

**ECHO II™**

***SPEECH SYNTHESIZER***



**STREET ELECTRONICS  
CORPORATION**

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## INTRODUCTION

Congratulations on your purchase of an ECHO ][ Speech Synthesizer! The ECHO ][ is the most versatile APPLE plug-in compatible speech board on the market today. Its TEXTALKER (TM) text-to-speech system converts normal English text directly into speech. Now adding speech to your programs is as easy as sending text to a printer! TEXTALKER also incorporates the SPEAKEASY (TM) phoneme generation system which allows you to phonetically code words if you desire.

The heart of the ECHO ][ is Texas Instruments' TMS 5200 speech processor. This circuit is an upgraded version of the one used in the Speak & Spell (TM of Texas Instruments) which models the human vocal tract using LPC (Linear Predictive Coding). Instead of storing the actual speech signal, only those parameters needed to describe each speech sound are stored. This accounts for the compactness of the TEXTALKER system which takes up no more memory than a HIRES page.

Speech has many potential applications including games, education, and aiding the handicapped. Included on the disk are some sample programs that may help demonstrate some of these possibilities. Please be sure and fill out the warranty registration card so we can keep you up to date on any future enhancements. Also, if you develop any novel applications we would enjoy hearing from you. Have fun!

## ECHO ][ INSTALLATION

The ECHO ][ software supplied with the system requires a 48K Apple and at least one disk drive with DOS 3.3. It may be used with either Applesoft or machine code. The ECHO ][ may be installed in any slot except slot #0. Be certain that the power is off prior to installation. Plug the speaker cable into the jack on the rear of the card and insert the card firmly into the slot you wish to use. The volume may be adjusted later by using a small screwdriver to adjust the control on the card. Be sure to turn off the power prior to adjusting the volume to prevent damaging your APPLE if you should drop the screwdriver.

The disk supplied with the ECHO ][ is copyable, and you should make a copy immediately. Save the original in a safe place for backup purposes. The loading and use of both TEXTALKER and SPEAKEASY are described in the following sections and summarized at the end of the manual.

## TEXTALKER TEXT-TO-SPEECH SYSTEM

TEXTALKER will take any printed output and convert it directly to speech. Once it has been installed all video output will pass through it before going to the screen. Text will then either be spoken, sent to the screen, or both. Any time reset is pressed or the output is redirected with a "PR#" command TEXTALKER will be disconnected. You may easily reconnect it with a "PR#0" command.

The various features of TEXTALKER are controlled by printing a control "E" (CTRL-E) followed by the command. This is similar to the way CTRL-I commands are sent to most printer cards. To type a control character, press the CTRL key and while holding it down press the desired key, in this case the "E". Then release the CTRL key and type in the rest of the command. From within a program it is generally a good idea to define CTRL-E with E\$ = CHR\$(5). Then you may "PRINT" E\$ followed by the command.

The following descriptions of TEXTALKER's features require that you actually try them out with your APPLE, so if you haven't already done so install the ECHO ][ and make your backup copy of the disk.

Now boot the disk and type "RUN ROBOT DEMO". A picture of a robot will appear on the screen with a question mark at the bottom. At this point the APPLE will say whatever you type in (followed by RETURN). Except for the "LETTER MODE" which is discussed later, TEXTALKER will store text in a buffer and then speak it all at once when it receives a RETURN.

**PITCH CONTROL** - Type in the phrase "I AM A COMPUTER". The computer will respond in a low monotonic voice. To change the pitch type CTRL-E followed by "25F". Do not type any spaces between the CTRL-E and the 2. Now retype the sample phrase. The pitch is higher although the speech is still monotonic or "flat" (hence the F). Now try using the number 1 and then 63 instead of 25. These are the limits of the ECHO's pitch range.

The above examples were all monotonic or flat. The ECHO is also capable of speaking with some inflection. Try typing CTRL-E followed by "25P". This will set the base pitch to 25 but the actual pitch will vary slightly depending on the word. The speech won't be completely natural since the software required to look at each word and what context it is used in quickly gets out of hand. However it is an improvement over the monotone.

The pitch of the ending vowel sound may also be modified with punctuation. Type in the above test phrase followed by a period. The end of the word "computer" now has a lower pitch. Now try a question mark. This should have raised the pitch of the ending vowel. Punctuation which causes the final pitch to be lowered

are periods, exclamation points, and colons. Question marks, commas, and semicolons will cause a rise in pitch.

**VOLUME CONTROL** - Aside from the on-card volume adjustment, the volume may also be controlled from within a program. This is covered in detail in the SPEAKEASY phoneme section which follows on page 7.

