FONIX

DECtalk®

Software

4.6.4 SDK
Help
Guide

fonix
freedom of speech

Fonix proudly introduces DECtalk version 4.6.4, the world's most intelligible text-to-speech (TTS) synthesizer, now with a more natural sounding voice. DECtalk has the smallest memory footprint in the industry for a full featured, multi-language voice synthesizer. DECtalk's small footprint allows it to be used in devices where a TTS engine usually wouldn't be viable. DECtalk 4.6.4 supports seven languages: U.S. & U.K. English, Castilian & Latin American Spanish, German, French, and Italian.

It also offers nine voices, Paul, Betty, Harry, Dennis, Frank, Ursula, Rita, Wendy, and Kit, the industry's first child voice.

DECtalk comes with an easy to use API, as well as Microsoft's Speech API, so you can give your application the power of speech. DECtalk has more than 1,400 letter-to-sound rules, as well as extensive text preprocessing, so it correctly speaks monetary text like: $1.25, or clock times: 12:31 pm, or dates: Jan. 1, 2004, and even phone numbers: 800-297-4863.

Fonix DECtalk. Hear it for yourself.

Table Of Contents

Fonix DECtalk software

Welcome to DECtalk

DECtalk converts ASCII text into speech without special or proprietary hardware. The most important features of DECtalk text-to-speech (TTS) technology are described below.

High-Quality Speech

- Represents the latest in speech synthesis technology.

- Requires only a standard sound card for audio output.

- Provides nine different voices.

- Programmatically controls voice pitch, rate of speech, and word/phrase emphasis.

Word Pronunciation Accuracy

- Comes with a built-in dictionary for accurate pronunciation of individual words (enhances rhythmic naturalness).

- Accurately reads ASCII text from a variety of sources, including electronic mail and word processors.

Letter, Word, and Clause Modes

- Provides normal clause buffering for natural speech.

- Speaks letters, words, phrases, clauses, paragraphs, and even whole documents.

- Speaks single characters immediately (doesn't have to buffer an entire clause).

- Can terminate speech immediately (buffered text doesn't have to complete processing).

Pronunciation Heuristics

- Recognizes and pronounces non-word sequences, including sequences with uppercase initials (e.g., FBI and AAA) and sequences without vowels (e.g., CBS and NBC).

Conventions

enter

> Press the Enter key.

mouse

> Refers to any pointing device, such as a mouse, a puck, or a stylus.

MB1

> Identifies the left mouse button.

click

> Press and release MB1.

double click

> Press and release MB1 twice in rapid succession without moving the mouse.

drag

> Press and hold MB1, move the mouse, then release MB1 when the pointer is in the desired position.

Menu > command

> The right arrow key is an abbreviated instruction for choosing a command from a menu. For example, File > Exit means click the File menu, move the pointer to the Exit command, and release MB1.

Courier type face

> Often used for program and program-type examples.

XX YY and XXn YYn

> In DECtalk in-line command syntax, XX refers to options and YY refers to parameters. When more than one choice of options and/or parameters exists, the symbol XXn or YYn (n is replaced by a number) refers to individual options and/or parameters in symbolic representations. For example, [:phoneme XX1 XX2 YY].

> **NOTE**: The number of characters in the symbolic representation does NOT represent the number of characters allowed in the option or parameter name.

DD and DDn

In DECtalk in-line command syntax, DD indicates a decimal (base 10) value. When more than one decimal values are allowed, the symbol DDn (n is replaced by a number) represents possible values. For example, [:volume XX DD1 DD2].

NOTE: The number of characters in the symbolic representation does NOT represent the number of characters allowed in the decimal value.

Fonix Speech™

Fonix Speech provides the most advanced speech technology for enhancing telecom systems, electronic games, assistive devices, and mobile and hand-held products. For more information follow the Internet links below.

Fonix Speech Web site

- **About Fonix Speech**

  From this or any of the links below, click the "Solutions & Applications" menu item for information on electronic games, mobile phones and PDAs, electronic dictionaries, the assistive market and more.

- Development Tools and SDKs

  - **ASR: VoiceIn Standard Edition**

  - **ASR: VoiceIn Game Edition**

  - **TTS: DECtalk 4.6.3**

  - **TTS: DECtalk 5.0**

  - **TTS: DECtalk RT for Linux**

- **Fonix Speech Development Kits Overview** (PDF)

- **Fonix Technology Questions**

- **Case Studies**

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Licensing examples

1. Multiple threads running

   Three applications are running on a server. All three applications want to access DECtalk U.S. English at the same time and/or all three applications want to individually access DECtalk U.S. English, DECtalk Spanish, and DECtalk French at the same time. In both cases three licenses are required.

   2. Multiple text-to-speech instances running in the same thread

   One application is running. It opens two instances of DECtalk speech and wants concurrent access to DECtalk U.S. English and/or it wants concurrent access to DECtalk U.S. English and DECtalk Spanish (one language in each instance). In both cases two licenses are required.

Linux licensing

Put channel license information in /etc/DECtalk.conf. Update the file when customers purchase more channels.

The files locations.sh and install.sh contain information on installing DECtalk software.

Getting started

Introduction

Fonix DECtalk simplified software provides the functionality of Fonix DECtalk without a dictionary file. It can be used on platforms not using an OS, or are using an OS that is not multi-threaded.

The simplified API set has been designed to reduce the overhead of APIs requiring files. The word "Simple" has been added to the library names to distinguish the simple API set from the standard API set.

Related topic

DECtalk simplified API

DECtalk simplified API

Introduction

DECtalk simplified API

Fonix DECtalk simplified text-to-speech (TTS) APIs allow programmers to create embedded systems that support unlimited vocabulary, using the multi-language DECtalk TTS engine.

API sets

- **FnxTTSDtSimpleChangeVoice**
- **FnxTTSDtSimpleClose**
- **FnxTTSDtSimpleHaltSpeech**
- **FnxTTSDtSimpleOpen**
- **FnxTTSDtSimpleResetSpeech**
- **FnxTTSDtSimpleSetLanguage**
- **FnxTTSDtSimpleStart**

Required files

Header file: FonixTtsDtSimple.h

Library file: FonixTtsDTSimple

FnxTTSDtSimpleChangeVoice

Description

Changes the currently selected voice for subsequent synthesis.

Syntax

int **FnxTTSDtSimpleChangeVoice**(**FnxDECtalkVoiceId** *NewVoice*, **int** *nFlags*, **char** **nand_filename*, **char** **nand_tablename*)

Parameters

NewVoice	**FnxDECtalkVoiceId**	Voice identifier of the new voice (defined in the header file). - Paul - Harry - Frank - Dennis - Kit - Betty - Ursula - Rita - Wendy
nFlags	**int**	Audio format of synthesized audio (defined in the header file). - WAVE_FORMAT_08M16 (8 KHz, 51 samples per buffer) - WAVE_FORMAT_1M16 (11 KHz, 71 samples per buffer)

Returns

None (future use).

Comments

- API is provided for convenience. The same functionality is achieved using the DECtalk in-line command **Name [:name]**.

- API may crash if called before the TTS engine is initialized (**FnxTTSDtSimpleOpen** has returned successfully), because the system has no initialized variables.

Header file

FonixTtsDtSimple.h

Library file

FonixTtsDTSimple

FnxTTSDtSimpleClose

Description

Closes the text-to-speech engine.

Syntax

int **FnxTTSDtSimpleClose**(**void**)

Parameters

None

Returns

None (future use).

Header file

FonixTtsDtSimple.h

Library file

FonixTtsDTSimple

FnxTTSDtSimpleHaltSpeech

Description

Aborts speech synthesis initiated by **FnxTTSDtSimpleStart**(). Resets the text-to-speech engine.

Syntax

int **FnxTTSDtSimpleHaltSpeech**(**void**)

Parameters

None

Returns

None (future use).

Comments

- API can only be used to reset the engine (engine blocks until synthesis is complete). The voice is the last one set by **FnxTTSDtSimpleChangeVoice**().

- API may crash if called before the TTS engine is initialized (**FnxTTSDtSimpleOpen** has returned successfully), because the system has no initialized variables.

Header file

FonixTtsDtSimple.h

Library file

FonixTtsDTSimple

Related topic

FnxTTSDtSimpleStart()

Fonix DECtalk Software Documentation Version 4.6.4

FnxTTSDtSimpleOpen

Description

Initializes the Text-to-Speech engine.

Syntax

int **FnxTTSDtSimpleOpen** (**short** **callback*, **void** * *user_dict*)

Parameters

callback	**short**	Address of the function DECtalk calls to return audio data.
user_dict	**void**	Reserved for future use. Pass a NULL.

Returns

0	Successful.
1	Not successful.

Comments

No destroy function is required.

Callback function prototype

Syntax

short * **callback** (**short** **AudioData*, **long** *Flags*)

Parameters

AudioData	**short**	Pointer to the audio data returned by DECtalk.
Flags	**long**	Used to return index marks (must be supported by the current platform).

Returns

Pointer to the buffer used by DECtalk for the next audio frame. If the address of *AudioData* is NULL, text-to-speech is stopped, and **FnxTTSDtSimpleStart**() aborts.

Header file

FonixTtsDtSimple.h

Library file

FonixTtsDTSimple

FnxTTSDtSimpleResetSpeech

Description

Resets the text-to-speech engine to its default settings, including changes made through in-line commands.

Syntax

int **FnxTTSDtSimpleResetSpeech**(**void**)

Parameters

None

Returns

None (future use).

Comments

API may crash if called before the TTS engine is initialized (**FnxTTSDtSimpleOpen** has returned successfully), because the system has no initialized variables.

Header file

FonixTtsDtSimple.h

Library file

FonixTtsDTSimple

Related topic

FnxTTSDtSimpleHaltSpeech()

FnxTTSDtSimpleSetLanguage

Description

Sets the current language when multiple languages are available.

Syntax

int **FnxTTSDtSimpleSetLanguage** (**int** *nLanguageId*, **void** **user_dict*)

Parameters

nLanguageId	**int**	Language identifier of the new voice (defined in the header file).
		▪ US_English
		▪ French
		▪ German
		▪ Castilian_Spanish
		▪ UK_English
		▪ Latin_American_Spanish
		▪ Italian
user_dict	**void**	Reserved for future use. Pass a NULL.

Returns

0	Successful.
-1	Multiple languages not supported for this project.
-2	Invalid language ID.
-3	Language not included in project.

Comments

- Project must be built to support multiple languages.

- Language libraries must be included in the project.

- Set the text-to-speech engine to use the desired language.

- API may crash if called before the TTS engine is initialized (**FnxTTSDtSimpleOpen** has returned successfully), because the system has no initialized variables.

Header file

FonixTtsDtSimple.h

Library file

FonixTtsDTSimple

FnxTTSDtSimpleStart

Description

Synthesizes audio for the given input text.

Syntax

int **FnxTTSDtSimpleStart**(**char** *szString, **short** *nBuffer, **int** *nBuflength*, **int** *nFlags*)

Parameters

szString	**char**	Pointer to a sound-bank object.
nBuffer	**short**	Pointer to receive synthesized audio samples.
nBuflength	**int**	Length of *nBuffer* (number of shorts). Must be greater than or equal to 51 for 8 KHz, and 71 for 11 KHz. This parameter is strictly observed (the input buffer is never overrun).
nFlags	**int**	Audio format of synthesized audio (flags are defined in the header file). ▪ WAVE_FORMAT_08M16 (8 KHz, 51 samples per buffer) ▪ WAVE_FORMAT_1M16 (11 KHz, 71 samples per buffer)

Returns (with or without callback function)

0	Successful.
1	Invalid parameters.
2	Returned early due to reset.

Returns (callback function not used)

When successful, the number of synthesized samples. If the synthesized wave is larger than *nBuflength*, only the portion that fits in the buffer is returned. The required buffer length is returned as a negative number of samples.

Comments

API may crash if called before the TTS engine is initialized (**FnxTTSDtSimpleOpen** has returned successfully), because the system has no initialized variables.

Header file

FonixTtsDtSimple.h

Library file

FonixTtsDTSimple

Related topic

FnxTTSDtSimpleHaltSpeech()

In-line commands

Introduction (simplified SDK)

In-line commands control voice characteristics, such as speaking rate and the speaker's voice. In-line commands can be placed in the edit window of a DECtalk sample application (👀), in a text file (👀), or in a buffer passed to the DECtalk DLL (dectalk.dll) via a text-to-speech API call (👀).

In-line Commands

- See **Conventions** for an explanation of **XX YY** and **DD** in-line command options, parameters, and syntax conventions.

- Commands are not synchronous unless otherwise indicated. Use Sync [:sync] to make a command synchronous.

- Beginning with SAPI Version 5, DECtalk can be used in SAPI text buffers as in-line commands. This feature is not supported in earlier SAPI versions.

- Design Voice [:dv] modifies the characteristics of a voice. See **Design voice command** for information on modifying a DECtalk voice.

- **Phoneme Interpretation [:phoneme]** can be used to control intonation and stress, and to create special effects (e.g., singing).

- Several commands used together may interact with each other to affect the output. If incorrect syntax is used in a command, the right bracket (]) is ignored because it might be considered part of an illegal string. To avoid this situation, insert an extra right bracket (]) in the command.

Abbreviations

All in-line commands accept first match abbreviations. For example, **Comma Pause** works equally well as `[:comma]` or `[:c]`. Since no other in-line command begins with the letter c, no conflict exists. **Volume** works equally well as `[:vol]`, `[:vo]`, or `[:v]`.

Six in-line commands begin with the letter p. Using `[:p]` resolves to the first in-line "p" command which is **Period Pause**. As a result, use `[:pi]` for **Pitch**, `[:pu]` for **Punctuation**, and so on.

> **NOTE**: Alternate in-line commands exist for all "double-word" commands, such as **Comma Pause** and **Period Pause**. See individual in-line commands for alternates.

Quick list

- **Comma Pause** [:comma DD] or [:cp DD]

Inserts a comma pause into spoken text.

- **Design Voice** [:dv XX YY]

Customizes a DECtalk voice by selecting and setting speaker definition options.

- Dial Tones [:dial YY]

Dials telephone numbers.

- **Error** [:error XX]

Sets the error mode for a module.

- Loadv [:loadv DD YYn]

Loads up to ten in-line command sets for insertion into a text buffer.

- **Mode** [:mode XX YY]

Allows words and symbols to be interpreted for special use.

- **Name** [:name XX] or [:XXn]

Selects the name of the DECtalk voice.

- **Period Pause** [:period DD] or [:pp DD]

Inserts a pause equivalent to a period in a sentence into spoken text.

- **Phoneme Interpretation** [:phoneme XX1 XX2 YY]

Allows everything within brackets to be interpreted as phonemic text.

- **Pitch** [:pitch DD]

Modifies the frequency difference between spoken upper and lowercase letters.

- **Pronounce** [:pronounce XX]

Speaks alternate, primary, or proper noun pronunciation of a word.

- **Punctuation** [:punct XX]

Turns punctuation on and off.

- **Rate Selection** [:rate DD]

Selects the speed at which text is spoken.

- **Say** [:say XX]

Allows DECtalk to speak words before they are queued.

- Setv [:setv DD]

Inserts one of ten in-line command sets into a text buffer.

