COMPUTER SPEECH PROGRAMS

For the VOICE-PAK

* *

TRNSLATE
(a text to speech machine language program)
(includes standard exception word dictionary)

SPEAK
(a BASIC user interface to the TRNSLATE M/L program)

MANAGER
(Program for creating and editing custom dictionaries)

* *

THE EASY WAY

If you are like most people, you want to start enjoying your new unit right away and not have to read pages and pages of instructions. This section is dedicated to you. You will however gain the most benefit from your program by understanding all of the options available to you.

The easiest way to see this software at work is to CLOAD "SPEAK(16)". Keep the play button down and type RUN. Choose Tape or Disk and then sit back and wait for the menu. Hit '1' to get into the direct input mode. Just type in a message and hit [ENTER]. You should now be hearing everything that you just typed in. Hit [ENTER] at the prompt to go back to menu.

The translator cassette contains 6 files on one side for the 32K COCOs and 5 files on the other side for the 16K COCOs.

SIDE 1. (32K Programs)

SPEAK /BAS				Basic program.
TRNSLATE/BIN	&H6000	&H7FFF	&H6000	M/L program that does it all.
MANAGER /BAS				Basic program for dictionaries.
MANAGER /BIN	&H6000	&H73FF	&H6000	M/L program for dictionaries.
DICT32K /BIN	&H7400	&H7FFF	.....	Spare standard dictionary.
BASWORDS/BIN	&H7400	&H7FFF	.....	Basic dialect dictionary.

SIDE 2. (16K Programs)

SPEAK16 /BAS				See above for description.
TRNSLT16/BAS	&H2600	&H3FFF	&H2600	
MANAGE16/BAS				
MANAGE16/BIN	&H2600	&H38FF	&H2600	
DICT16K /BIN	&H3900	&H3FFF	.....	

The three letters after the file name are called filename extentions and are only of concern to the disk user. Cassette users may ignore the extentions. The starting, ending and execution addresses are shown after the machine language programs. These addresses are given to make it easier to make backup copies of the programs.

Follow these steps to use your own Basic program.

STEP 1. To insure that there is enough memory for your Basic program type PCLEAR1.
STEP 2. To insure memory is reserved for the translator you should type CLEAR 100,&H5FFF (32K version) or CLEAR 100.&H25FF (16K version).
* You can combine steps 1 & 2 by typing PCLEAR1:CLEAR 100,&H5FFF [ENTER]
STEP 3. To load the machine language driver type CLOADM "TRNSLATE".
STEP 4. To load the Basic program CLOAD "PROGRAM" (the program name).
STEP 5. Type RUN to execute the program.

I hope that this does not seem too complicated. In practice, steps 1,2 and 3 will be required only at the beginning of a session. From that point on you will merely load in your own BASIC programs as indicated in steps 4 & 5.

When copying backups of the programs SPEAK and MANAGER (16K users see similar filenames), you should save the programs using the "A" (ASCII) option. For example, CSAVE "SPEAK",A. This is necessary since the programs work with both disk and tape and therefore contains disk commands that are not recognizable by the normal BASIC interpreter. They are only recognized by DISK EXTENDED BASIC.

There is a lot of information in the manual that will make your use of these programs much more enjoyable. Please take the time to read it through.

Thank You
Frank Delargy

Frank Delargy (DEL SOFTWARE)

THE TRANSLATE M/L PROGRAM AND SPEAK (C)

You will find it very easy to use the text to speech programs by following the menu prompts within the BASIC program SPEAK (SPEAK16 for 16K). To get started you first load the program SPEAK. Prepare tape recorder for loading and type in CLOAD "SPEAK" (SPEAK16) (RUN "SPEAK" for disk). For tape systems, when the program has loaded keep the PLAY button depressed on the recorder and type "RUN". The program is now loading the machine language routine that does most of the work and a built in standard dictionary. When the program is through loading you will be prompted by a menu on the screen. An explanation of the menu items follows;

1. Direct input from keyboard.
Choosing this mode will allow you to enter short phrases and sentences that will be spoken upon hitting the [ENTER] key. After the computer speaks out the phrase an arrow prompt will appear for the next line of input. Hit [ENTER] at the prompt to return to the menu. This mode is ideal for getting used to the sound of the computer speech and for trying out new words.