**PUNCTUATION MODES** - Normally, TEXTALKER only pronounces unusual punctuation such as a dollar sign or number sign. Other punctuation causes pauses of varying lengths. In some instances, it may be desirable to have all punctuation pronounced. Type in CTRL-E "A" (for All punctuation) and then the sample phrase. Every character including spaces, carriage returns, and line feeds will be pronounced.

Now type in CTRL-E "M" (for Most punctuation) and the sample phrase. All punctuation except spaces, returns, and line feeds will be spoken. To return to the original case where only unusual punctuation is pronounced type CTRL-E "S" (for Some punctuation).

**SPEECH RATE** - Type in a tongue twister such as "RUBBER BABY BUGGY BUMPERS" and note the length of time it takes the ECHO to say it. Now type CTRL-E "C" (for Compressed mode) and retype the same phrase. The ECHO will say it almost twice as fast! Once you are fully accustomed to the ECHO's voice you may find it convenient to have it speak faster with little loss in understanding. To return to the slower rate of speech use CTRL-E "E" (for Expanded mode).

**LETTER MODE** - Sometimes it's better to spell a word rather than pronouncing it in its entirety. Type in CTRL-E "L" (for Letter mode) and any word or phrase. Each word will be spelled out letter by letter. To return to the normal mode type CTRL-E "W" (for Word mode).

**OUTPUT MODES** - You have three choices as far as output goes: you can speak the output, print the output, or both. To have the text spoken only use CTRL-E "T" (for Talk only). To have text both printed and spoken use CTRL-E "B" (for Both). And to have text printed only use CTRL-E "O" (for Output only). The demo program we have been using is already switching between the "T" and "O" modes so you may find it confusing if you try entering them directly at this time.

WORD PRONUNCIATION - TEXTALKER contains close to four hundred rules which allow it to correctly pronounce over 96% of the thousand most commonly used words in English. However, English is not a phonetically spelled language and with so many exceptions to the rules there are many words TEXTALKER will mispronounce. This can easily be overcome by misspelling the word or breaking it up into segments separated by spaces.

Try typing in the word "typewriter". The "y" is mispronounced as a short "i" sound. Now type it in as "type writer" with a space dividing it in half. Quite often breaking a word into its component parts is all that is needed.

Next enter the word "robot". The first "o" is mispronounced in this case. This can easily be corrected by spelling it as "rowbot". By following the "o" with a "w" it was changed from a "short" sound to a "long" sound. Similarly, an "a" can be changed by substituting "ay" and an "e" by substituting "ee". To make a "long" vowel "short" try doubling the following consonant.

Space doesn't permit covering all methods of correcting pronunciation since they are too numerous. However, a little experimentation along with the knowledge you gained while learning to read should make correcting words a simple matter. Some fairly common words that TEXTALKER mispronounces are listed in APPENDIX A along with a spelling that is pronounced correctly.

TEXTALKER INSTALLATION - There are two versions of TEXTALKER depending on whether you have a language card or not. If you do have a language card, you may load TEXTALKER into it and not use up any of the lower 48K of memory. In either case you should load TEXTALKER at the start of your program prior to doing anything else.

The normal version of TEXTALKER is installed by "BRUNing" the program called "TALK". The program loads into \$7400 to \$95FF and starts executing at \$7400. The code from \$7400 to \$75FF is only used for initializing the system. Once TEXTALKER is installed this portion of the code is no longer needed and may be overwritten. However you still need to protect the rest of the code from \$7600 to \$95FF so you should immediately set "HIMEM : 30208" before doing anything else.

The "Ram Card" version of TEXTALKER is installed by "BRUNing" the program called "TALKPLUS". This program loads into \$9300 to \$9510 and is used to load "TALKPLUS.OBJ" into the ram card. Like the first part of "TALK", this code is only used to initialize the system and may be overwritten. However, since TEXTALKER is now loaded into the ram card, you do not need to set HIMEM. Note that when you are using this version of TEXTALKER you are restricted to whatever language your system has in ROM.

Binary (machine language) programs may access TEXTALKER by doing a JSR to "COUT" (\$FDED) with the character to be output in the accumulator.

#### SPEAKEASY PHONEME GENERATOR

The SPEAKEASY Phoneme Generator allows you to program on a phonetic level using "phonemes" or individual word sounds. The phonemes used by SPEAKEASY are listed in APPENDIX B. You may wish to use this if you want to "hand tailor" a word or phrase to get a more accurate pronunciation or inflection. Or if you don't have a ram card and can't spare the 8K of memory that TEXTALKER requires, you can still add speech using SPEAKEASY and only use 3K of memory.