- **Skip** [:skip XX]

Allows users to skip specified parts of the text preprocessing.

- Tone [:tone DD, DD]

Creates tones of a specified length and frequency.

- **Volume** [:volume XX DD] or [:volume XX DD1 DD2]

Sets the volume.

Comma Pause [:comma]

Description

- Changes the length of the comma pause in milliseconds.

- Changes the duration of all future pauses.

- Inserts a pause when the command is processed.

- Set the length of the pause by adding the command value to the default value.

- Can be increased by 30,000 ms and decreased by 280 ms (-280).

- All values outside the legal range default to the nearest legal values.

- [:cp 0] resets the comma pause to its default state (approximately 280 ms).

Syntax	[:comma DD]
Alternate	[:cp DD] and [:cp 0]
Range	Min: -280 Max: 30000
Options	...
Parameters	Pause time in milliseconds (ms)
Default	280 ms
Notes	1. Asynchronous
	2. DD indicates a decimal (base 10) value. See Range.
	3. See **Adjusting Period and Comma Pause Durations**.
Example	[:comma 250]

Design voice [:dv]

Description

Customizes DECtalk voices by introducing voice options and parameters that can be entered as a string or one at a time.

- DECtalk's nine built-in voices are distinguished by a large set of voice (speaker-definition) options. The voices can be modified, but the modifications cannot be saved.

- See **Customizing DECtalk voices** for detailed information on how to use this in-line command.

Syntax	[:dv XX YY]	
Alternate	...	
Range	...	
Options	ap	Average pitch, in Hz
	as	Assertiveness, in %
	b4	Fourth formant bandwidth, in Hz
	b5	Fifth formant bandwidth, in Hz
	bf	Baseline fall, in Hz
	br	Breathiness, in decibels (dB)
	f4	Fourth formant resonance frequency, in Hz
	f5	Fifth formant resonance frequency, in Hz
	hr	Hat rise, in Hz
	hs	Head size, in %
	la	Laryngealization, in %
	lx	Lax breathiness, in %
	nf	Number of fixed samples of open glottis
	pr	Pitch range, in %
	qu	Quickness, in %
	ri	Richness, in %
	sm	Smoothness, in %
	sr	Stress rise, in Hz
	sx	Sex 1 (male) or 0 (female)
	save	Save the current speaker-definition options as Val's voice.
Parameters	See the options above for valid parameter values. See **Voice Definitions** for default parameter values.	
Default	...	
Notes	...	
Example	[:np][:dv ap 100] Changes Paul's average pitch to be 100.	

Related topic

Customizing DECtalk voices

Error [:error]

Description

Sets the error mode for the text-to-speech system. This command is useful for debugging an application.

Syntax	[:error XX]	
Alternate	...	
Range	...	
Options	**text**	log text to a file called log.txt in the current directory
	ignore	turn command error reporting off
	speak	speak detected command errors
Parameters	...	
Default	speak	
Notes	1. Asynchronous	
	2. Error [:error] fails if the system is in one of the text-to-speech special modes (wave file, log file, or speech-to-memory).	
Example	[:error speak]	

Related topic

Text-to-speech modes

Mode [:mode]

Description

Changes the mode for all text processed after this command, which remains in effect until the next Mode command or the engine is reset.

Syntax	[:mode XX YY]	
Alternate	...	
Range	...	
Options	math	Change interpretation of selected symbols (see example below).
	europe	Select European cardinal pronunciation (see example below).
	spell	Spell all words.
	name	Pronounce all uppercase verbs as proper nouns (see **Pronounce [:pronounce]**; example below).
	citation	Pronounce short sentences and single words without vowel reduction.
	latin	Not supported.
	table	Table speaking mode.
	email	Activates email parsing rules (see example below).
	reading	Uses classic voices.
Parameters	on	Turns on the specified mode option.
	off	Turns off the specified mode option.
	set	Turns on the specified mode option while turning off all other mode options.
Default	All mode options are turned off.	
Notes	Asynchronous. See Sync [:sync] for information on making this command synchronous.	
Example	[:mode spell on]	

Mode examples

- **[:mode europe on]**

A comma separates the integer and fraction part of a number. A period separates 3-digit blocks.

```
1.255 (United States) = 1,255 (Europe)

125,873 (United States) = 125.873 (Europe)
```

- **[:mode name on]**

  Uppercase words that do not begin a sentence are pronounced as proper names. Only use when pronouncing lists of names. Set to "off" when finished.

- **Math mode example**

- **Email mode example**

Name [:name]

Description

Changes the current speaking voice to one of ten DECtalk voices.

Syntax	[:name XX]		
Alternate	[:n<first letter of name>]		
Range	...		
Options	Variable	Speaker	Description
	p	PAUL	default male voice
	h	HARRY	full male voice
	f	FRANK	aged male voice
	d	DENNIS	male voice
	b	BETTY	full female voice
	u	URSULA	aged female voice
	w	WENDY	whispering female voice
	r	RITA	female voice
	k	KIT	child's voice
	v	VAL	Val's voice
Parameters	...		
Default	PAUL (HARRY in Spanish version)		
Notes	1. Synchronous		
	2. A user can change any of the voice characteristics of the current speaker by using the **Design Voice [:dv]** in-line command. These changes are active only while the current speaker remains current. To save the voice changes, use the save option of the Design Voice command, which saves the changes as the voice of Val. For information on the individual characteristics of a speaker or details on how to change a voice using the **Design Voice [:dv]** command, see the information under **Design voice command**.		
Example	[:name Paul] or [:np]		

The Speak applet displays language-specific speaker names, as listed below.

English	Spanish	German	French	Italian
Paul	Pablo	Paul	Olivier	Paolo
Harry	Humberto	Hans	Michel	Ettore
Frank	Francisco	Frank	François	Frederico
Dennis	Domingo	Dieter	Joël	Diana
Betty	Berta	Beate	Marjoliane	Berenice
Ursula	Ursula	Ursula	Angèle	Orsola
Wendy	Wendy	Wendy	Nadia	Viviana

Rita	Rita	Rita	Jacqueline	Rosetta
Kit	Juanito	Karsten	Sébastien	Rico

Period Pause [:period]

Description

Increases or decreases the length of the period pause in milliseconds.

- **[:pp 0]** resets the period pause to its default state (640 ms).

- Period Pause can be increased by 30,000 ms and decreased by 420 ms (-420).

- Pause length is set by adding the parameter value to the default value.

- All values outside the legal range default to the nearest legal values.

- Changes the duration of all future pauses.

- Inserts a pause when the command is processed.

Syntax	`[:period DD]`
Alternate	`[:pp DD]` and `[:pp 0]`
Range	`Min: -420 Max: 30000`
Options	`...`
Parameters	`Pause time in milliseconds`
Default	`640 ms`
Notes	1. Asynchronous
	2. See **Adjusting Period and Comma Pause Durations**.
Example	`[:period 250]`

Phoneme Interpretation [:phoneme]

Description

When phoneme interpretation is set to on, the Phoneme Interpretation command allows everything within brackets to be interpreted as phonemic text. All phoneme interpretation of text can be silenced by using the **[:phoneme silent on]** command. By default, the text is spoken without phoneme interpretation.

When you phonemicize text, put valid phoneme strings in brackets. See **Reference Tables** for a list of valid phonemic symbols.

Phoneme interpretation allows you to specify the preferred pronunciation of a word or phrase. It is important to note that this command sets the left bracket ([) and right bracket (]) characters as phoneme delimiters. When the user has the phoneme interpretation turned on [:phoneme on], all text and characters that appear between brackets are interpreted as phonemic text and is pronounced as such. For example, to say the word associate, simply embed the phonemic string [axs ' owshiyeyt] in the text string. Note that the pronunciation of the phonemic string is different depending on whether phoneme interpretation is on or off.

When phoneme interpretation is on, additional attributes can be associated with the phoneme text. See **Pitch and Duration of Tones** (**Reference Tables**) for information on how to code a phoneme sequence to produce musical sounds. See **Stress and Syntactic Symbols** for a complete list of symbols used with phoneme text.

NOTE 1: Arpabet mode is a 2-character system. All single character symbols must be followed by a space so that faulty translations do not occur. Consider the phonemic representation of "whitehorse," [* w 'ayt hxowr s]. The letter "t" in this phonemic representation must be followed by a space, so that it is not interpreted as part of the phonemic symbol [th] in the representation of "whitehorse."

NOTE 2: Some older versions of DECtalk supported single characters in arpabet mode. Application programs written for use with those versions may fail to function correctly when used with DECtalk V4.6 or higher.

Syntax		[:phoneme XX1 XX2 YY] or [:phoneme arpabet speak on]
Alternate		...
Range		...
Options	**arpabet**	Set phonetic interpretation to arpabet alphabet. (Currently, this option is the only alphabet allowed.)
	speak	If phoneme interpretation is on, speak encountered phonemes. The speak option is ignored if phoneme interpretation is off.
	silent	If phoneme interpretation is on, do

			not speak encountered phonemes. The silent option is ignored if phoneme interpretation is off.
Parameters		**on**	turn phoneme interpretation on
		off	turn phoneme interpretation off
Default	off		
Notes	1. Asynchronous		
	2. Make sure you use a right bracket (]) to end the phonemic symbols. If you do not, any normal text appearing after the phonemic symbols sounds garbled. One right bracket is sufficient to close phonemic mode. It is sometimes useful to begin a text file with a right bracket (]) to ensure that text is not interpreted phonemically. A command sequence consisting of a left bracket followed by a colon ([:) is always interpreted as the beginning of a command.		
Examples	[:phoneme arpabet speak on] [axs 'owshiyeyt] associate [:phoneme speak on] [axs 'owshiyeyt] associate [:phoneme on] [axs 'owshiyeyt] associate [:phoneme speak off] [axs 'owshiyeyt] pronounced as axsociate [:phoneme off] [axs 'owshiyeyt] pronounced as axsociate [:phoneme silent off] [axs 'owshiyeyt] pronounced as axsociate [:phoneme silent on] [axs 'owshiyeyt] associate not spoken		

Pitch [:pitch]

Description

Modifies the frequency of uppercase letters, spoken in typing mode using the typing table (spoken one letter at a time). The default difference between upper and lowercase letters is 35 Hz. The frequency difference enables users to distinguish between uppercase and lowercase letters. You can return the pitch increment for uppercase letters to the default value by specifying the command **[:pitch 35]** or by restarting Speak.

DECtalk adds the value of the argument, **DD** (in Hertz), as a pitch increment, to the uppercase letters in the next phoneme string it processes. However, the Pitch command is asynchronous. Place a Sync [:sync] command in the character stream after the Pitch command to ensure that the Pitch command is processed before the letters that follow it in the buffer.

Syntax	[:pitch DD]
Alternate	...
Range	...
Options	...
Parameters	Frequency in hertz
Default	35
Notes	Asynchronous
Examples	[:pitch 60] bBcCdD [:pitch 35] eEfFgGhH

Pronounce [:pronounce]

Description

Determines the type of pronunciation for the word immediately following this command. This command is synchronous.

Use the **[:pronounce alternate]** command to obtain an alternative pronunciation for a word. See the **Homograph** tables for examples of primary and alternate pronunciations of words. Using the word wind as an example, the primary pronunciation is **w ' ihn d**, as in "the wind is blowing." The alternate pronunciation, denoted by **[:pronounce alternate]** wind, is **w ' ayn d**, as in "wind up the top."

Use the **[:pronounce name]** command to pronounce a word as a proper name. First names, last names, street names, and place names are all examples of proper names.

Syntax	[:pronounce XX]	
Alternate	...	
Range	...	
Options	**alternate**	Pronounce the next word with the less common (alternate) homograph pronunciation.
	primary	Pronounce the next word with the most common (primary) homograph pronunciation.
	name	Pronounce the next word as if it was a name according to the special name and address rules.
	noun	Pronounce the noun version of the homograph that follows.
	adjective	Pronounce the adjective version of the homograph that follows.
	verb	Pronounce the verb version of the homograph that follows.
Parameters	...	
Default	uses the primary pronunciation	
Notes	...	
Example	Terry [:pronounce name] Doucette played [:pronounce primary] bass in the band.	

Punctuation [:punct]

Description

Determines how DECtalk treats punctuation marks.

Syntax	[:punct XX]		
Alternate	...		
Range	...		
Options	**none**	Punctuation and some other symbols are not pronounced. Exceptions: dollar and percentage signs. Punctuation symbols are treated as text breaks.	
	some	Text is read normally; clause boundary punctuation is not spoken, but all symbols such as $ are spoken as words.	
	all	All punctuation symbols and other symbols are spoken as words.	
	pass	All special punctuation processing is turned off. The pass option is useful in proofreading, as well as in applications where special characters are encountered, such as in a computer program. See **Preprocessor Parsing Rules** for more information on preprocessor parsing for treatment of punctuation.	
Parameters	...		
Default	some		
Notes	Synchronous		
Example	[:punct none]		

Related topic

Punctuation Parsing Rules

Rate Selection [:rate]

Description

Sets DECtalk speaking rate.

Syntax	[:rate DD]
Alternate	...
Range	Min: 75 Max: 600
Options	Speaking rate (DD)
Parameters	...
Default	200 words per minute
Notes	1. Asynchronous
	2. All values outside the range 75 to 600 default to the nearest legal value. For example, if you select a speaking rate of **[:rate 880]** or 880 words per minute, DECtalk defaults to 600 words per minute.
	3. See Speaking Rate.
Example	[:rate 400]

Say [:say]

Description

Specifies when speaking begins.

Syntax	[:say XX]	
Alternate	...	
Range	...	
Options	**clause**	Speak on end of clause.
	word	Speak on end of word.
	letter	Speak on end of letter. **NOTE:** In letter mode, the left bracket is spoken only after the next character is entered because DECtalk needs to know if this is the beginning of a new command.
	filtered letter	Speak on end of letter, ignoring control characters (e.g., vertical tab and line feed).
	line	Speak on end of line.
Parameters	...	
Default	clause	
Notes	1. Synchronous	
	2. In DECtalk, each clause, word, or letter is spoken as it is queued. In word and letter mode, DECtalk does not need to wait for a clause terminator to begin speaking. Word mode is similar to letter mode except text is spoken a word at a time. A space after a character or string of characters causes that string to be spoken. This mode interacts with the **Rate Selection** command to increase or decrease the rate at which the text is spoken. In clause mode, speaking starts when DECtalk is sent a clause terminator (period, comma, exclamation point, or question mark) followed by a space. There is no time-out limit. This is the normal mode where text is spoken a phrase, clause, or sentence at a time.	
Example	[:say word]	

Skip [:skip]

Description

Skips a selected part of text preprocessing, which remains in effect until another Skip command is encountered.

Syntax	[:skip XX]	
Alternate	...	
Range	...	
Options	**punct**	Turns off punctuation rules (punctuation is spoken).
	rule	Turns off rules for processing items like phone numbers.
	all	Skip all preprocessing.
	parser	Turns off the language parser for US English. This parameter has no effect on other languages.
	off	Returns processing to the default state.
	cpg	Skip code page translation.
	none	Do not skip anything.
Parameters	...	
Default	none	
Notes	1. Synchronous	
	2. Only one option can be in effect at a time. For example, [:skip cpg] overrides [:skip all].	
	3. See **Preprocessor Parsing Rules**.	
Examples	[:skip cpg] [:skip all] [:skip none]	

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Volume [:volume]

Description

Changes the volume setting.

