

**PERCOM**

# SPEAK-2-ME-2™

**USERS MANUAL**

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**PERCOM DATA COMPANY  
211 N. KIRBY  
GARLAND, TEXAS 75042**



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ATTENTION  
\*\*\*\*\*SPECIAL NOTICE\*\*\*\*\*

READ THIS NOTICE BEFORE OPENING THE SEALED PACKAGE CONTAINING THE  
SPEAK-2-ME-2(TM).

INSTALLATION OF SPEAK-2-ME-2(TM) IN A TI SPEAK & SPELL- REQUIRES  
SOME MODIFICATION OF THE SPEAK & SPELL- UNIT. MOREOVER, THE  
INSTALLATION PROCEDURE, WHICH MAY BE DIFFERENT FROM THAT DE-  
SCRIBED IN THE SPEAK-2-ME-2(TM) USERS MANUAL, REQUIRES THE SKILLS  
OF AN EXPERIENCED ELECTRONICS TECHNICIAN. IF YOU FEEL YOU DO  
NOT HAVE THE NECESSARY SKILL AND ARE UNABLE TO FOLLOW THE IN-  
STALLATION INSTRUCTIONS, YOU MAY RETURN THE SEALED PACKAGE CON-  
TAINING THE SPEAK-2-ME-2(TM) AND THE INSTRUCTION MANUAL FOR A  
FULL REFUND.

\*\*\* NOTICE \*\*\*

WE CANNOT ISSUE ANY REFUND IF THE PACKAGE SEAL IS BROKEN.

PERCOM DATA COMPANY WILL INSTALL A SPEAK-2-ME-2(TM) IN YOUR SPEAK  
& SPELL- FOR A \$25.00 INSTALLATION CHARGE, SUBJECT TO THE CONDI-  
TIONS SET FORTH IN THE FRONT MATTER OF THE USERS MANUAL.





## CHANGE NOTICE

PERCOM SPEAK-2-ME-2(tm)

USERS MANUAL (PN 050-1030-001)  
USERS MANUAL SUPPLEMENT (PN 059-1030-001)

Pages changed:

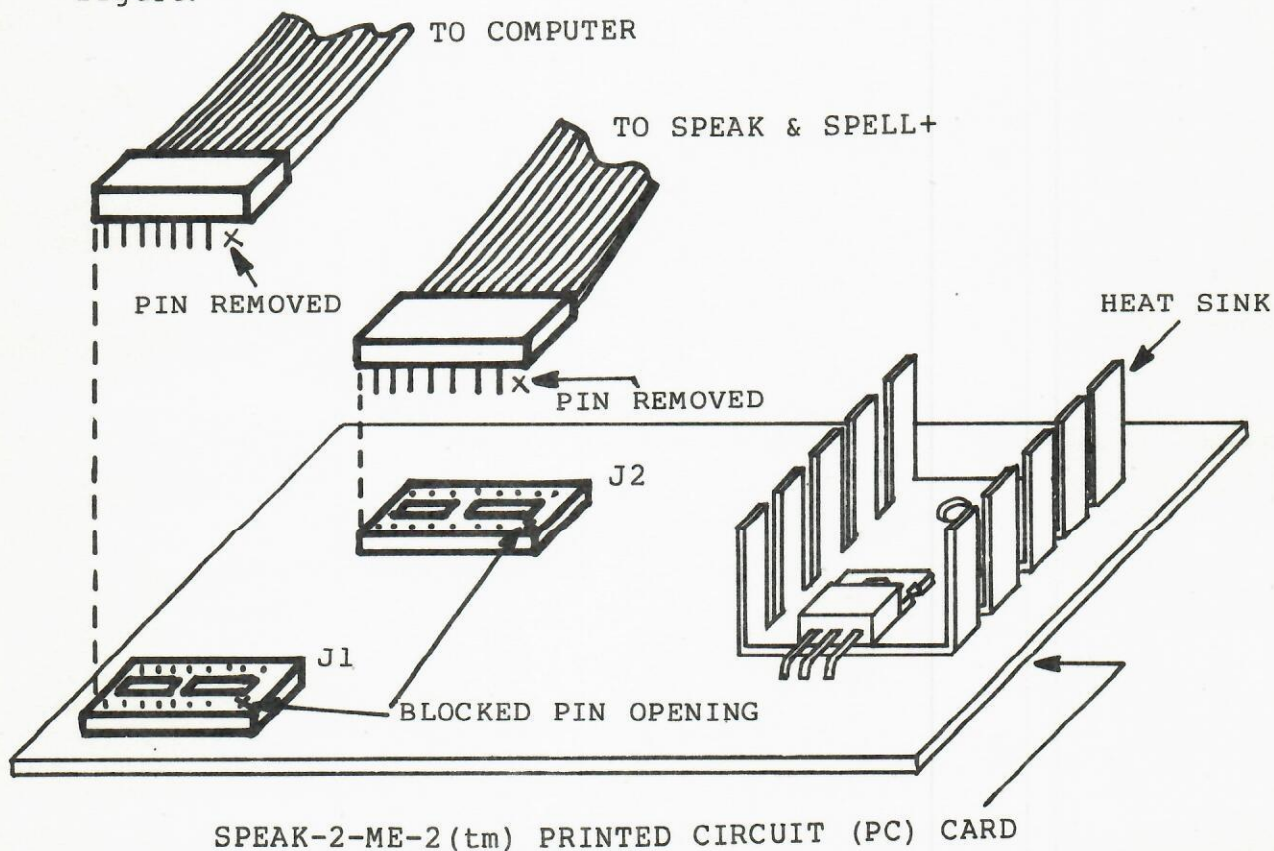
Page 2-5, Figure 2.3 of USERS MANUAL

Page 6, Figure 2.3 of USERS MANUAL SUPPLEMENT

### CHANGE:

DIP sockets J1 and J2 on the SPEAK-2-ME-2(tm) PC card have been modified to block the lower right-hand pin opening of each socket, and the corresponding pin on their mating cable DIP plugs have been removed.

This modification "polarizes" these connectors to prevent inserting a cable DIP plug incorrectly into its PC card DIP socket. The changes are illustrated in the following figure.







IMPORTANT NOTICE

READ THE SPECIAL NOTICE INCLUDED WITH THIS MANUAL BEFORE BEGINNING THE INSTALLATION PROGRAMS. YOUR SERIAL NUMBER IS 050-1030-001.

SPEAK-2-ME-2 (tm)

## USERS MANUAL

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PN 050-1030

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READ USERS MANUAL SUPPLEMENT, PN 059-1030-001, BEFORE BEGINNING THE INSTALLATION PROCEDURES OF SECTION II.

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## I INTRODUCTION

SPEAK-2-ME-2(tm) is an inexpensive PC interface module which allows you to operate a Texas Instruments' SPEAK & SPELL+ learning aid with your computer.

In effect, SPEAK & SPELL+ becomes the voice of your computer, articulating words, phrases and sentences under control of your own BASIC programs.

The exceptional speech quality, which is derived from a speech synthesis technique known as linear predictive coding (LPC), makes your SPEAK-2-ME-2(tm) useful in applications ranging from games to industrial controls and educational aids.

The SPEAK-2-ME-2(tm) module is installed in a SPEAK & SPELL+ unit in the compartment which normally houses the batteries. Since the batteries are removed for the installation, an alternate power source must be provided. This may be an ordinary calculator power pak or a battery.

The computer interconnecting cable supplied with a SPEAK-2-ME-2(tm) is configured to connect to a TRS-80\* computer. Two versions are available: PN 330-1030-001 connects the SPEAK & SPELL+ through the Expansion Interface and PN 330-1030-002 connects the SPEAK & SPELL+ through the Radio Shack Printer Interface Cable. Either cable may be modified for use with other computers.

Two levels of speech driver software are available. The first level driver, which is included as a source (BASIC) listing, installs the driver as a user (USR) function. Example application programs are included. The optional self-loading advanced driver provides additional programming options such as the ability to form words from the word parts of standard vocabulary words.

The advanced speech driver comes on a minidiskette along with a bonus of eight talking game programs.

### \*\*\* NOTE \*\*\*

Parts and software ordering information is included at the end of this manual.





## II INSTALLATION

### 2.1 PRELIMINARY INFORMATION

Installing the SPEAK-2-ME-2(tm) in a SPEAK & SPELL+ involves:

1. Disabling the controller chip of the SPEAK & SPELL+ by disconnecting its power.
2. Installing the SPEAK-2-ME-2(tm) module (PC card) in the SPEAK & SPELL(tm).
3. Providing dc power to the modified SPEAK & SPELL+ unit.

#### \*\*\* CAUTION \*\*\*

Some types of integrated circuits are extremely sensitive to charge build-up on the leads. When handling the SPEAK & SPELL+ or SPEAK-2-ME-2(tm) printed circuit boards, the following precautions should be observed:

1. Wear clothes that do not create static charge.
2. Work in an area that is not carpeted.
3. Gather all materials and tools before starting the installation so that you will not have to leave the work area until the job is completed.

#### 2.1.1 Disassembling the SPEAK & SPELL+ Unit

1. Lay the SPEAK & SPELL+ unit face down on the work surface and remove the two screws near the bottom of the case.
2. Using a narrow-blade screwdriver, pry back the two plastic snap connectors along one side, and slightly separate the back of the case from the front part.
3. Repeat step 2 for the other side, and remove the back from the front of the case.
4. Remove the battery compartment cover from the back part of the case and set the cover and the back aside. If batteries have been installed, remove them.

### 2.2 DISABLING THE SPEAK & SPELL+ CONTROLLER IC

The Percom SPEAK-2-ME-2(tm) performs functions normally accomplished by the SPEAK & SPELL+ controller IC, which is identified as A1 in Figures 2.1 and 2.2. The controller IC must be disabled to prevent loading or other contention between the controller and the SPEAK-2-ME-2(tm) circuit.

#### \*\*\* CAUTION \*\*\*

Power to the controller IC may be removed by cutting



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leads 38, 39 and 40. The controller IC may be destroyed, however, unless extreme care is used in cutting and bending the leads. An alternate method of removing controller chip power is to sever the printed wiring traces as described below.

#### 2.2.1 Procedure

Since the SPEAK & SPELL+ PC card has printed wiring on both surfaces, it is necessary to sever some traces on both sides of the board.