2. Direct speech with phonemes printed. (Not available for 16K)
This mode is identical to mode 1 above with one addition. After the phrase is spoken, the phonemes that were used for pronunciation are displayed on the screen or printer. This gives you the ability to try different spellings to get better pronunciation. When you get the pronunciation that you like, you can then use the phonemes output to add the correct pronunciation to the dictionary (discussed at length in following pages).

3. Build text from keyboard. (Menu item '2' for 16K)
This mode allows you to input more than one line at a time. The computer will wait until you hit [ENTER] twice in a row at the beginning of a line before it will begin to speak. Using this mode you can compose long messages. After the text has been spoken you will be given a chance to save the text to tape or disk for later retrieval. Follow the prompts by answering with 'Y' or 'N' and inputing a valid file name when prompted (for tape, make sure the RECORD button is depressed). By saving the file to tape or disk you can send it to anyone else who has this program and they can 'HEAR' and see your message by using the next mode.

4. Speak text from tape file. (Menu item '3' for 16K)
By choosing this mode you will be able to hear the text that is saved in an ASCII file on tape or disk. Follow the prompts, making sure that the tape or disk is ready to be read when prompted. For tape: make sure RECORD button is NOT depressed. You will get an I/O error if the tape is positioned in the middle of a program.

5. Single key echo. (Not available for 16K)
When in this mode each alphanumeric key pressed will be spoken. When [ENTER] is pressed the text input up to that point will be spoken. Press [UP-ARROW] to exit. The text will also be spoken when 240 characters are input. If you backspace when you are inputting the text may not be clear.

6. Return to BASIC. (Menu item '4' for 16K)
Exits program and returns to BASIC.

The machine language program 'TRNSLATE' can be used by itself. Just LOADM or CLOADM the program and type EXEC (be sure to clear high memory first). You will then be in Mode 1 above. Hitting [ENTER] at the prompt will return you to BASIC. You may get a SYNTAX error message as the program expects to go back to a BASIC program. Ignore the message, it is not important.

**** RADIO SHACK Multi-pack Interface must be used for program to work with disks. Disk controller must be in slot 4 and Voice unit must be in slot 3.

SOME RULES

Numbers and special characters are recognized by the m/l program and will be spoken out. Numbers as high as 999,999,999,999,999.999 will be understood and spoken as trillions, billions, millions, thousands, hundreds, teens etc. Any number bigger than this will be spoken as individual digits (ie. one, two, three ..etc.). The phrase 100 * 3 = 4 * 80 - 20 will be spoken as;
'ONE HUNDRED TIMES THREE EQUALS FOUR TIMES EIGHTY MINUS TWENTY'
If you put a '$' directly in front of a number string, the program will assume that you are talking money. $1234.56 will be spoken as 'one thousand two hundred thirty four dollars fifty six cents'.
Quotation marks will be spoken as 'QUOTE' and the pound sign # will be pronounced as 'NUMBER'. Each comma and period within an alphabetic string will produce a pause in the output. More commas will give a longer pause.
eg. 'HERE IS A SHORT PAUSE, NOW A LONG PAUSE,,,,,,,,,,, FINISH LINE'
A period (.) found between two numbers will be pronounced 'POINT'. You can make the program ignore special characters by sending an exclamation point (!) in the string. This will toggle the special character flag and allow you to turn this feature on and off, eg. the phrase '1/2*3=! 1/2*3=! 1/2' will be spoken as "ONE DIVIDED BY TWO TIMES THREE EQUALS ONE TWO THREE ONE DIVIDED BY TWO". The (!) control code will also force individual digit output for those cases when speaking out each number is prefered over saying thousands and hundreds, eg. telephone numbers, ZIP code & Social Security number.

Another control code that is available allows you to raise or lower the inflection level. An (up arrow) followed by a digit 0, 1, 2 or 3 will set the inflection level. '0' is the lowest level and '3' the highest. You can change the inflection as many times in a string as you want.

In the phoneme pronunciation mode you can input a phoneme string separated by spaces or commas for direct translation. To enter and leave the phoneme pronunciation mode you need only preface the phoneme string with [shift] [up arrow]. When in this mode the translator will treat all strings as phonemes (provided they are valid). An example of this would be "NOT YET [shift] [up arrow] B,UH1,UH3,T,EH3,N [shift] [up-arrow] BACK TO NORMAL". This will be spoken as 'NOT YET BUTTON BACK TO NORMAL'. The inflection control can be used while in the phoneme mode to allow inflection control over each phoneme. It is worth mentioning that the phoneme mode flag will behave differently depending on whether you have chosen direct input or multi line input. In direct input (Menu choice 1.) the flag will stay on until the user turns it off by inserting another [shift] [up arrow]. In the multi-line mode the flag is cleared (back to normal) after each line is spoken. Returning to the menu will clear the flag and turn the phoneme input mode off. If you are getting funny pronunciation in the direct input mode after using phoneme input, check to make sure that you have switched back. If you want to stay in the phoneme input mode in the multi-line mode remember to start each line with a [shift] [up arrow].

