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**Author:** Texas Instruments

**Language:** TI Extended BASIC

**Hardware:** TI Home Computer  
TI Solid State Speech<sup>TM</sup> Synthesizer  
TI Memory Expansion unit  
TI Disk Drive Controller and Disk Memory Drive  
TI Extended BASIC Solid State Software<sup>TM</sup> Command Module

**Media:** Diskette

Designed to operate with the TI Extended BASIC Command Module, the TI Text-to-Speech (English) package makes it possible for the computer to speak almost any word in the English language. And the package offers an alternative to the TI Terminal Emulator II Command Module, another method which gives a TI Home Computer this same speech capability.

With the Text-to-Speech (English) package, you can:

- o Enter English words via the computer keyboard that the computer then speaks.
- o Construct words, phrases, and sentences which have the pitch contour, inflection, and pause characteristics you want, thus enabling you to create dialects, special or unusual words, and even sound effects.
- o Add any word or phrase to a TI Extended BASIC program instead of being limited to those words resident in the Speech Synthesizer.

The Text-to-Speech (English) package uses a type of speech technology, referred to as text-to-speech, in which words are broken down into parts of speech called allophones. An allophone is one of two or more articulatorily and acoustically different forms of the same phoneme. A phoneme is the smallest unit of speech that distinguishes one utterance from another. But you do not have to be a "speech expert" to use Text-to-Speech (English). A list of the allophones used by TI Text-to-Speech (English) and their numeric codes is contained in Appendix A. All other information you need is described in the step-by-step instructions and other appendices contained in this manual.

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**TEXT-TO-SPEECH (ENGLISH)****Description**

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The Text-to-Speech (English) subroutine package contains three subroutines which allow you to create allophone strings from text strings. Thus, your task of adding speech to Extended Basic programs is as simple as using the XLAT routine to translate the English phrase into allophones and then using the SPEAK routine to speak the translated phrase. The English phrase may be a string variable, string constant, or string expression.

This section describes how you can access the Text-to-Speech (English) system from a TI Extended BASIC program. It explains how to initialize the system, how to download the speech database, and how to access the individual routines. With this feature, you can add speech to games, educational programs, and many other applications.

The subroutine package contains the following subroutines: SETUP which is the Text-to-Speech (English) initialization subroutine; XLAT which is the text-to-allophone translator; SPEAK which is the allophone-to-LPC (Linear Predictive Coding) translator. Briefly, the steps involved in using these subroutines are initializing the system's expansion memory, loading the Text-to-Speech (English) subroutines, then calling and executing the subroutines.

- STEP 1. Be sure that the Speech Synthesizer, the Memory Expansion System, the Disk Drive Controller, and the Disk Memory Drive are connected to the computer and turned on and that the TI Extended BASIC Command Module is inserted into the console. (See the owner's manuals for product details.) Set the volume control on the computer monitor to mid-range.
- STEP 2: Next, press any key to make the master selection list appear. Then press the key necessary to select TI Extended BASIC.
- STEP 3: Insert the Text-to-Speech diskette into Disk Drive 1.
- STEP 4: Type the following to initialize the Memory Expansion Unit and load the Text-to-Speech (English) subroutines:

```
CALL INIT :: CALL LOAD("DSK1.S  
ETUP", "DSK1.XLAT", "DSK1.SPEA  
K")
```

and press ENTER.

Note: It will take 1-1/2 to 2 minutes for the system to accomplish this because of the length of the subroutines.

- STEP 5: Next, call the routine SETUP by typing
- ```
CALL LINK("SETUP", "DSK1.DATABASE")
```

and pressing ENTER. The indicated file, DSK1.DATABASE, is loaded from the diskette into the computer's memory. The general format for a call to this routine is CALL LINK("SETUP", filename ) where filename is the name of the file from which to load the database. This file is loaded into the computer's memory.

In addition to the standard error messages for the LINK routine, the following error messages can result from the SETUP call:

| Error Message           | Description                                                                                                                                                                                                 |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Memory Full             | There is not enough space left for the database. Reduce program size.                                                                                                                                       |
| Incorrect Argument List | There is an incorrect number of arguments in call parameter list.                                                                                                                                           |
| I/O Error               | There was an I/O error during transfer of database. This could be caused by one of these two factors: (1) file or device doesn't exist; (2) file parameters do not agree with expected database parameters. |

STEP 6: Now, call the XLAT routine to create an allophone string from any given text string. The general format of a call to XLAT is

CALL LINK("XLAT", text string, allophone string)

In this call, the text-string is a string expression giving the text string to be translated; and allophone-string is a string variable (or string array element) that receives the resulting allophone string.