1. Remove the PC board and keypads from the SPEAK & SPELL+ case. These are held in place by plastic snap connectors -- three for the PC card and four each for the two keypads. It is not necessary to unsolder the speaker wires.
2. Inspect both surfaces of the PC card and locate the traces that connect to pins 38, 39 and 40 of A1. Some of the traces on the component side of the board run under the controller IC, so check carefully.
3. Sever all traces to pins 38, 39 and 40, as near as practical to the IC. This may be done using a scribe, pocket knife, small file, etc. Be sure each trace is completely cut so that there is no electrical continuity. Figures 2.1 and 2.2 show a SPEAK & SPELL+ PC card with traces cut to disable the controller IC.

#### \*\*\* CAUTION \*\*\*

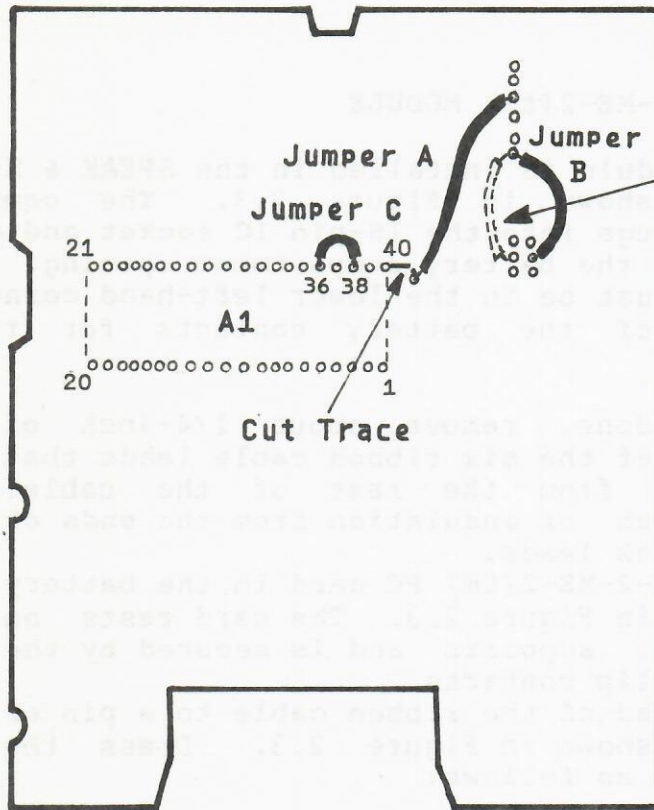
The PC card of your SPEAK & SPELL+ may not have the same printed wiring configuration as the unit shown in Figures 2.1 and 2.2. Do not cut traces as shown in these figures unless the printed wiring of your unit is exactly the same configuration.

4. Reinstall the SPEAK & SPELL+ keypads and PC board.
5. Solder three insulated jumper wires, jumper A, jumper B, and jumper C to contacts on the PC card as indicated in Figure 2.1.

#### \*\*\* NOTE \*\*\*

If the controller leads are cut instead of severing printed wiring traces, as previously discussed, it is only necessary to install jumper C between controller pins 36 and 38 to complete this part of the installation.

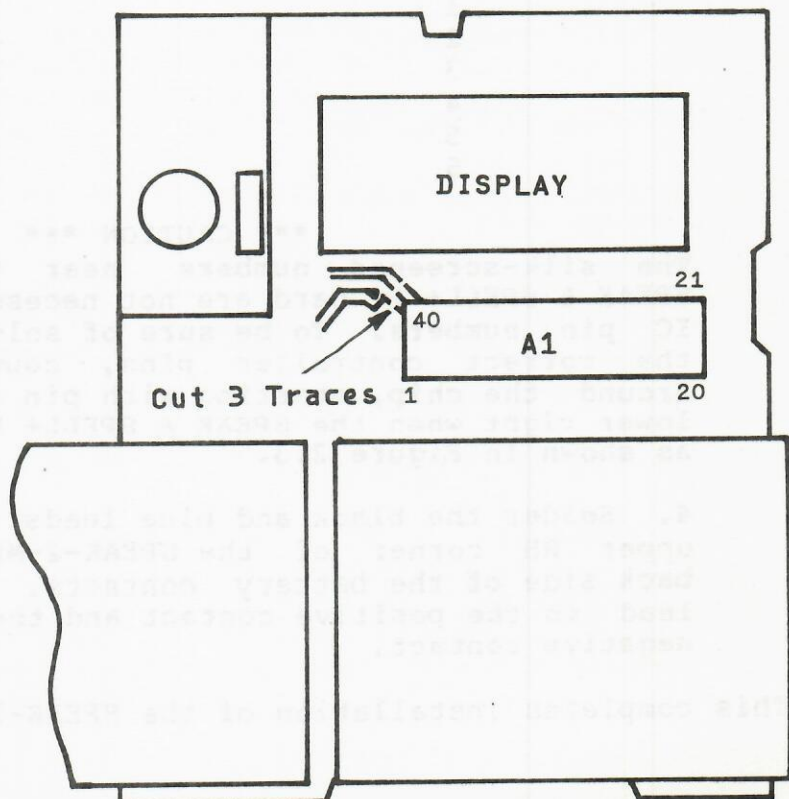
This completes the procedure for disabling the controller IC.



Alternate position for Jumper B. Check the component side to determine which contacts are used, and install Jumper B accordingly.

Figure 2.1  
 SPEAK & SPELL PC CARD  
 Bottom View

Figure 2.2  
 SPEAK & SPELL PC CARD  
 Top View





### 2.3 INSTALLING THE SPEAK-2-ME-2(tm) MODULE

The SPEAK-2-ME-2(tm) module is installed in the SPEAK & SPELL+ battery compartment as shown in Figure 2.3. The computer interconnecting cable plugs into the 16-pin IC socket and exits the SPEAK & SPELL+ through the battery compartment opening. The key on the cable plug must be in the lower left-hand corner as shown. Note the polarity of the battery contacts for future reference.

1. If not already done, remove about 1/4-inch of insulation from each of the six ribbon cable leads that have been separated from the rest of the cable. Remove about 1/4-inch of insulation from the ends of the red, blue and black leads.
2. Install the SPEAK-2-ME-2(tm) PC card in the battery compartment as shown in Figure 2.3. The card rests on the plastic vertical supports and is secured by the four battery spring clip contacts.
3. Solder each lead of the ribbon cable to a pin of the controller IC as shown in Figure 2.3. Dress the leads for connections as follows:

DIP SOCKET PIN	to	CONTROLLER PIN
1		26
2		14
3		13
4		12
5		11
6		10

**\*\*\* CAUTION \*\*\***

The silk-screened numbers near the IC pins on the SPEAK & SPELL+ PC card are not necessarily the actual IC pin numbers. To be sure of soldering the leads to the correct controller pins, count pins clockwise around the chip, starting with pin #1, which is to the lower right when the SPEAK & SPELL+ PC card is oriented as shown in Figure 2.3.

4. Solder the black and blue leads that exit at the upper RH corner of the SPEAK-2-ME-2(tm) card to the back side of the battery contacts. Solder the blue lead to the positive contact and the black lead to the negative contact.

This completes installation of the SPEAK-2-ME-2(tm) module.

SPEAK & SPELL+ shown face down  
 with back of case removed.

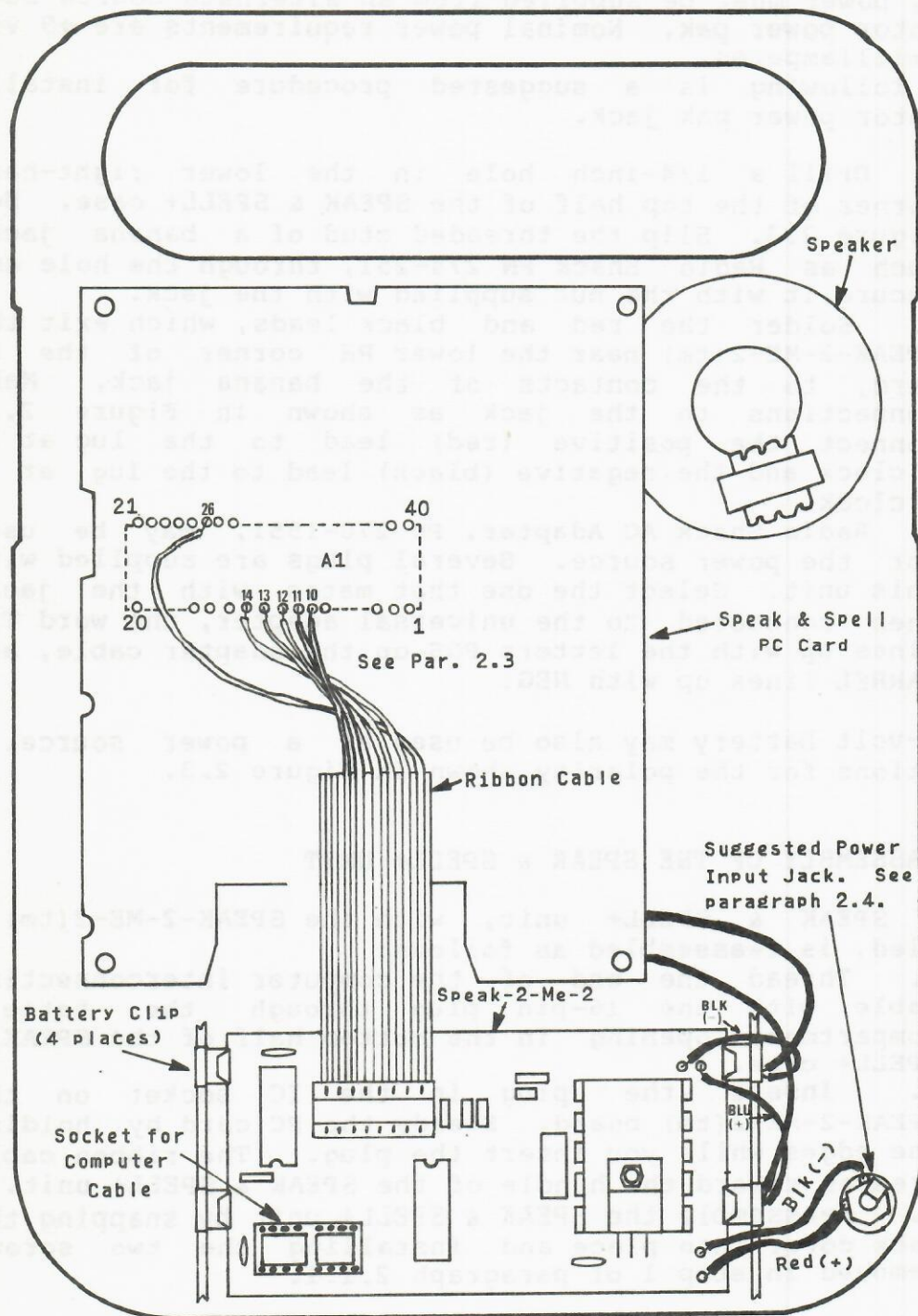


Figure 2.3 SPEAK-2-ME-2(tm) INSTALLED IN SPEAK & SPELL



## 2.4 POWER OPTIONS

With the SPEAK-2-ME-2(tm) module installed in a SPEAK & SPELL+, power must be supplied from an alternate source such as a calculator power pak. Nominal power requirements are +9 volts dc @ 300 milliamperes.

