



# **Language Manual**

## **HQ and HD American English**

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## Language Manual: HQ and HD American English

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# Table of Contents

1. General .....	1
2. Letters in orthographic text .....	2
3. Punctuation characters .....	3
3.1. Comma, colon and semicolon .....	3
3.2. Quotation marks .....	3
3.3. Full stop .....	3
3.4. Question mark .....	3
3.5. Exclamation mark .....	3
3.6. Parentheses, brackets and braces .....	3
4. Other non alphanumeric characters .....	4
4.1. Non-punctuation characters .....	4
4.2. The <sup>2</sup> and <sup>3</sup> signs .....	4
4.3. Symbols whose pronunciation varies depending on the context .....	5
5. Number Processing .....	6
5.1. Full number pronunciation .....	6
5.2. Leading zero .....	7
5.3. Decimal numbers .....	7
5.4. Currency amounts .....	7
5.5. Ordinal numbers .....	8
5.6. Arithmetic operators .....	8
5.7. Mixed digits and letters .....	9
5.8. Time of day .....	9
5.9. Years .....	10
5.10. Dates .....	10
5.11. Phone numbers .....	11
6. How to change the pronunciation .....	13
7. American English Phonetic Text .....	14
7.1. Consonants .....	14
7.2. Vowels .....	15
7.3. Lexical stress .....	15
7.4. Glottal stop .....	15
7.5. Pause .....	15
8. Abbreviations .....	16
9. Web-addresses and email .....	19

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## List of Tables

4.1. Non-punctuation characters .....	4
7.1. Symbols for the American English consonants .....	14
7.2. Symbols for the American English vowels .....	15
8.1. Abbreviations .....	16

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## Chapter 1. General

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This document discusses certain aspects of text-to-speech processing for the American English text-to-speech system, in particular the different types of input characters and text that are allowed.

This version of the document corresponds to the High Quality (HQ) voices Tracy, Heather, Laura and Ryan, the HQ child voices Nelly and Kenny, and the High Density (HD) voices John and Jane. Note that there are some differences between the voices when it comes to text processing.

Please note that the *User's Guide*, mentioned several times in the manual, is called *Help* in some applications.

Note: This language manual is general and applies to all Acapela Group HQ and HD American English voices. One or more of the voices may be included in a certain Acapela Group product.

Note: For efficiency reasons, the processing described in this document has a different behaviour in some Acapela Group products. Those products are:

- Acapela TTS for Windows Mobile
- Acapela TTS for Linux Embedded
- Acapela TTS for Symbian



For these products, the default processing of numbers, phone numbers, dates and times has been simplified for the low memory footprint (LF) voice formats. Developers have the possibility to change the default behaviour from *simplified* to *normal* preprocessing by setting corresponding parameters in the configuration file of the voice. Please see the documentation of these products for more information. In the following chapters, each simplification will be described by the indication *[not SP]* following the description of the standard behaviour. The *SP* in the indication stands for *Simplified Processing*.

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## Chapter 2. Letters in orthographic text

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Characters from *A-Z* and *a-z* may constitute a word. Certain other characters are also considered as letters, notably those used as letters in other European languages, i.e. *ñ, õ, â, ç, é*. These letters are not pronounced as in their native languages though, they are pronounced as regular *n, o, a, c, e* when occurring in a word

Characters outside of these ranges, i.e. numbers, punctuation characters and other non-alphanumeric characters, are not considered as letters.

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## Chapter 3. Punctuation characters

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Punctuation marks appearing in a text affect both rhythm and intonation of a sentence. The following punctuation characters are permitted in the normal input text string: , ; “ ” . ? ! ( ) { } [ ]

### 3.1. Comma, colon and semicolon

Comma ',', colon ':' and semicolon ';' cause a brief pause to occur in a sentence, accompanied by a small rising intonation pattern just prior to the character.

### 3.2. Quotation marks

Quotes "" appearing around a single word or a group of words cause a brief pause before and after the quoted text.

### 3.3. Full stop

A full stop '.' is a sentence terminal punctuation mark which causes a falling end-of-sentence intonation pattern and is accompanied by a somewhat longer pause. A full stop may also be used as a decimal marker in a number (see chapter *Number processing*) and in abbreviations (see chapter *Abbreviations*).

