INSTRUCTION MANUAL

VOICEBOX™

SPEECH SYNTHESIZER

for

COMMODORE-64™

CONTENTS

I.   WHAT THE VOICE BOX DOES

     The VOICE BOX lets you add speech to any Commodore
64 program written in BASIC.

     The speech can be entered using ordinary English
spelling or the standard Votrax phonetic spelling. A
third alternative is to use the phoneme number codes.

     The VOICE BOX plugs into the user port, from which
it draws its power. It contains a small loudspeaker,
and has knobs to control the loudness and pitch of the
speech.

II.   WHEN YOU FIRST UNPACK YOUR VOICE BOX

IMPORTANT: Be Sure To Turn OFF The Computer Before
            Plugging In The VOICE BOX!!

* With the computer turned OFF, plug the VOICE BOX
   into the user port. This is the rightmost slot as
   you look at the rear of your computer.

* Switch ON the computer.

* Put the cassette in the drive and rewind it.
 OR
   Put the disk in your disk drive. (Disk drive owners
   will know they must add   ,8   after each LOAD command.
* Type: LOAD "TYPETALK"

* Press PLAY

* When the program is loaded, type : RUN

     You may then type in words and hear them spoken by
the VOICE BOX. Set both control knobs about halfway
to start.

* Switch OFF the computer and plug in the VOICE BOX.

* Switch ON and rewind the tape.

* TYPE: LOAD"SPEAK" and press PLAY

When the program is loaded, the computer will signal: 'READY'.

You may LIST the program if you like, but all you will see is:

    1 SPK=PEEK(45)+256 X PEEK(46)-2054

* Enter your program, such as:

    10 SP$ = "I CAN SPEAK.":SYS SPK

* Type: RUN.

    You can save this program in the usual way and it will work when you reload it. Although it appears to have only two lines, it does in fact contain some 2000 bytes of machine code, which are executed whenever BASIC comes to a SYS SPK statement.

    Here is a simple program you may try to let you hear the limitations of the text-to-speech program.

        20   INPUT SP$
        30   SYS SPK
        40   GOTO 20

    After you type RUN, you may type in words or numbers and the VOICE BOX will speak them. You can get it to repeat by hitting RETURN.

    You will probably soon notice that it mispronounces many words, particularly names. In many cases you can correct this by misspelling the word. For example:

        CREATE   CRE ATE
        MICHAEL   MI KEL
        MARY   MA RY

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In other cases you must use the Votrax phoneme alphabet listed in Appendix III. This consists of some 64 basic sounds, called phonemes. Each is represented by a one, two or three character code. For example, here is the phonetic spelling of several names:

```
Elizabeth = UH3-L-I1-Z-UH2--B-EH1-TH
Phillip   = F-I1-L-I2-P
Charles   = CH-AH1-R-L-Z
William   = W-I2-L-Y1-UH2-M
George    = J-O-R-J
Victoria  = V-I1-K-T-O-R-Y-UH3
```

The hyphens help the speaking program to distinguish between English and phonetic spelling.They can usually be ommitted.

IV.   PITCH CONTROL

The VOICE BOX can speak in four pitch registers. It starts each sentence with the third highest. You can move up one register by putting a / (=SHIFT N) in the text, or move down by using \ (=SHIFT M). For example:

\\AH./AH./AH./AH.

V. HOW TO ADD SPEECH TO AN EXISTING BASIC PROGRAM

If the BASIC program leaves 2090 or more bytes free, you can merge in the SPEAK program, and add speech in English or phonetic spelling. You can check how many bytes are free by running the program, stopping it, and typing:
          PRINT FRE($\emptyset$)

Here are the steps for merging in the SPEAK program:

* Load the program to which you will be adding speech.

* Type: POKE 251,PEEK(43):POKE 252,PEEK(44)

* Type: POKE 43, PEEK(45):POKE 44,PEEK(46)

* Rewind the tape.

* Type: LOAD"SPEAK" and press PLAY

* Type: POKE 43, PEEK (251):POKE 44, PEEK (252)

* Add this line somewhere near the beginning of the
  program:
          9 SPK=PEEK(45) + 256*PEEK(46)-2054 (when merging
  PSPEAK this last number should be 677).