The following is a suggested procedure for installing a calculator power pak jack.

1. Drill a 1/4-inch hole in the lower right-hand corner of the top half of the SPEAK & SPELL+ case. See Figure 2.3. Slip the threaded stud of a banana jack, such as Radio Shack PN 274-251, through the hole and secure it with the nut supplied with the jack.
2. Solder the red and black leads, which exit the SPEAK-2-ME-2(tm) near the lower RH corner of the PC card, to the contacts of the banana jack. Make connections to the jack as shown in Figure 2.3: Connect the positive (red) lead to the lug at 12 o'clock and the negative (black) lead to the lug at 9 o'clock.
3. Radio Shack AC Adapter, PN 270-1551, may be used for the power source. Several plugs are supplied with this unit. Select the one that mates with the jack. When connected to the universal adapter, the word TIP lines up with the letters POS on the adapter cable, and BARREL lines up with NEG.

A 9-volt battery may also be used as a power source. Make connections for the polarity shown in Figure 2.3.

## 2.5 REASSEMBLY OF THE SPEAK & SPELL+ UNIT

The SPEAK & SPELL+ unit, with the SPEAK-2-ME-2(tm) module installed, is reassembled as follows:

1. Thread the end of the computer interconnecting cable with the 16-pin plug through the battery compartment opening in the bottom half of the SPEAK & SPELL+ case.
2. Insert the plug in the IC socket on the SPEAK-2-ME-2(tm) board. Steady the PC card by holding the edges while you insert the plug. The ribbon cable dresses toward the handle of the SPEAK & SPELL+ unit.
3. Reassemble the SPEAK & SPELL+ unit by snapping the back cover into place and installing the two screws removed in step 1 of paragraph 2.1.1.

This completes the installation.

### III COMPUTER HOOK-UP

At this point, the SPEAK-2-ME-2(tm) module has been installed in a SPEAK & SPELL+ unit as described in Section II.

\*\*\* CAUTION \*\*\*

Be sure power is off on all equipment before making the hook-up to the computer.

Either of two interconnecting cables is supplied with SPEAK-2-ME-2(tm). One cable, PN 330-1030-001, interfaces the TRS-80\* computer via the Expansion Interface. The other cable, PN 330-1030-002, interfaces the TRS-80\* computer via the Radio Shack Printer Interface Cable. If the connection is made through the Printer Interface Cable, the equipment must be modified as described in Appendix A2.

Connect the SPEAK-2-ME-2(tm) cable to the computer either via the printer port of the Expansion Interface or via the Printer Interface Cable.

\*\*\* NOTE \*\*\*

The cable exits DOWN from the Expansion Interface when properly plugged in.

Press the Off button on the SPEAK & SPELL+ keypad, then connect the alternate dc power source to the SPEAK & SPELL+ unit.

The system is now ready for operation.





## IV OPERATION

### 4.1 SPEECH DRIVER PROGRAM

The Level II BASIC program set forth in Listing 4.1 installs the SPEAK-2-ME-2(tm) speech driver as a USR function. The program must be entered exactly as listed. If data is typed incorrectly, the program, when run, will display the message

PROGRAM ENTRY ERROR

and the program must be re-entered.

The program should be S(aved) before it is run since it cannot be recovered after execution.

### 4.2 WORD NUMBER CODES

Each different word or phrase synthesized by SPEAK & SPELL+ is assigned a number code. These codes are used as data for the user function. The number code assignments are listed in Appendix A1. The values may be either plus or minus.

#### \*\*\* NOTE \*\*\*

Appendix A1 includes two word code lists. One or the other is appropriate for any given SPEAK & SPELL+. Determine which list is correct for your system by trial and error. For example, if a "zero" is not clearly pronounced when the number code for zero from list #1 is tried, the appropriate code list for your system is list #2.

The speech synthesis circuitry may be initialized by entering 0 (zero) for USR data.

Listings 4.2 and 4.3 are included as examples that may be used as models in writing your own programs.

### 4.3 ADVANCED SPEECH DRIVER

An advanced speech driver which forms words from the parts of standard vocabulary words, allows programming for speech at half the word rate and provides other programming amenities, is available from Percom. The program is provided on minidiskette along with eight talking game programs.

#### \*\*\* NOTE \*\*\*

Parts and software ordering information is included at the end of this manual.



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```
100 'SPEAK-2-ME-2 DRIVER
    COPYRIGHT (c) 1980 BY PERCOM DATA COMPANY
    ALL RIGHTS RESERVED
    THIS NOTICE MUST BE TYPED EXACTLY AS IT READS!
110 C=0
:   POKE 16553,255
120 READ D
:   C=C+D
:   IF D>=0 THEN 120
    ELSE IF C<>11012 THEN PRINT "PROGRAM ENTRY ERROR!"
:                               END
130 CLS
:   PRINT "INSTALLING DRIVER"
:   DEFINT A-Z
:   RESTORE
140 L=PEEK(16548)
:   H=PEEK(16549)
:   A=L+H*256
:   POKE 16548,PEEK(A)
:   POKE 16549,PEEK(A+1)
:   POKE 16526,L
:   POKE 16527,H > FOR NON DISK USERS ONLY
:   DEFUSR0=L+H*256 ' <---<< THIS LINE FOR DISK USERS ONLY!
150 FOR I=0 TO 92
:   READ D
:   POKE A+I,D
:   NEXT I
160 READ D
:   IF D<0 THEN 200
170 OL=PEEK(A+D)
:   OH=PEEK(A+D+1) AND 127
:   NL=OL+L
180 IF NL>255 THEN NL=NL-256
:   C=1
    ELSE C=0
190 NH=OH+H+C
:   POKE A+D,NL
:   POKE A+D+1,NH
:   GOTO 160
200 A=USR(0)
:   A=USR(19513)
:   NEW
210 DATA 205,127,10,124,181,32,12,6,5,175,205,77,128,16,250,62
220 DATA 128,24,58,33,33,65,175,205,77,128,6,5,175,237,103,35
230 DATA 237,103,43,7,7,7,7,79,205,71,128,16,239,62,128,205
240 DATA 77,128,62,160,205,77,128,62,224,205,77,128,175,205,77,128
250 DATA 58,232,55,23,48,250,201,62,32,205,77,128,121,47,238,8
260 DATA 50,232,55,245,241,245,241,238,8,50,232,55,201
270 DATA 11,24,41,48,53,58,62,74,-1
```

Listing 4.1 SPEAK-2-ME-2(tm) DRIVER

EXAMPLE PROGRAM 1 - A PRE-SCHOOL ALPHABET GAME

```
-----  
100 CLEAR 500  
:   A$="ABCDEFGHIJKLMNOPQRSTUVWXYZ"  
:   DIM A(26)  
:   FOR I=1 TO 26  
:   READ A(I)  
:   NEXT I  
110 L=RND(26)  
:   L$=MID$(A$,L,1)  
:   X=USR(-3565)  
:   X=USR(A(L))  
120 X$=INKEY$  
:   IF X$="" THEN 120  
130 IF X$=L$ THEN X=USR(-12272)  
    ELSE X=USR(23042)  
:       X=USR(A(L))  
:       GOTO 120  
140 FOR I=1 TO 500  
:   NEXT  
:   GOTO 110  
200 DATA 7173,17157,-32251,-16379,-3323,5126,18950,-30202  
210 DATA -15354,-1018,19207,-29945,-13305,2312,16136,29704  
220 DATA -17656,2825,17929,31497,-16631,1802,19466,-16118  
230 DATA -2294,19211
```

Listing 4.2 Example Program #1

EXAMPLE PROGRAM 2 - THE MACHINE SPEAKS!