### 3.4. Question mark

A question mark '?' ends a sentence and causes question-intonation, first rising and then falling.

### 3.5. Exclamation mark

The exclamation mark '!' is treated in a similar manner to the full stop, causing a falling intonation pattern followed by a pause.

### 3.6. Parentheses, brackets and braces

Parenthesis '()', brackets '[''] and braces '{}' appearing around a single word or a group of words cause a brief pause before and after the bracketed text.

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## Chapter 4. Other non alphanumeric characters

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### 4.1. Non-punctuation characters

The characters listed below are processed as non-letter, non-punctuation characters. Some are pronounced at all times and others are only pronounced in certain contexts, which are described in the following sections of this chapter.

**Table 4.1. Non-punctuation characters**

Symbol	Reading
/	slash
+	plus
\$	dollar
£	pound
€	euro
¥	yen
<	less than
>	greater than
%	percent
^	circumflex
	pipe
~	tilde
@	at
=	equals
<sup>2</sup>	(see below)
<sup>3</sup>	(see below)
-	(see below)
*	(see below)

### 4.2. The <sup>2</sup> and <sup>3</sup> signs

The reading of expressions with <sup>2</sup> and <sup>3</sup> is:

Expression	Reading
mm <sup>2</sup>	square millimeters
cm <sup>2</sup>	square centimeters
m <sup>2</sup>	square meters
km <sup>2</sup>	square kilometers
mm <sup>3</sup>	cubic millimeters
cm <sup>3</sup>	cubic centimeters
m <sup>3</sup>	cubic meters
km <sup>3</sup>	cubic kilometers

## 4.3. Symbols whose pronunciation varies depending on the context

### 4.3.1. Hyphen

A hyphen '-' is pronounced *minus* in two cases:

1. if followed by a digit and no other digit is found in front of the hyphen, i.e. as in the pattern -X but not in X-Y or X-Z where X, Y, and Z are numbers.
2. if followed by a digit and an equals sign '=', i.e. as in the pattern X-Y=Z. Space is allowed between digits, hyphen and equals sign.

If there is no equals sign, as in X-Y or X-Z, the hyphen is pronounced *dash*.

[not SP] In certain date formats, in between days or years, the hyphen is pronounced *to*. In other cases the hyphen is never pronounced.

Expression	Reading	
-3	minus three	
44-3	forty-four dash three	
44-3=41	forty-four minus three equals forty-one	
44 - 3 = 41	forty-four minus three equals forty-one	
15-20 October	the fifteenth to twentieth of October	[not SP]
6-10 Nov	the sixth to tenth of November	[not SP]
1998-2004	nineteen ninety-eight to two thousand and four	[not SP]
02-02-2002	February second two thousand and two	
low-income	low income	
mother-in-law	mother in law	

### 4.3.2. Asterisk

Asterisk '\*' is pronounced *times* if enclosed by digits and followed by equals sign '='. In other cases it is pronounced *asterisk*.

Expression	Reading
2*3	two asterisk three
2*3=6	two times three equals six
*bc	asterisk b c

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## Chapter 5. Number Processing

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Strings of digits that are sent to the text-to-speech converter are processed in several different ways, depending on the format of the string of digits and the immediately surrounding punctuation or non-numeric characters. To familiarize the user with the various types of formatted and non-formatted strings of digits that are recognized by the system, a brief description of the basic number processing is provided below, along with examples. Number processing is subdivided into the following categories:

- Full number pronunciation
- Leading zero
- Decimal numbers
- Currency amounts
- Ordinal numbers
- Arithmetic operators
- Mixed digits and letters
- Time of day
- Years
- Dates
- Phone numbers

### 5.1. Full number pronunciation

Full number pronunciation is given for the whole number part of the digit string.

#### Example

2425	full number
2,425	full number
2 425	full number
24.25	24 is a full number, 25 is the decimal part

Numbers denoting thousands, millions and billions (numbers larger than 999) may be grouped using space or comma (not full stop). In order to achieve the right pronunciation the grouping must be done correctly.

The rules for grouping of numbers are the following:

- Numbers are grouped in groups of three starting at the end.
- The first group in a number may consist of one, two, or three digits.
- If a group, other than the first, does not contain exactly three digits, the sequence of digits is not interpreted as a full number.
- The highest number read is 999999999999 (twelve digits). Numbers higher than this are read as separate digits.

