[6](http://en.wikipedia.org/wiki/6_(number)) | [g](http://en.wikipedia.org/wiki/G)/[7](http://en.wikipedia.org/wiki/7_(number)) | [h](http://en.wikipedia.org/wiki/H)/[8](http://en.wikipedia.org/wiki/8_(number)) | [i](http://en.wikipedia.org/wiki/I)/[9](http://en.wikipedia.org/wiki/9_(number)) | [j](http://en.wikipedia.org/wiki/J)/[0](http://en.wikipedia.org/wiki/0_(number)) |
| [Braille K colored.svg](http://en.wikipedia.org/wiki/File:Braille_K_colored.svg) | [Braille L colored.svg](http://en.wikipedia.org/wiki/File:Braille_L_colored.svg) | [Braille M colored.svg](http://en.wikipedia.org/wiki/File:Braille_M_colored.svg) | [Braille N colored.svg](http://en.wikipedia.org/wiki/File:Braille_N_colored.svg) | [Braille O colored.svg](http://en.wikipedia.org/wiki/File:Braille_O_colored.svg) | [Braille P colored.svg](http://en.wikipedia.org/wiki/File:Braille_P_colored.svg) | [Braille Q colored.svg](http://en.wikipedia.org/wiki/File:Braille_Q_colored.svg) | [Braille R colored.svg](http://en.wikipedia.org/wiki/File:Braille_R_colored.svg) | [Braille S colored.svg](http://en.wikipedia.org/wiki/File:Braille_S_colored.svg) | [Braille T colored.svg](http://en.wikipedia.org/wiki/File:Braille_T_colored.svg) |
| [k](http://en.wikipedia.org/wiki/K) | [l](http://en.wikipedia.org/wiki/L) | [m](http://en.wikipedia.org/wiki/M) | [n](http://en.wikipedia.org/wiki/N) | [o](http://en.wikipedia.org/wiki/O) | [p](http://en.wikipedia.org/wiki/P) | [q](http://en.wikipedia.org/wiki/Q) | [r](http://en.wikipedia.org/wiki/R) | [s](http://en.wikipedia.org/wiki/S) | [t](http://en.wikipedia.org/wiki/T) |
| [Braille U colored.svg](http://en.wikipedia.org/wiki/File:Braille_U_colored.svg) | [Braille V colored.svg](http://en.wikipedia.org/wiki/File:Braille_V_colored.svg) | [Braille X colored.svg](http://en.wikipedia.org/wiki/File:Braille_X_colored.svg) | [Braille Y colored.svg](http://en.wikipedia.org/wiki/File:Braille_Y_colored.svg) | [Braille Z colored.svg](http://en.wikipedia.org/wiki/File:Braille_Z_colored.svg) |  | | | | [Braille W colored.svg](http://en.wikipedia.org/wiki/File:Braille_W_colored.svg) |
| [u](http://en.wikipedia.org/wiki/U) | [v](http://en.wikipedia.org/wiki/V) | [x](http://en.wikipedia.org/wiki/X) | [y](http://en.wikipedia.org/wiki/Y) | [z](http://en.wikipedia.org/wiki/Z) | [w](http://en.wikipedia.org/wiki/W) |

The next ten letters (the next "[decade](http://en.wiktionary.org/wiki/decade#English)") are the same again, but with dots at both 3 and 6 (green dots). Here *w* was left out as not being part of the basic French alphabet; the French braille order is *u v x y z ç é à è ù* (⠥⠧⠭⠽⠵⠯⠿⠷⠮⠾).[[8]](http://en.wikipedia.org/wiki/Braille#cite_note-9) The next ten, ending in *w*, are the same again, except that for this series position 6 (purple dot) is used without position 3. These are *â ê î ô û ë ï ü ö w* (⠡⠣⠩⠹⠱⠫⠻⠳⠪⠺).[[9]](http://en.wikipedia.org/wiki/Braille#cite_note-10) The *a–j* series lowered in dot space (⠂⠆⠒⠲⠢⠖⠶⠦⠔⠴) are used for punctuation. Letters *a* ⠁ and *c* ⠉, which only use dots in the top row, were lowered two places for the apostrophe and hyphen: ⠄⠤. (These are the decade diacritics, at left in the table below, of the second and third decade.) In addition, there are ten patterns that are based on the first two letters (⠁⠃) shifted to the right; these were assigned to non-French letters (*ì ä ò* ⠌⠜⠬) or serve non-letter functions: ⠈ (superscript; in English the accent mark), ⠘ (currency prefix), ⠨(capital, in English the decimal point), ⠼ (number sign), ⠸ (emphasis mark), ⠐ (symbol prefix).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **The 64 braille cells**[[b]](http://en.wikipedia.org/wiki/Braille#cite_note-11) | | | | | | | | | | | | | | | |
| **decade** | |  | **numeric sequence** | | | | | | | | | |  | **shift right** | |
| **1st** | [Braille NULL.svg](http://en.wikipedia.org/wiki/File:Braille_NULL.svg) | [Braille A1.svg](http://en.wikipedia.org/wiki/File:Braille_A1.svg) | [Braille B2.svg](http://en.wikipedia.org/wiki/File:Braille_B2.svg) | [Braille C3.svg](http://en.wikipedia.org/wiki/File:Braille_C3.svg) | [Braille D4.svg](http://en.wikipedia.org/wiki/File:Braille_D4.svg) | [Braille E5.svg](http://en.wikipedia.org/wiki/File:Braille_E5.svg) | [Braille F6.svg](http://en.wikipedia.org/wiki/File:Braille_F6.svg) | [Braille G7.svg](http://en.wikipedia.org/wiki/File:Braille_G7.svg) | [Braille H8.svg](http://en.wikipedia.org/wiki/File:Braille_H8.svg) | [Braille I9.svg](http://en.wikipedia.org/wiki/File:Braille_I9.svg) | [Braille J0.svg](http://en.wikipedia.org/wiki/File:Braille_J0.svg) | [Braille Accent.svg](http://en.wikipedia.org/wiki/File:Braille_Accent.svg) | [Braille Currency.svg](http://en.wikipedia.org/wiki/File:Braille_Currency.svg) |
| **2nd** | [Braille Apostrophe colored.svg](http://en.wikipedia.org/wiki/File:Braille_Apostrophe_colored.svg) | [Braille K colored.svg](http://en.wikipedia.org/wiki/File:Braille_K_colored.svg) | [Braille L colored.svg](http://en.wikipedia.org/wiki/File:Braille_L_colored.svg) | [Braille M colored.svg](http://en.wikipedia.org/wiki/File:Braille_M_colored.svg) | [Braille N colored.svg](http://en.wikipedia.org/wiki/File:Braille_N_colored.svg) | [Braille O colored.svg](http://en.wikipedia.org/wiki/File:Braille_O_colored.svg) | [Braille P colored.svg](http://en.wikipedia.org/wiki/File:Braille_P_colored.svg) | [Braille Q colored.svg](http://en.wikipedia.org/wiki/File:Braille_Q_colored.svg) | [Braille R colored.svg](http://en.wikipedia.org/wiki/File:Braille_R_colored.svg) | [Braille S colored.svg](http://en.wikipedia.org/wiki/File:Braille_S_colored.svg) | [Braille T colored.svg](http://en.wikipedia.org/wiki/File:Braille_T_colored.svg) | [Braille ST colored.svg](http://en.wikipedia.org/wiki/File:Braille_ST_colored.svg) | [Braille Ä colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%84_colored.svg) |
| **3rd** | [Braille Hyphen colored.svg](http://en.wikipedia.org/wiki/File:Braille_Hyphen_colored.svg) | [Braille U colored.svg](http://en.wikipedia.org/wiki/File:Braille_U_colored.svg) | [Braille V colored.svg](http://en.wikipedia.org/wiki/File:Braille_V_colored.svg) | [Braille X colored.svg](http://en.wikipedia.org/wiki/File:Braille_X_colored.svg) | [Braille Y colored.svg](http://en.wikipedia.org/wiki/File:Braille_Y_colored.svg) | [Braille Z colored.svg](http://en.wikipedia.org/wiki/File:Braille_Z_colored.svg) | [Braille Ç colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%87_colored.svg) | [Braille É colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%89_colored.svg) | [Braille À colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%80_colored.svg) | [Braille È colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%88_colored.svg) | [Braille Ù colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%99_colored.svg) | [Braille Ò colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%92_colored.svg) | [Braille Number colored.svg](http://en.wikipedia.org/wiki/File:Braille_Number_colored.svg) |
| **4th** | [Braille Capital colored.svg](http://en.wikipedia.org/wiki/File:Braille_Capital_colored.svg) | [Braille Â colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%82_colored.svg) | [Braille Ê colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%8A_colored.svg) | [Braille Î colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%8E_colored.svg) | [Braille Ô colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%94_colored.svg) | [Braille Û colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%9B_colored.svg) | [Braille Ë colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%8B_colored.svg) | [Braille Ï colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%8F_colored.svg) | [Braille Ü colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%9C_colored.svg) | [Braille Ö colored.svg](http://en.wikipedia.org/wiki/File:Braille_%C3%96_colored.svg) | [Braille W colored.svg](http://en.wikipedia.org/wiki/File:Braille_W_colored.svg) | [Braille Decimal colored.svg](http://en.wikipedia.org/wiki/File:Braille_Decimal_colored.svg) | [Braille Cursive colored.svg](http://en.wikipedia.org/wiki/File:Braille_Cursive_colored.svg) |
| **5th** | **shift down** | [Braille Comma colored.svg](http://en.wikipedia.org/wiki/File:Braille_Comma_colored.svg) | [Braille Semicolon colored.svg](http://en.wikipedia.org/wiki/File:Braille_Semicolon_colored.svg) | [Braille Colon colored.svg](http://en.wikipedia.org/wiki/File:Braille_Colon_colored.svg) | [Braille Period colored.svg](http://en.wikipedia.org/wiki/File:Braille_Period_colored.svg) | [Braille QuestionMark colored.svg](http://en.wikipedia.org/wiki/File:Braille_QuestionMark_colored.svg) | [Braille ExclamationPoint colored.svg](http://en.wikipedia.org/wiki/File:Braille_ExclamationPoint_colored.svg) | [Braille Bracket colored.svg](http://en.wikipedia.org/wiki/File:Braille_Bracket_colored.svg) | [Braille QuoteOpen colored.svg](http://en.wikipedia.org/wiki/File:Braille_QuoteOpen_colored.svg) | [Braille Asterisk colored.svg](http://en.wikipedia.org/wiki/File:Braille_Asterisk_colored.svg) | [Braille QuoteClose colored.svg](http://en.wikipedia.org/wiki/File:Braille_QuoteClose_colored.svg) | [Braille ContractionPrefix colored.svg](http://en.wikipedia.org/wiki/File:Braille_ContractionPrefix_colored.svg) | [Braille Correction colored.svg](http://en.wikipedia.org/wiki/File:Braille_Correction_colored.svg) |

