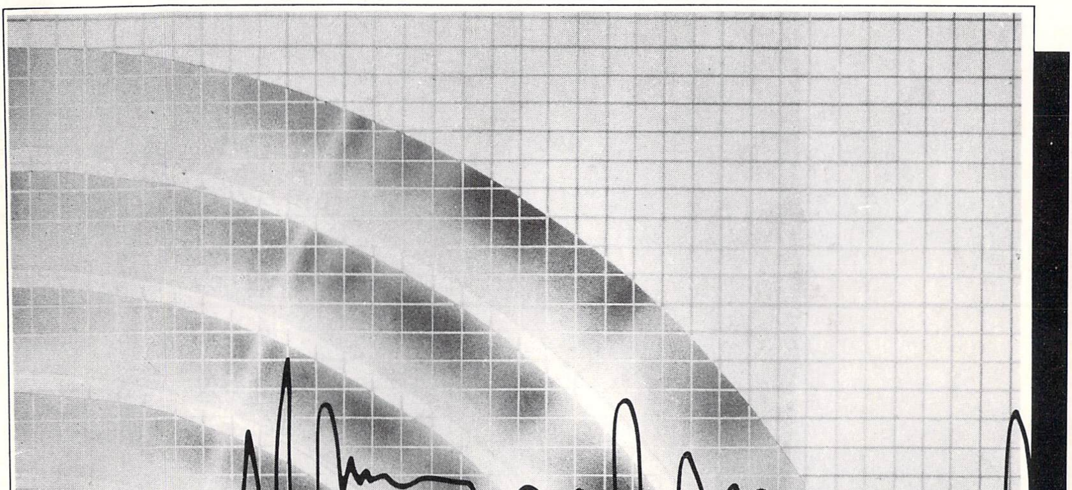
commodore

MAGIC VOICE SPEECH MODULE

The most realistic voice synthesizer on the market



For use with the Commodore 64

C64850

CONTENTS

YOUR COMMODORE COMPUTER TALKS!

Your COMMODORE 64 computer has a VOICE . . . in fact, lots of voices! Whether you're a student, teacher, parent, hobbyist, executive, novice programmer or expert . . . you're going to enjoy your Commodore Magic Voice™ Speech Module.

Here's a short list of the Magic Voice's special features:

- High quality UNDERSTANDABLE speech output
- Includes pre-programmed vocabulary of 235 utterances
- Accepts talking software on cartridge, diskette or tape
- Easily programmed using Commodore BASIC
- Accepts additional vocabularies on diskettes
- Generates speech and music simultaneously
- Generates speech and graphics/animation simultaneously

Your Magic Voice plugs directly into the cartridge port of your COMMODORE 64 or SX-64 Portable Color Computer. You can use diskette, tape or cartridge software (cartridges plug into the Magic Voice's convenient top-loading cartridge port). The Magic Voice will give voice to programs that talk. Most programs that don't include speech operate normally when the Magic Voice is plugged in. However, some older programs may not work. If you have difficulty using a non-speaking program while the module is plugged in, turn off the computer and then remove the module.

The Magic Voice speaks in a pleasant female voice, and has the ability to generate natural sounding human speech using male, female, children's and character voices. The module comes with its own built-in vocabulary of 235 utterances, and you can add thousands of other words using speech-compatible cartridges, diskettes and tapes.

Commodore's "talking" software includes the innovative **"MAGIC DESK"** series, learning programs like **"A Bee C's"**, and talking games like **WIZARD OF WOR** and **GORF!** We've only just begun to explore the educational and recreational opportunities created by talking computers: foreign language training, elementary education, creative strategy games — the possibilities are endless.

If you're a computer programmer, you can use the Magic Voice in your own BASIC or ASSEMBLY LANGUAGE programs! If you develop a program you'd like us to consider as a software product, send a sample to our Software Acquisitions Manager in care of Commodore Software, 1200 Wilson Drive, West Chester, PA 19380.

To find out about new speech-compatible products as they're introduced, see your Commodore dealer, and read Commodore's two computer magazines (POWER/PLAY and COMMODORE).

1. INSTALLING YOUR MAGIC VOICE SPEECH MODULE

1. Using A Television

It's easy to set up the Magic Voice with your COMMODORE 64 or SX-64 computer. Just follow these simple steps:

STEP 1: SET UP YOUR COMPUTER for use with television as described in your User's Guide. Do NOT turn it on yet.

STEP 2: PLUG THE MAGIC VOICE INTO THE CARTRIDGE PORT of your computer.

STEP 3: LOCATE THE AUDIO CABLE that comes packed with your speech module.

STEP 4: TAKE THE PHONO PLUG of the cable and PLUG IT INTO THE "AUDIO OUT" SOCKET on the speech module (there are two sockets on the side of the module. The audio in and out sockets are marked on the bottom of the module.

STEP 5: TAKE THE 5-pin DIN AUDIO/VIDEO CONNECTOR of your AUDIO CABLE and PLUG IT INTO THE AUDIO/VIDEO SOCKET on the computer.

STEP 6: TURN ON THE TELEVISION SET. TURN THE VOLUME UP.

(Note: If you're using a speech-compatible cartridge, PLUG IT INTO THE CARTRIDGE SLOT on the top of the speech module . . . DON'T EVER PLUG IN A CARTRIDGE UNLESS YOUR COMPUTER IS TURNED OFF!)

STEP 7: TURN ON THE COMPUTER.

Note: If you're using pre-recorded software on DISKETTE or TAPE, LOAD the program at this time and RUN it.)