The program TRNSLATE consists of a M/L text to speech algorithm which first checks to see if a word is in the dictionary which is loaded just above the M/L program. When you load TRNSLATE, either by using the SPEAK program or by a CLOADM TRNSLATE you are automatically loading the standard dictionary as well. See the discussion on the MANAGER program for how to create your own special dictionaries.

The procedure for using "TRNSLATE" with your own Basic program follows:

1. Text to Speech output

The Basic program must clear enough space in high memory to leave room for the TRNSLATE machine language driver. The TRNSLATE program uses &H6000 to &H7FFF (&H2600 to &H3FFF for 16K). In addition to the memory reserved for the m/l program you must also clear space for any strings that you plan to use.

A typical program might start;

```
10 PCLEAR 1: REM *clear video RAM unless needed
20 CLEAR 5000,&H5FFF: REM *reserve high RAM for M/L
...(16K.. CLEAR 1000,&H25FF)
```

The next step is to load the m/l program into memory.

```
30 CLOADM "TRNSLATE": REM * Load m/l program
** The next line is optional....read complete manual for instructions.
35 'CLOADM "YOURDICT": REM * Optional custom dictionary loaded
```

There are three entry points to the m/l program

a. &H6000 for direct input. (Returns to BASIC after empty line)
b. &H6005 for multi-line input. (Returns to BASIC after each line)
c. &H6007 for direct input plus phoneme printing (Not available in 16K)

In Extended Basic we must define these entry points using the DEFUSR statement. ie.

```
40 DEFUSR0=&H6000: REM *entry point to direct input
50 DEFUSR1=&H6005: REM *entry point to multi-line input
60 DEFUSR2=&H6007: REM *entry point to direct plus phonemes
  (for 16K DEFUSR0=&H2600:DEFUSR1=&H2605)
```

To speak a phrase we must first put the phrase into a string variable which can be passed to the m/l routine. eg.

```
60 PHRASE$="THIS IS A TEST"
```

Then we just call the m/l program with a USR statement, passing the appropriate string variable by way of a USR call.

```
80 X$=USR1(PHRASE$)
```

VOILA! The computer has spoken.

The simplest of programs follows ;

```
5  REM *Demo program
10 PCLEAR1:REM *reduce memory reserved for graphics
20 CLEAR 5000,&H5FFF:REM *reserve memory for m/l
30 CLOADM "TRNSLATE":REM *load m/l program
40 DEFUSR1=&H6005:REM *define entry point
60 PHRASE$="THIS IS A TEST":REM *place phrase into string variable
70 X$=USR1(PHRASE$):REM *say it..
80 END
```

Many variations to this basic procedure can be used.You can, for example, use a subscripted variable to hold multiple phrases. ie.

```
25 DIM PHRASE$(200)
```

The call would then take the form

```
70 X$=USR1(PHRASE$(N))
```

By increasing the index you can then output a very long message. Each phrase is limited by BASIC to 240 characters, including spaces and control codes. An example;

```
70 FOR N = 1 TO 200
80 X$= USR1(PHRASE$(N))
85 NEXT
```

You can enter the values for PHRASE$(N) by an appropriate input routine. eg. from the screen;

```
62 FOR N = 1 TO 200
64 INPUT PHRASE$(N)
66 IF PHRASE$(N)="" THEN 70: REM Hit [ENTER] to finish input
68 NEXT
```

Then speak out array

```
70 FOR M = 1 to N-1
80 X$= USR1(PHRASE$(N))
85 NEXT
```

For some applications the words will be the same each time that the program is run. In this case the variable PHRASE$ can be read in from a DATA array. eg.;

```
62 FOR N = 1 TO 200
64 READ PHRASE$(N)
66 IF PHRASE$(N) = "XXX" THEN 70: REM * look for end of input flag
68 NEXT
70 FOR M = 1 TO N-1
80 X$= USR1(PHRASE$(N))
85 NEXT
990 DATA HERE,ARE,THE,WORDS,THAT NEED,TO BE SPOKEN
991 DATA AND,THE,ENDING,CHARACTER,XXX
```

The Basic Program 'SPEAK' uses other variations on this theme.

