SPEECH SYNTHESIZER MANUAL

WARNING

This unit must be used in accordance with these instructions. Never plug in or remove the interface without first disconnecting the power from the computer. Failure to follow these instructions may result in damage to the interface or the computer.

2.1 INSTALLATION

The jack plug on the short flying lead must be connected to the stereo output on the rear of the computer next to the joystick socket. The speech interface can only be connected to the floppy disc/ expansion port. The speakers are plugged into the left and right sockets on the interface, the left socket is the left channel, the right socket is the right channel (as viewed from the front of the interface). The computer can now be switched on.

2.2 SETTING UP AND USING THE STEREO AMPLIFIER

The volume control is located the right hand side of the interface for the CPC 464 and on the left hand side of the interface for the CPC 6128. To check the volume setting type in the following line of program as a direct command.

SOUND 2,50,3000 (Enter).

You can now adjust the volume to the required level.

Just below the volume control is a small hole, this is the balance between the left and the right channels and is factory set and should not require adjustment.

To check the balance type in the following program.

```
10 SOUND 1,50,100;REM Left channel.
20 SOUND 4,50,100;REM Right channel.
30 GOTO 10

RUN <ENTER>.
```

You should hear the tone change between the left and right speakers. If it is necessary to adjust the balance you should use a small screwdriver. The internal speaker on the Amstrad should be turned down (right-hand end for the 464, rear right for the 6128 computer) as the mono output could distract from the effects of the stereo output.

Any sound that previously came out of the mono internal speaker will now be sent out via the interface in stereo. All programs that use the sound in any way (ie commercial software) will now output through the interface.

2.3 SPEECH SYNTHESIS

The Amstrad speech synthesis utilises parts of the spoken word known as allophones. These are actual sounds that go to make up speech. The SP0256 allophone speech synthesis technique provides the ability to synthesize an unlimited vocabulary. Fifty-nine discrete speech sounds (allophones) and five pauses are stored in the speech chips internal rom. In the past, Speech Synthesis has required large data bases to store words because every word had to have its own set of data. This method of speech synthesis is slightly clearer than the SP0256 speech chip but would require at least 5 mega bytes of memory to store the English Language. This is obviously not practical. Therefore, for the home computer the SP0256 is the ideal chip.

2.4.1 SOFTWARE LOADING DETAILS (cassette)

The software cassette supplied with your Amstrad Speech Synthesizer has been recorded in speed write 0 and speed write 1. To load press the green control key and enter (the numeric key pad enter). Note that if you are using the CPC 664 then you will require an external cassette player

The software is in two parts the first part is the relocater, this enables you to load and run the software in the 16384 to 39000 part of the basic memory map. This is because other software may be running in high memory (ie disc software). The second part is the machine code to run the text to speech converter, this is 4K in length.

After the first part has loaded the screen will clear and ask you for the load address. This should be a high address in the range of 16384 to 39000 (39000 is a good address). The routines will automatically lower HIMEM so that basic will not run into the machine code it is important to remember the load address if you intend using speech from machine code.

Once the second part has loaded the machine code will perform the initialisation routine and print the copyright message on the screen.

2.4.2 SOFTWARE LOADING DETAILS (ROM)

On power-up the Rom should identify itself with the sign-on message :-

SPEECH ROM VER. 1.1

All that is required to initialise the Speech Rom is to type in '|speak' then press <ENTER>.

This will also test the unit by saying "DK'tronics speech synthesizer" and displaying the extra commands.

2.5 BASIC COMMAND EXTENSIONS

There are 10 new basic commands and an example of their use is given below.

|SPON Turn on the interrupt to read the buffer, (speech on)

|SPOF Turn off the interrupt and stop reading the buffer, (speech off)

|FEED,n This is used to feed the speech buffer direct and also for sound effects. The |FEED,n command is followed by a maximum of 30 data items seperated by commas.

|FLUS This command clears the speech and text buffers.

|SPED,n This command controls the speed at which the words are spoken, n, is a number from 0 to 15.

|OUTM,1 Sets access to 'text to speech' using print "'xxxx'" only, ie listing etc will not be spoken.

|OUTM,2 Sets access to 'text to speech' from all print outputs. Anything that outputs to the screen ie listings, Syntax errors, ready will be spoken. (BUT WITHOUT PRINTING THEM ON SCREEN).

|OUTM,3 As |OUTM,2 but text is spoken and printed on the screen.