STEP 8: TEST THE MAGIC VOICE by typing the following exactly as shown (note that to obtain the quotation marks (") around the word HI, you should hold down the SHIFT key and press the 2 key at the same time):

SAY "HI" (and press the RETURN key)

The computer should say "**Hi**", and you're ready to go. If it does not respond properly, adjust the volume and fine tuning adjustments on your television and try again . . . then consult the TROUBLESHOOTING CHART on Page 4.

*Note: The Commodore Magic Voice may be used with both the COMMODORE 64 and COMMODORE SX-64 computers, but we refer to COMMODORE 64 throughout the text, since the SX-64 portable computer is compatible with the COMMODORE 64 and works identically when used with the Speech Module.

2. Using A Monitor

Using the Magic Voice with a monitor may yield better sound quality than a television set. Commodore makes a low-priced color monitor which is specially engineered to provide maximum sound and picture quality on Commodore computers. The following steps describe how to use the speech module with Commodore Model 1701/1702 Color Monitor:

STEP 1: SET UP YOUR COMPUTER for use with MONITOR, as described in your User's Manual. Do NOT turn it on yet.

STEP 2: PLUG THE MAGIC VOICE INTO THE CARTRIDGE PORT of your computer. The cartridge slot and COMMODORE label on the module must be facing UP.

STEP 3: Note: you will NOT USE THE AUDIO CABLE that comes packed with your Magic Voice module.

STEP 4: TAKE the long "TV CABLE" that comes with your COMMODORE 64 (it has identical PHONO PLUGS at each end) and PLUG ONE END INTO THE "AUDIO OUT" SOCKET on the speech module. PLUG THE OTHER END INTO THE "AUDIO" SOCKET on the front righthand corner of your Commodore Model 1701/1702 monitor.

STEP 5: TAKE THE "MONITOR CABLE" that comes with your Commodore monitor and PLUG THE LARGE AUDIO/VIDEO CONNECTOR INTO THE AUDIO/VIDEO SOCKET on your computer (the AUDIO/VIDEO connector is a round metal plug which has either 5 pins or 8 pins). Plug the VIDEO connector into the "VIDEO" SOCKET on your monitor. Connect the AUDIO PLUG on the monitor cable to the "AUDIO IN" SOCKET on the speech module.

STEP 6: Steps 6-8 are the same as for a television set (above).

A Special Note for COMMODORE Color Monitor Owners:

The Commodore Model 1701/1702 Color Monitor has a special capability which can boost the quality even more on your COMMODORE 64 . . . using 3 sockets on the BACK of the monitor labelled "Chroma," Luma" and "Audio." If you have a Commodore 64 with an 8-pin DIN audio/video connector, you can obtain a cable which has an 8-pin DIN connector on one end and 3 phono plugs on the other. You can improve the picture and sound quality by plugging one plug into the CHROMA socket, one plug into the LUMA socket, and the AUDIO plug into the AUDIO socket (you may have to experiment to determine which plug gets the CHROMA and LUMA sockets). When using the MAGIC VOICE with this arrangement, use the "TV Cable" from your COMMODORE 64 to connect the AUDIO OUT socket of the speech module to the AUDIO socket on the back of your Commodore monitor, and connect the AUDIO PLUG on the 8-pin DIN cable into the "AUDIO IN" socket on the speech module.

3. Using Your Own Audio System

You can channel the sound output from the Magic Voice through your own audio system, but if you do, remember that the SID CHIP which creates music synthesis and sound effects in the COMMODORE 64 operates SEPARATELY from the Magic Voice. This means if you use a cable to connect the AUDIO OUT socket on the module to the AUDIO IN socket on your audio system, you will need some special cables to connect the audio portion of the signal coming from the computer's music synthesizer. Do this by plugging the "AUDIO OUT" PLUG coming out of the computer into the "AUDIO IN" SOCKET on the speech module.

4. Troubleshooting Tips

If you've tried using your Magic Voice and your computer still isn't talking, try these troubleshoting steps:

1. Make sure your computer operates normally without the Magic Voice speech module.
2. Tune the fine tuning dial on your TV or monitor and go to Step 9.
3. Turn up the volume on your television set/monitor/system.
4. Turn off the power to your 64 and make sure the cartridge is firmly seated in the expansion slot on your computer.
5. Check the audio cable to make sure it's connected to AUDIO OUT and not AUDIO IN.
6. If using a TV, make sure the switchbox is set to "computer" and not "TV", and you're tuned to the right channel (Channel 3 or 4. See your Commodore 64 User's Guide).
7. Turn the computer OFF and ON and try again.
8. If using a Commodore monitor, make sure the "front/rear" selector switch on the back of the monitor is properly set.
9. Retype the SAY test command and press the RETURN key.
   The SAY test command is SAY "HI" <return>.

2. MAKING YOUR COMMODORE 64 TALK

1. Your First Words

Type these lines exactly as shown:

```
SAY“THE”                          (and press the RETURN key)
SAY“COMMODORE”                    (and press the RETURN key)
SAY“COMPUTER”                     (and press the RETURN key)
SAY“IS”                           (and press the RETURN key)
SAY“TERRIFIC”                     (and press the RETURN key)
```

Your computer has a female voice! Of course, special software can create any type of voice — man, child, cartoon character — even sound effects. One of the first voices created by Commodore’s speech technology researchers was the robot voice in the best-selling game WIZARD OF WOR, available on cartridge for the Commodore 64.

As you’ve seen, you can SAY any of the words in the Magic Voice built-in vocabulary, ONE WORD AT A TIME, if you . . .