* At each point in the program where you want speech, add
  a statement such as:

          101 SP$ = "1.2.3.TESTING":SYS SPK.

The statement that does the actual speaking, SYS SPK,
Finds SP$ and speaks it.

VI.   PROGRAMMING THE VOICE BOX ENTIRELY IN BASIC

If the speech you want to add consists of just a few
messages, then you can program the VOICE BOX without using
any machine code. This will save a good deal of memory,
but requires that you translate English into phonetic
codes by hand.

Here is a program that says "HELLO", and then in a
lower register, "I CAN TALK":

```
10   POKE 56579,255
20   P=56577:POKE P, 255
30   POKE 56578,PEEK (56578)OR4
40   S=56576:POKE S, PEEK(S)AND 251:POKE S,
     PEEK(S) OR 4
100  SP$=">R;IP&"
110  GOSUB 200
130  SP$="8L<RØM6<&"
140  FRQ=3:GOSUB 200
150  END

200  FOR A=1 TO LEN(SP$)
210  WAIT 56589,16
```

```
22Ø   POKE P,FRQ:POKE P, FRQ+64
23Ø   POKE P,ASC(MID$(SP$,A))-35
24Ø   NEXT:RETURN
```

The first four lines (on the preceding page) set up
the VOICE BOX, and need to be executed only once.

Lines 1ØØ and 13Ø have the coded speech. The pho-
neme list in Appendix III shows which code to use for
each sound. The values for SP$ are taken from the third
column. Thus:

English: I   C A N T AL K
phonetic: AH1-Y-K-AE1-N-T-AW1-K-.
13Ø SP$: " 8 L < R Ø M 6 < &"

The subroutine at 2ØØ delivers the codes to the
VOICE BOX. The variable FRQ determines which of the
four pitch registers is used. It may have the value
0,1,2 or 3, 3 being the lowest register.

VII.   THE TALKING "ALIEN" FACE

A program called FSPEAK is included on the tape.
This is in all respects similar to SPEAK except that
it incorporates a simple face outline whose mouthshape
changes as words are spoken. The face uses the standard
character set, so you can alter the outline by changing
lines 11 to 18. The moving parts of the mouth are con-
trolled by the machine code and cannot easily be changed.

You can add your own BASIC statements to FSPEAK or
merge it with an existing program using the procedure
detailed earlier. If you do merge it, you will have to
type in the BASIC statement:

9 SPK = PEEK(45)+256 * PEEK(46)-2228

and also the statements that draw the face outline.

The mouth can be moved to a different part of the
screen by poking a suitable value in a location given
by SPK + 457. For Example:

19 POKE SPK+457, 218
     moves it to the top-center of the screen

          19 POKE SPK+457,242
     moves it down one line.

Its usual position in the top-left-corner is given by 202.

Drawing of the mouth can be inhibited by:
          21 POKE SPK=4ØØ, Ø

and re-enabled by:
          23 POKE SPK+400, 1

VIII.   PSPEAK

     A further variant of SPEAK called PSPEAK is also
included. This only requires that you have 713 free
bytes of memory to make room for it. It recognizes
the Votrax phonemes (listed in Appendix III), and the
numbers Ø through 9.

     Example Of A Very Simple Program Using PSPEAK:

     This program rolls an imaginary dice and speaks
the result every time you hit 'RETURN'.

* Type: LOAD"PSPEAK" and press "PLAY"

* When it is loaded, type in the following program:

          1Ø SP$ = "HI1T REH3TERRN 4 DAH1YS ROL.": SYS SPK
          2Ø INPUT SP$
          3Ø SP$ = STR$(INT(6*RND(Ø)+1))+".."
          4Ø SYS SPK : GOTO 2Ø

* Type: RUN

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IX.   WHAT ARE PHONEMES?

The native language of the VOICE BOX is phonemes.
These are the elementary speech sounds of which English
uses 64. A list of these, together with a word that in-
corporates each one, is given in Appendix III.