NOTE: |OUTM,2 and |OUTM,3 can only be stopped by the break key.

Note during extensive printing in |OUTM 2 or 3, the computer may seem to be unresponsive to the Break key. This is due to the speech buffer being full and Basic waiting until there is some more space.

To get out of this keep the BREAK key pressed until Basic scans for it, then the computer will print BREAK followed by READY while continuing to say the contents of the buffer which may continue for up to a minute.

The two remaining commands are only available on the Rom version. They are:-

|LEFT, Returns the value of the free memory in the speech buffer. This is used as follows :-

```
1000 a%=0
1010 |left,@a%
1020 print a%
```

With the buffers empty the result would be 250 bytes.

|SAY, This command is the normal way of getting the unit to speak. It uses the text to speech convertors. The correct syntax for the command is;-

664, 6128 computers: |say,"the cat sat on the mat"

464 computers: a$="the cat sat on the mat":|say,@a$

2.6 SPEECH SYNTHESIZER

The speech synthesizer can be used in various modes.

a) DIRECT- WITHOUT SOFTWARE SUPPLIED.
b) USING |FEED COMMAND.
c) USING THE TEXT TO SPEECH CONVERTER.
d) USING PRINTING MODE COMMANDS.

2.6.1 SPEECH CONTROL DIRECT FROM BASIC

The speech chip is in the I/0 memory map at location &FBFE. It is possible to send data straight to this location but the correct allophones must be worked out and converted to data. Also the program must find out when the speech chip has finished saying each allophone by reading from I/O locations &FBFE and waiting until its value is less than 128.

The following simple example shows a program to do this, to send this data to the speech chip.

```
10 FOR X=1 TO 8;REM Length of data statement.
20 IF INP(&FBFE)>127 THEN 20;REM Wait
   for chip ready signal.
30 READ A
40 OUT &FBFE,A
50 NEXT X;STOP
60 DATA 26,16,55,17,39,26,21,0;REM Amstrad
```

This example is using the speech chip in its crudest form and requires that the component parts of the text to be spoken are converted to data. To do this use the allophone table on page 47, also see the dictionary on page 49. An example of the word "COMPUTER" is;-

```
WORD  C   O   M   P  U   T   E   R
DATA  42, 15, 16, 9, 49, 22, 13, 51, 0
```

NOTE: That at the end of the data we send a 0 to the speech chip, this is to stop the last sound from sounding forever.

2.6.2 USING THE !FEED COMMAND

This requires that the software supplied is first loaded (cassette version).

The !FEED command is an extended basic command. This command allows you to enter raw data into the speech buffer and output it under interrupt control (ie transparent). Once the data is fed into the buffer (this is done in fractions of a second) the computer can carry on with its next task. It is very similar to the direct basic mode (see section 2.6.1) and requires that the text is converted into data by using the allophone table, (see allophone table section 2.8.)

Example :-

```
!SPON
!FEED,33,19,4,42,20,4,17,39,23,56,12,41,55,
4,45,12,16,12,17,12,21,0
```

When you enter the above the computer will say DK'TRONICS LTD:-

See the dictionary on page 49 for other examples or construct your own.
The maximum number of parameters that the !FEED command can accept is 30. The mode of operation is much easier than the direct basic mode but still requires that you convert the text into allophones. It has been included in the software mainly for sound effects and can be looked upon as the fourth sound channel.

Example.

```
!FEED,62,62,62,62,0
```
Will Produce a pulsating sound

```
!FEED,41,41,41,0
```
Will produce a knocking sound

You can try any numbers from 5-63 for different effects.

2.6.3 TEXT TO SPEECH CONVERTER

The machine-code software supplied is mainly devoted to this mode of operation. Of the 4K of machine code 3.5K is used as tables which contain the rules and exceptions of the English Language.

This is therefore the most important mode and allows speech to be entered in normal English without any converting of data by the user. The software must first be loaded.

The text to speech uses two new commands :-

!SPON This command turns on the speech interrupts.

!SPOF This command turns off the speech interrupts.

```
PRINT "'Amstrad'"
```
The above example is the Syntax for using text to speech.

The ' character after the first speech mark is the control character which tells the computer that what follows is not to be printed on the screen but to be sent to the speech routines.

The second ' character is the end mark.

All text to be sent to the speech chip in this mode must be enclosed by these characters.

The ' character is the shifted \ key which is to the right of the ? key

The text to speech converter is best explained by the following examples.