```
-----  
100 READ A  
:   FOR I=1 TO A  
:   READ D  
:   X=USR(D)  
:   NEXT I  
110 DATA 15,-32728,-15354,-27610,7173,5454,13152,65,-15354  
120 DATA 9765,12651,-15354,-20147,7458,20492,-9439
```

Listing 4.3 Example Program #2

NOTE: BOTH OF THE ABOVE PROGRAMS ARE WRITTEN TO USE WORD LIST #1.









## WORD LIST #1

'USR' VALUE	SPEECH GENERATED	'USR' VALUE	SPEECH GENERATED
-26357	0	-4263	ALREADY
1292	1, ONE, WON	-3716	ANCIENT
20492	2, TOO, TO, DUE	-21733	ANGEL
-27124	3	-14527	ANOTHER
-3572	4, FOR	32287	ANSWER
16141	5	3698	ANXIOUS
-24819	6	9574	ANYTHING
-6643	7	22362	APPROVE
9742	8, ATE	29247	BEAUTY
22030	9	11074	BEIGE
-17138	10, TIN	31831	BELIEVE
19991	TONE #1	30510	BLOOD
-31209	TONE #2	4209	BOULDER
-16873	TONE #3	2658	BROUGHT
-2537	TONE #4	-18353	BUILT
23042	TRY AGAIN	16689	BULLET
-12272	YOU ARE RIGHT	-27024	BULLETIN
7173	A	-14989	BUREAU
17157	B, BE, BEE	6179	BUSH
-32251	C, SEE, SEA	-5796	BUSHEL
-16379	D, THE	-3480	BUSINESS
-3323	E	29298	BUTCHER
5126	F	-7136	CALF
18950	G, GEE	-14216	CARAVAN
-30202	H	-21962	CARRY
-15354	I, EYE, AYE	-26052	CHALK
-1018	J, JAY	28205	CHILD
19207	K	-15494	CIRCUIT
-29945	L	26210	CLEANSER
-13305	M	25881	COLOR
2312	N, IN, INN	17997	COMFORT
16136	O, OWE, OH	-14011	COMING
29704	P, PEA	7535	CONQUER
-17656	Q, CUE, QUEUE	-15612	CORRECT
2825	R, ARE	380	CORSAGE
17929	S	24169	COUNTRY
31497	T, TEE, TEA	-32178	COUPLE
-16631	U, EWE, YOU	-16289	COURAGE
1802	V	6480	COUSIN
19466	W	-975	DANGER
-16118	X, EX	-18827	DISCOVER
-2294	Y, WHY	-17369	DOES
19211	Z	30008	DOZEN
-4076	SAY IT	28269	DUNGEON
-3565	NOW TRY	-31945	EARLY
532	I'LL TRY	1127	EARNEST
14101	I WIN	14367	EARTH
-28395	YOU WIN	-27366	ECHO
3094	HERE IS YOUR SCORE	-20968	EGG
-13290	PERFECT SCORE	-4277	ENOUGH
26921	ABOVE	19507	ERROR
-26757	ABSCISS	22570	EVERY
30568	ACHIEVE	865	EVERYONE
-20386	AGAINST	39	EXTRA
25392	ALMOST	-30117	EYEBROW



## WORD LIST #1 (Continued)

'USR' VALUE	SPEECH GENERATED	'USR' VALUE	SPEECH GENERATED
19566	FEATHER	-24783	MARRY
-19413	FIELD	3671	MEADOW
23115	FIERCE	21252	MEANING
-21434	FINGER	-11708	MEASURE
15915	FIRED	-13719	MECHANIC
15158	FLOOD	-20707	MILD
-13251	FLOOR	29562	MINUTE
-15753	FOREHEAD	3130	MIRROR
22629	FREIGHT	16166	MONEY
16928	FROM	-8884	MOTHER
-6094	FRONT	14884	MOST
24138	GARAGE	-26573	MOVE
10079	GASOLINE	10348	MUSTACHE
-5350	GIVE	3922	NARROW
21885	GLACIER	-4510	NEIGHBOR
-13509	GLOVE	20842	NUISANCE
-22426	GREATER	27171	OBEY
31312	GUARD	12065	OCEAN
-3539	GUIDE	-32728	ONCE
-28636	HALF	-10704	ONION
-7890	HASTE	-17346	OTHER
15916	HEALTH	10822	OUTDOOR
-4023	HEALTHY	-27360	OVEN
2879	HEAVEN	21836	PERIOD
15193	HEAVY	-22175	PIERCE
-26558	HEROES	-184	PLAGUE
-11201	HONEY	19828	PLEASANT
-30687	HONOR	-4505	PLEASURE
-5083	HOST	30002	PLURAL
-20394	HOSTESS	-29839	PLUNGER
-11164	HYGIENE	-9906	POLICE
22292	I	28487	POSTAGE
-17105	IMPROVE	-22162	POSTPONE
24149	INSTEAD	-12931	POULTRY
-12765	IRON	-19375	PRETTY
-20733	IS	29754	PRIEST
-6632	ISLAND	24408	PROMISE
-16103	ISLE	-29132	PROVE
8304	JEALOUS	-8156	PULL
14454	JOURNEY	6942	PUSH
13608	KEY	-21667	QUESTION
-12233	KNOWN	-31675	QUEER
-14237	LANGUAGE	31324	QUIET
-28071	LAUGH	2413	QUOTIENT
-26762	LAUGHTER	-16598	RANGE
7458	LEARN	16965	RANGER
2170	LEATHER	19513	READY
15221	LEISURE	5751	REINDEER
-5267	LETTUCE	-5549	RELIEF
11128	LIBRARY	27001	RELIEVE
-22677	LICORICE	-957	REMOVE
20541	LINGER	-23700	RHYTHM
16923	LOSE	4369	RIGHT
13152	MACHINE	-6856	RURAL
3383	MANGER	16243	SARDINE



## WORD LIST #1 (Continued)

'USR' VALUE	SPEECH GENERATED	'USR' VALUE	SPEECH GENERATED
-2020	SAYS	23335	WASH
-15254	SCHEDULE	28225	WATCH
-9926	SCHOOL	-22215	WATER
-8358	SEARCH	-13736	WEALTH
-19867	SERIOUS	-18123	WEIRD
-5294	SHIELD	-5561	WELCOME
-20147	SHOULD	-12247	WILD
25188	SHOULDER	25412	WOLVES
10307	SHOVEL	-7339	WOMAN
8551	SHRIEK	28755	WONDER
-4056	SIGN	25374	WORD
-13790	SKI	-10126	WORKMAN
5703	SMOTHER	8988	WORLD
-4780	SOLDIER	12123	WORTH
6492	SOMEONE	21521	WRONG
12126	SOMETIME	-14722	YACHT
856	SOURCE	-205	YIELD
21778	SPELL	-27108	YOLK
-27069	SPONGE	5454	YOUNG
26964	SPREAD	30024	YOURSELF
13615	SQUAD	20310	YOUTH
21327	SQUASH	9022	ZEROS
-11204	SQUAT		
-5558	STATUE		
-20128	STOMACH		
-31633	STRANGER		
-24000	SUGAR		
-10722	SURE		
22654	SURGEON		
14912	SWAMP		
29477	SWAN		
-6625	SWAP		
15676	SWEAT		
23907	SWEATER		
9765	TALK		
-5296	TERROR		
11064	THIEF		
-27780	THOUGH		
65	TODAY		
12651	TOMORROW		
31778	TON		
-23221	TONGUE		
27957	TOUGH		
14417	TOWARD		
-11916	TREASURE		
-30647	TROUBLE		
-28652	TRY		
14612	TRY		
-3276	UNION		
15163	USUAL		
-32174	VAGUE		
8986	VIEW		
-9439	WALK		
21533	WARM		
-27610	WAS		

-end list #1-

-more-

## WORD LIST #2

'USR' VALUE	SPEECH GENERATED	'USR' VALUE	SPEECH GENERATED
-29429	0	891	ANCIENT
-1781	1, ONE, WON	18459	ANGEL
17420	2, TOO, TO, DUE	-27840	ANOTHER
-30196	3	6943	ANSWER
-6644	4, FOR	-32144	ANXIOUS
13069	5	-29852	ANYTHING
-27891	6	-15272	APPROVE
-9715	7	5438	BEAUTY
6670	8, ATE	-5824	BEIGE
18958	9	-5803	BELIEVE
-20210	10, TIN	-21971	BLOOD
16919	TONE #1	-31633	BOULDER
31255	TONE #2	13686	BROTHER
-19945	TONE #3	-19901	BUILT
-5609	TONE #4	29744	BULLET
19970	TRY AGAIN	2671	BULLETIN
-15344	YOU ARE RIGHT	14706	BUREAU
4101	A	22107	BUSHEL
14085	B, BE, BEE	22375	BUSINESS
30213	C, SEE, SEA	-6544	BUTCHER
-19451	D, THE	-29408	CALF
-6395	E	14199	CARAVAN
2054	F	-5323	CARRY
15878	G, GEE	14139	CHALK
32262	H	-24276	CHILD
-18426	I, EYE, AYE	12921	CIRCUIT
-4090	J, JAY	-11680	CLEANSER