1. Type the SAY command
2. Enclose the word you want to say in QUOTATION MARKS
3. Press the RETURN key to activate speech

2. Making Plural Words

Let’s learn another secret of the Magic Voice — how to make plural words, words that end in “S”. Try typing this example exactly as shown:

```
SAY“COMPUTER”:SAY“SSSS”       (press the RETURN key)
```

Did you hear “S” at the end of the word “COMPUTER”? There’s a special utterance in the Magic Voice vocabulary which produces an “S” sound for pluralizing words . . . the special utterance is spelled with FOUR “S’s”.

Before we learn how to write simple computer programs that ”talk”, let’s take a quick look at the Magic Voice built-in vocabulary . . .

3. Using the Built-in Vocabulary

There are 235 utterances built into the Magic Voice vocabulary, which means you can mix and match a wide range of words and sounds to come up with all types of sentences. Colors, numbers, math words, computer words . . . they're all here. Most of the common words you'll want to use in your programs are included.

Take a look at the alphabetical listing on Page 22. Notice that each word also has a VOCABULARY NUMBER. If you like, you can use the number instead of the word. For example, look at the word "READY" which has the VOCABULARY NUMBER 144. Now try these two examples:

SAY"READY"	(press the RETURN key)
SAY144	(press the RETURN key)

Both examples have the same result. Remember . . . if you SAY an utterance be sure to put it in quotation marks. If you SAY the VOCABULARY NUMBER of the utterance, do not use quotation marks; just type SAY and the number.

4. Beginner's Programming Tips — How Basic Programs Work

So far, you've typed all commands DIRECTLY into the computer . . . but a much more efficient way is to type the same commands using a COMPUTER PROGRAM. Computer programs for your COMMODORE 64 are written in the computer language called BASIC, which is built into your Commodore computer.

If this is your first experience with BASIC PROGRAMMING, the following information may help you get started with the examples we're going to explore:

A BASIC program consists of one or more NUMBERED LINES with BASIC commands on each line. Every time you type a number at the far left margin followed by a valid BASIC command, your computer REMEMBERS what you typed and stores that line in its memory. BASIC programs are typically numbered by tens (10, 20, 30 and so on) . . . that's so you can go back later and insert additional lines (11, 12, 13, etc). A BASIC program using the Magic Voice looks like this . . . try typing it:

```
10 SAY“COMMODORE”        (press RETURN)
20 SAY“COMPUTER”         (press RETURN)
30 SAY“SSSS”             (press RETURN)
```

Type the word RUN and press the RETURN key to hear the program, then type the word LIST and press RETURN to see the program listed. Here are a few “basic” rules for beginning programmers:

- Always start a program line at the far LEFT (first) column on your screen.
- You must press the RETURN key at the end of each line to enter it into the computer's memory.
- A program actually doesn't start working until you type the word RUN and press the RETURN key. To STOP a program which keeps running, press the RUN/STOP key.
- To view your program lines, type the word LIST and RETURN.
- To erase an entire program, type the word NEW and RETURN.
- To erase one line in a program, type the LINE NUMBER BY ITSELF and press RETURN, or else RETYPE the entire line.
- To edit any line, LIST the program, then move the cursor to the line you want to change, change it and press RETURN.

Counting From 1 to 10

If you type the SAY command with a word, the word must be in quotation marks, but if you type the SAY command with the NUMBER of the word, you don't use quotation marks. This NUMBERING feature was included because using numbers allows BASIC programmers to conserve space in their programs. Here's a short example:

```
10 FORX=1TO10            (press RETURN)
20 SAYX                  (press RETURN)
30 NEXT                  (press RETURN)
```

Type the word RUN and press the RETURN key. Note that the vocabulary numbers zero to ten are the same as the spoken numbers.

SAYing the Alphabet

Now type the following line exactly as shown, then type the word RUN and press the RETURN key:

```
10 FORX=21TO46      (press RETURN)
```

This is the same as the counting program, except here we substituted vocabulary numbers 21 to 46, which are the numbers of the letters A through Z.

Well, your computer is starting to talk — but what if you want to create longer sentences? This requires some simple computer programming . . . whether you're a beginner or expert, you'll be surprised how easily you can program speech using the Commodore Magic Voice.

5. Your First Sentences

Here's a little program which speaks a sentence. Type the word NEW and press RETURN to erase your previous program, and type the example as shown:

```
10 FORX=1TO5
20 READA$
30 SAYA$:NEXT
40 DATACOMMODORE,COMPUTER,SSSS,ARE,TERRIFIC
```

Type RUN and press RETURN. Is this a terrific sentence? Here's how the program works:

Line 10: A FOR...NEXT loop tells the computer to count from 1 to 5. The NEXT command farther down in the program tells the computer to perform all the actions between the FOR and NEXT commands . . . in this case, READ and SAY 5 words from the DATA statements.

Line 20: READA$ means look at the DATA in Line 40 and "read" it one item at a time (there are 5 items), all separated by commas.

Line 30: SAYA$ tells the speech module to speak each item, one item at a time. The NEXT command is the other part of the FOR...NEXT loop. FORX=1TO5 told the computer to perform the following actions 5 times (READA$ and SAYA$ which means READ one item from the DATA statements and SAY that item) and the NEXT command said go back and do it again until the LIMIT (5) is reached.

Line 40: The DATA contained here consists of 5 "words" which together make up the sentence you just programmed. The sentence the computer spoke was: "COMMODORE COMPUTERS ARE TERRIFIC".

Remember that a plural word requires that you add four S's as a separate word, immediately after the word you want to pluralize.

Now type the word NEW and press the RETURN key to erase your previous program.