### Assignment

Historically, there have been three principles in assigning the values of a [linear script](http://en.wikipedia.org/wiki/Linear_writing) (print) to braille: Using Louis Braille's original French letter values; reassigning the braille letters according to the [sort order](http://en.wikipedia.org/wiki/Sort_order) of the print alphabet being transcribed; and reassigning the letters to improve the efficiency of writing in braille.

Under international consensus, most braille alphabets follow the French sorting order for the 26 letters of the [basic Latin alphabet](http://en.wikipedia.org/wiki/ISO_basic_Latin_alphabet), and there have been attempts at unifying the letters beyond these 26 (see [international braille](http://en.wikipedia.org/wiki/International_braille)), though differences remain, for example in [German Braille](http://en.wikipedia.org/wiki/German_Braille) and the contractions of [English Braille](http://en.wikipedia.org/wiki/English_Braille). This unification avoids the chaos of each nation reordering the braille code to match the sorting order of its print alphabet, as happened in [Algerian Braille](http://en.wikipedia.org/wiki/Algerian_Braille), where braille codes were numerically reassigned to match the order of the Arabic alphabet and bear little relation to the values used in other countries (compare modern[Arabic Braille](http://en.wikipedia.org/wiki/Arabic_Braille), which uses the French sorting order), and as happened in an early American version of English Braille, where the letters *w, x, y, z* were reassigned to match English alphabetical order. A convention sometimes seen for letters beyond the basic 26 is to exploit the physical symmetry of braille patterns iconically, for example, by assigning a reversed *n* to *ñ* or an inverted *s* to *sh*. (See [Hungarian Braille](http://en.wikipedia.org/wiki/Hungarian_Braille) and [Bharati Braille](http://en.wikipedia.org/wiki/Bharati_Braille), which do this to some extent.)

A third principle was to assign braille codes according to frequency, with the simplest patterns (quickest ones to write) assigned to the most frequent letters of the alphabet. Such frequency-based alphabets were used in Germany and the United States in the 19th century (see [American Braille](http://en.wikipedia.org/wiki/American_Braille)), but none are attested in modern use. Finally, there are braille scripts which don't order the codes numerically at all, such as [Japanese Braille](http://en.wikipedia.org/wiki/Japanese_Braille) and [Korean Braille](http://en.wikipedia.org/wiki/Korean_Braille), which are based on more abstract principles of syllable composition.

Academic texts are sometimes written in a script of eight dots per cell rather than six, enabling them encode a greater number of symbols. (See [Gardner–Salinas braille codes](http://en.wikipedia.org/wiki/Gardner%E2%80%93Salinas_braille_codes).) [Luxembourgish Braille](http://en.wikipedia.org/wiki/Luxembourgish_Braille) has adopted eight-dot cells for general use; for example, it adds a dot below each letter to derive its capital variant.

## Form

[](http://en.wikipedia.org/wiki/File:Alianca_braille.JPG)

Silver wedding bands with names*Henri(que)* and *Tita* written in braille

Braille was the first writing system with [binary](http://en.wikipedia.org/wiki/Binary_numeral_system) [encoding](http://en.wikipedia.org/wiki/Character_encoding).[[5]](http://en.wikipedia.org/wiki/Braille#cite_note-digital-6) The system as devised by Braille consists of two parts:[[6]](http://en.wikipedia.org/wiki/Braille" \l "cite_note-D.26B-7)

1. [Character encoding](http://en.wikipedia.org/wiki/Character_encoding) that mapped characters of the [French alphabet](http://en.wikipedia.org/wiki/French_alphabet) to [tuples](http://en.wikipedia.org/wiki/Tuple) of six [bits](http://en.wikipedia.org/wiki/Bit) (the dots),
2. The physical representation of those six-bit characters with raised dots in a braille cell.

Within an individual cell, the dot positions are arranged as two columns of three positions. A raised dot can appear in any of the six positions, producing sixty-four (26) possible patterns, including one in which there are no raised dots. For reference purposes, a pattern is commonly described by listing the positions where dots are raised, the positions being universally numbered, from top to bottom, as 1 to 3 on the left and 4 to 6 on the right. For example, dot pattern 1-3-4 describe a cell with three dots raised, at the top and bottom in the left column and at the top of the right column: that is, the letter ⠍ *m*. The lines of horizontal braille text are separated by a space, much like visible printed text, so that the dots of one line can be differentiated from the braille text above and below. Different assignments of braille codes (or [code pages](http://en.wikipedia.org/wiki/Code_page)) are used to map the character sets of different printed scripts to the six-bit cells. Braille assignments have also been created for mathematical and musical notation. However, because the six-dot braille cell allows only 64 (26) patterns, including the space, the characters of a braille script commonly have multiple values, depending on their context. That is, character mapping between print and braille is not one-to-one. For example, the character ⠙corresponds in print to both the letter *d* and the digit *4*.