- Audio system gain is changed in decibel (dB) increments ranging from 0 to 140.

- Increments or decrements of 10 to 20 provide a perceptible increase or decrease in volume. Setting volume to 0 causes volume to go silent. Setting it greater than 100 can cause distortion.

- Does not affect volume when an application writes wave files or uses the speech-to-memory capability (scaling is not done to the speech samples based on the Volume command settings).

Monaural volume control

Syntax	`[:volume XX DD]`	
Alternate	`...`	
Range	`Min: 0 Max: 140`	
Options	`att`	`change the internal volume`
Parameters	`Volume amount (DD must be in the range 0 to 140)`	
Default	`100`	
Notes	`Synchronous`	
Examples	`[:volume att 90]`	

Using in-line commands

Introduction

This section provides an in-depth look at the DECtalk in-line commands, which can be used within a DECtalk text file or application. The in-line command **Design Voice [:dv]** requires its own section. See **Design voice command** for more information on this command.

Topics

- Changing Rhythm, Stress, and Intonation

  DECtalk uses stress and syntactic symbols to control rhythm, stress, and intonation patterns within a spoken text file. These symbols include punctuation marks such as commas, periods, and parentheses. Punctuation marks are recognized by DECtalk as indicating special phrasing requirements. See **Stress and syntactic symbols** for a list of these symbols. Also, study the examples in the topics below.

- **Rules and syntax**

- **Optimizing spoken text**

- **Period and comma pause durations**

- **Text-tuning example**

- **Electronic mail-reading example**

- **Avoiding common errors**

Rules and syntax

Including In-line Commands in a Text File

1. Enclose every command within brackets. The **Rate Selection [:rate]** and **Name [:name]** commands are used in the following example. A space does not need to follow a command. One is used here and below for visual clarity.

   [:rate 150] [:name Betty] Hello. How are you?

2. Some commands provide an alternate form to simplify input. The **[:name]** command and its argument **Betty** are replaced by the alternate command **[:nb]**.

   [:rate 150] [:nb] Hello. How are you?

3. Begin every command with a colon. The **Design Voice [:dv]** and **Name [:name]** commands are used in the following example.

   [:dv ap 160 pr 50 save] [:nv] Hello.

4. Two or more in-line commands can be placed in a row. Each command must be enclosed by its own set of brackets. The **Name [:name]** and **Rate Selection [:rate]** commands are used in the following example.

   [:name Paul] [:rate 100] This is Paul speaking slowly.

5. Separate command names, options, and/or parameters with a space or a tab (a valid word boundary marker). The following example uses a space.

   [:dv ap 160 pr 50 save] [:nv] Hello.

   Command name: **dv**. Options: **ap** and **pr**. Parameters: **160** and **50**.

6. Include multiple options and/or parameters within the same set of command brackets. The **Design Voice [:dv]** command is used in the following example.

   [:dv ap 160 pr 50 save] [:nv] Hello.

7. Avoid using conflicting commands. If a conflict exists, the last command is used. Paul's voice would be used in the following example, where two **Name [:name]** commands are used without intervening text.

   [:name Betty] [:name Paul] Hello.

8. If you enable phoneme interpretation by using the [:phoneme arpabet speak on] command, you can include phonetic spelling for text-to-speech synthesis. The phonetic spelling replaces the actual spelling and is enclosed within brackets. In this example, the phonetic spelling of the word really (**r ' iyl iy**) is included.

   Now I'm [:dv ap 90 pr 130] [r ' iyl iy] thrilled.

Additional In-line Command Rules

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1. If an option value is too high or too low, the maximum or minimum value is used. See **Design Voice [:dv]** and **Rate Selection [:rate]** commands.

2. The placement of an in-line command affects all subsequent text until overridden by another command. The following example uses the **Rate Selection [:rate]** in-line command. The first sentence is spoken slower than the second. The final **[:rate 200]** command sets the speaking rate to normal for all subsequent text (not shown in this example), or until another Rate Selection command is encountered.

   [:rate 75]I can speak slower. [:rate 350] I can speak faster.[:rate 200]

3. Invalid commands are ignored. Setting the **Error [:error]** in-line command to **[:error speak]** causes an audible invalid command warning for every error.

4. Do not put arpabet parameters within the brackets for another command.

5. DECtalk interprets text between brackets as phonemes only after the [:phoneme arpabet speak on] command is sent to the application. If [:phoneme arpabet speak on] has not been sent, DECtalk interprets the brackets and characters between them literally. The [:phoneme arpabet speak off] command must be sent with literal characters if you want to insert brackets in normal text.

6. If the command [:phoneme arpabet speak on] is set and you forget the right bracket ( ]), DECtalk attempts to interpret all text following the ASCII text as phonemes, skipping over illegal letter combinations. The resulting text sounds garbled. Enter a right bracket to fix this problem.

7. Phonetic spellings of words can be included also. Phonetic spellings are enclosed within a set of square brackets. (For example, [r ' iyl iy] for really) Note: if you want to use phonetic spellings, you must use the [:phoneme arpabet speak on] command to turn on recognition of phonetic spellings.

Optimizing spoken text

Homograph Discussion

- DECtalk chooses correct pronunciations for similar words.

    Example:

    - He produced a lot of **refuse**. She **refuse**d the produce.

    - She **inserts** five **inserts** per minute.

    - He **deliberate**d **deliberate**ly a long time.

- DECtalk also pronounces homographs correctly (see **Homograph** tables).

    Example:

    - He will **refuse** the **refuse**.

    - Her **conduct** was not acceptable today. She will **conduct** herself better tomorrow.

    - He **lead** the troops into battle. The **lead** ball missed its mark.

- Occasionally, a special technique may be necessary to pronounce a homograph correctly.

    Example:

    - Replace the correct spelling of the word with a clever misspelling (I **red** yesterday that. . .).

    - Spell the word phonetically (I **[r ' ehd]** yesterday that. . .).

Optimization Techniques

- If necessary, use a hyphenated spelling for compound words to help DECtalk see the two parts of the compound.

    Example: The slide-show host . . .

- Replace the text version by a phonemic string. Use the commands and phonemic symbols, and make sure to place the lexical stress pattern correctly.

- After words are pronounced correctly, listen to the sentence rhythm and accent pattern. If it is not right, follow some of these suggestions:

    - If a short pause is needed where one is not provided, insert a comma between the words.

    - If the wrong word is emphasized, emphasize the correct word with a stress symbol.

Example: `The ["] younger man is the trouble-maker, not the older one.`

- Use the stress symbols slash `[/]`, backslash `[\]`, and slash and backslash `[/\]` to make final adjustments.

Related topic

See **Stress and Syntactic Symbols** for a complete list of stress symbols.

Period and comma pause durations

At the default speaking rate of 200 WPM, DECtalk pauses about half a second after a period, and about a sixth of a second after a comma. When the speaking rate changes, pause durations are automatically adjusted.

To change the pause after a period or a comma and not change the speaking rate, use the **Period Pause [:period]** and/or **Comma Pause [:comma]** in-line commands. For example, reading a word list with an extended pause after each word allows a listener to copy the words as they are spoken.

- **[:period 4500] apple. banana. strawberry.**

  Adds a period pause of 4,500 ms (4.5 seconds) to the default half-second pause. The range for a period pause is -420 to 30,000 ms. A negative value shortens the default period pause.

- **[:comma 4800] apple, banana, strawberry.**

  Adds a comma pause of 4,800 ms (4.8 seconds) to the default sixth of a second pause. The range for a comma pause is -280 to 30,000 ms. A negative value shortens the normal comma pause.

- **[:pp 0 :cp 0]**

  Resets the period pause and the comma pause to their default values.

Text-tuning example

Although DECtalk allows for natural text-to-speech synthesis, the quality of speech can sometimes be enhanced by giving it a more natural flow. Much of this tuning involves strategic placement of commas and periods, which pause the spoken text. Spoken language and spoken text are different in that spoken text generally does not contain pause information.

The examples that follow are presented twice. The revised version adds phonemic and textual changes. See **Stress and Syntactic Symbols** for a complete list of symbols.

Original Version

```
[:np] A California Shaggy Bear Tale for Seven DECtalk Software
Voices by Dennis Klatt

[:np] Once upon a time, there were three bears. They lived in a
great forest and tried to adjust to modern times.

[:nh] I'm papa bear. I love my family but I love honey best.

[:nb] I'm mama bear. Being a mama bear is hard work.

[:nk] I'm baby bear and I have trouble relating to all the demands
of older bears.

[:np] One day, the three bears left their condominium to search for
honey. While they were gone, a beautiful young lady sneaked into the
bedroom through an open window.

[:nw] My name is Wendy. My purpose in entering this building should
be clear. I am planning to steal any jewels I can find.

[:np] Hot on her trail was the famous police detective, Frank Dogood.

[:nf] Have you seen a lady carrying a laundry bag over her shoulder?

[:np] A woman kneeling with her left ear firmly placed against a
large rock responded.

[:nu] No. No one passed this way. I've been listening for
earthquakes all morning. I did see three bears searching for honey.
```

Revised Version

Text is enhanced with DECtalk in-line commands. Phoneme interpretation is tuned (stress and syntactic symbols are translated). See **Phoneme Interpretation [:phoneme]** for more information.

Turn on phoneme interpretation.

```
[:phoneme arpabet speak on]
```

Add periods to include brief pauses after the title and author.

[:np] A California Shaggy Bear Tale for Seven DECtalk Software
Voices. By Dennis Klatt.

[:np] Once upon a time, there were three bears. They lived in a
great forest and tried to adjust to modern times.

**Add commas to increase pause length and quotation marks for emphatic
stress.**

[:nh] I'm papa bear. I love my family, but I love ["]honey best.

[:nb] I'm mama bear. Being a mama bear is hard work.

[:nk] I'm baby bear, and I have trouble relating to all the demands
of older bears.

[:np] One day, the three bears left their condominium to search for
honey. While they were gone, a beautiful young lady sneaked into the
bedroom through an open window.

[:nw] My name is Wendy. My purpose in entering this building should
be clear. I am planning to steal any jewels I can find.

[:np] Hot on her trail was the famous police detective, Frank Dogood.

[:nf] Have you seen a lady carrying a laundry bag over her shoulder?

Add commas to increase pause length and phrasing.

[:np] A woman, kneeling with her left ear firmly placed against a
large rock, responded.

**If the selected language supports pitch rise and fall symbols [/ \] and
emphatic stress symbols ["], use them to add pitch control and emphatic
stress.**

[:nu] [']No. No [/]one passed this [/ \]way. I've been listening for
[']earthquakes all morning. I did see bears searching for honey.

Electronic mail-reading example

DECtalk supplies an email parser for Windows and UNIX, but not for MS-DOS. See **Mode [:mode]** for additional information. To write an electronic mail preprocessor, use the following text conversions before sending the text to DECtalk:

- Parse the header boilerplate to remove extraneous information.

- Add the new paragraph symbol `[+]` to blank lines between paragraphs if DECtalk is speaking paragraphs of text. See **Stress and Syntactic Symbols** for a complete list of syntactic symbols.

- Create a user dictionary for words that have an application-specific pronunciation.

- Use one of the available options if DECtalk is connected to a database containing names.

    - Add the **Pronounce [:pronounce]** in-line command before the database word to force language specific rules on the name. Example: `[:pronounce name] <name>`.

    - Replace the database word with its phoneme text. For this option, turn **Phoneme Interpretation [:phoneme]** on.

- Scan the text for strings of numbers in a format the application understands but DECtalk does not.

    - To extract the time format from an electronic mail message, add code to an application to expand it to the "o'clock" form.

    - In many applications, the listener may want to write down numbers (such as prices or telephone numbers). An application can scan for numbers and send them to DECtalk with pauses at critical locations. For example:

      ```
      The number is, 1 (800) 5 5 5, 1 2 3 4. [:rate 120]
      ```

      ```
      That is, [_<300>] 1 (800), [_<500>] 5 5 5, [_<900>] 1 2 3 4.
      [:rate 180].
      ```

    - See **Phonetic Symbols** (multiple languages) for a complete list of phoneme symbols, including the silent underscore symbol. See **Pitch and Duration of Tones** to add duration and pitch to phoneme text.

    - The spaces between the numbers ensure that "`five five five`" is spoken rather than "`five hundred fifty five`." Use `[:mode spell on]` to produce the same results. A slower speaking rate (`[:rate 120]`), and the silence phonemes of specified duration (`[_<300>], [_<500>], [_<900>]`), were selected to allow enough time for the listener to write down the entire number. Silence phonemes were positioned after the commas (`[_<300>] 1 (800), [_<500>]`) to maintain appropriate intonation.

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- If the application speaks sums of money (bank balances or item costs), write the text to say:

  ```
  Your balance is $244.05. That is, 2 4 4, [_<400>] point 0 5,
  [_<400>] dollars.
  ```

- When spelling an item, an application may need to distinguish letter case. Consider using the **Pitch [:pitch]** command or different voices to distinguish between uppercase and lowercase letters.

  ```
  [:nf]Maynard [:nf]M[:nb]a y n a r d [:nf]Maynard
  ```

Avoiding common errors

- After changing the voice (see **Name [:name]**), all text uses the currently selected voice.

- The default **Error [:error]** setting is on. Turn off to avoid reporting detected errors.

- Enter a right bracket (**]**) at the beginning of text when using the **Phoneme Interpretation [:phoneme]** command.

- Beginning with SAPI Version 5, DECtalk in-line commands can be used in SAPI text buffers. In-line commands are ignored in previous versions.

- If **Phoneme Interpretation [:phoneme]** is set to allow phonemic input (**[:phoneme arpabet speak on]**), it is possible to enter phonemic mode unintentionally.

  - If the text being spoken contains an unexpected left bracket (**[**), all text after the left bracket (**[**) is interpreted as phoneme text. In the following example, "apple, banana, strawberry" is interpreted as phoneme text.

    [:phoneme arpabet speak on] Here is the list [apple, banana, strawberry]

  - If the right bracket (**]**) is missing after the Phoneme Interpretation **[:phoneme]** in-line command, all text after the missing right bracket (**]**) is interpreted as phoneme text. In the following example, "Ladies and Gentlemen" is interpreted as phoneme text.

    [:phoneme arpabet speak on Ladies and Gentlemen

Customizing DECtalk voices

Introduction

Customizing DECtalk voices

DECtalk comes with nine built-in voices. The voices can be modified, but the modifications cannot be saved.

Approximating all the variations that characterize a person's voice — sex, age, head size and shape, larynx size and behavior, pitch range, pitch and timing habits, dialect, and emotional state — can be very time-consuming.

The following topics provide information on speech production, acoustics, and perception. The information is technical, but examples show how to modify options and listen to results.

Topics

- **Voice Definitions**

- **Changing Gender and Head Size**

- **Changing Voice Quality**

- **Changing Pitch and Intonation**

- Changing Relative Gains and Avoiding Overloads

> **NOTE**: Of the 28 options, only a few cause dramatic changes in the voice. The greatest effects result from changes to the **hs** (head size), **ap** (average pitch), **pr** (pitch range), and **sx** (male, female) options. Moderate changes occur modifying the **la** (laryngealization) and **br** (breathiness) options.