If the text string to be translated is longer than 128 bytes, an error message "STRING TRUNCATED" is returned. If the resulting allophone string is longer than 255 bytes, an error message "SPEECH STRING TOO LONG" is returned.

STEP 7 An example of the XLAT routine call is:

```
CALL LINK("XLAT", "PRESS Y FOR YES. PRESS N  
FOR NO", B$)
```

In this example, the routine XLAT creates the allophone string B\$ for the text string "PRESS Y FOR YES. PRESS N FOR NO".

The XLAT routine can translate any standard English language text. In addition to the normal alphabetic characters, some special characters are recognized by the routine. If a special character is not recognized, it is ignored. It does, however, cause a word break, thereby terminating the current word.

The special characters recognized by the XLAT routine can be divided into four functional groups: numerical characters, pause and break characters, inflection symbols, and special symbols.

#### NUMERICAL CHARACTERS

The numerical character group consists of the standard numerical characters 0 through 9, and the symbols ",", ".", "-", and "+". The characters 0 through 9 are always pronounced in the usual way. The other symbols, however, are only recognized if they directly precede a numerical character. Then, and only then, it is pronounced.

#### PAUSE AND BREAK CHARACTERS

This character group consists of the characters ".", ",", "!", "?", ":", and ";". Note that the period and comma symbols must be followed by a space unless it is the last character in the string.

These characters generate a pause code, the length of which depends upon the character. The "." symbol causes a short break (2 frames), while all of the others cause a long break (9 frames). The duration of one frame is approximately 25 milliseconds.

Use the sample program Phrase and type in the following example to hear the difference in pause characters.

THE COMMA IS A SHORT PAUSE, BUT THE PERIOD  
IS A LONG PAUSE. DID YOU HEAR THE  
DIFFERENCE?

In addition to generating pause codes, these characters also affect the inflection contour of the sentence if a primary stress point (vocal emphasis) has been indicated. The "," and "?" characters both specify rising contour for the preceding phrase, while all other codes generate the standard falling contour. For more information, refer to Appendix D, Speech Contouring Algorithms.

#### INFLECTION SYMBOLS

This group consists of two main symbols, the "^" and the " ", plus one other symbol, the ">". The "^" symbol denotes primary stress and the " " symbol denotes secondary stress. The ">" symbol is the shift indicator and is used to shift the stress within a word or phrase. When you input a word or phrase, for example, the word IMPORTANT, without any stress points, it will have the standard falling contour. But if you want the primary stress to be on the second syllable, then type in "^>IMPORTANT". The stress is shifted to the second syllable.

The primary stress point triggers a rising or falling pitch that starts at the inflection symbol and continues to the end of the phrase. The pause and break symbols within the phrase determine whether the pitch rises or falls. The "?" and "," make the pitch rise and all other symbols make the pitch fall. The following examples illustrate the use of the primary stress point and the effect that the pause and break characters have on those stress points.

THE SUN RISES IN THE ^ WEST?

THE SUN ^ SETS IN THE WEST.

If a secondary stress point is used, it forces the specific syllable to be pronounced at a higher pitch than the other syllables within the word or phrase. If several secondary stress points are used, then the first one starts at a higher pitch and all subsequent secondary stress points step down to a lower pitch but still remain higher than the pitch level of the syllables that have no stress. Normally, if you use secondary stress points within a phrase, you should use a primary stress point also. If a primary stress point is not used, then all syllables after the last secondary stress point will take on a flat monotone level. Also, only one primary stress point can be used in a phrase. If you use more than one primary stress point, then all other primary stress points after the first one will be changed to secondary stress points.

Below are more examples of the usage of the inflection symbols.