Most people quickly learn to make the VOICE BOX
speak using phoneme spelling. The trick is to say a
word very slowly and listen to how it sounds rather
than think of the way it is spelled. Then look through
the phoneme list to find the nearest match for each part
of the word.

Vowels and Dipthongs: If you say a word like "I"
(eye) slowly, you will hear that it is composed of two
quite different sounds--'AH' as in FATHER, and 'Y' as in
ANY. Therefore, to make "I", one could use the phonemes
AH-Y. Actually, there are several ways of spelling it,
each of which might sound better in a certain context.
AH1-EH3-Y sounds best when the word is stressed. Note
that the numbers differentieate between phonemes which
have the same sound but a different duration. These
can affect the meaning of a word as well as how natural
it sounds. For example:

        AHBDJEH3KT = óbject (noun)

        AH2BDJEH1KT = objéct (verb)

X.   SINGING DEMONSTRATION

This little program sings the first verse of "A
Bicycle Built For Two".

To hear it, type:

LOAD"DAISY"

Turn the Pitch control counter-clockwise, and type:

RUN

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The singing program is written entirely in BASIC. If you want to write your own songs, you will have to crack the numerical code that controls the pitch. Be warned, it is tough!

XI.   SPELLING QUIZ

        This program challenges you to spell words of vary-
ing difficulty. It records and displays how many you
get right and makes suitable comments. It will keep on
testing you until you have eventually got every one right.

        To run the program, type:

                LOAD"SPELL"

        and when it is loaded, type:

                RUN

        You can at any time hear a word repeated by hitting
the space bar.

        You can add new words by entering additional data
statements from line 1ØØØ on. The format is:

                1ØØØ DATA "CORRECTSPELLING","PHONETICSPELLING"

APPENDIX I--HARDWARE REGISTERS

DDR. $DDØ3 (56579). Data direction register. Always initialised to $FF(255).

PHR. $DDØ1 (56577). Output register. Lower six bits should contain phoneme code, Ø to $FF (Ø to 63). Bottom two bits control voice pitch, Ø to 3. Positive transition of seventh bit strobes voice pitch. Thus, the sequence to output a phoneme code of 7, (=ZH), and a voice pitch of Ø (the highest register) would be:

        1Ø POKE 56577,Ø:POKE56577 Ø OR 64:POKE56577,7

VFR. $DDØD (56589). Ready flag. Fifth bit is set when VOICE BOX is ready for new data. The BASIC statement:
        1Ø WAIT 56589,16

will delay the program until the previous phoneme has been transferred from the PHR register to the speech synthesizer chip.

IER. $DDØD (56589). Interrupt enable register. If the eighth and fifth bits are set, the VOICE BOX will be allowed to cause interrupts. To enable interrupts

        POKE56589,144

TCR. $DDØF (56591). Timer control register. Controls whether the VOICE BOX master clock, which affects both pitch and speed, is controlled by the knob, 8, or by the computer, 7.

TILO. $DDØ6 (56582). Timer, lobyte.

TIHI. $DDØ7 (56583). Timer, hibyte.

TILO and TIHI together control the VOICE BOX master clock. The precise clock frequency is given by:

        $1024 \div 1.95 \times (2 + TILO + (256 \times TIHI))$ MHz

Its normal range should be between .5 and 1.3. When delivering a new value, both TILO and TIHI must be sent, with TIHI going last.

DDRA. $DDØ2 (56578). Data direction register for phoneme strobe bit. The third bit is active.

PRA. $DDØØ (56576). Register containing phoneme strobe bit. Third bit is active.

The above two registers may be used to force the VOICE BOX to start sounding a newly delivered phoneme irrespective of wheter or not the previous one had run its allotted time. This would be useful in singing. It is important that the other bits in DDRA and PRA are not disturbed.