See Also

Design Voice [:dv]

⬆Voice Definitions

See **Design Voice [:dv]** for option descriptions.

Example: ap = average pitch, in Hz.

NOTE: With DECtalk 4.6.4, options g1 through gv were removed from **Design voice [:dv]**. In previous versions these options were tuned manually (they were constant). Now they are auto tuned mathematically (they change and don't have a default value).

Options	Default Values								
	Paul	Harry	Frank	Dennis	Betty	Ursula	Wendy	Rita	Kit
ap	112	87	155	110	180	240	195	190	285
as	100	100	100	100	100	100	55	100	65
b4	280	280	350	240	400	260	300	240	500
b5	330	400	500	180	600	1200	2048	2048	2048
bf	18	5	18	9	10	18	10	10	10
br	0	0	55	30	0	0	45	30	0
f4	3300	3500	3500	3500	4418	4150	4600	4076	4700
f5	3650	3700	4500	3800	4900	2500	2500	2500	2500
hr	18	10	18	10	20	1	18	8	20
hs	100	107	100	100	100	100	100	100	96
la	0	0	0	0	0	0	0	4	0
lx	0	0	0	70	50	50	80	60	75
nf	10	30	10	10	20	15	15	12	15
pr	100	80	115	100	100	100	100	100	120
qu	40	45	40	50	45	30	20	45	50
ri	70	70	20	20	85	70	70	40	40
sm	30	0	30	65	20	60	20	70	50
sr	25	22	5	22	35	32	22	50	20
sx	1	1	1	1	0	0	0	0	0

⬆Changing Gender and Head Size

Options

Six speaker-definition options control the size and shape of the head.

sx	Sex 1 (male) or 0 (female)
hs	Head size, in %
f4	Fourth formant resonance frequency, in Hz
f5	Fifth formant resonance frequency, in Hz
b4	Fourth formant bandwidth, in Hz
b5	Fifth formant bandwidth, in Hz

Gender (sx):

Male and female voices differ in many ways, stemming from differences in head size, pharynx length, larynx mass, and speaking habits such as degree of breathiness, liveliness of pitch, choice of articulatory target values, and speed of articulation. Some of these differences are under the control of a single option **sx** (sex of the speaker).

Paul, Harry, Frank, and Dennis are male (**sx = 1**). Betty, Rita, Ursula, Wendy, and Kit are female (**sx = 0**). Kit can be male or female since children under ten years old have similar voices.

Setting the **sx** option to male or female causes DECtalk to access a different table of target values (formant frequencies, bandwidths, and source amplitudes). The male and female tables are patterned after two individuals who were judged to have pleasant, intelligible voices. The built-in voices of DECtalk are simply scaled transformations of Paul and Betty.

You can change the sex of any DECtalk voice by making the voice current and by modifying the **sx** option. The following example gives Paul some of the speaking characteristics of a woman. (The **sx** option does not change the average pitch or breathiness; thus, a peculiar combination of simultaneous male and female traits is the result of this **sx** change.)

        [:np][:dv sx 0] Am I a man or woman?

NOTE: If you change the sex of the voice, some phonemes might cause DECtalk's filters to overload, which produces a squawk-like sound. The modification of certain options such as f4, f5, and g1 can help to correct this problem.

Head Size (hs):

Head size (**hs**) set to 100 percent represents the average size for an adult man (**sx = 1**) or an adult woman (**sx = 0**). Head size has a strong influence on a person's voice. Humans with large heads tend to have low, resonant voices. To make Paul sound like a man with a vocal tract fifteen percent longer than the

average man (and formant frequencies that are scaled down by a factor of about 85 percent), use the following command:

> **[:np][:dv hs 115] Do I sound bigger this way?**

The head size option (**hs**) can be used to make dramatic voice changes. Paul's head size is 100 (average). Harry's deep voice is caused in part by a head-size change to 115. Decreasing head size produces a higher voice.

> **[:nh][:dv hs 135] Do I have a swelled head?**

> **[:nk] I am about 10 years old.**

> **[:nk][:dv hs 65] Do I sound like a six year old?**

NOTE: Extreme changes in head size can cause overloads, as well as difficulties in understanding speech. The modification of certain options such as f4, f5, and g1 can help correct this problem.

Higher Formants (f4, f5, b4, and b5):

The male voice typically has five prominent resonant peaks in the spectrum (over the range from 0 to 5 kHz). The female voice typically has only four (because of a smaller head size), and a child has three. If the fourth and fifth formant resonances exist for a specific voice, they are fixed in frequency and bandwidth characteristics. These characteristics are specified in Hz by options f4, f5, b4, and b5.

If a higher formant does not exist, the frequency and bandwidth of the speaker definition are set to special values that cause the resonance to disappear. To make a resonance disappear, the frequency is set to above 5500 Hz and the bandwidth is set to 5500 Hz (disables the formant filter). This was done to the fourth and fifth formants of Kit's voice.

The permitted values for the f4 and f5 options have fairly complicated restrictions. Violating these restrictions can cause overloads and squawks. The following restrictions apply to cases where a higher formant exists:

- The f5 option must be at least 300 Hz higher than f4.

- If sx is 1 (male), f4 must be at least 3250 Hz.

- If sx is 0 (female), f4 must be at least 3700 Hz.

- If hs is not 100, the preceding values should be multiplied by (hs / 100).

These higher formants produce peaks in the spectrum that become more prominent if the b4 and b5 options are smaller, and if the f4 and f5 options are closer together. The limits placed on the b4 and b5 options should ensure that no problems occur. However, smaller values for bandwidths may produce an overload in the synthesizer. You can correct these overloads by increasing the bandwidths or by changing the gain control, g1.

♦Changing Voice Quality

Options

Six speaker-definition options control larynx output (voice quality).

br	Breathiness, in decibels (dB)
lx	Lax breathiness, in %
sm	Smoothness, in %
ri	Richness, in %
nf	Number of fixed samples of open glottis
la	Laryngealization, in %

Breathiness (br):

Some voices can be characterized as breathy (the vocal folds vibrate to generate voicing and breath noise simultaneously). Breathiness is a characteristic of many female voices, but it is also common under certain circumstances for male voices.

The range of the breathiness (**br**) option is from 0 dB (no breathiness) to 70 dB (strong breathiness). To turn Paul into a breathy, whispering speaker, try the following:

    [:np][:dv br 55 gv 56] Do I sound more like Dennis now?

This voice is not as loud as the others, because of the simultaneous decrease in the gain (**gv**), but is intelligible and human sounding.

Lax Breathiness (lx):

The **br** option creates simultaneous breathiness whenever voicing is turned on. Another type of breathiness occurs at the end of a sentence, and when going from voiced to voiceless sounds. This type of breathiness is controlled by the **lx** option.

A non-breathy, tense voice has the **lx** option set to 0. A maximally breathy, lax voice has the **lx** options set to 100. The difference between the two is not great.

Smoothness (sm):

The **sm** option affects vocal fold vibrations. The vocal folds meet at the midline, as they do in normal voicing. They do not, however, slam together forcefully to create a sudden cessation of airflow.

DECtalk uses a variable-cutoff, gradual low-pass filter to model changes to smoothness. The **sm** range is 0 (least smooth and most brilliant) to 100 percent (most smooth and least brilliant). The voicing source spectrum is tilted so that energy at higher frequencies is attenuated by as much as 30 dB when smoothness is set to the maximum. It is not attenuated at all when smoothness is set to 0.

Trained professional singing voices that sing above an orchestra are usually brilliant, while someone who talks softly becomes breathy and smooth. To synthesize a breathy voice, try setting the **sm** option to 50 or more. Changes to smoothness do not greatly affect perceived voice quality.

Richness (ri):

The **ri** option is similar to smoothness and brilliance (forcefulness), but the spectral change occurs at lower frequencies. The spectral change difference is the result of a different physiological mechanism. Brilliant, rich voices carry well and are more intelligible in noisy environments. Smooth, soft voices sound more friendly. The following command produces a soft, smooth version of Paul's voice:

    [:np][:dv ri 0 sm 70] Do I sound more mellow?

The following command produces a maximally rich and brilliant voice:

    [:np][:dv ri 90 sm 0] Do I sound more forceful?

Usually smoothness and richness are negatively correlated when a speaker dynamically changes laryngeal output. The **sm** and **ri** options have little influence on speaker identity.

Nopen (nf):

The number of samples in the open part of the glottal cycle is determined by the **ri** and **nf** options. The **nf** option represents the number of fixed samples in the open portion of the glottal cycle.

Most speakers adjust the open phase to be a certain fraction of the period, and this fraction is determined by the **ri** option. Other speakers keep the open phase fixed in duration when the overall period varies. To simulate this behavior, set the **ri** option to 100 and adjust the **nf** option to the desired open phase duration. The shortest possible open phase is 10 (1 ms), and the longest is three quarters of the period duration (about 70 for a male voice).

Laryngealization (la):

Many speakers turn voicing on and off irregularly at the beginnings and ends of sentences, which gives a querulous tone to the voice. This departure from perfect periodicity is called laryngealization. It produces creaky voice quality.

The **la** option controls the amount of laryngealization in the voice. A value of 0 results in no laryngealized irregularity. A value of 100 (the maximum) produces laryngealization at all times. To make Betty moderately laryngealized, use the following command:

    [:nb][:dv la 20]

The **la** option creates a noticeable difference in the voice. The change is not always pleasant.

↟Changing Pitch and Intonation

Options

Seven speaker-definition options control aspects of the fundamental frequency (f0) voice contour.

bf	Baseline fall, in Hz
hr	Nominal hat rise, in Hz
sr	Nominal stress rise, in Hz
as	Assertiveness, in %
qu	Quickness, in %
ap	Average pitch, in Hz
pr	Pitch range, in %

Baseline Fall (bf):

The **bf** option determines one aspect of the dynamic fundamental frequency contour for a sentence. If the bf option is 0, the reference baseline fundamental frequency of a sentence begins and ends at 115 Hz. All rule-governed dynamic swings in fundamental frequency are computed with respect to the reference baseline.

Some speakers begin a sentence at a higher fundamental frequency, which gradually falls as the sentence progresses. This falling baseline behavior can be simulated by setting the **bf** option to the desired fall in Hz. For example, setting the **bf** option to 20 Hz causes a sentence's fundamental frequency pattern to begin at 125 Hz (115 Hz plus half of bf). It fails at a rate of 16 Hz per second until it reaches 105 Hz (115 Hz minus half of **bf**). The baseline remains at the lower value until it is reset automatically before the beginning of the next full sentence (after a period, question mark, or exclamation point). The rate of fall (16 Hz per second) is fixed, regardless of the extent of the fall.

Whenever a [+] syntactic symbol is included in the text (indicates the beginning of a paragraph), the baseline is automatically set to begin slightly higher for the first sentence of the paragraph. The baseline fall differs among speakers, and is not a good cue for differentiating among them. As long as the fall is not excessive, its presence or absence is hardly noticeable. See **Stress and Syntactic Symbols** for a complete list of symbols.

Hat Rise (hr):

The **hr** and **sr** options determine aspects of a sentence's dynamic fundamental frequency contour. To modify these values selectively, it is necessary to understand that the fundamental frequency contour is computed as a function of the lexical stress pattern and syntactic structure of a sentence.

A sentence is broken into clauses (punctuation and clause-introducing words determine clause boundaries). Within each clause, the fundamental frequency contour rises on the first stressed syllable. It stays at a high level until it reaches the last stressed syllable of the clause, where it falls dramatically. This rise and

fall is called the hat pattern by linguists (jumping from the brim of a hat to the top of the hat and back again).

The **hr** option indicates the nominal height in Hz of a pitch rise to a plateau on the first stressed syllable. A corresponding pitch fall is placed by rule on the last stress of the clause. Some speakers use relatively large hat rises and falls, while others use a local impulse-like rise and fall on each stressed syllable. The default **hr** option value for Paul is 18 Hz, indicating that the fundamental frequency contour rises a nominal 18 Hz. To simulate a speaker who does not use pitch rise and falls, use the command:

```
[:dv hr 0]
```

Other aspects of the hat pattern are important for natural intonation but are not accessible by speaker-definition commands. For example, the hat fall becomes a weaker fall followed by a slight continuation rise if the clause is succeeded by more clauses in the same sentence. Also, if unstressed syllables follow the last stressed syllable in a clause, part of the hat fall occurs on the very last (unstressed) syllable of the clause. DECtalk may break a long clause into two hat patterns by finding the boundary between the noun phrase and the verb phrase.

If DECtalk is in phoneme input mode and the pitch rise [/] and pitch fall [\ ] symbols are used, the **hr** option determines the actual rise and fall in Hz. See **Stress and Syntactic Symbols** for a complete list of symbols.

Stress Rise (sr):

The **sr** option indicates the nominal height in Hz, of a local pitch rise and fall on each stressed syllable. This rise-fall is added to any present hat rise or fall. For example, Paul has the **sr** option set to 32 Hz, resulting in an fundamental frequency rise/fall gesture of 32 Hz over a span of about 150 ms, located on the first and succeeding stressed syllables. However, DECtalk rules reduce the actual height of successive stress rise and falls in each clause, and cause the last stress pulse to occur early so there is time for the hat fall during the vowel.

If the **sr** option is set too low, speech sounds monotone within long phrases. Great changes to the **hr** and **sr** options are not usually necessary.

Assertiveness (as):

The **as** option as a percentage indicates the degree to which a voice tends to end a statement with a conclusive final fall. Assertive voices are characterized by a dramatic fall in pitch. Neutral voices often end a sentence with a slight rise in pitch. A value of 100 is very assertive. A value of 0 shows little or no assertion.

Quickness (qu):

The **qu** option as a percentage controls the response time to a change in pitch request. All hat rises, hat falls, and stress rises can be thought of as suddenly applied commands to a change in pitch. The larynx responds gradually to such commands. A smaller larynx is usually a little quicker. Harry (larger larynx) has a quickness value of 10, while Kit (smaller larynx) has a quickness value of 50.

In engineering terms, a value of 10 implies a time constant of about 100 ms (the time to get to 70 percent of a suddenly applied step target). A value of 90% corresponds to a time constant of about 50 ms. Lower quickness values may mean that the fundamental frequency never reaches the target value before a new command changes the target.

Average Pitch (ap) and Pitch Range (pr):

The **ap** option in Hz, and the **pr** option as a percentage of the normal range, modify the computed fundamental frequency values using the following formula:

```
f0' = ap + (((f0 - 120) * pr) / 100)
```

If the **ap** option is set to 120 Hz and the **pr** option to 100 percent, no change occurs to the normal fundamental frequency contour computed for a typical male voice. The effect of a change in the **ap** option is simply to raise or lower the entire pitch contour independently by a constant number of Hz, whereas the effect of the **pr** option is to expand or contract the pitch swings about 120 Hz.

Normally, a smaller larynx simultaneously produces fundamental frequency values that are higher in average pitch and in pitch range by about the same factor (the whole fundamental frequency contour is multiplied by a constant factor). Compare the values assigned to the **ap** and **pr** options for each DECtalk voice. The voices rank in average pitch from low (Harry) to high (Kit). Rankings for the **pr** option are similar. Frank, however, has a flat pitch range compared to his average pitch.