In addition to simple encoding, many braille alphabets use contractions to reduce the size of braille texts and to increase reading speed. (See [Contracted braille](http://en.wikipedia.org/wiki/English_Braille#Contractions))

## Writing braille

[](http://en.wikipedia.org/wiki/File:Braille_Writer.jpg)

Braille typewriter

Braille may be produced by hand using a [slate and stylus](http://en.wikipedia.org/wiki/Slate_and_stylus) in which each dot is created from the back of the page, writing in mirror image, or it may be produced on a [braille typewriter](http://en.wikipedia.org/wiki/Braille_typewriter) or [Perkins Brailler](http://en.wikipedia.org/wiki/Perkins_Brailler), or an electronic Brailler or eBrailler. Because braille letters cannot be effectively erased and written over if an error is made, an error is overwritten with all six dots (⠿).*Interpoint* refers to braille printing that is offset, so that the paper can be embossed on both sides, with the dots on one side appearing between the divots that form the dots on the other (see the photo in the box at the top of this article for an example). Using a computer or other electronic device, braille may be produced with a [braille embosser](http://en.wikipedia.org/wiki/Braille_embosser) (printer) or a[refreshable braille display](http://en.wikipedia.org/wiki/Refreshable_braille_display) (screen).

Braille has been extended to an 8-dot code, particularly for use with braille embossers and refreshable braille displays. In 8-dot braille the additional dots are added at the bottom of the cell, giving a matrix 4 dots high by 2 dots wide. The additional dots are given the numbers 7 (for the lower-left dot) and 8 (for the lower-right dot). Eight-dot braille has the advantages that the case of an individual letter is directly coded in the cell containing the letter and that all the printable [ASCII](http://en.wikipedia.org/wiki/ASCII) characters can be represented in a single cell. All 256 (28) possible combinations of 8 dots are encoded by the [Unicode](http://en.wikipedia.org/wiki/Unicode) standard. Braille with six dots is frequently stored as [Braille ASCII](http://en.wikipedia.org/wiki/Braille_ASCII).

### Letters

The first 25 braille letters, up through the first half of the 3rd decade, transcribe *a–z* (skipping *w*). In English Braille, the rest of that decade is rounded out with the ligatures *and, for, of, the,* and *with*. Omitting dot 3 from these forms the 4th decade, the ligatures *ch, gh, sh, th, wh, ed, er, ou, ow* and the letter *w*.

|  |  |  |
| --- | --- | --- |
| [⠡ (braille pattern dots-16)](http://en.wikipedia.org/wiki/File:Braille_%C3%85.svg) | [⠩ (braille pattern dots-146)](http://en.wikipedia.org/wiki/File:Braille_SH.svg) | [⠹ (braille pattern dots-1456)](http://en.wikipedia.org/wiki/File:Braille_%C3%94.svg) |
| ch | sh | th |

(See [English Braille](http://en.wikipedia.org/wiki/English_Braille).)

### Formatting

Various formatting marks affect the values of the letters that follow them. They have no direct equivalent in print. The most important in English Braille are:

|  |  |
| --- | --- |
| [⠠ (braille pattern dots-6)](http://en.wikipedia.org/wiki/File:Braille_CapitalSign.svg) | [⠼ (braille pattern dots-3456)](http://en.wikipedia.org/wiki/File:Braille_NumberSign.svg) |
| [Capital](http://en.wikipedia.org/wiki/Capital_letter) follows | [Number](http://en.wikipedia.org/wiki/Number) follows |

That is, ⠠⠁ is read as capital 'A', and ⠼⠁ as the digit '1'.

### Punctuation

Basic punctuation marks in English Braille include:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| [⠂ (braille pattern dots-2)](http://en.wikipedia.org/wiki/File:Braille_Comma.svg) | [⠆ (braille pattern dots-23)](http://en.wikipedia.org/wiki/File:Braille_Semicolon.svg) | [⠄ (braille pattern dots-3)](http://en.wikipedia.org/wiki/File:Braille_Apostrophe.svg) | [⠒ (braille pattern dots-25)](http://en.wikipedia.org/wiki/File:Braille_Colon.svg) | [⠤ (braille pattern dots-36)](http://en.wikipedia.org/wiki/File:Braille_Hyphen.svg) | [⠨ (braille pattern dots-46)](http://en.wikipedia.org/wiki/File:Braille_DecimalPoint.svg) |
| [Comma](http://en.wikipedia.org/wiki/Comma) | [Semicolon](http://en.wikipedia.org/wiki/Semicolon) | [Apostrophe](http://en.wikipedia.org/wiki/Apostrophe) | [Colon](http://en.wikipedia.org/wiki/Colon_(punctuation)) | [Hyphen](http://en.wikipedia.org/wiki/Hyphen) | [Decimal point](http://en.wikipedia.org/wiki/Decimal_point) |
| [⠲ (braille pattern dots-256)](http://en.wikipedia.org/wiki/File:Braille_Period.svg) | [⠖ (braille pattern dots-235)](http://en.wikipedia.org/wiki/File:Braille_ExclamationPoint.svg) | [⠦ (braille pattern dots-236)](http://en.wikipedia.org/wiki/File:Braille_QuoteOpen.svg) | [⠴ (braille pattern dots-356)](http://en.wikipedia.org/wiki/File:Braille_QuoteClose.svg) | [⠶ (braille pattern dots-2356)](http://en.wikipedia.org/wiki/File:Braille_Bracket.svg) | [⠌ (braille pattern dots-34)](http://en.wikipedia.org/wiki/File:Braille_ST.svg) |
| [Full stop (Period)](http://en.wikipedia.org/wiki/Full_stop) | [Exclamation point](http://en.wikipedia.org/wiki/Exclamation_point) | Open [quote](http://en.wikipedia.org/wiki/Quotation_mark), [question mark](http://en.wikipedia.org/wiki/Question_mark) | Close [quote](http://en.wikipedia.org/wiki/Quotation_mark) | [Bracket (Parentheses)](http://en.wikipedia.org/wiki/Bracket) | [Slash (Fraction)](http://en.wikipedia.org/wiki/Virgule) |

⠦ is both the question mark and the opening quotation mark. Its reading depends on whether it occurs before a word or after.

⠶ is used for both opening and closing parentheses. Its placement relative to spaces and other characters determines its interpretation.

Punctuation varies from language to language. For example, [French Braille](http://en.wikipedia.org/wiki/French_Braille) uses ⠢ for its question mark and swaps the quotation marks and parentheses (to ⠶and ⠦⠴); it uses the period (⠲) for the decimal point, as in print, and the decimal point (⠨) to mark capitalization.