- |                    |                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------|
| ^PRACTICAL         | Primary stress point on the first syllable                                              |
| ^>OBSCURE          | Primary stress point on the second syllable                                             |
| ^>>GRAVITATION     | Primary stress point on third syllable                                                  |
| _ONE _TIME ^ ONLY? | Secondary stress points and primary stress point within a phrase with a rising contour. |



SPECIAL SYMBOLS

This group consists of the symbols "@", "\$", "%", "&", "\*", "(", ")", "=", and "/". These symbols are pronounced as follows:

| Symbol | Pronounced as |
|--------|---------------|
| @      | at            |
| \$     | dollar        |
| %      | percent       |
| &      | and           |
| *      | asterisk      |
| (      | open          |
| )      | close         |
| =      | equals        |
| /      | slash         |

You may also want to experiment with typing in various letters and combinations of letters to find out the unusual sounds it is possible to create with Text-to-Speech (English). For example, use the sample program Phrase and type in the following letters to hear the sounds they produce.

```
WWWWW  
HCHCH  
XXXXX  
RFRFRF  
QQQQQQ
```

- STEP 8: After an allophone string has been created with the XLAT routine, the selected allophones can be spoken by the SPEAK routine. The general format to call the SPEAK routine is

```
CALL LINK("SPEAK", allophone-string, pitch,  
slope)
```

In this call, allophone-string is a string expression yielding the required allophone string; pitch is a numeric expression giving the pitch indicator; and slope is a numeric expression giving the slope value.

The normal pitch value is 43.

The pitch expression should yield a value in the range of 0 through 63. The slope expression is limited to a value of 0 through 255, although it actually indicates 32 times the slope increment used by the contouring algorithms. In general, the slope should be selected so that it is approximately 10% of the pitch value. For pitch equal to 40, the slope should be approximately 4 times 32, or 128. The multiplication factor of 32 has been selected to allow for fractional increments in integer-type variables.

Note that the only restriction to the slope parameter is that it not exceed these limits.

$$\text{slope} < (\text{pitch}-1) * 16$$

$$\text{slope} < (63-\text{pitch}) * 16$$

The reason for this is that if the selected slope is selected too large, inflection parameters cause the pitch parameter to cross the range of 0 to 63, either on the high or low side. The current allophone stringer automatically corrects the slope parameter to avoid that kind of a situation.

If the selected pitch level is selected too high (greater than 63), the pitch level is automatically limited to level 63. That means that any level above level 63 is treated as if level 63 had been specified.

Appendix A describes the standard allophone codes for II Text-to-Speech (English). Appendix B lists frequency tables which indicate the pitch-interval to frequency relationship. Appendix C describes some special inflection codes. In general, all codes above 240 are reserved for special function codes. And Appendix D provides speech contouring algorithms.

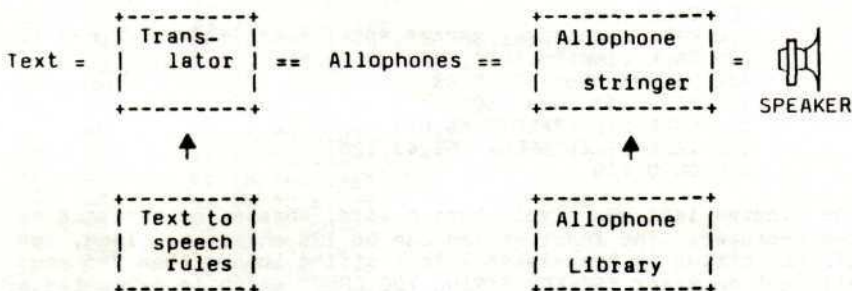
The following program called Phrase is an example of a program that can be created using Text-to-Speech (English).

```
100 CALL INIT
110 CALL LOAD("DSK1.SPEAK","DSK1.XLAT","DSK1.SETUP")
120 CALL LINK("SETUP","DSK1.DATABASE")
130 LINPUT "PHRASE- ":A$
140 IF A$="" THEN 160
150 CALL LINK("XLAT",A$,B$)
160 CALL LINK("SPEAK",B$,43,128)
170 GOTO 130
```

The program lets you simply type a word, phrase, or sentence on the computer. The input string can be 128 characters long, but if that string is translated into a string longer than 255 you will get an error "SPEECH STRING TOO LONG" which is generated by the XLAT routine. If the input string exceeds 128 characters, you will receive an error "STRING TRUNCATED". Then, when you press the ENTER key, the computer speaks the words you entered. This lets you have your computer speak a wide range of English language words. And it allows you to alter the spelling of a word to make it sound the way you want it to sound.

As you listen to the computer speak, you may decide that a word is not spoken the way you want, or you may decide that you want a longer pause between some words. You can change the pronunciation of words in two ways. First, you can misspell the word. For example, the computer pronounces the word break breek. Therefore, change the spelling of break to brake and the computer pronounces the word properly. Or you can spell great as ggreat, and the computer "stretches out" the r sound. Misspelling the word silently as sssilently causes the computer to pronounce the word with a longer s sound. You can experiment with other misspellings to create the pronunciation you want. Also, to achieve the pause duration you want, experiment with pause and break characters as described in the "Pause and Break Characters" section.