16135	K	22809	COLOR
32519	L	16460	COMFORT
-16377	M	-30908	COMING
-761	N, IN, INN	-28307	CONQUER
13064	O, OWE, OH	-18684	CORRECT
26632	P, PEA	380	CORSAGE
-20728	Q, CUE, QUEUE	30816	COULDN'T
-248	R, ARE	-15513	COUNTRY
14857	S	31821	COUPLE
28425	T, TEE, TEA	11614	COURAGE
-19703	U, EWE, YOU	4175	COUSIN
-1271	V	12081	DANGER
16394	W	10868	DISCOVER
-19190	X, EX	-4314	DOES
-5366	Y, WHY	4407	DOZEN
16139	Z	-16077	DREAD
-7148	SAY IT	-11413	DUNGEON
-6637	NOW TRY	-15306	EARLY
11029	I WIN	-1691	EARNEST
-31467	YOU WIN	-10978	EARTH
22	HERE IS YOUR SCORE	-30438	ECHO
-16362	PERFECT SCORE	-24040	EGG
-25560	ABOVE	-5814	ENOUGH
1658	ABSCISS	32562	ERROR
-9114	ACHIEVE	-29911	EVERY
7517	AGAINST	28767	EVERYONE
-27089	ALMOST	13094	EXTRA
23640	ALREADY	-3751	EYEBROW



## WORD LIST #2 (Continued)

'USR' VALUE	SPEECH GENERATED	'USR' VALUE	SPEECH GENERATED
-20116	FEATHER	29562	MINUTE
-6358	FIELD	-22472	MIRROR
27205	FINGER	29221	MONEY
28970	FIRE	-10421	MOTHER
31797	FLOOD	32035	MOST
28476	FLOOR	-26573	MOVE
-16797	FREIGHT	-29334	MUSTACHE
6962	FRONT	-7088	NARROW
7241	GARAGE	23137	NEIGHBOR
-27555	GASOLINE	11856	NIECE
26491	GLACIER	-18840	NUISANCE
28218	GLOVE	-10208	OCEAN
3685	GREATER	-19673	ONCE
29007	GUARD	2352	ONION
9517	GUIDE	24381	OTHER
-11485	HALF	-6076	OUTDOOR
5166	HASTE	15904	OVEN
28971	HEALTH	20299	PERIOD
-20920	HEALTHY	10877	PIANOS
-20931	HEAVEN	5728	PIERCE
-22441	HEAVY	-16094	PINT
22081	HEROES	-17081	PLAGUE
-11201	HONEY	19828	PLEASANT
12577	HONOR	21350	PLEASURE
7507	HOSTESS	-22479	PLURAL
14947	HYGIENE	-29839	PLUNGER
22292	I	-11443	POLICE
-4050	IMPROVE	11590	POSTAGE
-13485	INSTEAD	-12931	POULTRY
4387	IRON	-30384	PRETTY
-23805	IS	5945	PRIEST
-9704	ISLAND	-13226	PROMISE
-19175	ISLE	8996	PULL
8304	JEALOUS	-18403	PUSH
14454	JOURNEY	6236	QUESTION
26663	KEY	-31675	QUEER
11874	LANGUAGE	-6310	QUIET
-169	LAUGH	2413	QUOTIENT
-26762	LAUGHTER	-3543	RANGE
-14815	LEARN	68	RANGER
2170	LEATHER	-6089	READY
15221	LEISURE	5751	REINDEER
-5267	LETTUCE	22354	RELIEF
11128	LIBRARY	27001	RELIEVE
3178	LICORICE	-17854	REMOVE
-3269	LINGER	2155	RHYTHM
-8422	LOSE	4369	RIGHT
-24482	MACHINE	-32457	RURAL
20022	MANGER	16243	SARDINE
-11728	MARRY	-27364	SAYS
31573	MEADOW	10601	SCHEDULE
18180	MEANING	31801	SCHOOL
-28605	MEASURE	19545	SEARCH
12136	MECHANIC	6244	SERIOUS
19485	MILD	22609	SHIELD

## WORD LIST #2 (Continued)

'USR' VALUE	SPEECH GENERATED	'USR' VALUE	SPEECH GENERATED
-21684	SHOULD	30	WORD
-14238	SHOULDER	-10126	WORKMAN
-6591	SHOVEL	-16357	WORLD
9000	SIGN	-25511	WORTH
29474	SKI	18449	WRONG
-9659	SMOTHER	-14722	YACHT
20307	SOLDIER	12851	YIELD
-31142	SOMEONE	13084	YOLK
-25508	SOMETIME	3917	YOUNG
28758	SOURCE	13127	YOURSELF
18706	SPELL	-17324	YOUTH
21570	SPONGE	-14788	ZEROS
-10670	SPREAD		
26670	SQUAD		
19790	SQUASH		
30523	SQUAT		
-22455	STATUE		
7775	STOMACH		
-31633	STRANGER		
-8386	SUGAR		
29470	SURE		
22654	SURGEON		
30526	SWAMP		
-18908	SWAN		
-31969	SWAP		
-8134	SWEAT		
-15519	SWEATER		
26916	TALK		
-7601	TERROR		
15679	TODAY		
-27031	TOMORROW		
9506	TON		
-24758	TONGUE		
12325	TOUCH		
-20940	TOUGH		
6218	TOWARD		
-11916	TREASURE		
17992	TROUBLE		
-31724	TRY		
13364	UNION		
-8647	USUAL		
5914	VIEW		
-31711	WALK		
-3812	WARM		
-14555	WAS		
-16858	WASH		
14912	WATCH		
17720	WATER		
14167	WEALTH		
-1484	WEIRD		
-22458	WELCOME		
809	WILD		
8515	WOLVES		
20564	WOMAN		
28755	WONDER		





Appendix A2  
INTERFACING THE SPEAK-2-ME-2(tm) VIA THE  
RADIO SHACK PRINTER INTERFACE CABLE

This appendix describes the modifications required for interfacing the Percom SPEAK-2-ME-2(tm) to a TRS-80\* computer via the Radio Shack Printer Interface Cable, PN 26-1411.

I Modification of the SPEAK-2-ME-2(tm) Module

Connect an insulated jumper wire to the bottom (wiring side) of the SPEAK-2-ME-2(tm) PC card as shown in the following sketch:

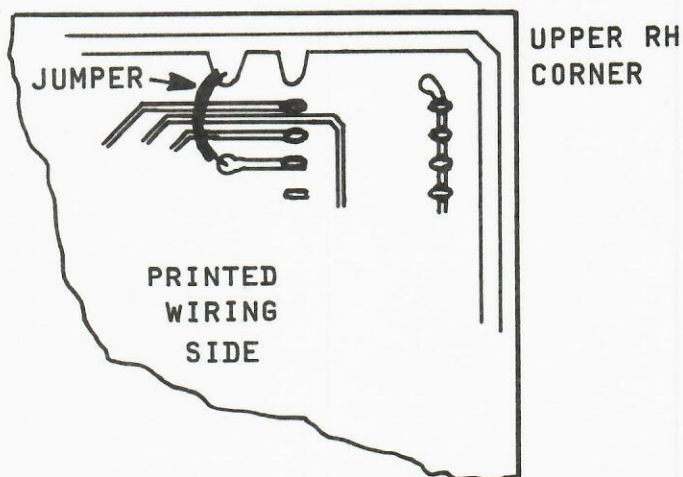


Figure A2.1 SPEAK-2-ME-2(tm) PC Card Modification

II Modification of the Printer Interface Cable

Solder an insulated jumper wire, as close to the plastic case as possible, between pin 35 and pin 19.

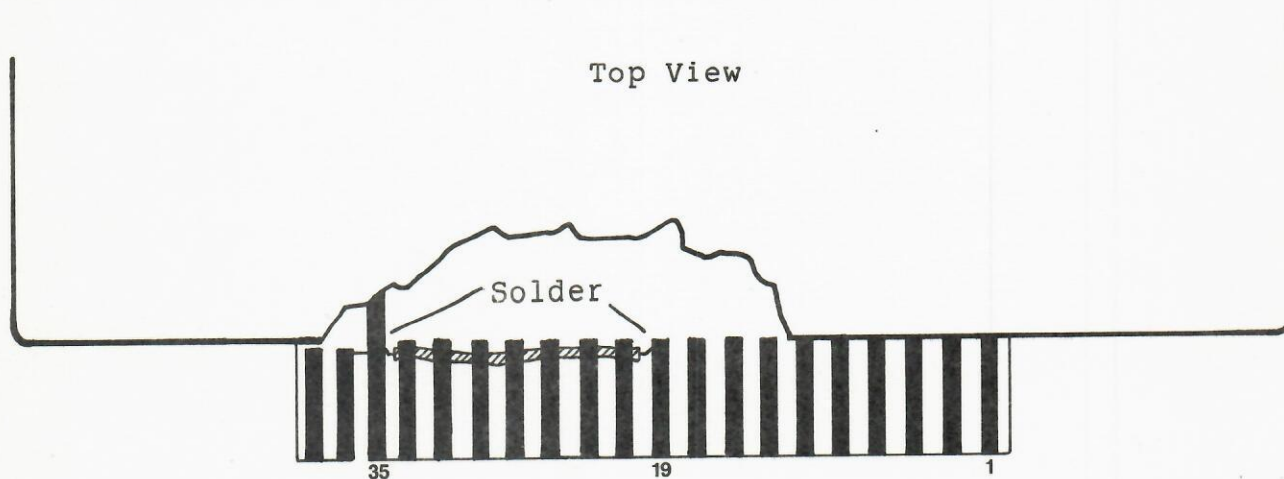


Figure A2.2 Printer Cable Interface Modification





Appendix A3  
CONNECTING THE SPEAK-2-ME-2(tm)  
TO A COMPUTER OTHER THAN THE TRS-80\* COMPUTER

This appendix includes information required to use the Percom SPEAK-2-ME-2(tm) module with a computer other than the TRS-80\* computer.

I HARDWARE INTERFACE

The computer-to-SPEAK-2-ME-2(tm) flat ribbon cable supplied with your SPEAK-2-ME-2(tm) module may be used to interconnect the SPEAK-TO-ME-2(tm) to your computer. Change the connector on the cable, if necessary, to mate with the connector on the output port of your system. The individual conductor signal assignments and pinouts at the SPEAK-2-ME-2(tm) P1 connector are shown in Figure A3.1. Note that five-volt power may be connected at pin P1-6 via the jumper option shown in Figure A3.1.

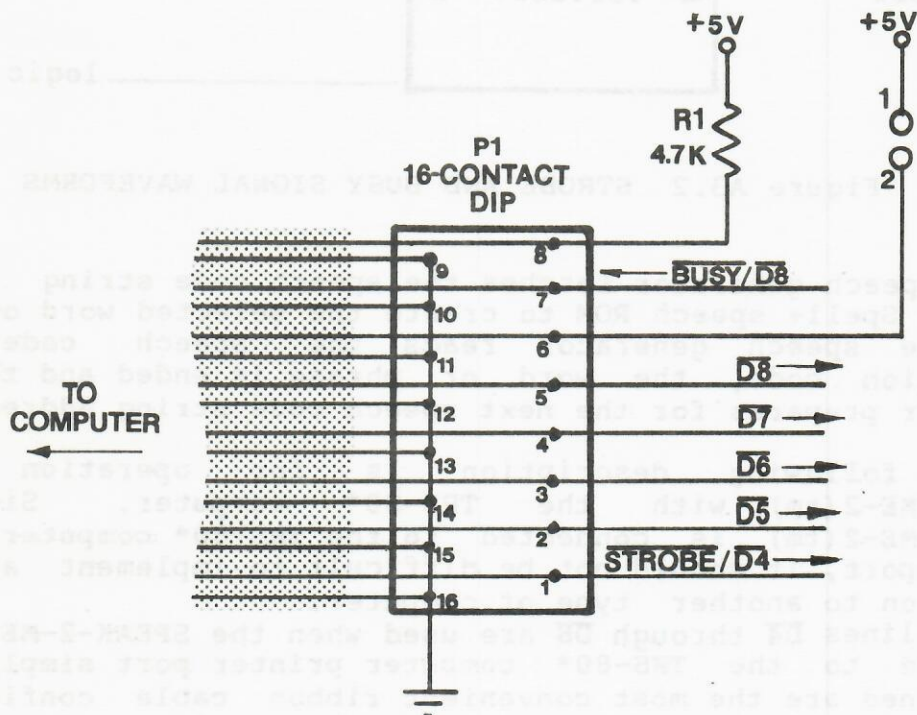


Figure A3.1 HARDWARE INTERFACE

II OPERATION

The host computer selects the word or phrase to be "spoken" by transmitting the starting address of the desired speech code string to the SPEAK-2-ME-2(tm). The speech code string address,



which is 16-bits long, is transmitted four bits at a time. The transmission is accomplished with a carefully timed STROBE pulse. STROBE and BUSY signal waveforms are shown in Figure A3.2.

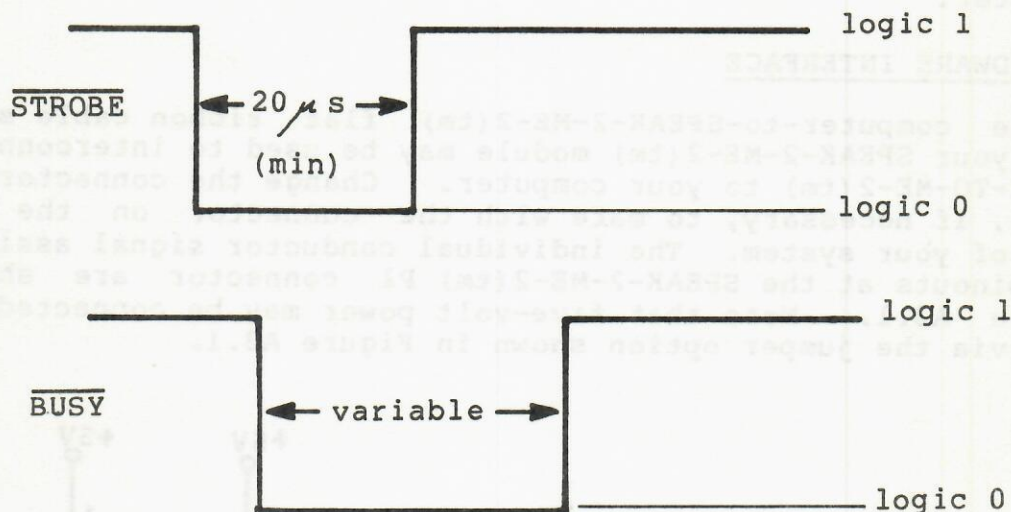