If you have TEXTALKER installed, you may go ahead and program with phonemes since SPEAKEASY is contained within TEXTALKER already. If you just want to use SPEAKEASY by itself, "BRUN" the program called "VOICE" at the beginning of your program. This loads SPEAKEASY into \$8900 to \$95FF and starts executing at \$8900. The lower portion of the program from \$8900 to \$89FF is used only to initialize SPEAKEASY and may be overwritten. Now set "HIMEM : 35328" to protect memory above \$8A00 (where SPEAKEASY now resides). When installed on its own by "BRUNing VOICE", SPEAKEASY will not become disconnected by a "PR#" command or reset.

OPERATION - Once SPEAKEASY (or TEXTALKER) is installed, all text sent to the screen will first be checked for phoneme codes. Phoneme codes are set off from normal text by preceding them with a CTRL-V. This is similar to preceding DOS commands with a CTRL-D. For example:

```
5 V$ = CHR$(22)
10 PRINT V$;"E3KO"
```

This will speak the word "ECHO". The phoneme string must be terminated with a RETURN before resuming normal output so never end the line with a semicolon. Always use CHR\$(22) to define the CTRL-V rather than entering it directly from the keyboard. That way when you list your program characters following the CTRL-V will be printed rather than spoken.

Binary programs may access SPEAKEASY in the same way by doing a JSR to "COUT" (\$FDED) with the character to be output in the accumulator. The first character will have to be a CTRL-V (\$16) and the last a RETURN (\$8D).

EDITOR - A phoneme editor has been included to make phoneme coding easier while writing programs. To enter the editor type an ampersand "&" from APPLESOFT. You will be given a quotation mark for a prompt at which point you may enter a phoneme string (no CTRL-V needed) and hear it immediately. Any changes may be made using the APPLE's normal editing features to re-enter the string until it sounds correct. To exit the edit mode simply press RETURN without entering any phonemes.

APPENDIX C contains some sample words that have already been coded. This is a good starting point when coding words for the first time. The stresses may need to be changed according to the context in which the word is being used. Another good reference is a standard English dictionary and the pronunciations given in them. The symbols used may vary depending on the dictionary, however the most commonly used ones are listed in APPENDIX B.

PHONEME STRUCTURE - The phonemes are listed in APPENDIX B and are broken down into their different classifications. The first column contains the ASCII character that SPEAKEASY uses to represent the phoneme. The next column contains the common dictionary representation of the sound and the third contains a word which uses it. All sounds are represented by a single ASCII character with the exception of the "R" colored vowels. These have an "R" as their second character. A "space" in the phoneme string will have no effect and is primarily used to improve legibility during the editing process.

When studying the following SPEAKEASY features, it will be helpful to enter the editor as described above and try the examples given. For any of the examples, type in the characters as they appear in the quotes followed by a RETURN.

STRESS - The stress of vowels, diphthongs, and "R" colored vowels may be modified with a single digit descriptor immediately following their code (0,1,2, or 3). If a sound is stressed it will have longer duration, be higher in pitch, or both. Likewise if the stress is reduced it may be shorter and lower. (Example: "!1 !2 !3"). If no stress is given a stress of "2" is assumed. (Example: "@1 @3"). A stress of "0" represents the fully reduced form which is a "schwa". A schwa also has its own code (') which may also be used. (Example: "U0B#3T 'B#3T").

PAUSES - A pause is represented by a comma. Like a vowel sound, a pause may be followed by a one digit descriptor to specify its length (1 = shortest, 9 = longest). If no descriptor is given, a length of two will be assumed. A pause of length one or two may be inserted between words to improve intelligibility, but may make the speech "choppier" sounding. (Example: "HELO1 ,1 HELO1 ,9 HELO1").

PITCH AND RATE CONTROL - The base pitch and rate of speech is controlled the same as when using TEXTALKER. See the previous discussion in the TEXTALKER section of the manual for further details.

Aside from setting the base pitch, there are nine different pitch levels that can be selected from within a phoneme string. These are set by a number (1-9) at any point within the string except immediately following a vowel, where it would be interpreted as a stress descriptor. A "5" is the midpoint and represents the base pitch. A "9" is the highest pitch and a "1" is the lowest. Any time the synthesizer encounters either a stop consonant or fricative, the pitch will automatically revert back to the base pitch. (Example: "113 513 913 !3 T!3").

The pitch pattern of a sound can be specified by using one of the following symbols: falling "<", flat "=", and rising ">". A pattern will remain in effect for all following voiced sounds but will default back to flat when a pitch change, stop consonant, or fricative is encountered. (Example: ">!!! =!!! <!!!" and ">!!!! S!!!!").