The best way to determine a good pitch range for a new voice is by trial and error. Setting the pitch range to 0 creates a monotone voice. To make Harry speak in a monotone voice at exactly 90 Hz, use the following command:

```
[:nh][:dv ap 90 pr 0] I am a robot.
```

Reducing the pitch range reduces the dynamics of the voice, and produces emotions such as sadness in the speaker. Increasing the pitch range, but leaving the average pitch the same or slightly higher, suggests excitement.

Due to constraints in the pitch-synchronous updating of other dynamically changing options, the fundamental frequency contour computed by the preceding formula is checked for values outside 500 (maximum) and 50 (minimum) Hz. Any value outside this range is adjusted accordingly.

The **Design Voice** command automatically adjusts pitch options to fall within specified limits before execution.

Reference tables

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Topics: Reference tables

Phonetic symbols

> **NOTE**: see Phoneme notifications

Stress and syntactic symbols

Phonemes in unicode sequence

Tones

Homographs

- **Homograph Phonetics: S-W**

Abbreviations

- **US English**

Phonetic symbols - US English

Ascii	DT index	DT internal	Example	Arpabet	Unicode	Unicode Character Name
_	0	SIL	(silence)	_	U+5F	Low line
i	1	US_IY	bEAn	iy	U+69	Latin small letter I
I	2	US_IH	pIt	ih	U+26A	Latin small letter Capital I
e	3	US_EY	bAY	ey	U+65	Latin small letter E
E	4	US_EH	pEt	eh	U+25B	Latin small letter open E
@	5	US_AE	pAt	ae	U+E6	Latin small letter AE
a	6	US_AA	pOt	aa	U+251	Latin small letter Alpha
A	7	US_AY	bUY	ay	U+61,U+26A	Latin small letter A + Latin small capital I
W	8	US_AW	brOW	aw	U+61,U+28A	Latin small letter A + Latin small capital Upsilon
^	9	US_AH	pUtt	ah	U+28C	Latin small letter turned V
c	10	US_AO	bOUght	ao	U+254	Latin small letter O
o	11	US_OW	nO	ow	U+6F,U+28A	Latin small letter O + Latin small letter Upsilon
O	12	US_OY	bOY	oy	U+254,U+26A	Latin small letter open O + Latin small letter capital I
U	13	US_UH	pUt	uh	U+28A	Latin small letter Upsilon
u	14	US_UW	bOOn	uw	U+75	Latin small letter U
R	15	US_RR	anothER	rr	U+25A	Latin small letter Schwa with hook
Y	16	US_YU	cUte	yu	U+6A,U+75	Latin small letter J + Latin small letter U
x	17	US_AX	About	ax	U+259	Latin small letter Schwa
|	18	US_IX	kissEs	ix	U+268	Latin small

						letter I with stroke
B	19	US_IR	pEEr	ir	U+69,U+2B4	Latin small letter I + modifier letter small turned R
K	20	US_ER	pAir	er	U+25,BU+2B4	Latin small letter open E + modifier letter small turned R
P	21	US_AR	bARn	ar	U+251,U+2B4	Latin small letter Alpha + modifier letter small turned R
M	22	US_OR	bOrn	or	U+254,U+2B4	Latin small letter open O + modifier letter small turned R
j	23	US_UR	pOOr	ur	U+28A,U+2B4	Latin small letter Upsilon + modifier letter small turned R
w	24	US_W	Why	w	U+77	Latin small letter W
y	25	US_YX	Yank	yx	U+6A	Latin small letter J
r	26	US_R	Rat	r	U+52	Latin capital letter R
l	27	US_LL	Lad	ll	U+6C	Latin small letter L
h	28	US_HX	Had	hx	U+68	Latin small letter H
R	29	US_RX	fiRe	rx	U+279	Latin small letter turned R with hook
l	30	US_LX	untiL	lx	U+26B	Latin small letter I with middle tilde
m	31	US_M	Mad	m	U+6D	Latin small letter M
n	32	US_N	Nat	n	U+6E	Latin small letter N
G	33	US_NX	baNG	nx	U+14B	Latin small letter Eng
L	34	US_EL	dangLe	el	U+6C,U+329	Latin small letter L combining vertical line below
D	35	US_DZ	wiDth	dz	U+64,U+32F	Latin small letter D +

						combining inverted breve below
N	36	EN	burdeN	en	U+6E,U+329	Latin small letter N + combining vertical line below
f	37	F	Fat	f	U+66	Latin small letter F
v	38	V	Vat	v	U+76	Latin small letter V
T	39	TH	THin	th	U+3B8	Greek small letter Theta
D	40	DH	THen	dh	U+F0	Latin small letter Eth
s	41	S	Sap	s	U+73	Latin small letter S
z	42	Z	Zap	z	U+7A	Latin small letter Z
S	43	SH	SHeep	sh	U+283	Latin small letter Esh
Z	44	ZH	meaSure	zh	U+292	Latin small letter Ezh
p	45	P	Pat	p	U+70	Latin small letter P
b	46	B	Bad	b	U+62	Latin small letter B
t	47	T	Tack	t	U+74	Latin small letter T
d	48	D	Dad	d	U+64	Latin small letter D
k	49	K	Cad	k	U+6B	Latin small letter K
g	50	G	Game	g	U+67	Latin small letter G
&	51	DX	riDer	dx	Internal use	
Q	52	TX	baTTen	tx	U+74,U+294	Latin small letter T + Latin letter glottal stop
q	53	Q	we eat	q	U+294	Latin letter glottal stop
C	54	CH	CHeap	ch	U+2A7	Latin small letter Tesh digraph
J	55	JH	Jeep	jh	U+2A4	Latin small letter Dezh digraph

F	56	DF	wriTer	df	Internal use	

Phonetic symbols - UK English

Ascii	DT Index	DT Internal	Example	Arpabet
_	0	SIL	(silence)	_
i	1	UK_IY	bEAn	iy
I	2	UK_IH	pIt	ih
e	3	UK_EY	bAY	ey
E	4	UK_EH	pEt	eh
@	5	UK_AE	pAt	ae
a	6	UK_AA	pOt	aa
A	7	UK_AY	bUY	ay
W	8	UK_AW	brOW	aw
^	9	UK_AH	pUtt	ah
c	10	UK_AO	bOUght	ao
o	11	UK_OW	nO	ow
O	12	UK_OY	bOY	oy
U	13	UK_UH	pUt	uh
u	14	UK_UW	bOOn	uw
R	15	UK_RR	anothER	rr
Y	16	UK_YU	cUte	yu
x	17	UK_AX	About	ax
|	18	UK_IX	kissEs	ix
I	19	UK_IR	pEEr	ir
R	20	UK_ER	pAIr	er
a	21	UK_AR	bARn	ar
c	22	UK_OR	bOrn	or
U	23	UK_UR	pOOr	ur
w	24	UK_W	Why	w
Y	25	UK_Y	Yank	yx
r	26	UK_R	Rat	r
l	27	UK_LL	Lad	l
h	28	UK_HX	Had	hx
	29	UK_OH		oh
l	30	UK_LX	untiL	lx
m	31	UK_M	Mad	m
n	32	UK_N	Nat	n
G	33	UK_NX	baNG	nx
L	34	UK_EL	dangLe	el
D	35	UK_DZ	wiDth	dz
N	36	UK_EN	burdeN	en
f	37	UK_F	Fat	f
v	38	UK_V	Vat	v

T	39	UK_TH	THin	th
D	40	UK_DH	THen	dh
s	41	UK_S	Sap	s
z	42	UK_Z	Zap	z
S	43	UK_SH	SHeep	sh
Z	44	UK_ZH	meaSure	zh
p	45	UK_P	Pat	p
b	46	UK_B	Bad	b
t	47	UK_T	Tack	t
d	48	UK_D	Dad	d
k	49	UK_K	Cad	k
g	50	UK_G	Game	g
&	51	UK_DX	riDer	dx
Q	52	UK_TX	baTTen	tx
q	53	UK_Q	we eat	q
C	54	UK_CH	CHeap	ch
J	55	UK_JH	Jeep	jh
F	56	UK_DF	wriTer	df

Phonetic symbols - Castilian Spanish

Ascii	DT index	DT internal	Example	Arpabet
_	0	SIL	(silence)	_
	1	SP_A	Palabra	a
	2	SP_E	Leo	e
	3	SP_I	Hilo	i
	4	SP_O	Hola	o
	5	SP_U	Lunes	u
	6	SP_WX	(Rounded dipthong semiv.)	wx
	7	SP_YX (Unround dipthong semiv.)	yx	
	8	SP_RR	Rama	rr
	9	SP_L	Luna	l
	10	SP_LL	Calle	ll
	11	SP_M	Mama	m
	12	SP_N	Nana	n
	13	SP_NH	Munoz	nh
	14	SP_F	Feo	f
	15	SP_S	Casa	s
	16	SP_J	Caja	j
	17	SP_TH	Caza	th
	18	SP_BH	Haba	bh
	19	SP_DH	Hada	dh
	20	SP_GH	Haga	gh
	21	SP_YH	Yate (affricate)	yh
	22	SP_P	Papa	p
	23	SP_B	Barco	b
	24	SP_T	Tela	t
	25	SP_D	Dama	d
	26	SP_K	Casa	k
	27	SP_G	Gasa	g
	28	SP_CH	Charco	ch
	29	SP_Y	Haya (fricitive)	y
	30	SP_R	Sara	r
	31	SP_Q	~n (offglide)	q

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	32	SP_Z	Desde	z
	33	SP_W	Hueso	w
	34	SP_NX	Mango	nx
	35	SP_V	Afgano	v
	36	SP_IX	~n (offglide)	ix
	37	SP_MX	Infierno (nf)	mx
	38	SP_PH	Observar	ph

Phonetic symbols - Latin American Spanish

Ascii	DT Index	DT Internal	Example	Arpabet
_	0	SIL	(silence)	_
	1	LA_A	Palabra	a
	2	LA_E	Leo	e
	3	LA_I	Hilo	i
	4	LA_O	Hola	o
	5	LA_U	Lunes	u
	6	LA_WX	Rounded dipthong semiv.	wx
	7	LA_YX	Unround dipthong semiv	yx
	8	LA_RR	Rama	rr
	9	LA_L	Luna	l
	10	LA_LL	Calle	ll
	11	LA_M	Mama	m
	12	LA_N	Nana	n
	13	LA_NH	Munoz	nh
	14	LA_F	Feo	f
	15	LA_S	Casa	s
	16	LA_J	Caja	j
	17	LA_TH	Caza	th
	18	LA_BH	Haba	bh
	19	LA_DH	Hada	dh
	20	LA_GH	Haga	gh
	21	LA_YH	Yate (affricate)	yh
	22	LA_P	Papa	p
	23	LA_B	Barco	b

	24	LA_T	Tela	t
	25	LA_D	Dama	d
	26	LA_K	Casa	k
	27	LA_G	Gasa	g
	28	LA_CH	Charco	ch
	29	LA_Y	Haya (fricitive)	y
	30	LA_R	Sara	r
	31	LA_Q	~n (offglide)	q
	32	LA_Z	Desde	z
	33	LA_W	Hueso	w
	34	LA_NX	Mango	nx
	35	LA_V	Afgano	v
	36	LA_IX	~n (offglide)	ix
	37	LA_MX	Infierno (nf)	mx
	38	LA_PH	Observar	ph

Phonetic symbols - German

Ascii	DT index	DT internal	Example	Arpabet
_	0	SIL	(silence)	_
	1	GR_A	mAnn	a
	2	GR_E	Englisch	e
	3	GR_AE	hAEtte	ae
	4	GR_EX	gabE	ex
	5	GR_I	mIt	i
	6	GR_O	pOst	o
	7	GR_OE	kOEnnen	oe
	8	GR_U	mUnd	u
	9	GR_UE	lUEcke	ue
	10	GR_AH	sAgen	ah
	11	GR_EH	gEben	eh
	12	GR_AZ	wAEhlen	az
	13	GR_IH	lIEb	ih
	14	GR_OH	mOnd	oh
	15	GR_OZ	mOEgen	oz
	16	GR_UH	hUt	uh
	17	GR_UZ	hUEten	uz
	18	GR_EI	klEId	ei
	19	GR_AU	hAUs	au
	20	GR_EU	hEUte	eu
	21	GR_AN	pENsion	an
	22	GR_IM	tIMbre	im
	23	GR_UM	parfUM	um
	24	GR_ON	fONdue	on

	25	GR_J	Ja	j
	26	GR_L	Luft	l
	27	GR_RR	Rund	rr
	28	GR_R	waR	r
	29	GR_H	Hut	h
	30	GR_M	Mut	m
	31	GR_N	NeiN	n
	32	GR_NG	riNG	ng
	33	GR_EL	nabEL	el
	34	GR_EM	grossEM	em
	35	GR_EN	badEN	en
	36	GR_F	Fall	f
	37	GR_V	Was	v
	38	GR_S	meSSen	s
	39	GR_Z	doSe	z
	40	GR_SH	SCHule	sh
	41	GR_ZH	Genie	zh
	42	GR_CH	niCHt	ch
	43	GR_KH	noCH	kh
	44	GR_P	Park	p
	45	GR_B	Ball	b
	46	GR_T	Turm	t
	47	GR_D	Dort	d
	48	GR_K	Kalt	k
	49	GR_G	Gast	g
	50	GR_Q	Be_amtet	q
	51	GR_PF	PFerd	pf

	52	GR_TS	Zahl	ts
	53	GR_DJ	Gin	dj
	54	GR_TJ	maTSCH	tj
	55	GR_KS	Extra	ks

Phonetic symbols - French

Ascii	DT Index	DT Internal	Example	Arpabet
_	0	SIL	(silence)	_
	1	GR_A	mAnn	a
	2	GR_E	Englisch	e
	3	GR_AE	hAEtte	ae
	4	GR_EX	gabE	ex
	5	GR_I	mIt	i
	6	GR_O	pOst	o
	7	GR_OE	kOEnnen	oe
	8	GR_U	mUnd	u
	9	GR_UE	lUEcke	ue
	10	GR_AH	sAgen	ah
	11	GR_EH	gEben	eh
	12	GR_AZ	wAEhlen	az
	13	GR_IH	lIEb	ih
	14	GR_OH	mOnd	oh
	15	GR_OZ	mOEgen	oz
	16	GR_UH	hUt	uh
	17	GR_UZ	hUEten	uz
	18	GR_EI	klEId	ei
	19	GR_AU	hAUs	au
	20	GR_EU	hEUte	eu
	21	GR_AN	pENsion	an
	22	GR_IM	tIMbre	im
	23	GR_UM	parfUM	um

	24	GR_ON	fONdue	on
	25	GR_J	Ja	j
	26	GR_L	Luft	l
	27	GR_RR	Rund	rr
	28	GR_R	waR	r
	29	GR_H	Hut	h
	30	GR_M	Mut	m
	31	GR_N	NeiN	n
	32	GR_NG	riNG	ng
	33	GR_EL	nabEL	el
	34	GR_EM	grossEM	em
	35	GR_EN	badEN	en
	36	GR_F	Fall	f
	37	GR_V	Was	v
	38	GR_S	meSSen	s
	39	GR_Z	doSe	z
	40	GR_SH	SCHule	sh
	41	GR_ZH	Genie	zh
	42	GR_CH	niCHt	ch
	43	GR_KH	noCH	kh
	44	GR_P	Park	p
	45	GR_B	Ball	b
	46	GR_T	Turm	t
	47	GR_D	Dort	d
	48	GR_K	Kalt	k
	49	GR_G	Gast	g
	50	GR_Q	Be_amtet	q

	51	GR_PF	PFerd	pf
	52	GR_TS	Zahl	ts
	53	GR_DJ	Gin	dj
	54	GR_TJ	maTSCH	tj
	55	GR_KS	Extra	ks

Phonetic symbols - Italian

Ascii	DT Index	DT Internal	Example	Arpabet
R	8	IT_R		rr
a	1	IT_ap		ap
e	2	IT_ep		ep
i	3	IT_iy		
o	4	IT_op		
u	5	IT_uw		
x	6	IT_ax		
J	7	IT_y		y
I	9	IT_I		I
L	10	IT_II		II
m	11	IT_m		m
n	12	IT_n		n
h	13	IT_nh		nh
f	14	IT_f		f
s	15	IT_s		s
E	16	IT_eh		eh
T	17	IT_td		td
B	18	IT_bd		bd
D	19	IT_dd		dd
G	20	IT_gd		gd
8	21	IT_jh		jh
p	22	IT_p		p
b	23	IT_b		b
t	24	IT_t		t
d	25	IT_d		d
k	26	IT_k		k
g	27	IT_g		g
7	28	IT_ch		ch
c	29	IT_ao		ao
r	30	IT_r		r
K	31	IT_kd		kd
z	32	IT_z		z
w	33	IT_w		w
Q	34	IT_nx		nx
v	35	IT_v		v
N	36	IT_nd		nd
M	37	IT_mf		mf
P	38	IT_pd		pd
H	39	IT_nj		nj

S	40	IT_sh		sh
9	41	IT_ts		ts
0	42	IT_dz		dz

Stress and syntactic symbols

The following tables display the stress and syntactic symbols supported by DECtalk. Phoneme interpretation must be turned on for the stress and syntactic symbols to work. See **Phoneme Interpretation [:phoneme]** for more information.