The Text-to-Speech (English) system can be subdivided into two distinct functional blocks as shown here.



The first block (labeled translator) is the text-to-allophone translator. This block is the main component in the Text-to-Speech (English) system. It uses speech rules, stored in a rules library in the system, to translate English text into its allophonic equivalent. It also includes symbols for sentence contouring. This block is implemented in a routine called XLAT.

The second block (labeled allophone stringer) converts allophone strings, which may include pitch contour modifiers, to LPC strings. These strings are output directly to the system's speech chip. Note that this means that the actual LPC data is never completely in memory, thus saving space. This block is implemented in a routine called SPEAK.

## Allophone Code Description

This appendix provides a brief description of the code numbers assigned to the allophones and the sound associated with each.

| <u>Allophone</u> | <u>Description</u>    |
|------------------|-----------------------|
| 1 - AE1          | as in ".A.ddition"    |
| 2 - AE1N         | as in ".A.nnuity"     |
| 3 - AH1          | as in "Delt.a."       |
| 4 - AH1N         | as in ".O.n time"     |
| 5 - AW1          | as in ".Au.tonomy"    |
| 6 - AW1N         | as in "An.o.nimity"   |
| 7 - E1           | as in ".E.liminate"   |
| 8 - E1N          | as in ".E.nough"      |
| 9 - EH1          | as in "Cont.e.xt"     |
| 10 - EH1N        | as in "Anci.e.nt"     |
| 11 - ER1N        | as in "West.e.rn"     |
| 12 - I1          | as in "Synth.e.s.i.s" |
| 13 - I1N         | as in ".I.nane"       |
| 14 - O01         | as in "T.o.o.k on"    |
| 15 - OW1N        | as in "D.o.nation"    |
| 16 - U1          | as in "Ann.u.al"      |
| 17 - U1N         | as in ".U.nique"      |
| 18 - UH1         | as in ".A.bove"       |
| 19 - UH1M        | as in "Instr.u.ments" |
| 20 - UH1N        | as in ".U.nderneath"  |
| 21 - Y1          | as in "Ros.e.s"       |
| 22 - Y1N         | as in "Basem.e.nt"    |
| 23 - ER1         | as in "Seek.e.r"      |
| 24 - OW1         | as in "Rati.o."       |
| 25 - Y2          | as in "Funn.y."       |
| 26 - AE2         | as in "H.a.t"         |
| 27 - AH2         | as in "H.o.t"         |
| 28 - AI2         | as in "H.e.i.ght"     |
| 29 - AR2         | as in "C.a.rt"        |
| 30 - AU2         | as in "H.ou.se"       |
| 31 - AW2         | as in "S.ou.ght"      |
| 32 - E2          | as in "H.ea.t"        |
| 33 - EER2        | as in "P.i.e.rce"     |
| 34 - EH2         | as in "S.e.t"         |
| 35 - EHR2        | as in "Th.e.rapy"     |
| 36 - EI2         | as in "T.a.ke"        |
| 37 - ER2         | as in "H.u.r.t"       |
| 38 - I2          | as in ".I.ssue"       |
| 39 - OI2         | as in "Ch.o.i.ce"     |