Here's another example which includes 7 utterances...type this as shown:

```
10 FORX=1TO7                                    (RETURN)
20 READA$                                       (RETURN)
30 SAYA$:NEXT                                   (RETURN)
40 DATAYOUR,COMMODORE,SIX,TY,FOUR,CAN,TALK      (RETURN)
```

Type and RUN this program. (Note if you missed a comma or made another mistake, the computer will give you an ERROR message . . . LIST your program and retype the line which is wrong.) Here, the sentence reads: "Your Commodore 64 can talk." Did you notice that in LINE 40 we split the word SIXTY into two parts — SIX and TY? This is because our researchers were able to save more space for extra words in our vocabulary by using the "TY" and combining it with FOUR to make FORTY, FIF to make FIFTY, SIX to make SIXTY, SEVEN to make

SEVENTY, and so on . . . otherwise we would need separate words for all of these numbers and you would have fewer words for making sentences. The same applies to numbers in the "teens" — for example, THIRTEEN becomes two separate words: THIR and TEEN.

6. SAY and Spell

This little program will show you some general programming tips, as well as how to turn your computer into a SPELLING MACHINE. Type in this program:

```
10POKE53280,6:POKE53281,0:POKE646,7
20PRINTCHR$(147)TAB(240)
30PRINT"TYPE A WORD AND PRESS RETURN":INPUTX$
40FORY=1TOLEN(X$)STEP1:SAYMID$(X$,Y,1):NEXT
50GOTO10
```

Type the word RUN and press the RETURN key, then enter any word (no spaces or numbers) and press the RETURN key. Your COMMODORE 64 will automatically SPELL OUT LOUD the word you typed. The program keeps "looping back" to itself, which means it will keep asking you to type in a word . . . to get out of this "loop", hold down the RUN/STOP key and at the same time, press the RESTORE key. You can always stop a program which is running in this way. The computer will clear itself, BUT YOUR PROGRAM IS STILL IN THE COMPUTER so if you RUN or LIST it, it's still there. Let's see how this program works:

LINE 10 includes 3 POKE commands which change the screen and border colors. POKE 53280 followed by a comma and a number from 0 to 15 will change the BORDER COLOR. POKE 53281 changes the SCREEN COLOR and POKE 646 changes the CHARACTER COLOR. So the first POKE changes the border to blue, the second POKE changes the inside screen to black and last POKE changes the character color to yellow. You can type these POKEs directly into the computer without writing a program. Try experimenting yourself with different color combinations!

LINE 20 clears the screen (PRINTCHR$(147) is the same as PRINT"CLR/HOME") and TABs 240 spaces from the upper left corner, which just happens to be 6 lines down on your screen — this is used to position the message.

LINE 30 PRINTs the message on the screen. The INPUTX$ command tells the computer to wait until you type in a word (letters only, no numbers or spaces) and automatically prints a question mark.

LINE 40 uses a FOR...NEXT loop. Remember we said that a FOR...NEXT loop causes all the actions between the FOR and NEXT to be performed, up to the limit of the loop? Here, we start by saying that the loop limits are from 1 (the first letter) up to the LENgth of the word you typed in. LEN(X$) means the length of the word you type in, which the computer has defined as “X$”. So if you type a 9-letter word like “COMMODORE”, the length of the word is 9 and the loop becomes: FORY= 1TO9. The next portion SAYMID$(X$,Y,1) tells the computer which letter to say. X$ is your word. Y is the position of the letter — it starts with position 1 and changes each time until the “loop” reaches the limit, which is 9, or the LENgth of our word. The number 1 can be considered as a “constant” for the purpose of this discussion.

LINE 50 uses a GOTO statement. This causes the computer to go back to the beginning of the program and start over again at LINE 10.

7. SAYing Numbers

The following example gives you a fairly simple way of telling the computer to SAY numbers generated in your program. It doesn't matter whether the numbers being generated come from a student entering the answer to a question, or are being used to repeat a number out loud for an accountant who doesn't have time to look up from a checklist during a calculation . . . whatever the use, it's helpful if the computer is able to speak all numbers up to 999,999,999.

```
5    DIMB%(12)
10   FORL= 1TO9:READA$(L):NEXT:FORL= 2TO9:READB$(L):NEXT:
     FORL= 0TO9:READC$(L):NEXT
15   FORL= 1TO2:READD$(L):NEXT
20   POKE53280,6:POKE53281,0:POKE646,7
25   PRINTCHR$(147)TAB(240)
30   PRINT“TYPE A NUMBER AND PRESS RETURN”:INPUTZ
35   IFZ>999999999THEN:SAY“TOO”:SAY“LARGE”:GOTO25
40   IFZ< – 999999999THEN:SAY“TOO”:SAY“SMALL”GOTO25
45   IFZ<0THEN:SAY“MINUS”
50   IFZ= 0THEN:SAY“ZERO”:GOTO25
55   D= 0:Z$= STR$(Z):RATE(2)
60   FORL= LEN(Z$)TO2STEP– 1:B%(D)= VAL(MID$(Z$,L,1)):
     D= D+ 1:NEXT
65   FORL= INT(D/3)TO0STEP– 1:A= B%(L*3+ 2):B= B%(L*3+ 1):
     C= B%(L*3)
70   IFA>0THEN:SAYA$(A):SAY“HUNDRED”
75   IFB>1THEN:SAYB$(B):IFB$(B)<>“TWENTY”THEN:SAY“TY”
80   IFB= 1THEN:SAYC$(C):IFC>2THEN:SAY“TEEN”GOTO90
85   IFC>0ANDB<>1THEN:SAYA$(C)
90   IFA+ B+ C>0ANDL>0THEN:SAYD$(L)
95   NEXT:RUN
100  DATAONE,TWO,THREE,FOUR,FIVE,SIX,SEVEN,EIGHT,NINE
110  DATATWENTY,THIR,FOUR,FIF,SIX,SEVEN,EIGHT,NINE
120  DATATEN,ELEVEN,TWELVE,THIR,FOUR,FIF,SIX,SEVEN,
     EIGHT,NINE
130  DATATHOUSAND,MILLION
READY
```

8. The RATE Command — Changing the Talking Speed

You can change the “rate” or speed at which utterances are said, by adding a special command called the RATE command. Here’s an example:

```
10 RATE1:SAY“APOSTROPHE”
20 RATE4:SAY“APOSTROPHE”
30 RATE8:SAY“APOSTROPHE”
40 RATE10:SAY“APOSTROPHE”
```

Type RUN and press RETURN. Did you hear the difference in the rate each number was spoken? The computer talked slower each time. There are 10 RATE settings. RATE1 is the FASTEST speech and RATE 10 is the slowest. RATE4 is standard.