Stress symbols

Symbol	Name	Indicates	Unicode
'	Apostrophe	primary stress	U+27
`	Grave accent	secondary stress	U+60
"	Quotation mark	emphatic stress	U+22
/	Slash	pitch rise	U+2F
\	Backslash	pitch fall	U+5C

Syntactic symbols

Symbol	Name	Indicates	Unicode
-	Hyphen	syllable boundary	U+2D
*	Asterisk	morpheme boundary	U+2A
#	Number sign	compound nouns	U+23
(	Open parenthesis	beginning of prepositional phrase	U+28
)	Close parenthesis	beginning of a verb phrase	U+29
,	Comma	clause boundaries	U+2C
.	Period	period	U+2E
?	Question mark	question mark	U+2F
!	Exclamation point	exclamation point	U+21
+	Plus sign	new paragraph	U+2B
	Space	word boundary	U+20

English phonemes in unicode sequence

Unicode	Unicode Character Name	Ascii	DT Index	DT Internal	Example	Arpabet
U+20	Space				Word boundary	\<space\>
U+21	Exclamation point					
U+22	Quotation mark				Hello	
U+23	Number sign	#				
U+27	Apostrophe				rehd	
U+28	Left parenthesis	(				
U+29	Right parenthesis	)				
U+2A	Asterisk	*				
U+2B	Plus sign	+				
U+2C	Comma	,				
U+2D	Hyphen	–				
U+2E	Full stop	.			Syllable break	–
U+2F	Solidus	/				
U+3F	Question mark	?				
U+52	Latin capital letter R	R	26	US_R	Rat	r
U+5C	Reverse solidus	\				
U+5F	Low line	_	0	US_SIL	(silence)	_
U+61, U+26A	Latin small letter A + Latin small capital I	A	7	US_AY	bUY	ay
U+61, U+28A	Latin small letter A + Latin small capital Upsilon	W	8	US_AW	brOW	aw
U+62	Latin small letter B	b	46	US_B	Bad	b
U+64, U+32F	Latin small letter D + combining inverted breve below	D	35	US_DZ	WiDth	dz
U+64	Latin small letter D	d	48	US_D	Dad	d
U+65	Latin small letter E	e	3	US_EY	bAY	ey

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U+66	Latin small letter F	f	37	US_F	Fat	f
U+67	Latin small letter G	g	50	US_G	Game	g
U+68	Latin small letter H	h	28	US_HX	Had	hx
U+69, U+2B4	Latin small letter I + modifier letter small turned R	I	19	US_IR	pEEr	ir
U+69	Latin small letter I	i	1	US_IY	bEAn	iy
U+6A, U+75	Latin small letter J + Latin small letter U	Y	16	US_YU	cUte	yu
U+6A	Latin small letter J	Y	25	US_Y	Yank	yx
U+6B	Latin small letter K	k	49	US_K	Cad	k
U+6C, U+329	Latin small letter L + combining vertical line below	L	34	US_EL	dangLe	el
U+6C	Latin small letter L	l	27	US_LL	Lad	l
U+6D	Latin small letter M	m	31	US_M	Mad	m
U+6E, U+329	Latin small letter N + combining vertical line below	N	36	US_EN	burdeN	en
U+6E	Latin small letter N	n	32	US_N	Nat	n
U+6F, U+28A	Latin small letter O + Latin small letter upsilon	o	11	US_OW	nO	ow
U+70	Latin small letter P	p	45	US_P	Pat	p
U+73	Latin small letter S	s	41	US_S	Sap	s
U+74	Latin small letter T	t	47	US_T	Tack	t
U+74, U+294	Latin small letter T + Latin letter glottal stop	Q	52	US_TX	baTTen	tx
U+75	Latin small	u	14	US_UW	bOOn	uw

	letter U					
U+76	Latin small letter V	v	38	US_V	Vat	v
U+77	Latin small letter W	w	24	US_W	Why	w
U+7A	Latin small letter Z	z	42	US_Z	Zap	z
U+E6	Latin small letter AE	@	5	US_AE	pAt	ae
U+F0	Latin small letter Eth	D	40	US_DH	THen	dh
U+14B	Latin small letter Eng	G	33	US_NX	baNG	nx
U+251, U+2B4	Latin small letter Alpha + modifier letter small turned R	a	21	US_AR	bARn	ar
U+251	Latin small letter Alpha	a	6	US_AA	pOt	aa
U+254, U+26A	Latin small letter open O + Latin small letter capital I	O	12	US_OY	bOY	oy
U+254, U+2B4	Latin small letter open O + modifier letter small turned R	c	22	US_OR	bOrn	or
U+254	Latin small letter O	c	10	US_AO	bOUght	ao
U+259	Latin small letter Schwa	x	17	US_AX	About	ax
U+25A	Latin small letter Schwa with hook	R	15	US_RR	anothER	rr
U+25B	Latin small letter open E	E	4	US_EH	pEt	eh
U+25B, U+2B4	Latin small letter open E + modifier letter small turned R	K	20	US_ER	pAIr	er
U+268	Latin small letter I with stroke			18	US_IX	kissEs	ix
U+26A	Latin small letter Capital I	I	2	US_IH	pIt	ih
U+26B	Latin small letter I with middle tilde	l	30	US_LX	untiL	lx
U+279	Latin small	R	29	US_RX	fiRe	rx

	letter turned R with hook					
U+283	Latin small letter Esh	S	43	US_SH	SHeep	sh
U+28A, U+2B4	Latin small letter Upsilon + modifier letter small turned R	U	23	US_UR	pOOr	ur
U+28A	Latin small letter Upsilon	U	13	US_UH	pUt	uh
U+28C	Latin small letter turned V	^	9	US_AH	pUtt	ah
U+292	Latin small letter Ezh	Z	44	US_ZH	meaSure	zh
U+294	Latin letter glottal stop	q	53	US_Q	we eat	q
U+2A4	Latin small letter Dezh digraph	J	55	US_JH	Jeep	jh
U+2A7	Latin small letter Tesh digraph	C	54	US_CH	CHeap	ch
U+2C8	Modifier letter vertical line					
U+28CC	Modifier letter low vertical line	`				
U+3B8	Greek small letter Theta	T	39	US_TH	THin	th
Internal use only		&	51	DX	nDer	dx
Internal use only			56	DF	wriTer	df

Italian phonemes in unicode sequence

Unicode	Unicode Character Name	Ascii	DT Index	DT Internal	Example	Arpabet
U+280	Latin letter small capital R	R	8	IT_R		rr
U+61	Latin small letter A	a	1	IT_ap		ap
U+65	Latin small letter E	e	2	IT_ep		ep
U+69	Latin small letter I	i	3	IT_iy		
U+6F	Latin small letter O	o	4	IT_op		
U+75	Latin small letter U	u	5	IT_uw		
U+259	Latin small letter schwa	x	6	IT_ax		
U+6A	Latin small letter J	J	7	IT_y		y
U+6C	Latin small letter L	I	9	IT_I		I
U+28E	Latin small letter turned Y	L	10	IT_II		II
U+6D	Latin small letter M	m	11	IT_m		m
U+6E	Latin small letter N	n	12	IT_n		n
U+272	Latin small letter N with left hook	h	13	IT_nh		nh
U+66	Latin small letter F	f	14	IT_f		f
U+73	Latin small letter S	s	15	IT_s		s
U+25B	Latin small letter open E = latin smaller letter Epsilon	E	16	IT_eh		eh
U+74, 031A	Latin small letter T + Combining left angle above	T	17	IT_td		td
U+62, 031A	Latin small letter B + Combining left	B	18	IT_bd		bd

	angle above					
U+64, 031A	Latin small letter D + Combining left angle above	D	19	IT_dd		dd
U+67, 031A	Latin small letter G + Combining left angle above	G	20	IT_gd		gd
U+2A4	Latin small letter dezh digraph	8	21	IT_jh		jh
U+70	Latin small letter P	p	22	IT_p		p
U+62	Latin small letter B	b	23	IT_b		b
U+74	Latin small letter T	t	24	IT_t		t
U+64	Latin small letter D	d	25	IT_d		d
U+6B	Latin small letter K	k	26	IT_k		k
U+67	Latin small letter G	g	27	IT_g		g
U+2A7	Latin small letter Tesh digraph	7	28	IT_ch		ch
U+254	Latin small letter open O	c	29	IT_ao		ao
U+72	Latin small letter R	r	30	IT_r		r
U+6B, 031A	Latin small letter K + Combining left angle above	K	31	IT_kd		kd
U+7A	Latin small letter Z	z	32	IT_z		z
U+77	Latin small letter W	w	33	IT_w		w
U+14B	Latin small letter Eng	Q	34	IT_nx		nx
U+76	Latin small letter V	v	35	IT_v		v
U+6E, 032A	Latin small letter N + combining bridge below	N	36	IT_nd		nd
U+271	Latin small letter M with small hook	M	37	IT_mf		mf

U+50, 031A	Latin small letter P + combing left angle above	P	38	IT_pd		pd
U+6E, 0321	Latin small letter N + combining palatalized hook below	H	39	IT_nj		nj
U+283	Latin small letter Esh	S	40	IT_sh		sh
U+02A6	Latin small letter TS digraph	9	41	IT_ts		ts
U+02A3	Latin small letter DZ digraph	0	42	IT_dz		dz

Pitch and duration of tones

DECtalk can be used to sing songs and/or make musical tones. The table below contains the command syntax for "Happy Birthday." It provides the pitch numbers, associated notes, and frequencies needed to code musical sounds with a phonemic sequence. See **US English** phonemic symbols to decode the symbols used in the example below.

Syntax	[phoneme <duration, pitch number>]	
Parameters	duration	Tone duration in milliseconds.
	pitch number	Pitch number from
Example	[:phoneme arpabet speak on] [hxae<300,10>piy<300,10> brr<600,12>th<100>dey<600,10> tuw<600,15> yu<1200,14>_<120>] [hxae<300,10>piy<300,10> brr<600,12>th<100>dey<600,10> tuw<600,17> yu<1200,15>_<120>] [hxae<300,10>piy<300,10> brr<600,22>th<100>dey<600,19> dih<600,15>r deh<600,14>ktao<600,12>k_<120>_<120>] [hxae<300,20>piy<300,20> brr<600,19>th<100>dey<600,15> tuw<600,17> yu<1200,15>]	

See Also

Tone Table

Tone table

Pitch Number	Note	Pitch	Vocal Ranges				
1	C2	65					
2	C#	69					
3	D	73					
4	D#	77					
5	E	82	B				
6	F	87	A				
7	F#	92	S				
8	G	98	S	B			
9	G#	103		A			
10	A	110		R			
11	A#	116		I			
12	B	123		T			
13	C3	130		O	T		
14	C#	138		N	E		
15	D	146		E	N		
16	D#	155			O		
17	E	164			R		
18	F	174				A	
19	F#	185				L	
20	G	196				T	
21	G#	207				O	
22	A	220					
23	A#	233					
24	B	247					S

25	C4	261					O
26	C#	277					P
27	D	293					R
28	D#	311					A
29	E	329					N
30	F	348					O
31	F#	370					
32	G	392					
33	G#	415					
34	A	440					
35	A#	466					
36	B	494					
37	C5	523					

Homographs

Homographs are two or more words that have the same spelling but different pronunciations. For example, the word permit as a noun stresses the first syllable. Permit as a verb stresses the second syllable. The distinction is important for DECtalk when speaking homographs in connected discourse.

The default pronunciation is the more frequent form. When an alternate pronunciation is needed, select the correct phonetics from the homograph index below.

Use the **[:pronounce alternate]** in-line command before a word to pronounce an alternate pronunciation.

Example:

Bass guitar uses the primary pronunciation to speak the name of the instrument (**b'eys** guitar). The alternate pronunciation speaks the name of the fish (**b'aes**). For example, **I caught a [:pronounce alternate] bass when I went fishing.**

Related topic

See **Optimizing Spoken Text** for more information.