| <u>Allophone</u> | <u>Description</u> |
|------------------|--------------------|
| 40 - 002         | as in "C.oo.k"     |
| 41 - 00R2        | as in "P.oor.ly"   |
| 42 - 0R2         | as in "H.or.se"    |
| 43 - 0W2         | as in "B.oa.t"     |
| 44 - U2          | as in "Sh.oo.t"    |
| 45 - UH2         | as in "H.u.t"      |
| 46 - UU2         | as in "B.oo.t"     |
| 47 - AE3         | as in "H.a.d"      |
| 48 - AH3         | as in ".O.dd"      |
| 49 - AI3         | as in "H.i.de"     |
| 50 - AR3         | as in "C.a.rd"     |
| 51 - AU3         | as in "L.ou.d"     |
| 52 - AW3         | as in "S.a.w"      |
| 53 - E3          | as in "S.ee.d"     |
| 54 - EELL        | as in "H.eel."     |
| 55 - EER3        | as in "H.ear."     |
| 56 - EH3         | as in "S.ai.d"     |
| 57 - EHR3        | as in "Th.ere."    |
| 58 - EI3         | as in "D.ay."      |
| 59 - ER3         | as in "H.ear.d"    |
| 60 - I3          | as in "H.i.d"      |
| 61 - ILL         | as in "H.ill."     |
| 62 - ING2        | as in "Th.ink."    |
| 63 - OI3         | as in "B.oy."      |
| 64 - 003         | as in "C.ould."    |
| 65 - 00R3        | as in "P.oo.r"     |
| 66 - 0R3         | as in "C.ore."     |
| 67 - 0W3         | as in "L.ow."      |
| 68 - U3          | as in "Sh.oe."     |
| 69 - UH3         | as in "M.u.d"      |
| 70 - ULL         | as in "Sk.ull."    |
| 71 - UHL         | as in "P.ull."     |
| 72 - UU3         | as in "M.oo.n"     |
| 73 - L           | as in ".L.ike"     |
| 74 - L-          | as in "Bow.l."     |
| 75 - LL          | as in "Awf.ul."    |
| 76 - M           | as in ".M.ay."     |
| 77 - MM          | as in "Hu.m."      |
| 78 - N           | as in ".N.ice"     |
| 79 - NN          | as in "Sa.ne."     |
| 80 - NG1         | as in "Thi.n.k"    |
| 81 - NG2         | as in "Thi.ng."    |
| 82 - R           | as in ".R.eal"     |
| 83 - W           | as in ".W.itch"    |

| <u>Allophone</u> | <u>Description</u> |
|------------------|--------------------|
| 84 - WH          | as in ".Wh.ich"    |
| 85 - Y           | as in ".Y.ou"      |
| 86 - B           | as in ".B.ad"      |
| 87 - BB          | as in "Da.b."      |
| 88 - D           | as in ".D.ig"      |
| 89 - DD          | as in "Bi.d."      |
| 90 - G1          | as in ".G.ive"     |
| 91 - G2          | as in ".G.o"       |
| 92 - GG          | as in "Ba.g"       |
| 93 - J           | as in ".J.ug"      |
| 94 - JJ          | as in "Bu.dge."    |
| 95 - THV         | as in ".Th.is"     |
| 96 - THV-        | as in "Clo.the."   |
| 97 - V           | as in ".V.ine"     |
| 98 - VV          | as in "Li.ve"      |
| 99 - Z           | as in "Z.oo"       |
| 100 - ZZ         | as in "Doe.s."     |
| 101 - ZH         | as in "A.z.ure"    |
| 102 - ZH-        | as in "Bei.ge."    |
| 103 - K2         | as in "S.k.ate"    |
| 104 - KH         | as in ".C.ase"     |
| 105 - KH-        | as in "Ma.ke."     |
| 106 - KH1        | as in ".K.ey"      |
| 107 - KH2        | as in ".C.ough"    |
| 108 - P          | as in "S.p.ace"    |
| 109 - PH         | as in ".P.ie"      |
| 110 - PH-        | as in "Na.p."      |
| 111 - T          | as in "S.t.ake"    |
| 112 - TH         | as in ".T.ie"      |
| 113 - TH-        | as in "La.te."     |
| 114 - CH         | as in ".Ch.ur.ch." |
| 115 - F          | as in ".F.at"      |
| 116 - FF         | as in "Lau.gh."    |
| 117 - HI         | as in ".H.it"      |
| 118 - HO         | as in ".H.ome"     |
| 119 - HUH        | as in ".H.ut"      |
| 120 - S          | as in ".S.eem"     |
| 121 - SS         | as in "Mi.ss."     |
| 122 - SH         | as in ".Sh.ine"    |
| 123 - SH-        | as in "Wa.sh."     |
| 124 - THF        | as in ".Th.ing"    |
| 125 - THF-       | as in "Wi.th."     |
| 126 - Pause 1    | short pause        |
| 127 - Pause 1    | long pause         |

## Frequency Tables

This section indicates the pitch-interval to frequency relationship for Text-to-Speech (English). The given values are for a clock frequency of 8 kilohertz. The actual clock frequency for the speech module may vary +/- 5% in respect to this standard frequency.