Here’s a program that lets you vary the RATE of EACH WORD spoken in a sentence — the RATE settings in the DATA statements cause the utterances which FOLLOW to be spoken at that rate, until a different rate is specified. This is helpful in fine-tuning your programs to provide more natural sounding speech.

```
10    PRINT“CHANGING RATE IN SENTENCE”
20    GOSUB 5000
30    PRINT“PRESS ANY KEY FOR ANOTHER PHRASE”
40    GETA$:IFA$= “”THENGOTO40
50    GOSUB5000
60    SAY“AGAIN”:INPUT“AGAIN”;A$
70    IFLEFT$(A$,1)<> “Y”THENEND
80    RESTORE:GOTO10
5000  READSP$                         gets a word from DATA below
5010  IFSP$= “.”THENRETURN            if the word is a period then
                                      RETURNs above
5020  IFLEFT$(SP$,4)=“RATE”THENREADSP:RATE(SP):GOTO500
                                      if word is “RATE” —
                                      then READ the next
                                      number to set RATE
5030  SAYSP$                          say the word
5040  GOTO5000                        do it again
5050  DATATHE,COMMODORE,RATE,1,SIX,TY,FOUR,RATE,4
5060  DATAIS,TERRIFIC,RATE,6,BECAUSE,RATE,3,NOW
5070  DATAIT,RATE,2,CAN,RATE,4,TALK,.
5080  DATARATE,5,THIS,RATE,3,IS,RATE,8,GOOD,.
```

9. Using The RDY Command

Because your COMMODORE 64 has the ability to generate speech simultaneously and independently of music and graphics, sometimes it becomes necessary to tell the computer to wait until speech is completed so that an animation, song or sound effect is properly timed in relation to speech.

Here's a quick example of how you might use the RDY command . . . first, type the word NEW and press RETURN to erase any previous programs, then type in this program . . . notice that spoken words and printed words aren't synchronized properly:

```
10 PRINT“THIS”:SAY“THIS”
20 PRINT“WORD”:SAY“WORD”
30 PRINT“IS”:SAY“IS”
40 PRINT“BLUE”:SAY“BLUE”
```

Now type the word NEW and press RETURN, then enter this program:

```
10 IFNOTRDYTHENGOTO10
15 PRINT“THIS”:SAY“THIS”
20 IFNOTRDYTHENGOTO20
25 PRINT“WORD”:SAY“WORD”
30 IFNOTRDYTHENGOTO30
35 PRINT“IS”:SAY“IS”
40 IFNOTRDYTHENGOTO40
45 PRINT“BLUE”:SAY“BLUE”
```

The RDY command tells the computer that if NOT READY (in other words, if the computer isn't finished speaking the last word), THEN GOTO the same line and keep going back until the word is finished. Only then does the program drop through to the next command. The RDY command is often used as a NOTRDY condition as shown here. It can be used in a similar way if you are programming simultaneous graphics and speech or music and speech because the computer can process speech, graphics and music simultaneously, which means sometimes you will want the computer to wait until an utterance is completed before proceeding with a song, displaying a graphic symbol, or PRINTing a message on the screen.

3. SUMMARY OF BASIC SPEECH COMMANDS

This section describes the Magic Voice program mode from the BASIC language. This feature gives users the ability to write their own games and applications using the Magic Voice preprogrammed vocabulary. Four new commands have been added to Commodore BASIC to make speech easy to use.

1. SAY Command

This command asks the Magic Voice to say a specific word from its preprogrammed vocabulary or additional vocabularies from diskettes, cassettes, and ROM cartridges. The Module accepts either the word number as a numeric expression with a value of 0,...,234; or a BASIC text string spelling out the word to be said. The distinction is made automatically by the module based on the type (string or numeric) of the argument it receives.

Examples:

```
SAY“HI”     (Module says “HI”)
B$=“HI”
SAY B$      (Module says “HI”)
SAY 21      (Module says word #21 in its vocabulary)
X=21
SAY X
SAY(3*7)
```

2. RATE Command

This command sets the rate or speed at which words and phrases are spoken. Ten speeds are available ranging from 0.65 times slower to 1.4 times faster than the standard rate. The fastest rate is #1, the standard rate is #4, and the slowest rate is #10. The RATE command must be passed a numeric argument.

Example:

```
FOR I=1TO10
RATE(I)                 :REM SET SPEED
SAY “HI”                :REM NOW LISTEN TO IT
NEXT I
```

3. VOC Command

This command alerts the speech module to the presence of an extended vocabulary loaded into system memory. This vocabulary might come from optional disks or cassettes. This command is only needed when additional vocabulary data has been loaded into memory. Look for upcoming additional vocabulary from your Commodore dealer.