Number	Reading
2580	two thousand five hundred and eighty
2 580	"
2,580	"
25800	twenty-five thousand eight hundred
25 800	"
25,800	"

Number	Reading
2580350	two million five hundred and eighty thousand three hundred and fifty
2 580 350	"
2,580,350	"
1000000000	one billion
23 456 789 012	twenty-three billion four hundred fifty-six million seven hundred eighty-nine thousand and twelve
1234567890123	one two three four five six seven eight nine zero one two three

## 5.2. Leading zero

Numbers that begin with 0 (zero) are read digit by digit.

Number	Reading
09253	zero nine two five three
020	zero two zero

## 5.3. Decimal numbers

Comma or full stop may be used when writing decimal numbers.

The full number part of the decimal number (the part before comma or full stop) is read according to the rules in the section *Full number pronunciation*. The decimals (the part after comma or full stop) are read as separate digits. Note: A number containing a comma followed by exactly three digits is not read as a decimal number but as a full number, following the rules in the section *Full number pronunciation*.

Number	Reading
16.234	sixteen point two three four
3.1415	three point one four one five
1251.04	one thousand two hundred and fifty-one point zero four
1,251.04	one thousand two hundred and fifty-one point zero four
2.50	two point five zero
2,50	two comma five zero
3,141	three thousand one hundred and forty-one

## 5.4. Currency amounts

The following principles are followed for currency amounts:

- Numbers with zero or two decimals preceded or followed by the currency markers £, \$, ¥ or € are read as currency amounts.
- [not SP] Numbers with zero or two decimals followed by the words *pounds*, *dollars*, *yen* or *euros* (singular or plural) are read as currency amounts.
- Accepted decimal markers are comma ',' and full stop '.'.
- The decimal part (consisting of two digits) in currency amounts is read as *and nn pence* and *and nn cents*.

- If the decimal part is *00* it will not be read.

<b>Example</b>	<b>Reading</b>	
\$15.00	fifteen dollars	
15.00£	fifteen pounds	
15.00 euros	fifteen euros	[not SP]
€ 200.50	two hundred euros and fifty cents	
1,000,000 ¥	one million yen	

There is also the possibility of writing large amounts as follows:

\$ 1 million	one million dollars
--------------	---------------------

## 5.5. Ordinal numbers

Numbers are read as ordinals in the following cases:

- [not SP] The number is followed by a month name or one of the month name abbreviations and the number is smaller or equal to 31. The number may be preceded by a day or an abbreviation for a day.
- [not SP] The number consists of a day interval followed by a month name/abbreviation.
- The number is followed by *st*, *nd*, *rd*, *th*, *d*.

Examples: 1st, 2nd, 3rd, 4th, 23d.

[not SP] The valid abbreviations for months are: *Jan*, *Feb*, *Mar*, *Apr*, *Jun*, *Jul*, *Aug*, *Sept*, *Oct*, *Nov*, and *Dec*.

[not SP] The valid abbreviations for days are: *Mon*, *Tue*, *Wed*, *Thu*, *Thurs*, *Fri*, *Sat*, and *Sun*.

[not SP] The abbreviations above are only expanded to names of months and days when appearing in correct date contexts.

<b>Expression</b>	<b>Reading</b>
3 January	third of January
3 Jan	third of January
Tuesday 3 Jan	Tuesday third of January
15-16 January	fifteenth to sixteenth of January
2nd May	second May
4th Jun 2007	fourth June 2007

## 5.6. Arithmetic operators

Numbers together with arithmetical operators are read according to the examples below.

<b>Expression</b>	<b>Reading</b>
-12	minus twelve
14-2	fourteen dash two
14-2=12	fourteen minus two equals twelve
+24	plus twenty-four
2+3	two plus three

Expression	Reading
$2+3=5$	two plus three equals five
$2*3$	two asterisk three
$2*3=6$	two times three equals six
$2/3$	two thirds
$6/2=3$	six divided by two equals three
25%	twenty-five percent
3.4%	three point four percent

## 5.7. Mixed digits and letters

If a letter appears within a sequence of digits, the groups of digits will be read as numbers according to the rules above. The letter marks the boundary between the numbers. The letter will also be read.