Homograph phonetics: A

Spelling	Primary	Alternate
abstract	' aeb s t r aek t	aeb s t r ' aek t
abuse	axb ' yuz	axb ' yus
addict	axd ' ihk t	' aed ihk t
advocate	' aed v axk ` eyt	' aed v axk iht
affect	axf ' ehk t	' aef ehk t
affiliate	axf ' ih~lliy` eyt	axf ' ih~lliyiht
affix	axf ' ihk s	' aef ihk s
agglomerate	axg ll' aam rriht	axg ll' aam rr` eyt
aggregate	' aeg r ihg iht	' aeg r ihg ` eyt
allied	' ae~ llayd	ax~ ll' ayd
allies	' ae~ llayz	ax~ ll' ayz
ally	' ae~ llay	ax~ ll' ay
alternate	' aollt rrn axt	' aollt rrn ` eyt
animate	' aen axm ` eyt	' aen axm iht
annex	' aen ihk s	' aen ehk s
apo	' ey p ` iy ' ow	' aap ao
appropriate	axp r ' owp r iyiht	axp r ' owp r iy` eyt
approximate	axp r ' aak s axm iht	axp r ' aak s axm ` eyt
arithmetic	ax~ r ' ihthm axt ihk	` aer ihthm ' eht ihk
arsenic	' aar s nihk	aar s ' ehn ihk
articulate	aar t ' ihk yxax~ ll` eyt	aar t ' ihk yxax~ lliht
assay	aes ' ey	' aes ey
associate	axs ' owshiy` eyt	axs ' owshiyaxt
attenuate	axt ' ehn yu` yet	axt ' ehn yuiht
attribute	axt r ' ihb yut	' aet r axb ` yut
august	' aog axs t	aog ' ahs t

Homograph phonetics: B-C

Spelling	Primary	Alternate
bass	b ' eys	b ' aes
bow.	b ' ow	b ' aw
christen	k r ' ihs axn	k r ' ihs t axn
close	k ll' owz	k ll' ows
combat	k axm b ' aet	k ' aam b aet
combine	k axm b ' ayn	k ' aam b ayn
compact	k axm p ' aek t	k ' aam p aek t
complement	k ' aam p llaxm axn t	k ' aam p llaxm ` ehn t
complex	k ' aam p llehk s	k axm p ll' ehk s
compliment	k ' aam p llaxm axn t	k ' aam p llaxm ` ehn t
compound	k ' aam p awn d	k axm p ' awn d
compress	k axm p r ' ehs	k ' aam p r ehs
concert	k ' aan s rrt	k axn s ' rrt
conduct	k axn d ' ahk t	k ' aan d ahk t
confederate	k axn f ' ehd rriht	k axn f ' ehd axr ` eyt
confine	k axn f ' ayn	k ' aan f ayn
conflict	k ' aan f llihk t	k axn f ll' ihk t
conglomerate	k axnxg ll' aam rriht	k axnxg ll' aam axr ` eyt
conjugate	k ' aan jhaxg ` eyt	k ' aan jhaxg iht
console	k ' aan s owll	k axn s ' owll
construct	k axn s t r ' ahk t	k ' aan s t r ahk t
consumate	k ' aan s axm ` eyt	k ' aan s axm iht
contaminate	k axn t ' aem axn ` eyt	k axn t ' aem axn iht
content	k ' aan t ehn t	k axn t ' ehn t
contest	k ' aan t ehs t	k axn t ' ehs t
contract	k ' aan t r aek t	k axn t r ' aek t
contrast	k ' aan t r aes t	k axn t r ' aes t
converse	k ' aan v rrs	k axn v ' rrs
convert	k axn v ' rrt	k ' aan v rrt
convict	k axn v ' ihk t	k ' aan v ihk t
coordinate	k ow' aor d axn ` eyt	k ow' aor d axn iht
copulate	k ' aap yxax~ ll` eyt	k ' aap yxax~ lliht
correlate	k ' aor ax~ ll` eyt	k ' aor ax~ lliht
countermand	k ` awn t rrm ' aen d	k ' awn t rrm ` aen d

Homograph phonetics: D-H

Spelling	Primary	Alternate
decoy	d ' iyk oy	d ihk ' oy
decrease	d ihk r ' iys	d ' iyk r iys
defect	d ihf ' ehk t	d ' iyf ehk t
delegate	d ' ehllihg iht	d ' ehllihg ` eyt
deliberate	d ih~ ll' ihb rriht	d ih~ ll' ihb rr` eyt
desert	d ' ehz rrt	d ihz ' rrt
designate	d ' ehz ihg n ` eyt	d ' ehz ihg n iht
desolate	d ' ehs ax~ lliht	d ' ehs ax~ ll` eyt
detail	d ' iyt eyll	d iht ' eyll
deviate	d ' iyv iy` eyt	d ' iyv iyiht
Diffuse	d ihf ' yus	d ihf ' yuz
digest	d ayjh' ehs t	d ' ayjhehs t
disgard	d ihs k ' aar d	d ' ihs k aar d
discharge	d ihs ch' aar jh	d ' ihs chaar jh
discount	d ' ihs k awn t	d ihs k ' awn t
document	d ' aak yxaxm axn t	d ' aak yxaxm ` ehn t
dove	d ' owv	d ' ahv
duplicate	d ' uwp llihk ` eyt	d ' uwp llihk iht
effeminate	ihf ' ehm axn iht	ihf ' ehm axn ` eyt
egress	' iyg r ehs	ihg r ' ehs
ejaculate	iyjh' aek yu~ ll` eyt	iyjh' aek yxax~ lliht
elaborate	ihll' aeb axr iht	ihll' aeb axr ` eyt
emasculate	ihm ' aes k yxax~ ll` eyt	ihm ' aes k yxax~ lliht
escort	' ehs k aor t	ihs k ' aor t
essay	' ehs ey	ehs ' ey
estimate	' ehs t axm ` eyt	' ehs t axm iht
eviscerate	ihv ' ihs rr` eyt	ihv ' ihs rriht
exasperate	ihg z ' aes p rr` eyt	ihg z ' aes p rriht
excerpt	' ehk s rrp t	ihk s ' rrp t
excommunicate	` ehk s k axm ' yun ihk ` eyt	` ehk s k axm ' yun ihk iht
excuse	ihk s k ' yuz	ihk s k ' yus
expatriate	ehk s p ' eyt r iyiht	ehk s p ' eyt r iy` eyt
experiment	ihk s p ' ehr axm axn t	ehk s p ' ehr axm ` ehn t
exploit	ihk s p ll' oyt	' ehk s p lloyt
export	ihk s p ' owr t	' ehk s p owr t
extract	ihk s t r ' aek t	' ehk s t r aek t
federate	f ' ehd axr ` eyt	f ' ehd axr iht
ferment	f rrm ' ehn t	f ' rrm ehn t

forearm	f ' owr # ` aar m	f owr # ' aar m
frequent	f r ' iyk w axn t	f r iyk w ' ehn t
geminate	jh' ehm axn iht	jh' ehm axn ` eyt
graduate	g r ' aejhuw` eyt	g r ' aejhuwiht
guesstimate	g ' ehs t axm ` eyt	g ' ehs t axm iht
guestimate	g ' ehs t axm ` eyt	g ' ehs t axm iht
house	hx' aws	hx' awz

Homograph phonetics: I-L

Spelling	Primary	Alternate
illuminate	ih~ ll' uwm axn ` eyt	ih~ ll' uwm axn iht
impact	' ihm p aek t	ihm p ' aek t
implant	ihm p ll' aen t	' ihm p llaen t
import	' ihm p owr t	ihm p ' owr t
impregnate	ihm p r ' ehg n ` eyt	ihm p r ' ehg n iht
imprint	' ihm p r ihn t	ihm p r ' ihn t
incarcerate	ihnxk ' aar s rr` eyt	ihnxk ' aar s rriht
incense	' ihn s ehn s	ihn s ' ehn s
incline	ihn k ll' ayn	' ihn k llayn
incorporate	ihn k ' aor p rr` eyt	ihn k ' aor p rriht
increase	ihn k r ' iys	' ihn k r iys
indent	ihn d ' ehn t	' ihn d ehn t
inebriate	ihn ' iyb r iy` eyt	ihn ' iyb r iyiht
infatuate	ihn f ' aechuw` eyt	ihn f ' aechuwiht
initiate	ihn ' ihshiy` eyt	ihn ' ihshiyiht
inlet	' ihn lleht	ihn ll' eht
insert	ihn s ' rrt	' ihn s rrt
inset	' ihn s ` eht	ihn s ' eht
insult	ihn s ' ahllt	' ihn s ahllt
interchange	' ihn t rrch` eyn jh	` ihn t rrch' eyn jh
interface	' ihn t rrf ` eys	` ihn t rrf ' eys
intermediate	` ihn t rrm ' iyd iyaxt	` ihn t rrm ' iyd iy` eyt
intern	' ihn t rrn	ihn t ' rrn
interplay	' ihn t rrp ll` ey	` ihn t rrp ll' ey
intimate	' ihn t axm iht	' ihn t axm ` eyt
invalid	ihn v ' aellihd	' ihn v axllihd
jagged	jh' aeg ihd	jh' aeg d
jarred	jh' aar d	jh' ehr ihd
just	jhahs t	jh' ahs t
lacerate	ll' aes axr ` eyt	ll' aes rriht
lead	ll' iyd	ll' ehd
live	ll' ihv	ll' ayv
lopes	ll' owp s	ll' owp ehz

Homograph phonetics: M-P

Spelling	Primary	Alternate
matriculate	m axt r ' ihk yxax~ ll` eyt	m axt r ' ihk yxax~ lliht
mediate	m ' iyd iy` eyt	m ' iyd iyiht
merchandise	m ' rrchaxn d ` ays	m ' rrchaxn d ` ayz
minute	m ' ihn iht	m ayn ' yut
misconduct	m ihs * k ' aan d ahk t	m ` ihs * k axn d ' ahk t
miscount	m ' ihs * k ` awn t	m ihs * k ' awn t
misprint	m ' ihs * p r ` ihn t	m ihs * p r ' ihn t
misuse	m ihs * ' yuz	m ihs * ' yus
moderate	m ' aad axr iht	m ' aad axr ` eyt
monument	m ' aan yum axn t	m ' aan yxaxm ` ehn t
nominate	n ' aam axn ` eyt	n ' aam axn iht
numerate	n ' uwm axr ` eyt	n ' uwm rriht
object	' aab jhihk t	axb jh' ehk t
obligate	' aab llihg ` eyt	' aab llihg iht
offset	` aof # s ' eht	' aaf # s ` eht
opiate	' owp iyaxt	' owp iy` eyt
outcrop	' awt # k r ` aap	` awt # k r ' aap
outcry	' awt # k r ` ay	` awt # k r ' ay
outreach	' awt # r ` iych	` awt # r ' iych
outside	' awt # s ` ayd	` awt # s ' ayd
overage	' owv rr# ' eyjh	' owv rrihjh
overdrive	' owv rr# d r ` ayv	` owv rr# d r ' ayv
overflow	` owv rr# f ll' ow	' owv rr# f ll` ow
overhang	' owv rr# hx` aenx	` owv rr# hx' aenx
overload	` owv rr# ~ ll' owd	' owv rr# ~ ll` owd
overpass	' owv rr# p ` aes	` owv rr# p ' aes
overrun	` owv rr# ~ ' r ahn	' owv rr# ~ r ` ahn
oversupply	' owv rr# s axp ll` ay	` owv rr# s axp ll' ay
overturn	` owv rr# t ' rrn	' owv rr# t ` rrn
perfect	p ' rrf ihk t	p rrf ' ehk t
perfume	p ' rrf yum	p rrf ' yum
permit	p rrm ' iht	p ' rrm iht
pervert	p rrv ' rrt	p ' rrv rrt
polish	p ' aa~ llihsh	p ' ow~ llihsh
pontificate	p aan t ' ihf ihk ` eyt	p aan t ' ihf ihk iht
postulate	p ' aas chax~ ll` eyt	p ' aas chax~ llaxt
proceeds	p r axs ` iyd z	p r ' ows iyd z
process	p r ' aas ehs	p r aas ' ehs

predicate	p r ' ehd ihk ` eyt	p r ' ehd ihk axt
predominate	p r ihd ' aam axn ` eyt	p r ihd ' aam axn iht
prefab	p r ' iy* f ` aeb	p r iy* f ' aeb
present	p r ihz ' ehn t	p r ' ehz axn t
preset	p r iy* s ' eht	p r ' iy* s ` eht
produce	p r axd ' uws	p r ' owd uws
progress	p r ' aag r ehs	p r axg r ' ehs
project	p r ' aajhihk t	p r axjh' ehk t
protest	p r ' owt ehs t	p r axt ' ehs t
psyche	s ' ayk iy	s ' ayk

Homograph phonetics: R

Spelling	Primary	Alternate
radiate	r ' eyd iy` eyt	r ' eyd iyiht
read	r ' iyd	r ' ehd
rebel	r ' ehb el	r ihb ' ehll
recall	r ih* k ' aoll	r ' iy* k aoll
recap	r iy* k ' aep	r ' iy* k ` aep
recess	r ' iys ` ehs	r ihs ' ehs
record	r ' ehk rrd	r ihk ' owr d
recount	r iy* k ' awn t	r ' iy* k ` awn t
redial	r iy* d ' ayll	r ' iyd ` ayll
refill	r iy* f ' ihll	r ' iy* f ` ihll
refund	r iy* f ' ahn d	r ' iy* f ahn d
refuse	r ihf ' yuz	r ' ehf yus
regenerate	r iy* jh' ehn axr ` eyt	r ih* jh' ehn axr iht
regiment	r ' ehjhaxm axn t	r ' ehjhaxm ` ehn t
reincarnate	r ` iy* ihn k ' aar n eyt	r ` iy* ihn k ' aar n iht
reject	r ihjh' ehk t	r ' iyjhehk t
relapse	r ' iy* ~ llaep s	r ih* ~ ll' aep s
relay	r ' iy~ lley	r ih~ ll' ey
remake	r ' iym ` eyk	r iy* m ' eyk
replicate	r ' ehp llihk iht	r ' ehp llihk ` eyt
reprint	r ' iy* p r ` ihn t	r iy* p r ' ihn t
rerun	r ' iy* ~ r ` ahn	r iy* ~ r ' ahn
research	r ' iys rrch	r iys ' rrch
reset	r iy* s ' eht	r ' iy* s ` eht
resume	r ihz ' uwm	r ' ehz uhm ` ey
retake	r iyt ' eyk	r ' iyt ` eyk
retard	r iht ' aar d	r ' iyt aar d
retouch	r iy* t ' ahch	r ' iy* t ` ahch
rewind	r iy* w ' ayn d	r ' iy* w ` ayn d
rewrite	r iy* ~ r ' ayt	r ' iy* ~ r ` ayt
romance	r ' owm aen s	r owm ' aen s

Homograph phonetics: S-W

Spelling	Primary	Alternate
satiate	s ' eyshiy` eyt	s ' eyshiyiht
saturate	s ' aechaxr ` eyt	s ' aechrriht
sediment	s ' ehd axm axn t	s ' ehd axm ` ehn t
segment	s ' ehg m axn t	s ehg m ' ehn t
separate	s ' ehp axr ` eyt	s ' ehp r iht
serrate	s ' ehr eyt	s axr ' eyt
shanghai	shaenxhx' ay	sh' aenxhxay
sojourn	s ' owjhrrn	s owjh' rrn
sow	s ' ow	s ' aw
subject	s ' ahb jhihk t	s axb jh' ehk t
sublet	s ' ahb ll` eht	s axb ll' eht
sublimate	s ' ahb llaxm ` eyt	s ' ahb llaxm iht
subordinate	s axb * ' aor d eniht	s axb * ' aor d en` eyt
supplement	s ' ahp llaxm axn t	s ' ahp llaxm ` ehn t
survey	s ' rrv ey	s rrv ' ey
suspect	s ' ahs p ehk t	s axs p ' ehk t
syndicate	s ' ihn d ihk iht	s ' ihn d ihk ` eyt
tabulate	t ' aeb yxax~ ll` eyt	t ' aeb yxax~ lliht
tear	t ' ehr	t ' iyr
torment	t owr m ' ehn t	t ' owr m ehn t
transfer	t r aen s f ' rr	t r ' aen s f rr
transform	t r aen s * f ' owr m	t r ' aen s * f owr m
transplant	t r aen s * p ll' aen t	t r ' aen s * p ll` aen t
transport	t r aen s * p ' owr t	t r ' aen s * p owr t
transpose	t r aen s * p ' owz	t r ' aen s * p owz
twofold	t ' uw# f ` owlld	t ' uw# f ' owlld
underage	` ahn d rr# ' eyjh	' ahn d rrihjh
underestimate	` ahn d rr# ' ehs t axm ` eyt	` ahn d rr# ' ehs t axm iht
undulate	' ahn d yxax~ ll` eyt	' ahn d yxax~ lliht
upset	ahp # s ' eht	' ahp # s ` eht
upstart	' ahp # s t ` aar t	ahp # s t ' aar t
upsurge	ahp # s ' rrjh	' ahp # s ` rrjh
upturn	ahp # t ' rrn	' ahp # t ` rrn
use	` yuz	' yus
wind	w ' ihn d	w ' ayn d
wound	w ' uwn d	w ' awn d

Preprocessor parsing rules

Introduction

The preprocessor parses text to ensure that DECtalk pronounces the text correctly. Use **Skip [:skip]** to suppress the parsing action. Use **Punctuation [:punct]** to modify it. Three sets of rules apply to the parsing process (listed below).