SUMMARY

Following is a summary of rules and hints for using the text to speech software.

Exclamation point (!), [up arrow] and [SHIFT] [up arrow] are control codes.

Upper case and lower case are both O.K.

Any character except control codes is O.K. but not all characters are pronounced. eg. a comma or period will cause a pause.

When in a number string a period will be pronounced 'POINT'.

To change the inflection just preceed the word or text with [up arrow] and any digit 0, 1, 2 or 3. ('0' lowest... '3' highest).

To spell out a word just separate the letters by a comma or space.
eg. 'WORD IS SPELLED W O R D' or 'TEXT IS SPELLED T,E,X,T'

To pronounce difficult words try misspelling them to force correct pronunciation.

To enter phonemes in the text string preface the phonemes with [SHIFT] [up-arrow] and repeat after the phoneme string. Inflection can be changed prior to each phoneme to produce multi-inflection words.
eg. '[SHIFT] [up arrow] K,IU,IU,001,D'
or [SHIFT] [up arrow] K,[up arrow]2 IU,IU,[up arrow]0 D'.
Both pronounce 'could' with flat and intonated speech. You must use capital letters for phonemes. The phoneme flag will be turned off after each line in the multi-line input mode but it will remain on in the direct input mode (1) until the user turns it off. Returning to the menu will reset the flag to off.

To turn off the pronunciation of special characters just put an exclamation point (!) in the text string prior to the special characters. To return to normal put in another (!).

Each line of text is limited by Basic to 240 characters. You can have as many lines of text as you want until you run out of string space. (remember to reserve string space in the CLEAR statement).

Experiment with new ideas.. sound effects are possible by using the phoneme mode or by putting the sound of a word in the dictionary.
eg. 'HISS'.. H,I,S,S,S,S,S,S,S,S,S,S,S,S,S,S,S,S

PROGRAM	LOAD ADDRESS	END ADDRESS	EXEC ADDRESS	COMMENTS
SPEAK				BASIC program
TRNSLATE	&H6000	&H73FF	&H6000	M/L program w/o dict
TRNSLATE	&H6000	&H7FFF	&H6000	M/L program + dict
MANAGER				BASIC program
DICT32K	&H7400	&H7FFF	....	Standard dictionary
BASWORDS				BASIC dialect dictionary

MANAGER

As previously mentioned, the dictionary is a powerful part of the text to speech algorithm. The dictionary occupies the RAM space &H7400 to &H7FFF (&H3900 to &H3FFF) and can be loaded separately of the TRNSLATE program. The management of any user defined dictionary is an integral part of an efficient speech output system. The Basic program 'MANAGER' (MANAGE16) and the machine language program of the same name allow the user to print out selected parts of the dictionary to the screen or printer. It is also used to add and delete words from the dictionaries. In order to conserve memory the MANAGER does not use the text to speech algorithm so that you will not be able to hear the words until you use them with the SPEAK or TRNSLATE programs.

The MANAGER is menu-oriented and needs very little in the way of detailed instructions. After loading the Basic program and typing 'RUN' you will be asked to choose between tape or disk input. With this completed a menu will greet you with the following program functions.

1. LOAD MACHINE LANGUAGE PROGRAM (Needed for editing and printing)
2. LOAD DICTIONARY (Loads user dictionary to be worked on)
3. EXECUTE M/L PROGRAM (discussed below)
4. SAVE DICTIONARY (Save updated or new dictionary to tape or disk)
5. RETURN TO BASIC.

The machine language program does most of the work. When you execute this program through the menu choice 3. you will see another menu on the top line.

[A]DD [D]ELETE [L]IST [E]ND

Choose the mode by hitting the key implied (A,D,L or E). To add words, first answer 'Y' to the "Continue Dictionary?' prompt, then type in the word followed by its phonetic spelling. Separate each phoneme by a comma. End the Add Word mode by hitting return at the WORD prompt. To delete a word is very similar, you merely input the word to be deleted followed by [ENTER]. You will be prompted for another word to delete. End the deletion mode by hitting [ENTER] at the WORD: prompt.