### Contractions

*For a full list of abbreviations and contractions in English, see*[*English Braille#Contractions*](http://en.wikipedia.org/wiki/English_Braille#Contractions)*.*

Braille contractions are words and affixes that are shortened so that they take up fewer cells. In English Braille, for example, the word *afternoon* is written with just three letters, ⠁⠋⠝ ⟨afn⟩, much like [stenoscript](http://en.wikipedia.org/wiki/Stenoscript). There are also several abbreviation marks that create what are effectively [logograms](http://en.wikipedia.org/wiki/Logogram).[[6]](http://en.wikipedia.org/wiki/Braille#cite_note-D.26B-7) The most common of these is dot 5, which combines with the first letter of words. With the letter ⠍ *m*, the resulting word is ⠐⠍ *mother*. There are also [ligatures](http://en.wikipedia.org/wiki/Ligature_(typography)) ("contracted" letters), which are single letters in braille but correspond to more than one letter in print. The letter ⠯ *and*, for example, is used to write words with the sequence *a-n-d* in them, such as ⠓⠯ *hand*.

|  |  |  |
| --- | --- | --- |
| [⠁ (braille pattern dots-1)](http://en.wikipedia.org/wiki/File:Braille_A1.svg) [⠋ (braille pattern dots-124)](http://en.wikipedia.org/wiki/File:Braille_F6.svg) [⠝ (braille pattern dots-1345)](http://en.wikipedia.org/wiki/File:Braille_N.svg) | [⠐ (braille pattern dots-5)](http://en.wikipedia.org/wiki/File:Braille_ContractionPrefix.svg) [⠍ (braille pattern dots-134)](http://en.wikipedia.org/wiki/File:Braille_M.svg) | [⠓ (braille pattern dots-125)](http://en.wikipedia.org/wiki/File:Braille_H8.svg) [⠯ (braille pattern dots-12346)](http://en.wikipedia.org/wiki/File:Braille_AND.svg) |
| *afternoon (a-f-n)* | *mother (dot 5-m)* | *hand (h-and)* |

### Page dimensions

Most [braille embossers](http://en.wikipedia.org/wiki/Braille_embosser) support between 34 and 37 cells per line, and between 25 and 28 lines per page.

A manually operated Perkins braille typewriter supports a maximum of 42 cells per line (its margins are adjustable), and typical paper allows 25 lines per page.

A large interlining Stainsby has 36 cells per line and 18 lines per page.

An A4-sized Marburg braille frame, which allows interpoint braille (dots on both sides of the page, offset so they do not interfere with each other) has 30 cells per line and 27 lines per page.

## Braille transcription

[](http://en.wikipedia.org/wiki/File:Braille_on_tablet_box.JPG)

Braille on a box of tablets. The raised Braille reads 'P L A V I X'.

[](http://en.wikipedia.org/wiki/File:Braille_book.JPG)

Braille book and the same book in standard inkprint

Although it is possible to transcribe print by simply substituting the equivalent braille character for its printed equivalent, in English such a character-by-character transcription (known as *uncontracted braille*) is only used by beginners.

Braille characters are much larger than their printed equivalents, and the standard 11" by 11.5" (28 cm × 30 cm) page has room for only 25 lines of 43 characters. To reduce space and increase reading speed, most braille alphabets and orthographies use ligatures, abbreviations, and contractions. Virtually all English Braille books are transcribed in this*contracted braille,* which adds an additional layer of complexity to English orthography: The Library of Congress's*Instruction Manual for Braille Transcribing*[[19]](http://en.wikipedia.org/wiki/Braille" \l "cite_note-21) runs to over 300 pages and braille transcribers must pass certification tests.

Fully contracted braille is known as *Grade 2 Braille*. There is an intermediate form between Computer Braille—one-for-one identity with print—and Grade 2, which is called Grade 1 Braille. In Grade 1 the capital-sign and Number sign are used, and most punctuation marks are shown using their Grade 2 values.

The system of [contractions](http://en.wikipedia.org/wiki/Contraction_(grammar)) in English Braille begins with a set of 23 words which are contracted to single characters. Thus the word *but* is contracted to the single letter *b,* *can* to *c*, *do* to *d*, and so on. Even this simple rule creates issues requiring special cases; for example, *d* is, specifically, an abbreviation of the verb *do;* the noun *do* representing the note of the musical scale is a different word, and must be spelled out.

Portions of words may be contracted, and many rules govern this process. For example, the character with dots 2-3-5 (the letter "f" lowered in the braille cell) stands for "ff" when used in the middle of a word. At the beginning of a word, this same character stands for the word "to"; the character is written in braille with no space following it. (This contraction was removed in the [Unified English Braille Code](http://en.wikipedia.org/wiki/Unified_English_Braille_Code).) At the end of a word, the same character represents an exclamation point.

Some contractions are more similar than their print equivalents. For example, the contraction ⟨lr⟩, meaning 'letter', differs from ⟨ll⟩, meaning 'little', only in adding one dot to the second ⟨l⟩: ⠇⠇ *little*, ⠇⠗ *letter*. This causes greater confusion between the braille spellings of these words and can hinder the learning process of contracted braille.[[20]](http://en.wikipedia.org/wiki/Braille#cite_note-22)

The contraction rules take into account the linguistic structure of the word; thus, contractions are generally not to be used when their use would alter the usual braille form of a base word to which a prefix or suffix has been added. Some portions of the transcription rules are not fully codified and rely on the judgment of the transcriber. Thus, when the contraction rules permit the same word in more than one way, preference is given to "the contraction that more nearly approximates correct pronunciation."

*Grade 3 Braille*[[21]](http://en.wikipedia.org/wiki/Braille" \l "cite_note-23) is a variety of non-standardized systems that include many additional shorthand-like contraction. They are not used for publication, but by individuals for their personal convenience.

## Braille translation software

When people produce braille, this is called braille transcription. When computer software produces braille, this is called braille translation. Braille translation software exists to handle most of the common languages of the world, and many technical areas, such as math, music, and tactile graphics.

## Braille-reading techniques

Since braille is one of the few writing systems where tactile perception is used, as opposed to visual perception, a braille reader must develop new skills. One skill important for braille readers is the ability to create smooth and even pressures when running one's fingers along the words. There are many different styles and techniques used for the understanding and development of braille, even though a study by B. F. Holland[[22]](http://en.wikipedia.org/wiki/Braille" \l "cite_note-24) suggests that there is no specific technique that is superior to any other.

Another study by Lowenfield & Abel[[23]](http://en.wikipedia.org/wiki/Braille" \l "cite_note-25) shows that braille could be read "the fastest and best... by students who read using the index fingers of both hands." Another important reading skill emphasized in this study is to finish reading the end of a line with the right hand and to find the beginning of the next line with the left hand simultaneously. One final conclusion drawn by both Lowenfield and Abel is that children have difficulty using both hands independently where the right hand is the dominant hand. But this hand preference does not correlate to other activities.

## International uniformity

*Main article:*[*International uniformity of braille*](http://en.wikipedia.org/wiki/International_uniformity_of_braille)

[](http://en.wikipedia.org/wiki/File:Rapperswil_-_Duftrosengarten_20080222_005.jpg)

Braille plate in *Duftrosengarten* in[Rapperswil](http://en.wikipedia.org/wiki/Rapperswil), Switzerland

When braille was first adapted to languages other than French, many schemes were adopted, including mapping the native alphabet to the alphabetical order of French – e.g. in English W, which was not in the French alphabet at the time, is mapped to braille X, X to Y, Y to Z, and Z to the first French accented letter – or completely rearranging the alphabet such that common letters are represented by the simplest braille patterns. Consequently, mutual intelligibility was greatly hindered by this state of affairs. In 1878, the International Congress on Work for the Blind, held in Paris, proposed an international braille standard, where braille codes for different languages and scripts would be based, not on the order of a particular alphabet, but on phonetic correspondence and transliteration to Latin.[[24]](http://en.wikipedia.org/wiki/Braille#cite_note-IntlBraille-26)

This unified braille has been applied to the languages of India and Africa, Arabic, Vietnamese, Hebrew, Russian, and Armenian, as well as nearly all Latin-script languages. Greek, for example, *gamma* is written as Latin *g*, despite the fact that it has the alphabetic position of *c*; Hebrew *bet*, the second letter of the alphabet and [cognate](http://en.wikipedia.org/wiki/Cognate) with the Latin letter *b*, is sometimes pronounced /b/ and sometimes /v/, and is written *b* or *v* accordingly; Russian *ts* is written as *c*, which is the usual letter for /ts/ in those Slavic languages that use the Latin alphabet; and Arabic *f* is written as *f*, despite being historically *p*, and occurring in that part of the Arabic alphabet (between historic *o* and *q*).