| Pitch | Freq.(Hz) | Pitch | Freq.(Hz) | Pitch | Freq.(Hz) |
|-------|-----------|-------|-----------|-------|-----------|
| 1     | 571.4     | 22    | 210.5     | 43    | 88.8      |
| 2     | 533.3     | 23    | 200.0     | 44    | 83.3      |
| 3     | 500.4     | 24    | 195.1     | 45    | 80.8      |
| 4     | 470.5     | 25    | 186.0     | 46    | 77.6      |
| 5     | 444.4     | 26    | 177.7     | 47    | 74.7      |
| 6     | 421.1     | 27    | 166.6     | 48    | 71.4      |
| 7     | 400.0     | 28    | 163.2     | 49    | 68.3      |
| 8     | 380.9     | 29    | 156.8     | 50    | 65.5      |
| 9     | 363.6     | 30    | 148.1     | 51    | 62.9      |
| 10    | 347.8     | 31    | 145.4     | 52    | 60.1      |
| 11    | 333.3     | 32    | 140.3     | 53    | 57.5      |
| 12    | 320.0     | 33    | 133.3     | 54    | 55.1      |
| 13    | 307.7     | 34    | 129.0     | 55    | 52.9      |
| 14    | 296.2     | 35    | 125.0     | 56    | 50.9      |
| 15    | 285.7     | 36    | 117.6     | 57    | 48.7      |
| 16    | 275.8     | 37    | 111.1     | 58    | 46.7      |
| 17    | 266.6     | 38    | 108.1     | 59    | 44.9      |
| 18    | 258.1     | 39    | 105.2     | 60    | 43.0      |
| 19    | 250.0     | 40    | 98.7      | 61    | 41.2      |
| 20    | 235.2     | 41    | 94.1      | 62    | 39.6      |
| 21    | 222.2     | 42    | 91.9      | 63    | 37.9      |



## Inflection Codes

In general, the allophone code space is subdivided into two areas. The first one, ranging in numbers from 1 through 240, is the actual allophone range. Presently, only 126 of those 240 codes are actually used.

The second range, from 241 through 255, is used for special function codes. Each special function has up to two additional numbers associated with it. This appendix describes the codes currently used.

249      Secondary stress point. Depending on the state the stringer is in, the stress point will either be given the current vowel pitch level, and the vowel pitch will be incremented by a computed delta amount, or, after an upgoing primary stress point, the stress point will be raised one level above the current vowel pitch level, and the vowel pitch will be decremented by the computed delta amount.

250      Sentence break code. Resets parameters to default values given by SPEAK routine.

This code is followed by two parameters: the number of secondary stress points before and after the primary stress point, respectively. If the primary stress point is a rising (question mark) stress, the second parameter indicates the number of vowels after the primary stress point. If the first parameter has either of the values 254 or 255, the second parameter will indicate the total number of vowels in the phrase.

A value of 254 or 255 for the first parameter indicates that the entire phrase should have a rising or falling tendency respectively. This tendency is spread out over at least 8 vowels, and slopes over 15% as indicated by the slope parameter in the SPEAK call.

- 251 New default slope parameter. The number following this code indicates the new slope parameter to be used. As usual, the slope indicates 3 times the actual slope value, to allow for fractional values of the slope. Normally the slope parameter should be selected to be approximately 10% of the pitch parameter.
- 252 New default pitch parameter. The number following this parameter indicates the new default pitch level to be used. Notice that this pitch level is only valid for the current phrase. Permanent pitch level modifications have to be made using the parameters in the SPEAK routine.
- 253 Rising pitch contour. Used for question-type phrases at primary stress point. Will cause the next allophone to be gradually raised in pitch, starting below the current default level, and ending above the current default level.
- If no vowels are following the primary stress point, as indicated by the most recent 250 code, the allophone will be put at the standard pitch level, but along a gradually rising slope, starting at the current level (with the current stressed allophone), and rising to a higher level.
- 254 Falling pitch contour. Used for standard type phrases at primary stress point. Will cause the next allophone to be gradually lowered in pitch, starting at a higher than default level. The starting level is selected higher if secondary stress points are following the primary stress point, as indicated by the most recent 250 indicator.
- 255 Temporary pitch level modification. Will modify the pitch level of the allophone following it to the level indicated in the second byte. This is useful in special applications like singing computers etc., although most of the effects can also be accomplished by using the permanent modifier code 252.

## Speech Contouring Algorithms

Text-to-Speech (English) uses a pre-defined set of rules to translate secondary and primary stress points into pitch variations. This Appendix provides an explanation of how those rules interpret the stress points, and what effects stress points have on the pitch in a phrase.