VOLUME CONTROL - Aside from the on-board volume control, the volume of the speech may be adjusted to some extent from within phoneme string by using a "+" or "-". (Example: "EKO --- EKO -- EKO +++++ EKO"). When TEXTALKER or SPEAKEASY is first run, the volume will already be near the maximum. Going more than one level above this will increase the volume of the fricatives without a corresponding increase in the voiced sounds. (Example: "+++++ HELO EKO -----"). Lowering the volume may be helpful for late night editing or simulating echos. Once the volume is changed it will stay that way. Therefore you should always return it to its original state if you don't want to make a permanent change.

APPENDIX A - MISSPELLED WORD LIST

The following words must be misspelled to be pronounced correctly.

Correct Spelling	Misspelling	Correct Spelling	Misspelling
ACHIEVE	UCHEEVE	LION	LYON
ADEQUATE	ADIKWUT	MAJOR	MAYJOR
AMERICA	UHMERICA	MICRO	MY CRO
BEGIN	BIG IN	MODEM	MOWDEM
BOULDER	BOLDER	MOUNTAIN	MOUNTIN
BROWN	BROUN	MUSTACHE	MUSTASH
BUSINESS	BIZNESS	MULTIPLY	MULTIPL I
BUREAU	BUROW	NATURE	NAYTURE
CERTAIN	CERTIN	NUISANCE	NEWSANCE
CIRCUIT	CIRKIT	PARALLEL	PARILEL
CLOSE (NEAR)	CLOCE	PHONEME	PHO NEME
COLON	COALON	PLEASANT	PLESNT
CONQUER	CONKER	POUR	PORE
COUNTRY	KUNTRY	PROGRAM	PRO GRAM
CONTROL	CONTROWL	QUESTION	KWESTCHUN
CREATE	CRE ATE	QUOTIENT	KWO SHUNT
DEFINE	DIF EYEN	RADIO	RADEO
EQUIPMENT	E QUIPMENT	READING	REEDING
EQUALS	E QUALS	REPLACEMENT	RE PLACE MENT
FINAL	FYNAL	RELATIVE	RELLITIVE
FREQUENCY	FRE QUENCY	REINDEER	RAINDEER
FRIDAY	FRYDAY	ROBOT	ROWBOT
GLACIER	GLAYSHER	SCHEDULE	SKEJULE
HEADACHE	HEADAYK	SEARCH	SERCH
HUMAN	HUMUN	SHOULDER	SHOWLDER
HUNDRED	HUN DRED	SOMEONE	SOME ONE
HYGEINE	HI GENE	STOMACH	STUHMICK
JOURNEY	JURNEY	SUMMARY	SUHMARY
LAUGHTER	LAPFFTER	TACHOMETER	TAKOMIHTER
LABEL	LAYBLE	TOUCH	TUCH
LETTUCE	LETTIHS	TREASURE	TREHSHER
LEISURE	LEE SHER	VOLUME	VOL YOUM
LISTEN	LISSEN	WEDNESDAY	WENSDAY

APPENDIX B - SPEAKEASY PHONEME CODES

VOWELS (10)

A	a	"cat"
;	o	"lot"
*	o	"caught"
E	e	"let"
&	ē	"see"
I	i	"hid"
Q	oo	"book"
U	u	"but"
:	ōō	"due"
'	ə	"about"

DIPHTHONGS (6)

@	ā	"cake"
i	i	"tie"
O	ō	"toe"
#	ou	"pound"
?	oi	"toil"
%	ū	"you"

"R" COLORED VOWELS

;R	ār	"car"
@R	ār,er	"chair"
'R	ūr,ēr	"her"
&R	ēr	"hear"
!R	īr	"fire"
OR	ōr	"for"
QR	oor	"tour"
#R	our	"hour"

STRESSED	- "3"
NORMAL	- "2"
REDUCED	- "1"
SCHWA	- "0"

VOICED CONSONANTS (11)

L	l	"let"
M	m	"many"
N	n	"no"
/	ŋ	"sing"
R	r	"red"
(	tʰ	"this"
V	v	"very"
W	w	"wet"
Y	y	"yes"
Z	z	"zero"
X	zh	"azure"

STOP CONSONANTS (8)

B	b	"bat"
D	d	"dog"
G	g	"get"
K	k	"kick"
P	p	"pet"
T	t	"tie"
C	ch	"check"
J	j	"job"

UNVOICED FRICATIVES (5)

F	f	"fit"
H	h	"hat"
S	s	"see"
\$	sh	"she"
)	th	"think"