Topics

- **Punctuation parsing rules**

- **Email parsing rules**

- **General parsing rules**

Punctuation parsing rules

Unless an in-line command is used, the preprocessor uses punctuation to speak text correctly (see **Punctuation [:punct]** and **Skip [:skip]**).

Recognized punctuation

- . (period)

- , (comma)

- ; (semi-colon)

- : (colon)

- ? (question mark)

- ! (exclamation mark)

All other punctuation marks are ignored.

Interpreting punctuation as words

The **[:punct all]** in-line command causes the preprocessor to interpret punctuation marks as words to be spoken. The symbol "~" is spoken "tilde," and the symbol "," is spoken "comma."

The in-line commands **[:punct none]**, **[:punct pass]**, and **[:skip all]** cause the preprocessor to interpret punctuation marks as symbols that modify how text is spoken.

Interpreting punctuation as punctuation

The preprocessor applies the following rules to the **[:punct some]** command:

- Multiple instances of identical punctuation marks are reduced to a single symbol.

    Example: ----- becomes -, and *** becomes ***

- Double encapsulations are treated as single encapsulations.

    Example: "(intelligent)" and ((intelligent)) are treated as (intelligent)

- Hours and minutes are not altered.

    Example: 2:43 pm is spoken "two forty-three P M"

- Numerals and decimal numbers are not altered.

    Example: -3.52 is spoken "minus three point five two"

- Currency values are spoken as expected.

Example: -$43,65 is spoken "minus forty-three dollars and sixty-five cents"

+$123.21 is spoken "plus one hundred and twenty-three dollars and twenty-one cents"

- Uppercase single letters followed by periods are interpreted as single letters.

  Example: U.S.A. is spoken "U S A"; and P.M. and p.m. are spoken "P M"

- Doubled clause boundary symbols are reduced to the first clause boundary.

  Example: boom! is spoken "boom!"

- Commas and hyphens not followed by spaces are spoken with spaces.

  Example: look,look is spoken "look, look"

Email parsing rules

The preprocessor parses email messages, removing much of the mail header. It leaves the following items:

- Sent:
- Date:
- Subject:
- Subject: Re:
- From:
- To:
- Forwarded Message:

General parsing rules

Parsing rules vary according to language. Affected items are presented below.

English (US, UK)

- Dates

- Hours and minutes

- Street, avenue, and drive

- Numbered street names

  Example: 29 42 Street is spoken "twenty-nine forty-second street"

- Phone numbers are spoken as digits, with appropriate pauses.

- Dr. is spoken "doctor"

- St. is spoken "saint"

- Two-letter state names are pronounced in full.

  Example: MA 01749 is spoken "Massachusetts zero one seven four nine"

- Postal zip codes are spoken one digit at a time.

- URL addresses are spoken one character at a time.

- Filenames are spoken one character at a time.

- In compound words, prefixes may be broken apart from the second word.

- Days of the week.

- Compass directions are spoken in full.

  Example: 30 W is spoken "thirty west"

- Roman numerals following a name are spoken as ordinal numbers.

  Example: John Doe III is spoken "John Doe the third"

- Credit card numbers are spoken with intervening pauses.

  Example: 6011 4134 3621 4172 is spoken "six zero one one, four one three four, three six two one, four one seven two"

- Uppercase letters begin a new word in words with mixed upper and lowercase letters.

  Example: TextToSpeech is spoken "text to speech"

- Combinations of numbers and letters are broken into numbers and individual letters.

  Example: two34five is spoken "T W O thirty-four F I V E"

  XF302QB is spoken "X F three hundred and two Q B"

English (UK)

- Dates

- Addresses

French

- Dates

- Currency

- Hours and minutes

- Phone numbers

- Credit cards

German

- Hours and minutes

- Dates

- Currency

- Phone numbers

- Compound nouns

Italian

- Dates

- Currency

- Hours and minutes

- Phone numbers

- Credit cards

Spanish (Castilian and Latin American)

- Dates

- Currency

- Phone numbers

- Credit cards

Abbreviations

US English abbreviations

The table below contains abbreviations included in the system dictionary (+) or in the main U.S. dictionary. The following notes also apply.

Double asterisk note (**)

Abbreviations with two asterisks (**) represent more than one word. For example, "Dr." has two asterisks because it represents "doctor" and "drive." Fonix DECtalk relies on proprietary rules to say the correct word.

Single asterisk note (*)

Abbreviations with one asterisk (*) might be confused with whole words if the period is omitted, or if the abbreviation is the last word in a sentence. For example, "fig" is a word, and an abbreviation for another word "figure." Fonix DECtalk relies on proprietary rules to say the correct word.

Single plus note (+)

Abbreviations with one plus (+) are system abbreviations.

Capitalization

Abbreviations that begin with an uppercase letter are case sensitive. Abbreviations that begin with a lowercase letter are not case sensitive.

Abbreviations representing multiple words

Abbreviations can represent different words. For example, "dr." can represent "doctor" or "drive." Fonix DECtalk relies on proprietary rules to say the correct word.

Single and plural forms

Single and plural forms are not affected by the period. The abbreviation "in." says "inch" or "inches" depending on the number preceding it. A space between the number and the abbreviation is not required. The period is required, however, because "in." without a period is not in the abbreviation dictionary.

Periods in abbreviations

The abbreviations "mtn" and "mtn." say "mountain" because both appear in the abbreviation dictionary.

Word/phrase	Abbreviation	
account	acct	+
account	acct.	+

admiral	Adm.	
agriculture	agr	+
agriculture	agr.	+
apartment	apt.	*
April	Apr.	
assistant	asst.	
associates (noun)	Assoc.	
attorney	atty.	
august	Aug.	
avenue	Av.	
avenue	Ave.	
boulevard	Blvd.	
brothers	Bros.	
building	bldg.	
by the way	btw	+
by the way	btw.	+
captain	capt	+
captain	capt.	+
center	Cntr.	
center	Ctr.	
centimeter	cm.	
centimeters	cms.	
centimeters	cm.	
chapter	CH.	
chapter	Ch.	
circle	cir	
circle	cir.	+
commander	comdr.	+
Company	Co.	
continued	cont.	
corporation	Corp.	
cubic	cu.	
december	Dec.	
degrees	deg.	
department	Dept.	
district	Dist.	
doctor	Dr.	** +
dozen	doz.	
drive	Dr.	** +
especially	esp.	
established	est.	
et cetera	etc.	
expressway	expy	+
expressway	expy.	+
extension	ext.	

father	Fr.	
february	Feb.	
feet	ft.	
figure	fig.	
flight	Flt.	
foot	ft.	
footnote	fn.	
for example	e.g.	
for your information	fyi	+
for your information	fyi.	+
fort	Ft.	
friday	Fri.	
general	Gen.	
govenor	Gov.	
gram	gm.	
grams	gm.	
heights	hts	+
heights	hts.	+
highway	hwy	+
highway	hwy.	+
hour	hr.	
hours	hrs.	
hours	hr.	
inch	in.	
inches	ins.	
inches	in.	
incorporated	Inc.	
international	Intl.	
january	Jan.	
july	Jul.	
junction	jct	+
junction	jct.	+
june	Jun.	
junior	Jr.	
kilogram	kg.	
kilograms	kgs.	
kilograms	kg.	
kilometer	km.	
kilometers	km.	
knot	kt.	
lake	lk	
lake	lk.	
lane	ln.	+
lane	ln	+

limited	Ltd.	
manufacturing	Mfg.	
manuscripts	mss.	
march	Mar.	
merchandise	msde.	
microsecond	usec.	
microseconds	usec.	
mile	mi.	
miles	mi.	
miles per gallon	mpg	
miles per gallon	mpg.	
miles per hour	mph	
miles per hour	mph.	
miligram	mg.	
miligrams	mgs.	
miligrams	mg.	
milliliter	ml.	
milliliters	ml.	
millimeter	mm.	
millimeters	mm.	
millisecond	msec.	
milliseconds	msecs.	
milliseconds	msec.	
minute	min.	
minutes	min.	
miscellaneous	misc.	
mister	mr.	
mistress	mrs.	
miz (ms)	Ms.	
Monday	Mon.	
mount	Mt.	
mountain	mtn	+
mountain	mtn.	+
nanosecond	ns.	
nanosecond	nsec.	
nanoseconds	ns.	
nanoseconds	nsec.	
net weight	nt.wt.	
november	Nov.	
october	Oct.	
ounce	oz.	
ounces	ozs.	
ounces	oz.	
pages	pp.	

parkway	pky	+
parkway	pky.	+
place	Pl.	
place	pl	+
place	pl.	+
plaza	plz	+
plaza	plz.	+
post paid	p.p.d.	
post paid	ppd.	
pound	lb.	
pounds	lbs.	
pounds	lb.	
president	Pres.	
professor	Prof.	
quart	qt.	
quarts	qt.	
representative	Rep.	
reverend	Rev.	
ridge	rdg	+
ridge	rdg.	+
road	Rd.	
room	rm	+
room	rm.	+
route	Rte.	
saint	St.	** +
saturday	Sat.	
second	sec.	
second	secs.	
seconds	secs.	
seconds	sec.	
secretary	secy.	
senator	Sen.	
senior	Sr.	
september	Sep.	
september	Sept.	
square	sq.	
station	sta	+
station	sta.	+
street	St.	** +
Suite	ste	+
Suite	ste.	+
sunday	Sun.	
tablespoon	tbsp.	
tablespoons	tbsps.	
tablespoons	tbsp.	
teaspoon	tsp.	

teaspoons	tsps.	
teaspoons	tsp.	
terrace	ter	+
terrace	ter.	+
this is	i.e.	
thursday	Thu.	
thursday	Thurs.	
trail	trl	+
trail	trl.	+
tuesday	Tue.	
tuesday	Tues.	
turnpike	tpke	+
turnpike	tpke.	+
university	Univ.	
valley	vly	+
valley	vly.	+
versus	vs.	
volume	Vol.	
wednesday	Wed.	
yard	yd.	
yard		
yards	yds.	
Yards	yd.	

Software examples

Email mode example

The in-line command **[:mode email on]** activates e-mail parsing rules that determine what to speak and what to ignore.

- The following words identify header information and initiate line-by-line processing:

  ```
  From:
  Return-Path:
  %======Internet
  Message-ID:
  ```

- The following words identify text to be saved for preprocessing:

  ```
  Sent:
  Date:
  Subject: Re:
  Subject:
  From:
  To:
  cc: or CC:
  ------ Forwarded Message
  ```

- A pause is added to the end of each line of text saved for preprocessing.

- DECtalk begins processing text when it encounters an empty line (line that contains only a return code).

- DECtalk continues processing text until it encounters more header or footer information, which it ignores.

- [:mode email off] ends e-mail processing mode.

Example

The following example removes e-mail header information. Only the date, subject and sender are spoken. The footer is also removed. Abbreviations are expanded: E S T is spoken Eastern Standard Time; St. James St. is spoken Saint James Street.

```
[:mode email on]

From John Doe  Wed Aug 7 18:07:28 EST
Return-Path: <john@node.com>
Received: from home.node.com ([127.0.0.1]) by smtp.node.com
Message-ID:  <32FB6581.581A@smtp.node.com>
Date: Wed, 7 Aug 1996 18:07:28 EST
From:  john@node.com (John Doe)
Reply-To:  john@node.com
Organization:  Fonix Corporation
X-Mailer:  ELM
```

```
MIME-Version: 1.0
To: jane@node.com
Subject: DECtalk Parsing
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Mozilla-Status: 0001

Hi Jane,
At 11:52 EST on Wed Aug 7, I found a great web site from Fonix
Corporation. The site contains information about DECtalk
products.  Take a look at URL:

http://www.fonix.com/products/dectalk

Let me know what you think. E-mail address: john@aol.node.com. Snail
mail address: John Doe, 4321 St. James St., Mt. View, CA 12345-6789,
phone (123) 297-4863. Alternative snail mail address: Dr. John Doe,
10 42nd St., Boston, MA 01234, phone 617-546-2345.

See ya!   :-)

John

% ====== Internet headers and postmarks (see DECWRL::GATEWAY.DOC)
======
% Received: from smtp.node.com by node.com (5.65/rmc-22feb94) id
AA17792; Wed, 7 Aug 96 22:47:37 -0400
% Received: from node.com by node.com (8.7.5/UNX 1.2/1.0/WV) id
WAA13939; Wed, 7 Aug 1996 22:35:28 -0400 (EDT)
% Received: from node.com (smtp.node.com [127.0.0.1]) by
worldaccess.com (8.6.10/8.6.10) with SMTP id TAA10463 for
<jane@node.com>; Wed, 7 Aug 1996 19:33:57 -0700
% Message-Id: <32094F06.4045@node.com>
% Date: Wed, 07 Aug 1996 19:20:54 -0700
% From: john Doe <John@node.com>
% Organization: Fonix Corporation
% X-Mailer: ELM
% Mime-Version: 1.0
% To: "Jane Smith, jane@node.com"
% Subject: Re: DECtalk Parsing
% References: <9608071721.AA16334@node.com>
% Content-Type: text/plain; charset=us-ascii
% Content-Transfer-Encoding: 7bit

[:mode email off]
```

Related topic

Mode [:mode]

Math mode example

When mode math is set to **[:mode math on]**, certain symbols are pronounced with mathematical meanings according to the following table:

Symbol	Name	on (DECtalk says)	off (DECtalk says)
+	plus	plus	plus
–	hyphen	minus	dash
*	asterisk	multiplied by	asterisk
/	slash	divided by	slash
^	circumflex	to the power of	caret
<	less than	less than	left angle bracket
>	greater than	greater than	right angle bracket
=	equal signs	equals	equal
%	percent sign	percent	percent
.	period	point (no space)	(functions as period)
xxE–xx	(spelled)	(scientific notation)	(spelled)

Scientific notation example

The following example speaks "seven times 10 to the power minus fifty-five." With math mode turned off it would speak "seven e dash fifty-five."

```
[:mode math on]7E-55
```

Related topic

Mode [:mode]

Index