## Other braille conventions

Other systems for assigning values to braille patterns are also followed, beside the simple mapping of the alphabetical order onto the original French order. Some braille alphabets start with [unified braille](http://en.wikipedia.org/wiki/Unified_braille), and then diverge significantly based on the phonology of the target languages, while others diverge even further.

In the various Chinese systems, traditional braille values are used for initial consonants and the simple vowels. In both [Mandarin](http://en.wikipedia.org/wiki/Mainland_Chinese_Braille) and [Cantonese Braille](http://en.wikipedia.org/wiki/Cantonese_braille), however, characters have different readings depending on whether they are placed in syllable-initial (onset) or syllable-final (rime) position. For instance, the cell for Latin *k*,⠅, represents Cantonese *k* (*g* in [Yale](http://en.wikipedia.org/wiki/Yale_romanization_of_Cantonese) and other modern romanizations) when initial, but *aak* when final, while Latin *j*, ⠚, represents Cantonese initial *j* but final *oei*.

Novel systems of braille mapping include Korean, which adopts separate syllable-initial and syllable-final forms for its consonants, explicitly grouping braille cells into syllabic groups in the same way as [hangul](http://en.wikipedia.org/wiki/Hangul). Japanese, meanwhile, combines independent vowel dot patterns and modifier consonant dot patterns into a single braille cell – an [abugida](http://en.wikipedia.org/wiki/Abugida) representation of each Japanese [mora](http://en.wikipedia.org/wiki/Mora_(linguistics)#Japanese).

## Uses

[](http://en.wikipedia.org/wiki/File:Braille_wine_label.jpg)

A bottle of [Chapoutier](http://en.wikipedia.org/wiki/Chapoutier) wine, with braille on the label

[](http://en.wikipedia.org/wiki/File:Bahnhofsplan_f%C3%BCr_Blinde,_Hannover_Hbf,_Ausschnitt_Eingangsbereich.jpg)

An embossed map of a German train station, with braille text

The current series of [Canadian banknotes](http://en.wikipedia.org/wiki/Banknotes_of_the_Canadian_dollar) has a [tactile feature](http://en.wikipedia.org/wiki/Canadian_currency_tactile_feature) consisting of raised dots that indicate the denomination, allowing bills to be easily identified by visually impaired people. It does not use standard braille; rather, the feature uses a system developed in consultation with blind and visually impaired Canadians after research indicated that braille was not sufficiently robust and that not all potential users read braille. [Mexican bank notes](http://en.wikipedia.org/wiki/Mexican_peso#Series_D), [Indian rupee](http://en.wikipedia.org/wiki/Indian_rupee) notes, [Israeli New Shekel](http://en.wikipedia.org/wiki/Israeli_New_Shekel)notes,[[25]](http://en.wikipedia.org/wiki/Braille#cite_note-27) [Russian Ruble](http://en.wikipedia.org/wiki/Russian_Ruble) and [Swiss Franc](http://en.wikipedia.org/wiki/Swiss_Franc) notes also have special raised symbols to make them identifiable by the visually impaired.

In [India](http://en.wikipedia.org/wiki/India) there are instances where the parliament acts have been published in braille, such as *The Right to Information Act*.[[26]](http://en.wikipedia.org/wiki/Braille#cite_note-28)

In the United States, the [Americans with Disabilities Act of 1990](http://en.wikipedia.org/wiki/Americans_with_Disabilities_Act_of_1990)[[27]](http://en.wikipedia.org/wiki/Braille#cite_note-29) requires various building signage to be in braille.

In the United Kingdom, it is required that medicines have the name of the medicine in Braille on the labelling.[[28]](http://en.wikipedia.org/wiki/Braille#cite_note-30)

## Braille phone

In May 2014 a Braille phone was introduced by [London](http://en.wikipedia.org/wiki/London)-based manufacturer OwnFone. Constructed using [3D printing](http://en.wikipedia.org/wiki/3D_printing)techniques, the device has print raised text on the keypad to help those who cannot read Braille.[[29]](http://en.wikipedia.org/wiki/Braille#cite_note-31)

In August 2014 an [Australian MVNO](http://en.wikipedia.org/wiki/List_of_Australian_mobile_virtual_network_operators) [KISA Phone](http://en.wikipedia.org/wiki/KISA_Phone) launched the first Australian-designed Braille mobile phone. The phone was designed with input from organizations such as [Vision Australia](http://en.wikipedia.org/wiki/Vision_Australia) and Guide Dogs Victoria. The Braille text is large and Braille buttons can accommodate up to seven characters. Other versions of the [KISA Phone](http://en.wikipedia.org/wiki/KISA_Phone) are available, including high-contrast designs.[[30]](http://en.wikipedia.org/wiki/Braille#cite_note-32)

## Unicode

*Main article:*[*Unicode braille patterns*](http://en.wikipedia.org/wiki/Unicode_braille_patterns)

Braille was added to the [Unicode](http://en.wikipedia.org/wiki/Unicode) Standard in September, 1999 with the release of version 3.0.

Most [braille embossers](http://en.wikipedia.org/wiki/Braille_embosser) and [refreshable braille displays](http://en.wikipedia.org/wiki/Refreshable_braille_display) do not support Unicode, using instead 6-dot [braille ASCII](http://en.wikipedia.org/wiki/Braille_ASCII). Because of this, they are unable to display this article. Some embossers have proprietary control codes for 8-dot braille or for full graphics mode, where dots may be placed anywhere on the page without leaving any space between braille cells, so that continuous lines can be drawn in diagrams, but these are rarely used and are not standard.

The Unicode standard encodes 8-dot braille glyphs according to their binary appearance, rather than following their assigned numeric order. Dot 1 corresponds to the [least significant bit](http://en.wikipedia.org/wiki/Least_significant_bit) of the low byte of the Unicode scalar value, and dot 8 to the high bit of that byte.

The Unicode block for braille is U+2800 ... U+28FF:

2800 Braille Patterns 28FF

280 281 282 283 284 285 286 287 288 289 28A 28B 28C 28D 28E 28F

⠀ ⠁ ⠂ ⠃ ⠄ ⠅ ⠆ ⠇ ⠈ ⠉ ⠊ ⠋ ⠌ ⠍ ⠎ ⠏

2800 2801 2802 2803 2804 2805 2806 2807 2808 2809 280A 280B 280C 280D 280E 280F

⠐ ⠑ ⠒ ⠓ ⠔ ⠕ ⠖ ⠗ ⠘ ⠙ ⠚ ⠛ ⠜ ⠝ ⠞ ⠟

2810 2811 2812 2813 2814 2815 2816 2817 2818 2819 281A 281B 281C 281D 281E 281F

⠠ ⠡ ⠢ ⠣ ⠤ ⠥ ⠦ ⠧ ⠨ ⠩ ⠪ ⠫ ⠬ ⠭ ⠮ ⠯

2820 2821 2822 2823 2824 2825 2826 2827 2828 2829 282A 282B 282C 282D 282E 282F

⠰ ⠱ ⠲ ⠳ ⠴ ⠵ ⠶ ⠷ ⠸ ⠹ ⠺ ⠻ ⠼ ⠽ ⠾ ⠿

2830 2831 2832 2833 2834 2835 2836 2837 2838 2839 283A 283B 283C 283D 283E 283F

⡀ ⡁ ⡂ ⡃ ⡄ ⡅ ⡆ ⡇ ⡈ ⡉ ⡊ ⡋ ⡌ ⡍ ⡎ ⡏

2840 2841 2842 2843 2844 2845 2846 2847 2848 2849 284A 284B 284C 284D 284E 284F

⡐ ⡑ ⡒ ⡓ ⡔ ⡕ ⡖ ⡗ ⡘ ⡙ ⡚ ⡛ ⡜ ⡝ ⡞ ⡟

2850 2851 2852 2853 2854 2855 2856 2857 2858 2859 285A 285B 285C 285D 285E 285F

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2860 2861 2862 2863 2864 2865 2866 2867 2868 2869 286A 286B 286C 286D 286E 286F