Example:

```
LOAD"FISH.VOCAB",8,1
FISH=32768            :REM ADDRESS OF VOCAB DATA
VOC(FISH)             :REM TELL SPEECH MODULE
SAY"SHARK"            :REM MODULE SAYS "SHARK"
```

4. RDY Command

This command is for use in many advanced applications. It is a logical function which returns the value true if the Magic Voice is ready to accept another SAY command and false if not.

Example:

```
10 IF NOT RDY THEN 10
20 SAY "HI"
30 IF NOT RDY THEN 30
40 SAY "BYE"
```

This command can also be used by BASIC programs to detect the presence of a speech module in a system. The variable named "RDY" will be zero when a program is LOADed and RUN if a speech module is not present. If the module is present the value of "RDY" will be −1.

5. Error Conditions

The Magic Voice detects and informs the user of certain kinds of errors that it detects. The most common of these occurs when the user tries to "SAY" a word that is not in the module's vocabulary. When this happens, the module will flag an error to BASIC and the message "ILLEGAL QUANTITY ERROR" will appear on the screen.

The module's other functions (RATE & VOC) require numeric arguments. These functions will return the "? TYPE MISMATCH ERROR" message if called with a non-numeric argument.

6. Discussion

This simple command set gives the user the ability to program simultaneous speech output, music, and graphics actions. You may have noticed if you tried any of these examples that the BASIC READY message appears on the screen almost instantly — before the Magic Voice has finished saying what you asked it to say!

This is because the SAY command doesn't actually do the work of generating the speech output. It merely initiates the process by asking the module to start saying a word. Once the SAY command is finished "asking" the module to get started, the module operates independently and execution of our BASIC program continues while the speech is being produced! This is how combined speech, music, and graphics is possible.

The RDY command is included in order for your program to determine what the module is doing at any time. As an example, your program might start with a SAY"HI" and then play a three note tune. If you wanted to play the tune after the word "HI" was finished, you would use the following kind of program:

```
10  SAY "HI"
20  IF NOT RDY THEN 20
30  GOSUB 1000          :REM SUBROUTINE TO PLAY TUNE AT 1000
```

Several exciting examples of games that are created easily using these BASIC language commands and the pre-programmed vocabulary are included in this Commodore 64 Magic Voice User's Guide.

4. PROGRAMMING SPEECH IN ASSEMBLY LANGUAGE

The Commodore 64 Magic Voice includes a collection of linkage routines necessary to allow user assembly language programs to operate the speech synthesizer. User programs can "say" any of the built-in words and phrases as well as their own specially prepared speech data.

The synthesized signal is brought into the SID chip as an external input and mixed with music generated by the SID. It is important to note that the SID master volume must be turned on in order to hear the synthesized speech. The Magic Voice initializes the SID chip to a volume setting of 15 on power-up. User programs that manipulate the SID volume setting should restore it to 15 before attempting to generate speech output since the built-in talk command software does NOT interact with the SID in any way.

The design philosophy of the assembly language interface is that user access to the speech module occurs via service calls from the user program. Code to handle these service calls is copied into RAM at $C000-$C3FF at system power-on. In addition, the core of the speech driver routines and the native vocabulary of the Magic Voice are copied into RAM underneath the BASIC and KERNAL ROMs.

IT IS VERY IMPORTANT NOT TO DISTURB RAM MEMORY LOCATIONS $A000-$C3FF AND $E000-$FFFF for proper module operation. Programs which load their own speech data and do not rely on the built-in words and phrases of the module must only preserve $A000-$A800 and $C000-$3FF.

The assembly language interface consists of subroutine calls with the arguments passed in the A and X registers.

There is a separate subroutine for each of the following functions:

- Reset speech module
- Get speech module status
- Say a word

Detailed functional descriptions and calling specifications are provided below.

1. Assembly Language Calling Procedures

Upon power-up the speech module copies certain linkage code into memory locations $C000 to $C3FF and then enters a memory mapping mode appropriate to the demands of the cartridge. The cartridge program gains access to the module's programs by JSR'ing to the linkage programs which reside in that RAM area (which is active in all memory map modes).

Where possible, the calling procedures have been designed with ease of use in mind. Functions requiring a single byte except that byte in the processor's A-register. Where two bytes are needed the A-register and the X-register are both used. Only when a count is needed is the Y-register used. Registers are preserved only as indicated in the detailed descriptions below. The conventional uses of the registers are as follows:

A-register: complete operand or low byte if an address is passed.
X-register: upper byte if an address is passed
Y-register: count (0 implies 256).

2. Memory Requirements

Use of the speech module impacts the programmer's planning of memory utilization in several ways:

- RAM locations $C000 thru $C3FF are used for the linkage code and must NOT be modified by the application program.
- The following zero page locations are used during the voice synthesis process (including NMI processing after speech is initiated).

  $9B
  $9C
  $A7
  $A8
  $BD
  $BE
  $FB
  $FC
  $FD
- The NMI vector needed for voice synthesis is planted in locations $0318 and $0319 at the start of the synthesis operation. The original vector is relocated to locations $0338 and $0339. This original value is restored when synthesis is complete.

3. Assembly Routines

SRESET — Reset The Speech System/Stop Talking

ENTRY: $C003

ENTRY CONDITIONS: NONE

RETURNED INFORMATION: Accumulator is destroyed.

This command resets the synthesizer hardware. It should be included in applications programs for initialization purposes and may be used to stop speech output in mid-utterance.

SPSTAT — Get Status Of Speech Module

ENTRY: $C006

ENTRY CONDITIONS: NONE

RETURNED INFORMATION: ACC = 0 if ready/ – 1 if busy talking.

The N and Z bits of the processor status word are set accordingly. This command may be used to determine whether the speech module has completed previous "sayit" requests and whether a new "sayit" request can be handled immediately.