Sentence profiles can be subdivided into two major groups:

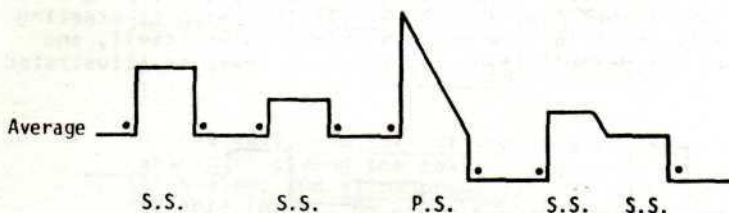
1. Falling phrase mode
2. Rising phrase mode

Typically, a rising phrase mode occurs in sentences terminated by a "," or a "?". The falling phrase mode prevails in any other situation.

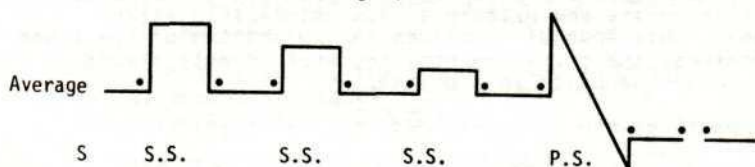
Stress points are only used for vowel allophones. These allophones are all grouped in the range 1 through 73. All the other allophones are not used for sentence profiling.

Falling Phrase Mode

A falling phrase centers around a falling pitch on the primary stress point. If the primary stress point is followed by one or more secondary stress points, the pitch on the primary stress point will fall from above the average pitch level, back to the average pitch level as illustrated here.



If the primary stress point is the last stress point in the phrase, the pitch on this point will fall from above the average pitch level to below the average pitch level as illustrated here.

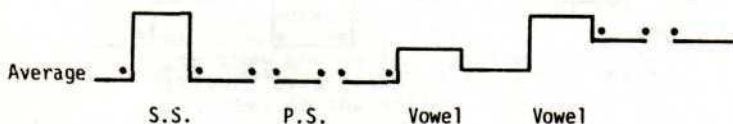


Notice that in both cases the default pitch level after the primary stress is lowered.

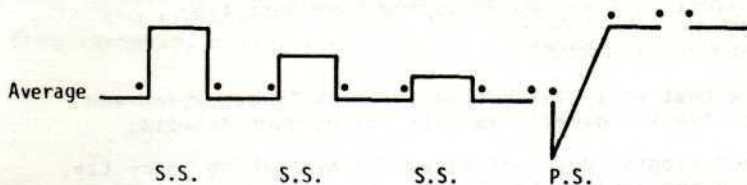
The secondary stress points before and after the primary stress point are treated in exactly the same way for falling phrase mode. The first secondary stress point is always positioned above the default level. Any further secondary stress points are spread out evenly between a raised level and the default level. That means for two stress points, the first one will be at the raised level, and the second one exactly between the raised level and the average level.

#### Rising Phrase Mode

A rising phrase, like a falling phrase, is centered around the primary stress point. As the name implies, the primary stress point will follow a rising contour. However, if the primary stress point is followed by one or more vowels, the rising contour is spread out over all the vowels following it starting at the default level for the primary stress point itself, and ending above the default level for the last vowel as illustrated here.



If no vowels are following the primary stress point, the primary stress point has a gradual upswing, starting at a level below the current default level, and rising to a level above the current default level as illustrated here.



1. Be sure that the diskette you are using is the correct one. Use the Catalog command on your Disk Manager Command Module to check for the correct program.

2. If your computer does not respond to the RUN command, be sure to select TI Extended BASIC and then just type

    RUN "DSK1.PHRASE"

3. Ensure that your disk system is properly connected and turned on. See the owner's manuals for product details.

4. If your program does not appear to be working correctly, press CLEAR and remove the diskette from the disk drive. Reinsert the diskette, and follow the "User Instructions" carefully. If the program still does not appear to be working properly, remove the diskette from the disk drive, turn the computer off, wait several seconds, and turn it on again. Then load the program again.

5. If you are having difficulty operating the Home Computer or are receiving error messages, refer to the "Maintenance and Service Information" and "Error Messages" appendices in your User's Reference Guide for additional help.

6. If you continue to have difficulty with your Texas Instruments computer or the Text-to-Speech (English) package, please contact the dealer from whom you purchased the unit or package for service directions.

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