Figure A3.2 STROBE AND BUSY SIGNAL WAVEFORMS

The speech generator fetches the speech code string from the Speak & Spell+ speech ROM to create the selected word or phrase. When the speech generator reads the speech code string termination code, the word or phrase is ended and the speech generator prepares for the next speech code string address.

The following description is for operation of the SPEAK-2-ME-2(tm) with the TRS-80\* computer. Since the SPEAK-2-ME-2(tm) is connected to the TRS-80\* computer parallel printer port, it should not be difficult to implement a similar connection to another type of computer.

Data lines D4 through D8 are used when the SPEAK-2-ME-2(tm) is connected to the TRS-80\* computer printer port simply because these lines are the most convenient ribbon cable configuration. With appropriate software changes, any five of the eight printer data lines could be used.

Data bits D5 through D8 transmit the speech code string address, which is 16 bits, to the SPEAK-2-ME-2(tm) speech generator four bits at a time. These four-bit address "nibbles" are clocked into the speech generator by the 20-microsecond STROBE pulse on data line D4. Four STROBE pulses are required to pass the full 16-bit speech ROM address. The speech generator then fetches whichever speech code string is addressed. The SPEAK-2-ME-2(tm) expects the four data lines to be latched and stable for the duration of the STROBE pulse.

The BUSY line notifies the host computer if the



is in the middle of a word or phrase. A new address should not be sent while the BUSY line is active, unless you wish to terminate the word before it normally ends.

### III SPEECH DRIVER SOFTWARE

A Z-80 assembly language listing of a speech driver is included below. This is the same speech driver that is loaded into memory by the BASIC program described in Section IV of the Manual.

The following "psuedo code" describes the subroutines identified by each label. The psuedo code and listing may be used as a guide to adapt this driver to run on your computer.

ENTRY:     Get User Parameter.  
              If Parameter  $\neq$  0, then go to SPEAK.  
              Set Loop-Count = 5.

RESET:     Set Data/Byte = 0.  
              Call STROBE.  
              Loop-Count = Loop-Count - 1,  
              go to RESET if > 0.  
              Set Data/Byte = 80H. (H = hexadecimal)  
              Go to STROBE.

SPEAK:     Set Data/Byte = 0.  
              Call STROBE.  
              Set Loop-Count = 5.

OUTADD:     Set Temp/Byte (Temporary/Byte) = next  
              four bits of User Parameter.  
              Shift Temp/Byte left 4 bits.  
              Call OUTCHR.  
              Loop-Count = Loop-Count - 1.  
              If Loop-Count > 0, then go to OUTADD.  
              Set Data/Byte = 80H.  
              Call STROBE.  
              Set Data/Byte = A0H.  
              Call STROBE.  
              Set Data/Byte = E0H.  
              Call STROBE.  
              Set Data/Byte = 0.  
              Call STROBE.

WAIT:     Set Data/Byte = Input/Port  
              If bit 7 of Data/Byte = 1, go to WAIT.  
              Return.

OUTCHR:     Set Data/Byte = 20H.  
              Call STROBE.



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Set Data/Byte = Temp/Byte.

STROBE:

Set Data/Byte = NOT Data/Byte.  
 Set Data/Byte = Data/Byte XOR 8.  
 Set Output/Port = Data/Byte.  
 Delay 20 microseconds.  
 Set Data/Byte = Data/Byte XOR 8.  
 Set Output/Port = Data/Byte.  
 Return.

DRIVER LISTING

	00100	;	SPEAK-2-ME-2 DRIVER		
	00200	;	COPYRIGHT (C) 1980 BY PERCOM DATA COMPANY		
	00300	;			
	00400	;	WRITTEN BY JAMES W. STUTSMAN		
	00500	;			
8000	00600		ORG	8000H	;
	00700	;			
	00800	;	BASIC REFERENCES		
	00900	;	-----		
0A7F	01000	GETINT	EQU	0A7FH	;
4121	01100	ACCUM	EQU	4121H	;
37E8	01200	PPORT	EQU	37E8H	;
	01300	;			
	01400	;			
8000	CD7F0A	01500	ENTRY	CALL	GETINT
8003	7C	01600		LD	A,H
8004	B5	01700		OR	L
8005	200C	01800		JR	NZ,SPEAK
8007	0605	01900		LD	B,5
8009	AF	02000	RESET	XOR	A
800A	CD4D80	02100		CALL	STROBE
800D	10FA	02200		DJNZ	RESET
800F	3E80	02300		LD	A,80H
8011	183A	02400		JR	STROBE
8013	212141	02500	SPEAK	LD	HL,ACCUM
8016	AF	02600		XOR	A
8017	CD4D80	02700		CALL	STROBE
801A	0605	02800		LD	B,5
801C	AF	02900	OUTADD	XOR	A
801D	ED67	03000		RRD	
801F	23	03100		INC	HL
8020	ED67	03200		RRD	
8022	2B	03300		DEC	HL
8023	07	03400		RLCA	
8024	07	03500		RLCA	
8025	07	03600		RLCA	
8026	07	03700		RLCA	
8027	4F	03800		LD	C,A
8028	CD4780	03900		CALL	OUTCHR

more-



802B 10EF	04000	DJNZ	OUTADD	#LOOP THROUGH THE REST
802D 3E80	04100	LD	A,80H	#FINISH UP THE WORD
802F CD4D80	04200	CALL	STROBE	
8032 3EA0	04300	LD	A,0A0H	
8034 CD4D80	04400	CALL	STROBE	#SET UP TO READ STATUS
8037 3EE0	04500	LD	A,0E0H	
8039 CD4D80	04600	CALL	STROBE	
803C AF	04700	XOR	A	
803D CD4D80	04800	CALL	STROBE	#GET STATUS
8040 3AE837	04900 WAIT	LD	A,(PPORT)	#BUSY BIT TO C FLAG
8043 17	05000	RLA		#LOOP UNTIL NOT BUSY
8044 30FA	05100	JR	NC,WAIT	#RETURN
8046 C9	05200	RET		
	05300 ;			
	05400 ;			
	05500 ; OUTPUT A CHARACTER (4 BITS)			
	05600 ; -----			
8047 3E20	05700 OUTCHR	LD	A,20H	#DO THE SETUP
8049 CD4D80	05800	CALL	STROBE	
804C 79	05900	LD	A,C	#GET THE CHARACTER
	06000 ;			
	06100 ;			
	06200 ; STROBE OUT 4 BITS			
	06300 ; -----			
804D 2F	06400 STROBE	CPL		#INVERT BITS