Expression	Reading
77B84Z3	seventy-seven B eighty-four Z three
0092B87-B	zero zero nine two B eighty-seven B

## 5.8. Time of day

The colon is used to separate hours, minutes and seconds.

[not SP] Abbreviations such as *A.M.* and *P.M.* (possible variants: *a.m.*, *am*, *AM*, *p.m.*, *pm*, *PM*) may follow or precede the time, with a space inserted between the time and the abbreviation. (Exception: when an hour is alone, the abbreviation must follow it. Example: 3 *AM* and not *AM* 3)

### Example

9 A.M.

4 pm

Possible patterns are:

- hh:mm* or *h:mm*
- hh:mm:ss* or *h:mm:ss*
- [not SP] *hh:mm:ss*" or *h:mm:ss*"

Example: 12:30'45"

*h* = hour, *m* = minute, *s* = second.

In pattern a:

If the *mm*-part is equal to *00*, this part will not be read. Instead, *o'clock* will be added if the hours are less than 13, or *hundred hours* will be added if the hours are greater than or equal to 13.

Expression	Reading
9:00	nine o'clock
13:00	thirteen hundred hours

Expression	Reading
12:00	noon
0:00	midnight

In pattern b:

An *and* will be inserted before the *ss*-part, and *seconds* will be added after it. If the *ss*-part is equal to *00*, this part will not be read.

Expression	Reading
10:24:00	ten twenty-four
10:24:20	ten twenty-four and twenty seconds

[not SP] In pattern c:

Pattern (c) follows the rules for pattern (b).

## 5.9. Years

Numbers between 1000 and 1999 are always read as hundreds (year reading) with the exception of numbers containing decimals. Years (2 or 4 digits) can also be followed by 's to indicate decades.

Expression	Reading	
1988	nineteen eighty-eight	
1939-45	nineteen thirty-nine to forty-five	[not SP]
1088	one thousand eighty-eight	
1988.0	one thousand nine hundred and eighty-eight point zero	
1988.32	one thousand nine hundred and eighty-eight point three two	
September 1999	September nineteen ninety-nine	
70's	seventies	
1980's	nineteen eighties	

## 5.10. Dates

The valid formats for dates are:

1. *mm-dd-yyyy*, *mm.dd.yyyy*, and *mm/dd/yyyy*
2. *mm-dd-yy*, *mm.dd.yy*, and *mm/dd/yy*

*yyyy* is a four-digit number, *yy* is a two-digit number, *mm* is a month number between 1 and 12 and *dd* a day number between 1 and 31. Hyphen, full stop, and slash may be used as delimiters. In all formats, one or two digits may be used in the *mm* and *dd* part. Zeros may be used in front of numbers below 10.

Examples of valid formats and their readings:

Type 1:	Reading
10-02-2003 or 10-2-2003	October second two thousand three
10.02.2003 or 10.2.2003	"

<b>Type 1:</b> 10/02/2003 or 10/2/2003	<b>Reading</b> “
<b>Type 2:</b> 10-02-03 or 10-2-03 10.02.03 or 10.2.03 10/02/03 or 10/2/03	<b>Reading</b> October second two thousand three “ “

[not SP] Ranges of days and years are also supported.

<b>Expression</b> 1998-1999 1939-45 2002/3 14-15 January October 19-20	<b>Reading</b> nineteen ninety-eight to nineteen ninety-nine nineteen thirty-nine to forty-five two thousand two to three fourteenth to fifteenth of January October nineteenth to twentieth
---	---

[not SP] Other possible formats include:

<b>Expression</b> Monday, 15 January Monday 15 January Mon, January 15 Mon January 15 30 April 1999 April 30 1999 May 1953 3 May	<b>Comment</b> Monday fifteenth of January Monday fifteenth of January Monday January fifteenth Monday January fifteenth thirtieth of April nineteen ninety-nine April thirtieth nineteen ninety-nine May nineteen fifty-three third of May
--	---

## 5.11. Phone numbers

In this section the patterns of digits that are recognized as phone numbers are described. In the pronunciation of phone numbers, all numbers are read out digit by digit with pauses between groups of numbers.

No phone numbers are recognized in the Simplified Processing voices.

### 5.11.1. Ordinary phone numbers

Sequences of digits in the following formats are treated as phone numbers.