PAUSE	- " , "
RISING	- " > "
FLAT	- " = "
FALLING	- " < "

APPENDIX C - SAMPLE PHONEME VOCABULARY

A - @  
 AND - AND  
 ANSWER - A3NS'R  
 APPLE - A3P'L

B - B&  
 BYTE - B13T

C - S&  
 CATALOG - KA3DIL\*1G  
 CORRECT - KORE3KT

D - D&  
 DECIMAL - DE3SIM'L  
 DIVIDE - DIIV13D

E - &  
 EQUALS - &3KW'LS  
 EXCLAMATION - EKS  
 KL'M@3SHUN

F - EF  
 FIRST - F'RST

G - J&  
 GOOD - GQ3D

H - `C  
 HELLO - HELO1

I - 13  
 INCORRECT - INKORE3KT

J - J@  
 KEYBOARD - K&3BORD

L - EL  
 MEMORY - MEM'R&1  
 MULTIPLIED - MULTI  
 PL11D

N - EN  
 NO - NO  
 NUMBER - NUMB'R

O - O3  
 OFF - \*F  
 ON - \*N  
 OPEN - OP'N

P - P&  
 PROGRAM - PRO3GRAM

Q - K&3  
 QUESTION - KWESC'N

R - ;R3  
 RETURN - R&T'R3N

S - ES  
 SORRY - S;R3&  
 SPELL - SPEL

T - T&  
 THAT - (AT  
 THE - (&3  
 THOUSAND - )#3ZS'ND

U - %3  
 UNDERSTAND - UND'RSTA3ND

V - V&  
 W - DUBI&1  
 WHERE - W@R3  
 WRONG - R\*/

X - EKS

Y - W13  
 YES - YES

Z - SZ&

APPENDIX D - DEMONSTRATION PROGRAMS

TALKING TYPEWRITER - This program turns your Apple into a talking keyboard. Any key that you press (with the exception of CTRL and RESET) will be pronounced. To exit press RESET.

SPELLING TEST - You can test yourself on a random sampling of words taken from a list that you create using "LIST BUILDER". A list can have up to 100 words and the number of words given for a test is selectable. You have only one chance at each word with words missed listed on the screen. During the test you will be shown the number of words correctly spelled, the number missed, your percentage, and your grade (A,B,C,D, or F).

LIST BUILDER - This is the companion program to "SPELLING TEST" which allows you to create a list of words. For each word you input the correct spelling followed by a spelling that the computer pronounces correctly. Words may be added, deleted, or alphabetized. After the list is complete you may save it to the disk.

ROBOT DEMO - This program puts a picture of a familiar robot on the screen. You are prompted to input any sentence or phrase which will be repeated in the robot's unique voice.

SEC DEMO - This is a general demonstration of the ECHO Synthesizer. The computer talks about the speech system after which you may type in a word or phrase and have it spoken back.

APPENDIX I - TECHNICAL SUMMARY

	TEXTALKER -----	RAM CARD TEXTALKER -----	SPEAKEASY -----
INSTALLING:	"BRUN TALK"	"BRUN TALKPLUS"	"BRUN VOICE"
MEMORY USAGE:			
INITIAL.	\$7400-\$75FF	\$9300-\$950F	\$8900-\$89FF
INSTALLED	\$7600-\$95FF	\$D800-\$FFFF	\$8A00-\$95FF
HIMEM	30208	NOT NEEDED	35328
COMMANDS:			
PITCH (n=1 to 63)			
FLAT	CTRL-E "nF"	CTRL-E "nF"	CTRL-E "nF"
INTON.	CTRL-E "nP"	CTRL-E "nP"	CTRL-E "nP"
RATE			
FAST	CTRL-E "C"	CTRL-E "C"	CTRL-E "C"
SLOW	CTRL-E "E"	CTRL-E "E"	CTRL-E "E"
PUNCTUATION SPOKEN			
ALL	CTRL-E "A"	CTRL-E "A"	N/A
MOST	CTRL-E "M"	CTRL-E "M"	N/A
SOME	CTRL-E "S"	CTRL-E "S"	N/A
PRONUNCIATION			
LETTERS	CTRL-E "L"	CTRL-E "L"	N/A
WORDS	CTRL-E "W"	CTRL-E "W"	N/A
OUTPUT MODES			
PRINT ONLY	CTRL-E "O"	CTRL-E "O"	N/A
TALK ONLY	CTRL-E "T"	CTRL-E "T"	N/A
BOTH	CTRL-E "B"	CTRL-E "B"	N/A
PHONEMES	CTRL-V	CTRL-V	CTRL-V