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2870 2871 2872 2873 2874 2875 2876 2877 2878 2879 287A 287B 287C 287D 287E 287F

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2880 2881 2882 2883 2884 2885 2886 2887 2888 2889 288A 288B 288C 288D 288E 288F

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2890 2891 2892 2893 2894 2895 2896 2897 2898 2899 289A 289B 289C 289D 289E 289F

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28A0 28A1 28A2 28A3 28A4 28A5 28A6 28A7 28A8 28A9 28AA 28AB 28AC 28AD 28AE 28AF

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28D0 28D1 28D2 28D3 28D4 28D5 28D6 28D7 28D8 28D9 28DA 28DB 28DC 28DD 28DE 28DF

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28E0 28E1 28E2 28E3 28E4 28E5 28E6 28E7 28E8 28E9 28EA 28EB 28EC 28ED 28EE 28EF

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28F0 28F1 28F2 28F3 28F4 28F5 28F6 28F7 28F8 28F9 28FA 28FB 28FC 28FD 28FE 28FF

## Appendix J: Text to Speech Tips

TIPS FOR TEXT TO SPEECH: \*\* Note: Acronyms and short form words should be avoided whenever possible. When in doubt, spell it out.

|  |  |  |
| --- | --- | --- |
|  | CORRECT | INCORRECT |
| Age | • 42 to 45 years old  • 42 years old | • 40-45  • 42 yr old  • 42 yrs old |
| Height | • 5 feet 6 inches  • 165 centimetres (or centimeters)  • 1.2 meters | • 5 foot 6  • 5 ft 6 in  • 165cm,  • 165 cms (cms is not a unit of measure)  • 1.2m |
| Speed | • Kilometres (kilometers) per hour | • km per hour  • km/h  • KmH  • kms/hr  • km/hour |
| Temperature | • -30 degrees Fahrenheit  • +30 degrees Celsius | • -30° F  • +30 degrees C |
| Date | • MM/DD/YYYY  • YYYY-MM-DD ISO preferred  Not ambiguous | • 02/12/2013 = February 12th, 2013  • 2013/2/12 = 2013, February 12th  • Only recognizes M-D-Y format.  Some countries use DD/MM/YYYY  Which is ambiguous |
| Time | • 10:00 AM  • 10:00 PM | • 10 o’clock  • 2200 hours (avoid using the 24 hour clock, recipients may not understand this format.) |
| Weight | 12 lbs (must have a space) 12 pounds  13 kg (plural form does not exist) | 12lbs  12 pds  13kgs wt |
| Directions | • North  • Northeast  • East  • Southeast  • South  • Southwest  • West  • Northwest | • N  • NE  • E  • SE  • S  • SW  • W  • NW |
| Directions of Travel | • Northbound, heading north  • Southbound, heading south  • Westbound, heading west  • Eastbound, heading east | • NB (northbound)  • SB (southbound)  • WB (westbound)  • EB (eastbound) |
| License Plate | • New Jersey  • A B C 1 2 3 (must have a space between each character) | • NJ  • ABC123  • ABC 123 Non alpha numeric |
|  | • and  • percent  • at  • #1(incl number = “number 1”)  • \_(will be pronounced “underscore”) | • &  • %  • @ |
| Roman  Numerals | • “Roman numeral” and the value | • I, II, III, IV, XI, MCMLXXIV |
| Addresses | • Ensure proper punctuation and capitalization. North, not N  • 14225 142nd Street  • 100 Ave. to 118 Ave. (requires period with Ave.)  • “Suite” needs to be spelled out in full  • Remember that numbers are spoken out in the tens and hundreds. So 12445 is twelve thousand four hundred forty five. So use spaces between such numbers as number and street number. Not no-break space  • New Jersey | • 506 2nd Street N  • Be careful about dual use abbreviations. St. = “Saint” rather than “Street”. 506 2nd St. N becomes “Five Hundred and Six, second Saint N”. Type out the full text to insure proper pronunciation.  • Spell out “Drive” and “Highway” in full  • NJ |
| Telephone Numbers | 780 980 8758  Do not use no-break space for phone numbers recommended.  9 1 1 (spaces need to be included in between each number)  Currently Excel does not recognize international phone number format e.g +64(7)321-4567 | 780-980-8758  7809808758  780.980.8758  (780)9808758  911 |
| Space in numbers | 1 234 567.89 use no-break space is ISO recommended.  123.45 ISO is decimal point, not a comma which is a string delimiter.  Currently Excel does not recognize a no-break space as a number format although it is ISO. | 1,234,567.89  123,45  No-break space is CTRL-SHIFT-SPACE in Word. |
| Acronyms | • Pronounce acronyms to right  • Pronounce unit of measure  • Pronounce unit of measure | • All uppercase English and IPA (International Phonetic Alphabet) except that SHALL, NOT, MAY, SHOULD and RECOMMENDED are not included.  • Mix of English and Greek  • digit(s) followed by space or no-break space then some lower case including e.g. kg, mm, mi, kyd, psi, Gb/s, gal (US or Imperial). |
| Money | • Pronounced as “dollar(s)”, may be written “dollar(s)”  • U S dollars  • Pronounced as “Euro”, may be written as “Euro”  • Pronounced as “Pound(s)” may be written as “Pound(s)”  • This is pronounced as “pound” or “hashtag” in the U.S., but is pronounced as “crosshatch” or “number sign” elsewhere.  • The appropriate currency pronunciation should be written e.g. “Yen”, “Yuan”.  • This may be pronounced as “check mark” or “tick” | • $  • $(US)  • €  • £  • #  • ¥  • ¤  • ✓ |

Failure to use proper punctuation may result in a word being mispronounced. \*\*\*WHEN IN DOUBT, SPELL IT OUT\*\*\*

Apparently the IPAWS to NWEM interface has a limited character set. So   
instead of creating a NWEMtext parameter (similar to the CMAMtext   
parameter) or translating character sets for systems with text   
limitations, originators can't use the full character set.  
  
The NOAA/NWEM character set is limited to letters, digits, a period (.),  
and ellipsis (...) [only three dots, not two, not four). No other   
punctuation is allowed, such as comma (,), semi-colon (;), colon (:), etc.  
  