The following sequences of digits can be separated by a space, a period, or a hyphen:

<b>Format</b> xxx xx xx xx xxx xxxx xx (xx) xxx xx xx (xx) xx xx xx xx xx xx (x)x xx xx xx xx xx (x) x xx xx xx xx
--

**Format**

xx x xx xx xx xx

The following sequences can only appear in these formats:

**Format**

(xx)-xxxx-xxx-xxx

(xx).xxxx.xxx.xxx

xx xxx xx xx

x-xxx-xxx-xxxx

Other formats are preceded by an area code that can consist of 1-3 numbers, either surrounded by parentheses or not. The groups of digits can be separated by a space, slash, hyphen or period. If the area code is surrounded by parentheses, it can be grouped with the other digits.

**Format**

(area code) xxx xxxx

(area code) xxx xxx

### 5.11.2. International phone numbers

International phone numbers follow the pattern below:

*International prefix + Country code + space or hyphen + Local number.*

International prefix:                   00 or +

Country code:                         1-3 digits

Local number:                         6-12 digits

All formats included above can be preceded by an international prefix and a country code.

**Examples**

001-12-456-7894

001-12 578 21 56

0032 (71).4521.521.843

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## Chapter 6. How to change the pronunciation

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Words that are not pronounced correctly by the text-to-speech converter can be entered in the user lexicon (see *User's guide*). In this lexicon, the user enters a phonetic transcription of the word (see chapter *American English Phonetic Text*). Phonetic transcriptions can also be entered directly in the text, using the *PRN* tag (see *User's guide*).

## Chapter 7. American English Phonetic Text

The American English text-to-speech system uses the American English subset of the SAMPA phonetic alphabet (*Speech Assessment Methods Phonetic Alphabet*), with a few exceptions. The symbol /o/ was replaced by /@U/ (ex. *nose*), /e/ was replaced by /E/ (ex. *hate*), /a/ was replaced by /A/ (ex. *light*), and /ɜ/ and /@/ were replaced by /r=/ (ex. *fers*, *corner*). The symbol /4/ was also introduced to represent a flapped *t* (ex. *better*). The symbols are written with a space between each phoneme.

Only the symbols listed here may be used in phonetic transcriptions. Symbols not listed here are not valid in phonetic transcriptions and will be ignored if included in the user lexicon or in a *PRN* tag.

### 7.1. Consonants

**Table 7.1. Symbols for the American English consonants**

Symbol	Word	Phonetic text	Comment
b	bad	b {1 d	
t	tab	t {1 b	
4	better	b E1 4 r=	flapped t
p	pipe	p A11 p	
d	date	d E11 t	
k	cone	k @U1 n	
g	gag	g {1 g	
m	man	m {1 n	
n	nose	n @U1 z	
r	rose	r @U1 z	
l	let	l E1 t	
N	ring	r l1 N	
f	fat	f {1 t	
v	vote	v @U1 t	
s	sat	s {1 t	
z	zoo	z u1	
S	shin	S l1 n	
tS	chin	tS l1 n	
Z	measure	m E1 Z r=	
dZ	gin	dZ l1 n	
D	this	D l1 s	
T	thin	T l1 n	
w	wait	w E11 t	glide
j	yacht	j A1 t	glide
h	hit	h l1 t	

## 7.2. Vowels

**Table 7.2. Symbols for the American English vowels**

Symbol	Word	Phonetic text	Comment
r=	corner	k O1 r n r=	
A	pot	p A1 t	
O	thought	T O1 t	
l	lit	l l1 t	
i	neat	n i1 t	
u	zoo	z u1	
V	hut	h V1 t	
U	put	p U1 t	
{	pat	p {1 t	
E	net	n E1 t	
@	allow	@ l aU1	
EI	main	m EI1 n	
AI	high	h AI1	
OI	boy	b OI1	
@U	nose	n @U1 z	
aU	pout	p aU1 t	

## 7.3. Lexical stress

In words with more than one syllable, one (and normally only one) of the syllables is more prominent than the others. This is referred to as word stress, or lexical stress. Words of one syllable also have word stress when spoken in isolation, although many may lose the stress in certain contexts. For the correct pronunciation of a word, it is important to include the symbol marking the word stress.

In the phonetic transcriptions the word stress is indicated by the symbol /1/ placed directly after the stressed vowel (with no space between the vowel symbol and the stress symbol).