If [L]IST is chosen you will be asked to choose from the screen or printer. If you choose the printer make sure that it is ready to print. You now will be prompted for the letter range that you want listed. Input appropriate limits at this time. The output will consist of each word within the alphabetic range, followed by the hex values of the phonemes that are pronounced. At the completion of the list the last memory location listed will be displayed for reference.

After you have created a new dictionary or modified an existing one you may press 'E' to return to the basic program. You now are able to save the new or modified dictionary to tape or disk by the appropriate menu selection. When saving the program you will need to supply the name for the updated dictionary. Be aware that <u>using a name that already exists on a disk will write over the old file</u>.

One word of caution..when adding words you will be asked if you want to continue the dictionary. <u>Answering 'N' to this prompt will immediately erase all memory reserved for the dictionary</u>.

It is recommended that you use the existing dictionary and delete and add where appropriate. The dictionary functions best when it contains all of the letters 'A' through 'Z'.

Now that you have your new dictionary, follow these steps to use it with the M/L program.

1. CLOADM "TRNSLATE" (TRNSLT16).load the M/L driver and standard dictionary.
2. CLOADM "YOURDICT" ..load your dictionary. You can repeat this procedure each time you want to replace the standard dictionary or you can save the new version of TRNSLATE with your custom dictionary.
CSAVEM "MYTRNSLT",&H6000,&H7FFF,&H6000...(&H2600,&H3FFF,&H2600 for 16K)
You now have your own custom copy for your own use.

Some of you do not have a disk system or do not have a Multi-Pak Interface and therefore must use cassette tapes for file and data storage. I will attempt here to make it easier for you to use the programs using the cassette recorder. Due to the sequential nature of tapes, cassette I/O must follow a more rigorous procedure than Disk I/O. When using 'SPEAK' you must have the tape recorder ready to load the 'TRNSLATE' M/L program before you type RUN, as the 'SPEAK' BASIC program expects to see the 'TRNSLATE' program ready to be loaded. The programs are in the correct order on the supplied cassette.

The 'MANAGER' program is even more picky about how the files are ordered. You must load the 'MANAGER' M/L program before you can do anything else. After you have loaded the M/L program (located following the 'MANAGER' BASIC program) you can then load the dictionary. If you are using cassette the standard dictionary (DICT32K or DICT16K) is the next file on the tape. An additional dictionary, 'BASWORDS', which contains correct pronunciation of BASIC keywords, is located following the standard dictionary for 32K only.

So..... the proper procedure for using MANAGER is to run the BASIC program, Choose tape or disk then press in succession the first second and third menu choices. ie.

1. LOAD M/L PROGRAM
2. LOAD DICTIONARY (you will be prompted for dictionary name)
3. EXECUTE M/L PROGRAM

If we wanted to add some words to the dictionary we would first make sure that there is enough room left. List out the words under the letter 'Z' by pressing 'L' for List the 'S' for screen then 'Z' for start and ending letter. Notice the last mem location used. If it is within a couple of bytes of $7FFF ($3FFF) you will need to delete some words to make room for the new ones.

If there is room left in the dictionary you proceed by pressing the 'A' key. You will be asked if you want to continue the current dictionary. Unless you want to start a completely new dictionary press 'N'. You will now be see the WORD: prompt. Type in the word that you want in the dictionary. When you are sure the word is correct type in a space. Once you have typed the space you will not be able to go back to the word while on this line. At this point you would enter in the phonemes that make up the correct pronunciation of the word. Use the mnemonic phonemes ie. PA0,EH3, etc. (refer to phoneme chart). Follow each phoneme with a comma. If the phoneme is valid the ASCII code that it represents will be put into memory immediately following the word.

If the phoneme you entered is invalid a message to that effect will be displayed on the top line of the screen. The cursor will move back to allow you to re-enter the phoneme. When entering the last phoneme for a word hit the [ENTER] key, no comma is needed. The word and the phoneme codes will be stored in the appropriate place in the current dictionary. A new version of a word will be stored in front of any previous entry of the same word, you should therefore delete a word before you add in the corrected version. If a mistake is made during phoneme entry hit the [BREAK] key to return to the menu. The word will not be added to the dictionary.