Enter this program into the computer;-

```
10 !SPON;REM Turn on speech interrupts.
20 PRINT "'THIS IS TALKING'"
30 PRINT "'AND SO IS THIS'"
```

Line 10 is only necessary at the start of the program.

NOTE; Graphics characters within the text to be spoken will be ignored or produce unusual representations.

The text to speech can handle 98% of all English words. There are a few which cause the text to speech slight problems. This is mainly because while there are rules for constructing words ie i before e except after c, there are more exceptions to the rules of the English Language. These problems can all be overcome by slighty misspelling of the word. Type in the following.

```
!SPON

PRINT "'SILICON'"
```

This word sounds wrong. However, type in

```
PRINT "'SILICKON'"
```

The word now sounds correct although it has been misspelt, with some words it may be necessary to experiment with spelling although this should be rare, Speech can also be sent to the speech chip using string variables or even string expressions.

EXAMPLE:-

```
10 LET A$="'SPEECH'"
20 !SPON
30 PRINT A$
```

Speech can be used from the input statement, eg:-

```
10 !SPON
20 INPUT "'WHAT IS YOUR NAME'";A$
```

Speech can be used using string expressions, eg:-

```
10 !SPON
20 FOR I=65 TO 90
30 PRINT "'";CHR$(I);"'";
40 NEXT I
```

2.6.4 TEXT TO SPEECH BUFFERS

The text to speech convertor uses two ram buffers, the text buffer to hold the words and the speech buffer to hold the data to be outputted by interrupts to the speech chip.

The text buffer can hold 100 characters while the speech buffer is bigger and can hold 250 allophones. It is possible to fill the text buffer and if this is allowed to occur then any characters sent to the buffer while it is full will be lost.

The speech buffer will hold about 45 seconds worth of speech and will continue to talk after the program has stopped or the break key has been used. There are two ways of stopping this, after all 45 seconds of unwanted speech could be a bit nauseating.

If you type in "!FLUS" <ENTER>

This will empty the buffers and stop all talking.

OR

"!SPOF" <ENTER>

this will stop the talking but leave the buffers with data still in them and the last allophone still sounding.

This could be useful for handling Breaks from BASIC.

EXAMPLE

```
10 !SPON
20 ON BREAK GOSUB 60
30 PRINT "'Once upon a time there was a beautiful princess'";
40 IF PEEK(39014)<200 THEN 40;REM    *
50 GOTO 30
60 !SPOF;REM Halt speaking of allophones
70 OUT &FBFE,0;REM Stop last sound
80 I$=INKEY$
90 IF I$=" " THEN STOP ;REM Abort when the SPACEBAR is pressed.
100 IF ,I$="" THEN 80
110 !SPON;REM Restart speaking of allophones.
120 RETURN
```

*This value is load address + 14 which you first typed in during loading. It contains the amount of space remaining in the buffer. See section 2.7 on machine-code.)

2.6.5 PRINT MODE COMMANDS

!OUTM,1

This command allows access to text to speech using "'xxx'" only. Listings and Syntax errors etc will not be spoken. This is the default setting on first loading and using the software. This command is only of any real use to cancel !OUTM,2 or !OUTM,3.

!OUTM,2

This command allows access to text to speech conversion from all print outputs. Anything that outputs to the screen ie listings, Syntax errors etc will, be spoken. The outputs will not however, be printed. You can use the command to say your listings instead of printing them to the screen. This form of listing is fairly slow as the routine will fill the buffers and then wait until there is some more room in the buffer and fill it again etc. To stop this routine press the break key and type "!FLUS" then <ENTER> if you're fed up with the speech.

EXAMPLE

To say a listing

```
!OUTM,2 (ENTER)
LIST (ENTER)
```

!OUTM,3

This command is similar to !OUTM,2 but the output will be printed on the screen as well as being spoken. To stop this routine press the break key and type into the computer "!FLUS" then <ENTER> to stop the speech.