804E EE08	06500	XOR	8	#SET STROBE BIT
8050 32E837	06600	LD	(PPORT),A	#OUTPUT DATA
8053 F5	06700	PUSH	AF	#DELAY FOR STROBE
8054 F1	06800	POP	AF	
8055 F5	06900	PUSH	AF	
8056 F1	07000	POP	AF	
8057 EE08	07100	XOR	8	#RESET STROBE BIT
8059 32E837	07200	LD	(PPORT),A	
805C C9	07300	RET		
	07400 ;			
	07500 ;			
8000	07600	END	ENTRY	
00000 TOTAL ERRORS				





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\*\*\* HOW TO ORDER PARTS AND OPTIONAL ITEMS \*\*\*

HOW TO ORDER: Order by mail...we're as near as your mailbox... or order by phone.

TOLL-FREE PHONE ORDERS: To save you money and insure prompt service, we've installed a toll-free number: 1-800-527-1592 FOR PLACING ORDERS ONLY. In Texas, and for Customer Service, dial (214) 272-3421. We cannot transfer calls received on our toll-free number to other departments -- please help us serve you better by dialing the correct number.

PROMPT SERVICE: We ship the cheapest, fastest way. We use UPS up to 50 lbs. per item, 100 lbs. per shipment. We use truck-freight for large or heavy shipments. Transportation charges collected on delivery.

COD ORDERS: COD orders are accepted where possible.

OPEN ACCOUNT TERMS: Net 10 days to rated firms.

TEXAS SALES TAX: Texas law requires that we collect 5% sales tax on all shipments in Texas.

MINIMUM ORDERS: We will add a handling charge of \$2.00 to all orders totalling less than \$15.00.

DAMAGED SHIPMENTS: Have carrier note if received in damaged condition, then file claim. About concealed damage: contact carrier for inspection, then file claim. Save the shipping carton.

\*\*\* HOW TO RETURN A UNIT FOR REPAIR \*\*\*

You have done everything you know how to do. You have read and reread the instruction manual and technical memos but you still can't get the ^\$(&@ thing to work!

Then it is time to let us help. We have yet to find a sick unit that cannot be restored to full health and vigor.



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There are a few things you can do to help us when you return a unit for repair.

1. Write or call for return authorization before returning any merchandise. RETURNS WITHOUT AUTHORIZATION WILL BE REFUSED.

2. When you return a unit for repair, enclose a complete description of the problem.

\*\*\* NOTE \*\*\*

Questions that do not relate to the reason the unit is being returned for repair must be sent in under separate cover.

3. If a unit is out of warranty, the repair payment must be enclosed. Payment may be made by check, money order or charge card. (Include all of the "raised" information on your charge card.) The repair prepayment for a SPEAK-2-ME-2(tm) is \$15.00.

4. When returning a unit for repair, pack it in a large carton with at least 3" of padding on all sides. We will not attempt to service any unit if there is shipping damage until the claim is settled (a real hassle). Ship prepaid by UPS or INSURED PARCEL POST to:

Percom Data Co.  
Service Dept.  
211 N. Kirby  
Garland, TX 75042

We try to turn most repairs around within one week.

SPEAK-2-ME-2(tm)

USERS MANUAL SUPPLEMENT

PN 059-1030-001

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Percom Data Company, Inc.  
All rights reserved.

\*\*\* IMPORTANT NOTICE \*\*\*

\* APPLICABILITY OF THIS SUPPLEMENT \*

This Users Manual Supplement applies if the controller integrated circuit, A1, of your SPEAK & SPELL+ is rotated 180 degrees from the orientation shown for A1 in Figures 2.1 through 2.3 of the Users Manual.



THIS SUPPLEMENT TO THE PERCOM SPEAK-2-ME-2(tm)  
USERS MANUAL REPLACES PARAGRAPHS 2.2 AND 2.3, AND  
ADDS A NOTE TO PARAGRAPH 4.2.

## 2.2 DISABLING THE SPEAK & SPELL+ CONTROLLER IC

The Percom SPEAK-2-ME-2(tm) performs functions normally accomplished by the SPEAK & SPELL+ controller IC, which is identified as A1 in Figures 2.1 and 2.2. The controller IC must be disabled to prevent loading or other contention between the controller and the SPEAK-2-ME-2(tm) circuit.

### \*\*\* CAUTION \*\*\*

Power to the controller IC may be removed by cutting leads 38, 39 and 40. The controller IC may be destroyed, however, unless extreme care is used in cutting and bending the leads. An alternate method of removing controller chip power is to sever the printed wiring traces as described below.

### 2.2.1 Procedure

The SPEAK & SPELL+ PC card has printed wiring on both surfaces, and therefore it is necessary to sever traces on both sides of the board.

- 1.--Remove the PC board and keypads from the SPEAK & SPELL+ case. These are held in place by plastic snap connectors -- three for the PC card and four each for the two keypads. It is not necessary to unsolder the speaker wires.
- 2.--Inspect both surfaces of the PC card and locate the traces that connect to pins 38, 39 and 40 of A1. Some of the traces on the component side of the board run under the controller IC, so check carefully.
- 3.--Sever all traces to pins 38, 39 and 40, as near as practical to the IC. This may be done using a scribe, pocket knife, small file, etc. Be sure each trace is completely cut so that there is no electrical continuity. Figures 2.1 and 2.2 show a SPEAK & SPELL+ PC card with traces cut to disable the controller IC.

### \*\*\* CAUTION \*\*\*

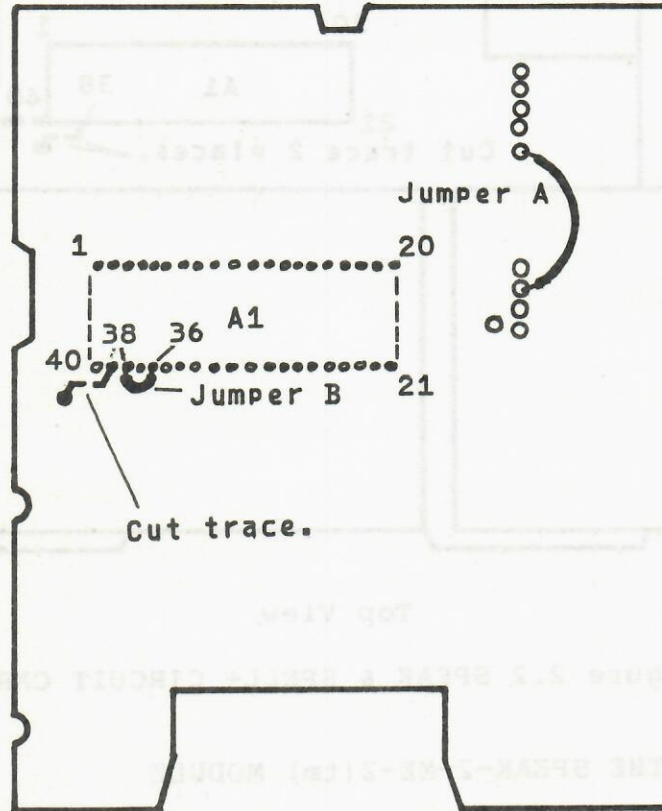