As long as IPAWS and NWEM have that character set limitation, it will be   
more challenging for text-to-speech systems.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Comparison of the various parts (1–16) of ISO/IEC 8859 | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Binary | Oct | Dec | Hex | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 13 | 14 | 15 | 16 |
| **1010 0000** | **240** | **160** | **A0** | [No-break space (NBSP)](https://en.wikipedia.org/wiki/Non-breaking_space) | | | | | | | | | | | | | | |
| **1010 0001** | **241** | **161** | **A1** | [¡](https://en.wikipedia.org/wiki/%C2%A1) | [Ą](https://en.wikipedia.org/wiki/%C4%84) | [Ħ](https://en.wikipedia.org/wiki/%C4%A6) | [Ą](https://en.wikipedia.org/wiki/%C4%84) | [Ё](https://en.wikipedia.org/wiki/Yo_(Cyrillic)) |  | [‘](https://en.wikipedia.org/wiki/%E2%80%98) |  | [¡](https://en.wikipedia.org/wiki/%C2%A1) | [Ą](https://en.wikipedia.org/wiki/%C4%84) | [ก](https://en.wikipedia.org/wiki/%E0%B8%81) | [”](https://en.wikipedia.org/wiki/%E2%80%9D) | [Ḃ](https://en.wikipedia.org/wiki/%E1%B8%82) | [¡](https://en.wikipedia.org/wiki/%C2%A1) | [Ą](https://en.wikipedia.org/wiki/%C4%84) |
| **1010 0010** | **242** | **162** | **A2** | [¢](https://en.wikipedia.org/wiki/%C2%A2) | [˘](https://en.wikipedia.org/wiki/%CB%98) | | [ĸ](https://en.wikipedia.org/wiki/%C4%B8) | [Ђ](https://en.wikipedia.org/wiki/Dje) |  | [’](https://en.wikipedia.org/wiki/%E2%80%99) | [¢](https://en.wikipedia.org/wiki/%C2%A2) | [¢](https://en.wikipedia.org/wiki/%C2%A2) | [Ē](https://en.wikipedia.org/wiki/%C4%92) | [ข](https://en.wikipedia.org/wiki/%E0%B8%82) | [¢](https://en.wikipedia.org/wiki/%C2%A2) | [ḃ](https://en.wikipedia.org/wiki/%E1%B8%82) | [¢](https://en.wikipedia.org/wiki/%C2%A2) | [ą](https://en.wikipedia.org/wiki/%C4%84) |
| **1010 0011** | **243** | **163** | **A3** | [£](https://en.wikipedia.org/wiki/Pound_sign) | [Ł](https://en.wikipedia.org/wiki/%C5%81) | [£](https://en.wikipedia.org/wiki/Pound_sign) | [Ŗ](https://en.wikipedia.org/wiki/%C5%96) | [Ѓ](https://en.wikipedia.org/wiki/Gje) |  | [£](https://en.wikipedia.org/wiki/Pound_sign) | | | [Ģ](https://en.wikipedia.org/wiki/%C4%A2) | [ฃ](https://en.wikipedia.org/wiki/%E0%B8%83) | [£](https://en.wikipedia.org/wiki/Pound_sign) | | | [Ł](https://en.wikipedia.org/wiki/%C5%81) |
| **1010 0100** | **244** | **164** | **A4** | [¤](https://en.wikipedia.org/wiki/%C2%A4) | | | | [Є](https://en.wikipedia.org/wiki/Ukrainian_Ye) | [¤](https://en.wikipedia.org/wiki/%C2%A4) | [€](https://en.wikipedia.org/wiki/Euro_sign) | [¤](https://en.wikipedia.org/wiki/%C2%A4) | | [Ī](https://en.wikipedia.org/wiki/%C4%AA) | [ค](https://en.wikipedia.org/wiki/%E0%B8%84) | [¤](https://en.wikipedia.org/wiki/%C2%A4) | [Ċ](https://en.wikipedia.org/wiki/%C4%8A) | [€](https://en.wikipedia.org/wiki/Euro_sign) | |
| **1010 0101** | **245** | **165** | **A5** | [¥](https://en.wikipedia.org/wiki/%C2%A5) | [Ľ](https://en.wikipedia.org/wiki/%C4%BD) |  | [Ĩ](https://en.wikipedia.org/wiki/%C4%A8) | [Ѕ](https://en.wikipedia.org/wiki/Dze) |  | [₯](https://en.wikipedia.org/wiki/%E2%82%AF) | [¥](https://en.wikipedia.org/wiki/%C2%A5) | | [Ĩ](https://en.wikipedia.org/wiki/%C4%A8) | [ฅ](https://en.wikipedia.org/wiki/%E0%B8%85) | [„](https://en.wikipedia.org/wiki/%E2%80%9E) | [ċ](https://en.wikipedia.org/wiki/%C4%8A) | [¥](https://en.wikipedia.org/wiki/%C2%A5) | [„](https://en.wikipedia.org/wiki/%E2%80%9E) |
| **1010 0110** | **246** | **166** | **A6** | [¦](https://en.wikipedia.org/wiki/%C2%A6) | [Ś](https://en.wikipedia.org/wiki/%C5%9A) | [Ĥ](https://en.wikipedia.org/wiki/%C4%A4) | [Ļ](https://en.wikipedia.org/wiki/%C4%BB) | [І](https://en.wikipedia.org/wiki/Dotted_I_(Cyrillic)) |  | [¦](https://en.wikipedia.org/wiki/%C2%A6) | | | [Ķ](https://en.wikipedia.org/wiki/%C4%B6) | [ฆ](https://en.wikipedia.org/wiki/%E0%B8%86) | [¦](https://en.wikipedia.org/wiki/%C2%A6) | [Ḋ](https://en.wikipedia.org/wiki/%E1%B8%8A) | [Š](https://en.wikipedia.org/wiki/%C5%A0) | |
| **1010 0111** | **247** | **167** | **A7** | [§](https://en.wikipedia.org/wiki/%C2%A7) | | | | [Ї](https://en.wikipedia.org/wiki/Yi_(Cyrillic)) |  | [§](https://en.wikipedia.org/wiki/%C2%A7) | | | | [ง](https://en.wikipedia.org/wiki/%E0%B8%87) | [§](https://en.wikipedia.org/wiki/%C2%A7) | | | |
| **1010 1000** | **250** | **168** | **A8** | [¨](https://en.wikipedia.org/wiki/%C2%A8) | | | | [Ј](https://en.wikipedia.org/wiki/Je_(Cyrillic)) |  | [¨](https://en.wikipedia.org/wiki/%C2%A8) | | | [Ļ](https://en.wikipedia.org/wiki/%C4%BB) | [จ](https://en.wikipedia.org/wiki/%E0%B8%88) | [Ø](https://en.wikipedia.org/wiki/%C3%98) | [Ẁ](https://en.wikipedia.org/wiki/%E1%BA%80) | [š](https://en.wikipedia.org/wiki/%C5%A0) | |
| **1010 1001** | **251** | **169** | **A9** | [©](https://en.wikipedia.org/wiki/%C2%A9) | [Š](https://en.wikipedia.org/wiki/%C5%A0) | [İ](https://en.wikipedia.org/wiki/%C4%B0) | [Š](https://en.wikipedia.org/wiki/%C5%A0) | [Љ](https://en.wikipedia.org/wiki/Lje) |  | [©](https://en.wikipedia.org/wiki/%C2%A9) | | | [Đ](https://en.wikipedia.org/wiki/%C4%90) | [ฉ](https://en.wikipedia.org/wiki/%E0%B8%89) | [©](https://en.wikipedia.org/wiki/%C2%A9) | | | |