EXAMPLE

To say and print a listing

```
!OUTM,3 <ENTER>
LIST <ENTER>
```

!OUTM,2 and !OUTM,3 will wait for space in the buffer,
!OUTM,1 will not wait and funny effects can occur if some data is lost after the buffer fills up,

2,6,6 THE !SPED COMMAND

The !SPED,n controls the speed at which the speech chip will talk, This is useful as slightly slower sounds on complicated words are easier to understand, Type in the following,

```
10 !SPON ;REM Turn on speech interrupts,
20 !SPED,0
30 PRINT "'THIS IS FAST'"
40 FOR X=1 TO 5000:NEXT X
50 !SPED,15
60 PRINT "'THIS IS SLOW'"
```

The number that you use after the !SPED command has to be in the range from 0 to 15,

The speed can be changed at any point in the program so you can switch from fast to slow as you wish, The !SPED,n command also works with the !FEED,n command,

EXAMPLE;-

```
10 !SPON ;REM Turn on speech interrupts,
20 !SPED,1
30 !FEED,26,16,55,17,39,26,21,0
40 FOR X=1 TO 5000:NEXT X
50 !SPED,10
60 !FEED,42,23,16,9,49,31,17,52,0
```

2,7 MACHINE CODE CONTROL

The speech can be used from machine code in two different ways, The safest way is to send data straight to the speech chip at I/O memory address &FBFE as the speech chip never moves in the I/O memory map, To use the text to speech routines requires more care as the speech software can be loaded in at different addresses,

2,7,1 TEXT TO SPEECH MACHINE CODE CALLS

```
ORIGIN        INITIALISE ROUTINE
ORIGIN +  2   OUTPUTS ALLOPHONE IN ACCUMULATOR TO BUFFER
ORIGIN +  4   OUTPUT STRING POINTED TO BY HL ENDED BY ZERO BYTE,
ORIGIN +  6 = !SPON
ORIGIN +  8 = !SPOF
ORIGIN + 10 = !FLUS
ORIGIN + 12 = !SPED SPEED IN ACCUMULATOR
ORIGIN + 14   NUMBER OF FREE POSITIONS IN BUFFER
ORIGIN      = LOAD ADDRESS FOR SOFTWARE
```

If you loaded the software at 39000 then the !SPON routine is at 39006,

EXAMPLE OF TEXT TO SPEECH IN MACHINE-CODE

```
        CALL ORIGIN+6
        LD HL,STRING
        CALL ORIGIN+4
        RET
STRING: DEFB."DAVID",0
```

The last character in the string must be 0

If the length of the string is rather long you can check that there is then enough space in the buffer by LD A, (ORIGIN+14) the amount of free space is in the accumulator,

EXAMPLE OF CHANGING THE SPEED

```
LD A,10
CALL ORIGIN+12
RET
```

NOTE IF YOU DISABLE INTERRUPTS (DI) THEN THE SPEECH CHIP WILL STOP TALKING UNTIL THEY ARE ENABLED AGAIN (EI) AND ANY ALLOPHONE PRESENTLY BEING SPOKEN MAY CONTINUE SOUNDING UNTIL THE (EI) IS ISSUED,
SO YOU ARE ADVISED TO OUTPUT A ZERO DIRECTLY TO THE SPEECH CHIP,

BASIC EXAMPLE

```
OUT &FBFE,0,
```

MACHINE CODE EXAMPLE

```
LD BC,0FBFE (HEX)
LD A,0
OUT (C),A
```

2.8 ALLOPHONE TABLE

Pauses

0	PA1	(10mS)	use before voiced stops and afficates
1	PA2	(30mS)	use before voiced stops and afficates
2	PA3	(50mS)	before voiceless stops and voiced fricatives also between words
3	PA4	(100mS)	between clauses and sentences
4	PA5	(200mS)	between clauses and sentences

Short Vowels - These can be repeated

7	EH	E	bend
12	IH	I	fitting
15	AX	U	succeed
23	AO	AU	aught
24	AA	O	cot
26	AE	A	fat
30	UH	OO	cook

Long Vowels

5	OY	OY	toy
6	AY	Y	sky
19	IY	E	see
20	EY	EA	great
22	UW1	O	to
31	UW2	OO	food
32	AW	OU	out
53	OW	OW	snow
62	EL	L	angle

R-Coloured Vowels

(monosyllables)	47	XR	AI	hair
	51	ER	ER	computer
	52	ER2	IR	bird
(non-monosyllables)	58	OR	OR	store
	59	AR	AR	farm
	60	YR	R	clear

Affricates

10	JH	J	jury
50	CH	CH	church

Resonants

14	RR1	R	read
39	RR2	R	brain
49	YY1	U	computer
25	YY2	Y	yes
45	LL	L	luck
46	WW	W	wool

Voiced Fricatives

18	DH1	TH	they
54	DH2	TH	bathe
35	VV	V	even
43	ZZ	Z	zoo
38	ZH	GE	beige

Voiced Fricatives

29	TH	TH	thin
40	FF	F	fire
55	SS	S	sat (29,40,55, double for initial position)
27	HH1	H	he
57	HH2	H	hoe
37	SH	SH	shirt
48	WH	WH	whig