The following sequence adds the words CAPACITY and TIME to the dictionary.

```
WORD: CAPACITY K,UH2,P,AE1,EH3,S,I3,DT,Y[ENTER]
WORD: TIME T,AH1,EH3,Y,M[ENTER]
WORD: [ENTER]
```

When you are through with your modifications you can save the dictionary with menu #4. The dictionary must be 'merged' with the 'TRNSLATE' (TRNSLT16) program before it can be of any use. You can accomplish this by loading 'TRNSLATE' (TRNSLT16) and then loading the dictionary. Remember to reserve the memory first with a CLEAR 200, &H5FFF (CLEAR100,&H25FF). You can now save the complete file 'TRNSLATE'+new dictionary as a new version of 'TRNSLATE'.

FOR MACHINE LANGUAGE PROGRAMMERS

'TRNSLATE' can be interfaced to a M/L program if you follow the procedure that BASIC expects of a USR call with parameter passing. Below is one example of how a short M/L program uses the TRNSLATE routine. TRNSLATE is a copyrighted program and any author wishing to sell programs that use the TRNSLATE routine in their own programs must obtain written permission from DEL SOFTWARE.

M/L program example:

```
TRNSLT   EQU $6005          32K entry point as subroutine
POLCAT   EQU $A000          indirect call to get character routine
         ORG $5000
START    LEAX TEXT,PCR      get start of text string
         STX WORDS+2,PCR    store text address
         LEAX WORDS,PCR     X reg points to reference bytes
         JSR TRNSLT         call text to speech algorithm
         JSR [POLCAT]       check keyboard
         BEQ START          no key so return
         RTS
* Next four bytes must be contiguous *
WORDS    FCB $F0            number of letters allowed
         FCB $0             dummy variable
         RMB 2              holds address of text
TEXT     FCC /TESTING ONE TWO THREE/ text string can be anywhere
         FCB $0D            text must end with CR or null
         END START
```

SOME ADDITIONAL HELP

Some of you do not have a disk system or do not have a Multi-Pak Interface and therefore must use cassette tapes for file and data storage. I will attempt here to make it easier for you to use the programs using the cassette recorder. Due to the sequential nature of tapes, cassette I/O must follow a more rigorous procedure than Disk I/O. When using 'SPEAK' you must have the tape recorder ready to load the 'TRNSLATE' M/L program before you type RUN, as the 'SPEAK' BASIC program expects to see the 'TRNSLATE' program ready to be loaded. The programs are in the correct order on the supplied cassette.

The 'MANAGER' program is even more picky about how the files are ordered. You must load the 'MANAGER' M/L program before you can do anything else. After you have loaded the M/L program (located following the 'MANAGER' BASIC program) you can then load the dictionary. If you are using cassette the standard dictionary (DICT32K or DICT16K) is the next file on the tape. For 32K users, an additional dictionary, 'BASWORDS', which contains correct pronunciation of BASIC keywords, is located following the standard dictionary. 'BASWORDS' will not fit into a 16K machine. Do not try to mix 16K and 32K programs and files as they will not work together.

So..... the proper procedure for using MANAGER is to run the BASIC program, Choose tape or disk then press in succession the first second and third menu choices. ie.

1. LOAD M/L PROGRAM
2. LOAD DICTIONARY (you will be prompted for dictionary name)
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If we wanted to add some words to the dictionary we would first make sure that there is enough room left. List out the words under the letter 'Z' by pressing 'L' for List the 'S' for screen then 'Z' for start and ending letter. Notice the last mem location used. If it is within a couple of bytes of $7FFF for 32K or $3FFF for 16K you will need to delete some words to make room for the new ones.

If there is room left in the dictionary you proceed by pressing the 'A' key. You will be asked if you want to continue the current dictionary. Unless you want to start a completely new dictionary press 'N'. You will now be see the WORD: prompt. Type in the word that you want in the dictionary. When you are sure the word is correct type in a space. Once you have typed the space you will not be able to go back to the word while on this line. At this point you would enter in the phonemes that make up the correct pronunciation of the word. Use the mnemonic phonemes ie. PA0,EH3, etc. (refer to phoneme chart). Follow each phoneme with a comma. If the phoneme is valid the ASCII code that it represents will be put into memory immediately following the word. If the phoneme you entered is invalid a message to that effect will be displayed on the top line of the screen. The cursor will move back to allow you to re-enter the phoneme. When entering the last phoneme for a word hit the [ENTER] key, no comma is needed. The word and the phoneme codes will be stored in the appropriate place in the current dictionary. A new version of a word will be stored in front of any previous entry of the same word, you should therefore delete a word before you add in the corrected version. If a mistake is made during phoneme entry hit the [BREAK] key to return to the menu. The word will not be added to the dictionary.