A secondary lexical stress can also be used. This secondary stress is indicated by the symbol /2/ placed directly after the stressed vowel like /1/ for primary stress.

## 7.4. Glottal stop

A glottal stop, represented by the phonetic symbol /ʔ/, is a small sound which is often used to separate two words when the second word starts with a stressed vowel. This sound can be inserted in a transcription in order to improve the pronunciation.

## 7.5. Pause

An underscore /\_/ in a phonetic transcription generates a small pause.

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## Chapter 8. Abbreviations

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In the current version of the American English text-to-speech system, the abbreviations in the table below are recognized in all contexts. These abbreviations are mostly case-insensitive (except for those indicated below by “\*”) and require no full stop in order to be recognized as an abbreviation.

As previously mentioned, there are also abbreviations for the days of the week and the months (see chapter *Ordinal numbers* ).

**Table 8.1. Abbreviations**

Abbreviation	Reading
kg	kilograms
°C	degrees Celsius
°F	degrees Fahrenheit
°K	degrees Kelvin
asap	A S A P
b/f	before
blvd	boulevard
cm	centimeters
corp	corporation
dB*	decibel
DM*	Deutschmark (only expanded after numbers) [not SP]
eg	for example
etc	et cetera
ft	foot
gal	gallon (only expanded after numbers)
gov	governor
hr	hour
hrs	hours
ie	that is
jr	junior
km	kilometers
Km/h	kilometers per hour
mg	milligrams
ml	milliliters
mm	millimeters
mph	miles per hour
mr	mister
mrs	missis
ms	miss
mt	mount
prof	professor
sgt	sergeant
sr	senior

Abbreviation	Reading
tsp	teaspoons
vs	versus
gen	general
ltd	limited
dept	department
ct	court
rd	road
av	avenue
ctrl	control
lb	pounds
sec	seconds (Note: SEC is another abbreviation, it is spelled out)

Some abbreviations are expanded differently depending on their position in the sentence. For example, *dr* and *st* are expanded into *drive* and *street* if they appear after a capitalized noun. They are expanded into *doctor* and *saint* when they appear before a capitalized noun.

Example	Reading
Main st.	Main street
St John.	Saint John
Bayview dr.	Bayview drive
Dr. Jones.	Doctor Jones

*m*, *g* and *in.* are expanded only when appearing after a number.

Example	Reading	
25 m	twenty-five meters	
30 in.	thirty inches	note that the period is mandatory here
45 g	forty-five grams	

The following state abbreviations are recognized in the American English system (because non-ambiguous):

AK	Alaska	NE	Nebraska
AL	Alabama	NV	Nevada
AZ	Arizona	NH	New Hampshire
AR	Arkansas	NJ	New Jersey
CA	California	NM	New Mexico
CT	Connecticut	NY	New York
DE	Delaware	PA	Pennsylvania
FL	Florida	PR	Puerto Rico
GA	Georgia	RI	Rhode Island
IA	Iowa	SC	South Carolina
IL	Illinois	SD	South Dakota
KS	Kansas	TN	Tennessee
KY	Kentucky	TX	Texas
MN	Minnesota	VT	Vermont

## Abbreviations

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MO	Missouri	WA	Washington
MT	Montana	WI	Wisconsin
NC	North Carolina	WV	West Virginia
ND	North Dakota	WY	Wyoming

Note that the other state abbreviations are ambiguous and are only read as states when found in addresses.

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## Chapter 9. Web-addresses and email

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Web-addresses and email-addresses are read as follows:

- *www* is read as three *w*'s spelled letter by letter.
- Full stops '.' are read as *dot*, hyphens '-' as *dash*, underscore '\_' as *underscore*, slash '/' as *slash*.
- *us*, *uk*, *fr* and all the other abbreviations for countries are spelled out letter by letter.
- The @ is read *at*.
- Words/strings (including *org*, *com* and *edu*) are pronounced according to the normal rules of pronunciation in the system and in accordance with the lexicon.

### String

www.acapela-group.com

http://www.acapela-group.com

smith@yahoo.us

jane\_smith@yahoo.us

### Reading

w w w dot acapela dash group dot com

h t t p colon slash slash w w w dot acapela dash group dot com

smith at yahoo dot u s

jane underscore smith at yahoo dot u s