| **1010 1010** | **252** | **170** | **AA** | [ª](https://en.wikipedia.org/wiki/%C2%AA) | [Ş](https://en.wikipedia.org/wiki/%C5%9E) | | [Ē](https://en.wikipedia.org/wiki/%C4%92) | [Њ](https://en.wikipedia.org/wiki/Nje) |  | [ͺ](https://en.wikipedia.org/wiki/%CD%BA) | [×](https://en.wikipedia.org/wiki/%C3%97) | [ª](https://en.wikipedia.org/wiki/%C2%AA) | [Š](https://en.wikipedia.org/wiki/%C5%A0) | [ช](https://en.wikipedia.org/wiki/%E0%B8%8A) | [Ŗ](https://en.wikipedia.org/wiki/%C5%96) | [Ẃ](https://en.wikipedia.org/wiki/%E1%BA%82) | [ª](https://en.wikipedia.org/wiki/%C2%AA) | [Ș](https://en.wikipedia.org/wiki/%C8%98) |
| **1010 1011** | **253** | **171** | **AB** | [«](https://en.wikipedia.org/wiki/%C2%AB) | [Ť](https://en.wikipedia.org/wiki/%C5%A4) | [Ğ](https://en.wikipedia.org/wiki/%C4%9E) | [Ģ](https://en.wikipedia.org/wiki/%C4%A2) | [Ћ](https://en.wikipedia.org/wiki/Tshe) |  | [«](https://en.wikipedia.org/wiki/%C2%AB) | | | [Ŧ](https://en.wikipedia.org/wiki/%C5%A6) | [ซ](https://en.wikipedia.org/wiki/%E0%B8%8B) | [«](https://en.wikipedia.org/wiki/%C2%AB) | [ḋ](https://en.wikipedia.org/wiki/%E1%B8%8A) | [«](https://en.wikipedia.org/wiki/%C2%AB) | |
| **1010 1100** | **254** | **172** | **AC** | [¬](https://en.wikipedia.org/wiki/%C2%AC) | [Ź](https://en.wikipedia.org/wiki/%C5%B9) | [Ĵ](https://en.wikipedia.org/wiki/%C4%B4) | [Ŧ](https://en.wikipedia.org/wiki/%C5%A6) | [Ќ](https://en.wikipedia.org/wiki/Kje) | [،](https://en.wikipedia.org/wiki/%D8%8C) | [¬](https://en.wikipedia.org/wiki/%C2%AC) | | | [Ž](https://en.wikipedia.org/wiki/%C5%BD) | [ฌ](https://en.wikipedia.org/wiki/%E0%B8%8C) | [¬](https://en.wikipedia.org/wiki/%C2%AC) | [Ỳ](https://en.wikipedia.org/wiki/%E1%BB%B2) | [¬](https://en.wikipedia.org/wiki/%C2%AC) | [Ź](https://en.wikipedia.org/wiki/%C5%B9) |
| **1010 1101** | **255** | **173** | **AD** | [soft hyphen (SHY)](https://en.wikipedia.org/wiki/Soft_hyphen) | | | | | | | | | | [ญ](https://en.wikipedia.org/wiki/%E0%B8%8D) | [SHY](https://en.wikipedia.org/wiki/Soft_hyphen) | | | |
| **1010 1110** | **256** | **174** | **AE** | [®](https://en.wikipedia.org/wiki/%C2%AE) | [Ž](https://en.wikipedia.org/wiki/%C5%BD) |  | [Ž](https://en.wikipedia.org/wiki/%C5%BD) | [Ў](https://en.wikipedia.org/wiki/Short_U_(Cyrillic)) |  |  | [®](https://en.wikipedia.org/wiki/%C2%AE) | | [Ū](https://en.wikipedia.org/wiki/%C5%AA) | [ฎ](https://en.wikipedia.org/wiki/%E0%B8%8E) | [®](https://en.wikipedia.org/wiki/%C2%AE) | | | [ź](https://en.wikipedia.org/wiki/%C5%B9) |
| **1010 1111** | **257** | **175** | **AF** | [¯](https://en.wikipedia.org/wiki/%C2%AF) | [Ż](https://en.wikipedia.org/wiki/%C5%BB) | | [¯](https://en.wikipedia.org/wiki/%C2%AF) | [Џ](https://en.wikipedia.org/wiki/Dzhe) |  | [―](https://en.wikipedia.org/wiki/%E2%80%95) | [¯](https://en.wikipedia.org/wiki/%C2%AF) | | [Ŋ](https://en.wikipedia.org/wiki/%C5%8A) | [ฏ](https://en.wikipedia.org/wiki/%E0%B8%8F) | [Æ](https://en.wikipedia.org/wiki/%C3%86) | [Ÿ](https://en.wikipedia.org/wiki/%C5%B8) | [¯](https://en.wikipedia.org/wiki/%C2%AF) | [Ż](https://en.wikipedia.org/wiki/%C5%BB) |
| **1011 0000** | **260** | **176** | **B0** | [°](https://en.wikipedia.org/wiki/%C2%B0) | | | | [А](https://en.wikipedia.org/wiki/A_(Cyrillic)) |  | [°](https://en.wikipedia.org/wiki/%C2%B0) | | | | [ฐ](https://en.wikipedia.org/wiki/%E0%B8%90) | [°](https://en.wikipedia.org/wiki/%C2%B0) | [Ḟ](https://en.wikipedia.org/wiki/%E1%B8%9E) | [°](https://en.wikipedia.org/wiki/%C2%B0) | |
| **1011 0001** | **261** | **177** | **B1** | [±](https://en.wikipedia.org/wiki/%C2%B1) | [ą](https://en.wikipedia.org/wiki/%C4%84) | [ħ](https://en.wikipedia.org/wiki/%C4%A6) | [ą](https://en.wikipedia.org/wiki/%C4%84) | [Б](https://en.wikipedia.org/wiki/Be_(Cyrillic)) |  | [±](https://en.wikipedia.org/wiki/%C2%B1) | | | [ą](https://en.wikipedia.org/wiki/%C4%84) | [ฑ](https://en.wikipedia.org/wiki/%E0%B8%91) | [±](https://en.wikipedia.org/wiki/%C2%B1) | [ḟ](https://en.wikipedia.org/wiki/%E1%B8%9E) | [±](https://en.wikipedia.org/wiki/%C2%B1) | |
| **1011 0010** | **262** | **178** | **B2** | [²](https://en.wikipedia.org/wiki/%C2%B2) | [˛](https://en.wikipedia.org/wiki/%CB%9B) | [²](https://en.wikipedia.org/wiki/%C2%B2) | [˛](https://en.wikipedia.org/wiki/%CB%9B) | [В](https://en.wikipedia.org/wiki/Ve_(Cyrillic)) |  | [²](https://en.wikipedia.org/wiki/%C2%B2) | | | [ē](https://en.wikipedia.org/wiki/%C4%92) | [ฒ](https://en.wikipedia.org/wiki/%E0%B8%92) | [²](https://en.wikipedia.org/wiki/%C2%B2) | [Ġ](https://en.wikipedia.org/wiki/%C4%A0) | [²](https://en.wikipedia.org/wiki/%C2%B2) | [Č](https://en.wikipedia.org/wiki/%C4%8C) |
| **1011 0011** | **263** | **179** | **B3** | [³](https://en.wikipedia.org/wiki/%C2%B3) | [ł](https://en.wikipedia.org/wiki/%C5%81) | [³](https://en.wikipedia.org/wiki/%C2%B3) | [ŗ](https://en.wikipedia.org/wiki/%C5%96) | [Г](https://en.wikipedia.org/wiki/Ge_(Cyrillic)) |  | [³](https://en.wikipedia.org/wiki/%C2%B3) | | | [ģ](https://en.wikipedia.org/wiki/%C4%A2) | [ณ](https://en.wikipedia.org/wiki/%E0%B8%93) | [³](https://en.wikipedia.org/wiki/%C2%B3) | [ġ](https://en.wikipedia.org/wiki/%C4%A0) | [³](https://en.wikipedia.org/wiki/%C2%B3) | [ł](https://en.wikipedia.org/wiki/%C5%81) |
| **1011 0100** | **264** | **180** | **B4** | [´](https://en.wikipedia.org/wiki/%C2%B4) | | | | [Д](https://en.wikipedia.org/wiki/De_(Cyrillic)) |  | [΄](https://en.wikipedia.org/wiki/%CE%84) | [´](https://en.wikipedia.org/wiki/%C2%B4) | | [ī](https://en.wikipedia.org/wiki/%C4%AA) | [ด](https://en.wikipedia.org/wiki/%E0%B8%94) | [“](https://en.wikipedia.org/wiki/%E2%80%9C) | [Ṁ](https://en.wikipedia.org/wiki/%E1%B9%80) | [Ž](https://en.wikipedia.org/wiki/%C5%BD) | |
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