DDRA should be set up once at the start of a program by:

```
1Ø POKE 56578,PEEK(56578) OR4
```

Each time a phoneme is delivered, the following command would strobe it instantly into the VOICE BOX:

```
2ØØ POKE 56576,PEEK(56576)AND 251:POKE 56576,
   PEEK(56576)OR4
```

APPENDIX II--FILES ON TAPE

NAME	COUNTER	DESCRIPTION
TYPTALK	0	Simple demonstartion program made using FSPEAK which speaks what you type. **2494 bytes.**
DAISY	23	Singing demonstration. 2572 bytes.
SPELL	44	Spelling quiz. Speaks words and challenges you to spell them. 6911 bytes.
PSPEAK	88	BASIC sub-program with machine code phoneme-to-speech conversion. 713 bytes.
SPEAK	97	BASIC sub-program with machine code English text-to-speech conversion. 2090 bytes.
FSPEAK	113	BASIC sub-program including machine code English text-to-speech conversion and animated "Alien" face. 2539 bytes.

end of tape 130   (counter numbers are approximate)

The three sub-programs are intended to be added to other BASIC programs.

APPENDIX III--PHONEME LIST

PHO-NEME	EXAMPLE	STRING CODE	HEX CODE	TIME (mS)
A	dAy	C	20	183
A1	mAde	)	06	103
A2	enAble	(	05	71
AE	dAd	Q	2E	185
AE1	After	R	2F	103
AH	mOp	G	24	250
AH1	fAther	8	15	146
AH2	hOnest	+	08	71
AW	cAll	6S	3D	250
AW1	lAWful	6	13	146
AW2	sAlty	S	30	90
AY	daY	D	21	65
B	Bag	1	0E	71
CH	CHip	3	10	71
D	paiD	A	1E	55
DT	buTTer	'	04	46
E	mEEt	0	2C	185
E1	bE	←	3C	121
EH	gEt	↑	3B	185
EH1	hEavy	%	02	121
EH2	Enlist	$	01	71
EH3	jackEt	#	00	59
ER	bIRd	]	3A	146
F	Fast	@	1D	103
G	Get	?	1C	71
H	Hello	>	1B	71
I	pIn	J	27	185
I1	inhIbit	.	0B	121
I2	Inhibit	-	0A	80
I3	inhibIt	,	09	55
IU	yoU	Y	36	59
J	Judge	=	1A	47
K	tricK	<	19	80
L	Land	;	18	103
M	Mat	/	0C	103
N	suN	0	0D	80
NG	thiNG	7	14	121
O	mOre	I	26	185
O1	abOard	X	35	121

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PHO-NEME	EXAMPLE	STRING CODE	HEX CODE	TIME (mS)
O2	fOr	W	34	80
OO	bOOk	:	17	185
OO1	lOOking	9	16	103
P	Past	H	25	103
.	no sound	&	Ø3	47
..	no sound	&&	3E	185
R	Red	N	2B	90
S	paSS	B	1F	90
SH	SHop	4	11	121
.	no sound	&	3F	47
T	Tap	M	2A	71
TH	THin	⊀	39	71
THV	THe	[	38	80
U	mOve	K	28	185
U1	yOu	Z	37	90
UH	cUp	V	33	185
UH1	Uncle	U	32	103
UH2	About	T	31	71
UH3	missIOn	F	23	47
V	Van	2	ØF	71
W	Win	P	2D	80
Y	anY	L	29	103
Y1	Yard	E	22	80
Z	Zoo	5	12	71
ZH	aZure	*	Ø7	90

DIPTHONGS

A1-AY-Y	gAme	UH3-AH2-U1	hOUse
AH1-EH3-Y	tIme	O1-U1	nOte
UH3-AH2-Y	fIght	O1-UH3-Y	tOy
AH1-UH3-U1	cOW	Y1-IU-U1	mUsic

The ALIEN Group will repair any product which fails to operate properly due to defects in materials or workmanship for a period of one (1) year*from the date of purchase, provided that said product has not been modified or abused. In the event that it should ever become necessary to return your unit to the factory for service, please ship it to us, securely packed, postage prepaid and insured, along with your check or a money order for $10.00 to cover the cost of handling and return shipping. All other charges for parts and labor will be paid for by The ALIEN Group during the period of this Warranty.

To qualify, please fill out & return the enclosed Warranty Registration Form within ten (10) days of the date of purchase.

This Warranty gives you specific legal rights. You may also have others which vary from state to state.

* thirty (30) days on software