Voiced Stops

28	BB1	B	rib
63	BB2	B	big
21	DD1	D	could
33	DD2	D	do
36	GG1	GU	guest
61	GG2	G	go
34	GG3	IG	wig

Voiceless Stops

17	TT1	T	its
13	TT2	T	to
42	KK1	C	computer
41	KK2	K	sky
9	PP	P	pub

Nasal

16	MM	M	milk
11	NN1	N	earn
56	NN2	N	no
44	NG	NG	bans

2.9 DICTIONARY

alarm	15,45,59,16
bathe	63,20,54
bathing	63,20,54,12,44
bread	28,39,7,7,1,21
calendar	42,26,26,49,7,11,2,33,51
clown	42,45,32,11
checked	50,7,7,3,41,2,13
checkers	50,7,7,3,42,51,43
checks	50,7,7,3,42,55
collide	8,15,45,6,21
cookie	8,30,42,19
correct	42,52,7,7,2,41,2,17
correcting	42,52,7,7,2,41,2,13,12,44
crown	42,39,32,11
daughter	33,23,13,51
divided	33,12,39,6,2,33,12,2,21
engage	7,7,1,11,36,20,2,10
engages	7,7,1,11,36,20,2,10,12,43
enrage	7,11,14,20,2,10
enrages	7,11,14,20,2,10,12,43
escape	7,55,55,3,42,7,3,9
escapes	7,55,55,3,42,2,3,9,55
equal	19,2,3,8,48,15,62
error	7,47,58
fir	40,52
freezer	40,40,14,19,43,51
freezing	40,40,14,19,43,12,44
gauge	36,20,2,10
gauges	36,20,2,10,12,43
hello	27,7,45,15,53
hour	22,51
intrigue	12,11,3,13,39,19,1,34
intrigues	12,11,3,13,39,19,1,34,43
investigate	12,12,11,35,7,7,55,2,3,13,12,1,36,20,2,13
investigater	12,12,11,35,7,7,55,2,3,13,12,1,36,20,2,13,51
investigates	12,12,11,35,7,7,7,55,2,3,13,12,1,36,20,2,17,55
key	42,19
legislating	45,7,7,2,10,10,55,55,45,20,2,3,13,12,44
legislated	45,7,7,2,10,10,55,55,45,20,2,3,13,12,21
letter	45,7,7,3,13,51
little	45,12,12,3,13,52
memories	16,7,7,52,19,43
month	16,11,12
nipped	11,12,12,2,3,9,3,17
nips	11,12,12,2,3,9,55
pin	9,12,12,11
pinning	9,12,12,11,44
pledge	9,45,7,7,3,10
pledges	9,45,7,7,3,10,12,43
plus	9,45,15,15,55,55

rays	14,7,20,43
red	14,7,7,1,21
robots	14,53,2,63,24,3,17,55
second	55,55,7,3,42,12,11,2,21
sincere	55,55,12,12,11,55,55,60
sincerity	55,55,12,12,11,55,55,7,7,14,12,2,3,13,19
speak	55,55,3,19,3,41
spelled	55,55,3,9,7,7,62,3,21
spellers	55,55,3,9,7,7,62,52,43
spells	55,55,3,9,7,7,62,43
started	55,55,3,12,59,3,13,12,1,21
starting	55,55,3,13,59,3,13,12,44
stop	55,55,3,17,24,24,3,9
stopper	55,55,3,17,24,24,3,9,51
stops	55,55,3,17,24,24,3,9,55
subject	55,55,15,2,28,2,10,7,7,3,41,3,13
sweated	55,55,46,7,7,3,13,12,3,21
sweaters	55,55,46,7,7,3,13,61
sweats	55,55,46,7,7,3,13,55
switched	55,5,48,12,12,3,50,3,13
switching	55,55,48,12,12,3,50,12,44
systems	55,55,12,12,55,3,13,7,16,43
talked	13,23,23,3,41,3,13
talkers	13,23,23,3,42,51,43
talks	13,23,23,41,55
threaded	29,14,7,7,2,21,12,2,21
threaders	29,14,7,7,2,33,51,43
threads	29,14,7,7,2,33,43
time	13,24,6,16
uncle	15,44,3,8,62
whaler	46,20,45,51
whales	46,20,62,43
year	25,60