The PC card of your SPEAK & SPELL+ may not have the same printed wiring configuration as the unit shown in Figure 2.1 and 2.2. Do not cut traces as shown in these figures unless the printed wiring of your unit is exactly the same configuration.

- 4.--Reinstall the SPEAK & SPELL+ keypads and PC board.
- 5.--Solder insulated wire, jumper A, to contacts on the PC card as indicated in Figure 2.1.

\*\*\* NOTE \*\*\*

If the controller leads are cut instead of severing printed wiring traces, as previously discussed, it is only necessary to solder jumper B, Figure 2.1, between controller pins 36 and 38 to complete this part of the installation.

This completes the procedure for disabling the controller IC.



Bottom View

Figure 2.1 SPEAK & SPELL+ CIRCUIT CARD



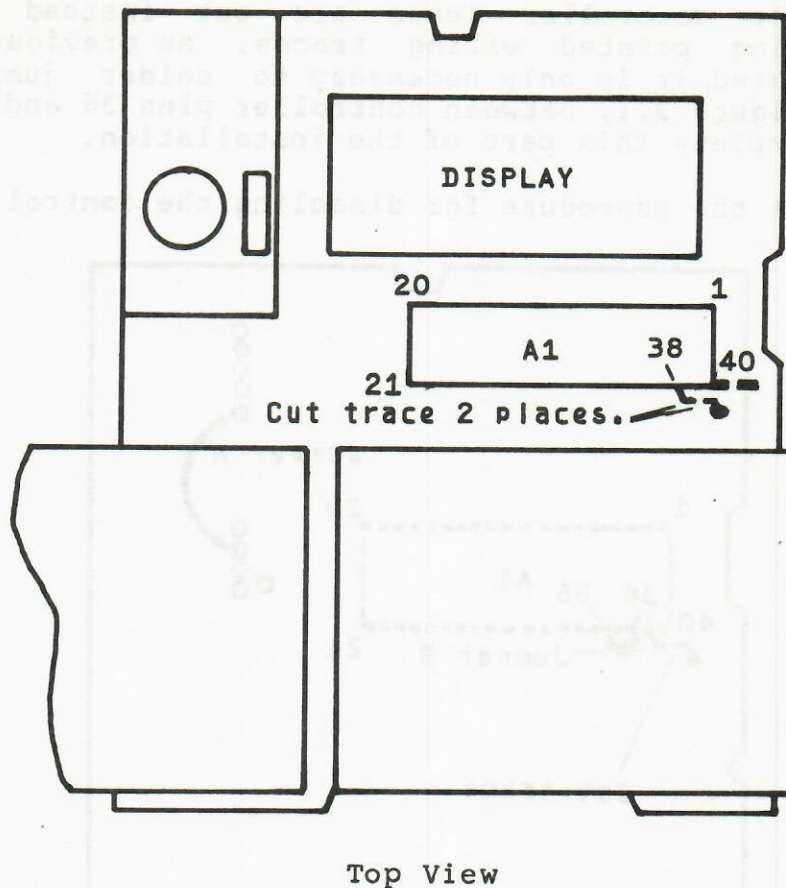


Figure 2.2 SPEAK & SPELL+ CIRCUIT CARD

### 2.3 INSTALLING THE SPEAK-2-ME-2(tm) MODULE

The SPEAK-2-ME-2(tm) module is installed in the SPEAK & SPELL+ battery compartment as shown in Figure 2.3. The computer interconnecting cable plugs into the 16-pin IC socket and exits the SPEAK & SPELL+ through the battery compartment opening. The key on the cable plug must be in the lower left-hand corner as shown. Note the polarity of the battery contacts for future reference.

1. If not already done, remove about 1/4-inch of insulation from each of the six ribbon cable leads that have been separated from the rest of the cable. Remove about 1/4-inch of insulation from the ends of the red, blue and black leads.
2. Install the SPEAK-2-ME-2(tm) PC card in the battery compartment as shown in Figure 2.3. The card rests on the plastic vertical supports and is secured by the four battery spring clip contacts.

3. Solder each lead of the ribbon cable to a pin of the controller IC as shown in Figure 2.3. Dress the leads for connections as follows:

DIP SOCKET PIN	to	CONTROLLER PIN
1		26
2		14
3		13
4		12
5		11
6		10

\*\*\* CAUTION \*\*\*

The silk-screened numbers near the IC pins on the SPEAK & SPELL+ PC card are not necessarily the actual IC pin numbers. To be sure of soldering the leads to the correct controller pins, count pins clockwise around the chip, starting with pin #1, which is to the upper left when the SPEAK & SPELL+ PC card is oriented as shown in Figure 2.3.

4. Solder the black and blue leads that exit at the upper RH corner of the SPEAK-2-ME-2(tm) card to the back side of the battery contacts. Solder the blue lead to the positive contact and the black lead to the negative contact.

This completes the installation of the SPEAK-2-ME-2(tm) module.



Speak & Spell\* unit shown face down with  
 back of case removed

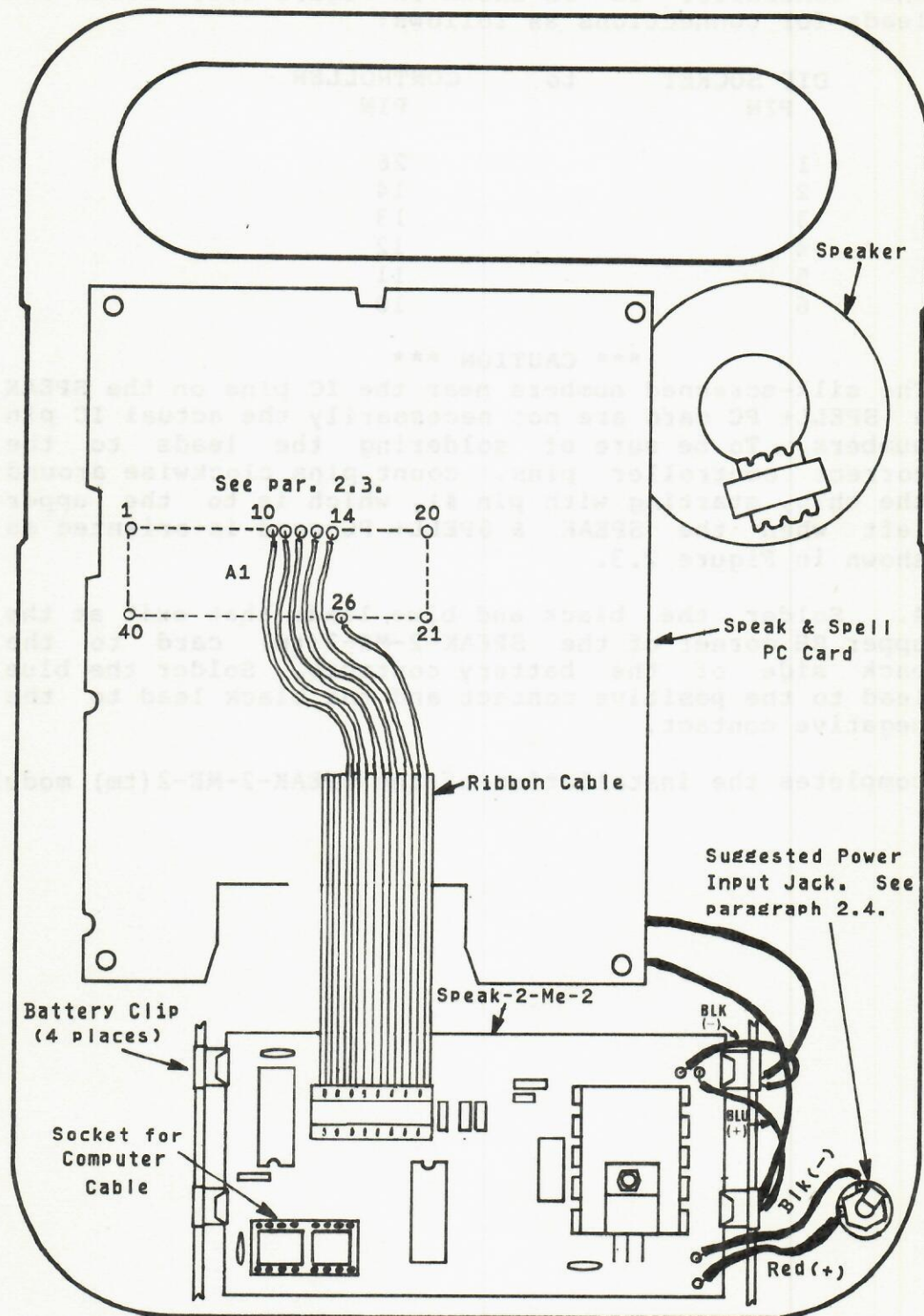


Figure 2.3 SPEAK-2-ME-2(TM) INSTALLED IN SPEAK & SPELL+

ADD THE FOLLOWING NOTE TO PARAGRAPH 4.2 OF THE USERS MANUAL.

\*\*\* NOTE \*\*\*

Change word code list 2 as follows:

USR VALUE	SPEECH GENERATED	
	WAS	IS
-5267	LETTUCE	STRANGER
29562	MINUTE	MASSAGE
19828	PLEASANT	COVER
-31633	STRANGER	BOULDER
28755	WONDER	DANGER

Delete the following USER values which are not available for SPEAK & SPELL+ units covered by this supplement: -20116, 7507, 22292, 8304, 14454, -26762, 2170, 15221, 11128, -26537, -29839, -12931, -31675, 2413, 5751, 27001, 4369, 16243, 20307, 22654, -11916, -16858, -10126 and -14722.



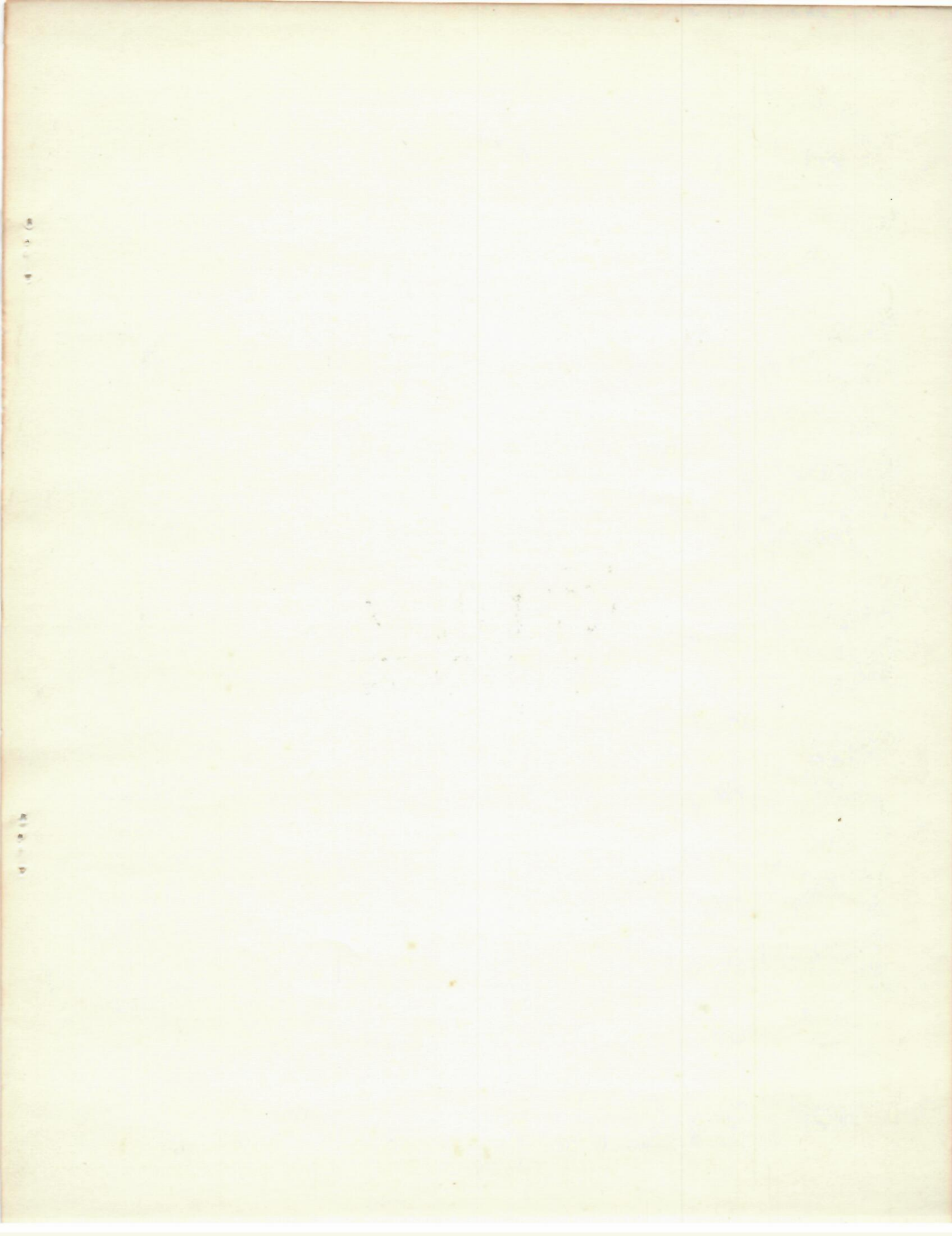
ADD THE FOLLOWING NOTE TO PARAGRAPH 4.3 OF THE USER'S MANUAL.

\*\*\* NOTE \*\*\*

Change word code line 3 as follows:

USER VALUE	WAS	SPEEDS CONVERSION
10100	10100	10100
10101	10101	10101
10102	10102	10102
10103	10103	10103
10104	10104	10104
10105	10105	10105
10106	10106	10106
10107	10107	10107
10108	10108	10108
10109	10109	10109
10110	10110	10110
10111	10111	10111
10112	10112	10112
10113	10113	10113
10114	10114	10114
10115	10115	10115
10116	10116	10116
10117	10117	10117
10118	10118	10118
10119	10119	10119
10120	10120	10120
10121	10121	10121
10122	10122	10122
10123	10123	10123
10124	10124	10124
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10126	10126	10126
10127	10127	10127
10128	10128	10128
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10130	10130	10130
10131	10131	10131
10132	10132	10132
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10189	10189	10189
10190	10190	10190
10191	10191	10191
10192	10192	10192
10193	10193	10193
10194	10194	10194
10195	10195	10195
10196	10196	10196
10197	10197	10197
10198	10198	10198
10199	10199	10199
10200	10200	10200

Before the following USER values which are not available for  
 USER 4 (EPI) - only covered by this supplement: -10110, -10111,  
 -10112, -10113, -10114, -10115, -10116, -10117, -10118, -10119,  
 -10120, -10121, -10122, -10123, -10124, -10125, -10126, -10127,  
 -10128, -10129, -10130, -10131, -10132, -10133, -10134, -10135,  
 -10136, -10137, -10138, -10139, -10140, -10141, -10142, -10143,  
 -10144, -10145, -10146, -10147, -10148, -10149, -10150, -10151,  
 -10152, -10153, -10154, -10155, -10156, -10157, -10158, -10159,  
 -10160, -10161, -10162, -10163, -10164, -10165, -10166, -10167,  
 -10168, -10169, -10170, -10171, -10172, -10173, -10174, -10175,  
 -10176, -10177, -10178, -10179, -10180, -10181, -10182, -10183,  
 -10184, -10185, -10186, -10187, -10188, -10189, -10190, -10191,  
 -10192, -10193, -10194, -10195, -10196, -10197, -10198, -10199,  
 -10200.







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