SAYIT — Say A Word

ENTRY: $C009

ENTRY CONDITIONS: X-reg = most significant portion of the word number. A-reg = least significant portion.

RETURNED INFORMATION: All registers destroyed.

This command initiates the synthesis of a word or phrase. Control is returned to the calling program almost immediately if the module is not already talking. If the module is talking, then control will not be returned until the current request can be initiated. Words number 0 through 255 are words which are in the speech module. Words number 256 through 4095 are interpreted as located in the user's program space.

CAUTION: Special care should be taken to ensure that no other process in the system that generates NMI's is active when the calls to the speech synthesizer are made. This includes the RS-232 channel and the serial bus devices. The RS-232 channel is the only channel which must actually be CLOSED. The serial bus channels may be open and may be left opened, but must not actively transmit data. It is recommended that programs which wish to perform series use I/O check, via SPSTAT to ensure that speech output is complete before initiating the operations.

SAYRAM — Say A Word From RAM.

ENTRY: $C00C

ENTRY CONDITIONS: X-reg = most significant portion of the word number. A-reg = least significant portion.

RETURNED INFORMATION: All registers destroyed.

This command is similar to the "SAYIT" except that the structure permitting access through the memory mapping system is bypassed. This entry point is intended to permit generation of speech from RAM based speech data. This may also be useful if RAM versions of words are modified under program control.

Speech is generated as in the SAYIT command above. Utterances 0...255 are taken from the on-board vocabulary and utterances 256...4095 are taken from memory as established by the SETTAB routine. No mapping is performed. Speech data is taken directly from the program's address space.

NOTE: See caution under SAYIT above.

SPEED — Set Speaking Speed Of Synthesizer

ENTRY: $C00F

ENTRY CONDITIONS: A-reg = desired speed code from 1...10.

RETURNED INFORMATION: No register affected.

The SPEED capability is used to speed up or slow down the speaking rate of the synthesizer. The range of speed variations is from .65X decrease in the speed (speed code = 10) to a 1.4X increase (speed code=1) Normal speed is speed code 4.

SETTAB — Set Utterance Look Up Table Address

ENTRY: $C012

ENTRY CONDITIONS: A-reg = lower byte of address. X-reg = upper byte of address.

RETURNED INFORMATION: None.

The SETTAB function is used to tell the speech module the starting memory address of user supplied speech data. It is identical to the BASIC VOC command. This command MUST be employed prior to any attempts to generate speech with utterance numbers greater than 255.

SIGNAL — Enable Vectoring To Completion Code

ENTRY: $C015

ENTRY CONDITIONS: JMP instruction to completion code handling routine MUST be planted in memory locations $C018-$C01A

RETURNED INFORMATION: None.

This function is for support of advanced applications which implement asynchronous event driven programming techniques. The effect of the SIGNAL call is to increment a counting semaphore maintained by the talking process. This semaphore is waited on by the speech completion, which when signalled, will jump to the completion code vector address ($C018). Users should plant a JMP instruction in the three bytes of memory starting at this address. ONLY $C018-$C01A SHOULD BE CHANGED.

This JMP instruction should point into user code which handles the completion of the speech output event. The user completion routine MUST terminate with an RTS instruction. Completion code handlers may be used for a variety of purposes but, in general, should be kept short since IRQ's are disabled and NMI's are ignored during this time.

NOTE: This facility also provides a means for user programs to detect the presence or absence of a speech module: a power-up footprint. The completor code vector area ($C018-$C01A) is initialized on power-up to the instruction sequence:

```
$C018     NOP
$C019     NOP
$C01A     RTS
```

These instructions correspond to the values $EA, $EA, $60. User programs may detect the presence of a module by verifying that these locations contain the given values.

5. APPENDIX

1. Resident Vocabulary

The Magic Voice contains a built-in vocabulary of 235 utterances in a female voice. The utterances are numbers 0 to 234. The following is a numerical listing of the utterances contained in the Commodore 64 Magic Voice.

0	ZERO
1	ONE
2	TWO
3	THREE
4	FOUR
5	FIVE
6	SIX
7	SEVEN
8	EIGHT
9	NINE
10	TEN
11	ELEVEN
12	TWELVE
13	THIR
14	FIF
15	TWENTY
16	HUNDRED
17	THOUSAND
18	MILLION
19	TEEN
20	TY
21	A
22	B
23	C
24	D
25	E
26	F
27	G
28	H
29	I
30	J
31	K
32	L
33	M
34	N
35	O
36	P
37	Q
38	R
39	S
40	T
41	U
42	V
43	W
44	X
45	Y
46	Z
47	(SILENCE)
48	ADD
49	SUBTRACT
50	DIVIDE
51	DIVIDED
52	EQUALS
53	LESS
54	MINUS
55	MORE
56	NUMBER
57	PLUS
58	REMAINDER
59	IT
60	AT
61	WHEN
62	HAS
63	TIMES
64	APOSTROPHE
65	WORD
66	ER
67	EST
68	ING
69	SSSS
70	TH
71	ALL
72	ME
73	MY
74	THAT
75	THEIR
76	THEY'RE
77	THIS
78	WHAT
79	WHICH
80	WHO
81	YOUR
82	YOU'RE
83	ANSWER
84	COMMODORE
85	END
86	POINT
87	THING
88	QUESTION
89	TURN
90	AM
91	ARE
92	BE
93	BUY
94	CAN
95	CORRECT
96	DID
97	DO
98	DOES
99	DONE
100	FIND
101	GET
102	HAVE
103	HEAR
104	HELP
105	IS
106	KNOW
107	LIKE
108	PRESENTS
109	READ
110	SAY
111	SEE
112	START
113	USE
114	WAIT
115	WANT
116	WAS
117	WON
118	WRITE
119	HERE
120	HIGH
121	HOW
122	THERE