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WORD: TIME T,AH1,EH3,Y,M[ENTER]
WORD: [ENTER]
```

When you are through with your modifications you can save the dictionary with menu #4. The dictionary must be 'merged' with the 'TRNSLATE' (TRNSLT16) program before it can be of any use. You can accomplish this by loading 'TRNSLATE' and then loading the dictionary. Remember to reserve the memory first with a CLEAR 200, &H25FF for 16K or CLEAR 200, &H5FFF for 32K. You can now save the complete file 'TRNSLATE'+new dictionary as a new version of 'TRNSLATE'.

FOR MACHINE LANGUAGE PROGRAMMERS

'TRNSLATE' can be interfaced to a M/L program if you follow the procedure that BASIC expects of a USR call with parameter passing. Below is one example of how a short M/L program uses the TRNSLATE routine. TRNSLATE is a copyrighted program and any author wishing to sell programs that use the TRNSLATE routine in their own programs must obtain written permission from DEL SOFTWARE.

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TRNSLT   EQU $6005          32K entry point as subroutine
POLCAT   EQU $A000          indirect call to get character routine
         ORG $5000
START    LEAX TEXT,PCR      get start of text string
         STX WORDS+2,PCR    store text address
         LEAX WORDS,PCR     X reg points to reference bytes
         JSR TRNSLT         call text to speech algorithm
         JSR [POLCAT]       check keyboard
         BEQ START          no key so return
         RTS
* Next four bytes must be contiguous *
WORDS    FCB $FD            number of letters allowed
         FCB $0             dummy variable
         RMB 2              holds address of text
TEXT     FCC /TESTING ONE TWO THREE/ text string can be anywhere
         FCB $0D            text must end with CR or null
         END START
```

Table 1. Phoneme Chart

Phoneme Code	Phoneme Symbol	Duration (ms)	Example Word
00	EH3	59	jacket
01	EH2	71	enlist
02	EH1	121	heavy
03	PA0	47	no sound
04	DT	47	butter
05	A2	71	made
06	A1	103	made
07	ZH	90	azure
08	AH2	71	honest
09	I3	55	inhibit
0A	I2	80	inhibit
0B	I1	121	inhibit
0C	M	103	mat
0D	N	80	sun
0E	B	71	bag
0F	V	71	van
10	CH*	71	chip
11	SH	121	shop
12	Z	71	zoo
13	AW1	146	lawful
14	NG	121	thing
15	AH1	146	father
16	OO1	103	looking
17	OO	185	book
18	L	103	land
19	K	80	trick
1A	J*	47	judge
1B	H	71	hello
1C	G	71	get
1D	F	103	fast
1E	D	55	paid
1F	S	90	pass
20	A	185	day
21	AY	65	day
22	Y1	80	yard
23	UH3	47	mission
24	AH	250	mop
25	P	103	past
26	O	185	cold
27	I	185	pin
28	U	185	move
29	Y	103	any
2A	T	71	tap
2B	R	90	red
2C	E	185	meet
2D	W	80	win
2E	AE	185	dad
2F	AE1	103	after
30	AW2	90	salty
31	UH2	71	about
32	UH1	103	uncle
33	UH	185	cup
34	O2	80	for
35	O1	121	aboard
36	IU	59	you
37	U1	90	you
38	THV	80	the
39	TH	71	thin
3A	ER	146	bird
3B	EH	185	get
3C	E1	121	be
3D	AW	250	call
3E	PA1	185	no sound
3F	STOP	47	no sound

T must precede /CH/ to produce CH sound.
D must precede /J/ to produce J sound.

Table 2. Phoneme Categories According to Production Features

Voiced					'Voiced' Fricat.	'Voiced' Stop	Fricative Stop	Fricative	Nasal	No Sound
E	EH	AE	UH	OO1	Z	B	T	S	M	PA0
E1	EH1	AE1	UH1	R	ZH	D	DT	SH	N	PA1
Y	EH2	AH	UH2	ER	J	G	K	CH	NG	STOP
Y1	EH3	AH1	UH3	L	V		P	TH		
I	A	AH2	O	IU	THV			F		
I1	A1	AW	O1	U				H		
I2	A2	AW1	O2	U1						
I3	AY	AW2	OO	W						