123	TOO
124	WHERE
125	WHY
126	UH
127	AN
128	AND
129	AS
130	BUT
131	BY
132	FOR
133	FROM
134	IF
135	IN
136	LARGE
137	NEXT
138	NOT
139	OF
140	OFF
141	OH
142	ON
143	OR
144	READY
145	SAME
146	THAN
147	THE
148	THUH
149	THEN
150	TO
151	WITH
152	VERY
153	BYE
154	HI
155	PLEASE
156	THANK
157	YES
158	BAD
159	GOOD
160	SORRY
161	WRONG
162	AFTER
163	MOST
164	BECAUSE
165	NO
166	OUT
167	SEND
168	TALK
169	ANY
170	EACH
171	ENTER
172	ERROR
173	MANY
174	EVERY
175	AGAIN
176	NOW
177	SMALL
178	TERRIFIC
179	TRY
180	LETTER
181	FIRST
182	SECOND
183	THIRD
184	COLOR
185	BLACK
186	WHITE
187	RED
188	CYAN
189	PURPLE
190	GREEN
191	BLUE
192	YELLOW
193	ORANGE
194	BROWN
195	GREY
196	LIGHT
197	HE
198	OUR
199	SHE
200	WE
201	YOU
202	COME
203	GIVE
204	PUT
205	SET
206	TAKE
207	WERE
208	UNTIL
209	MAY
210	OVER
211	DARK
212	COMMAND
213	COMPUTER
214	CONTROL
215	CURSOR
216	DISK
217	DOWN
218	GAME
219	KEY
220	LEFT
221	LOAD
222	NAME
223	PLAY
224	PRESS
225	PROGRAM
226	RIGHT
227	RUN
228	SAVE
229	STOP
230	SYMBOL
231	TAPE
232	UP
233	WEIGHT
234	HOUR

2. Alphabetical List Of Words

A	21
ADD	48
AFTER	162
AGAIN	175
ALL	71
AM	90
AN	127
AND	128
ANSWER	83
ANY	169
APOSTROPHE	64
ARE	91
AS	129
AT	60
B	22
BAD	158
BE	92
BECAUSE	164
BLACK	185
BLUE	191
BROWN	194
BUT	130
BUY	93
BY	131
BYE	153
C	23
CAN	94
COLOR	184
COME	202
COMMAND	212
COMMODORE	84
COMPUTER	213
CONTROL	214
CORRECT	95
CURSOR	215
CYAN	188
D	24
DARK	211
DID	96
DISK	216
DIVIDE	50
DIVIDED	51
DO	97
DOES	98
DONE	99
DOWN	217
E	25
EACH	170
EIGHT	8
ELEVEN	11
END	85
ENTER	171
EQUALS	52
ER	66
ERROR	172
EST	67
EVERY	174
F	26
FIF	14
FIND	100
FIRST	181
FIVE	5
FOR	132
FOUR	4
FROM	133
G	27
GAME	218
GET	101
GIVE	203
GOOD	159
GREEN	190
GREY	195
H	28
HAS	62
HAVE	102
HE	197
HEAR	103
HELP	104
HERE	119
HI	154
HIGH	120
HOUR	234
HOW	121
HUNDRED	16
I	29
IF	134
IN	135
ING	68
IS	105
IT	59
J	30

K	31
KEY	219
KNOW	106
L	32
LARGE	136
LEFT	220
LESS	53
LETTER	180
LIGHT	196
LIKE	107
LOAD	221
M	33
MANY	173
MAY	209
ME	72
MILLION	18
MINUS	54
MORE	55
MOST	163
MY	73
N	34
NAME	222
NEXT	137
NINE	9
NO	165
NOT	138
NOW	176
NUMBER	56
O	35
OF	139
OFF	140
OH	141
ON	142
ONE	1
OR	143
ORANGE	193
OUR	198
OUT	166
OVER	210
P	36
PLAY	223
PLEASE	155
PLUS	57
POINT	86
PRESENTS	108
PRESS	224
PROGRAM	225
PURPLE	189
PUT	204
Q	37
QUESTION	88
R	38
READ	109
READY	144
RED	187
REMAINDER	58
RIGHT	226
RUN	227
S	39
SAME	145
SAVE	228
SAY	110
SECOND	182
SEE	111
SEND	167
SET	205
SEVEN	7
SHE	199
(SILENCE)	47
SIX	6
SMALL	177
SORRY	160
SSSS	69
START	112
STOP	229
SUBTRACT	49
SYMBOL	230
T	40
TAKE	206
TALK	168
TAPE	231
TEEN	19
TEN	10
TERRIFIC	178
TH	70
THAN	146
THANK	156
THAT	74
THE	147
THEIR	75
THEN	149
THERE	122
THEY'RE	76
THING	87
THIR	13
THIRD	183
THIS	77
THOUSAND	17

THREE	3
THUH	148
TIMES	63
TO	150
TOO	123
TRY	179
TURN	89
TWELVE	12
TWENTY	15
TWO	2
TY	20
U	41
UH	126
UNTIL	208
UP	232
USE	113
V	42
VERY	152
W	43
WAIT	114
WANT	115
WAS	116
WE	200
WEIGHT	233
WERE	207
WHAT	78
WHEN	61
WHERE	124
WHICH	79
WHITE	186
WHO	80
WHY	125
WITH	151
WON	117
WORD	65
WRITE	118
WRONG	161
X	44
Y	45
YELLOW	192
YES	157
YOU	201
YOU'RE	82
YOUR	81
Z	46
ZERO	0

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