FOR
ATARI
COMPUTERS

LEARN TO
PROGRAM

S.A.M.
TUTORIAL

TRICKY TUTORIAL™ no.12

```
87,34:POKE 207,99:NEXT I:F
X+27,Y+88:SOUND 0,2,8,10:F
12:FOR I = LEN(ABS(INT(X/
GOSUB 50:READ BOOK:BOOK
= PEEK(242):LIST 800,120
```

EDUCATIONAL SOFTWARE INC

THE S.A.M. TUTORIAL
TRICKY TUTORIAL #12

by

CHARLIE PARKER

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INTRODUCTION

When we last left our hero, N. Nerdwell (the III), he was about to show his girlfriend the latest TRICKY TUTORIAL(tm), number 1410, from ESI. We join him as he inserts his Lazovision 2EX4 computer module into it's hole:

"Welcome students to Professor Von Chip's tutorial on speech synthesis. This tutorial will teach you everything you need to know about making S.A.M. talk (and even sing) on your Atari 400 or Atari 800 computer." S.A.M. stands for Software Automated Mouth and is a registered trademark of Don't Ask Software Inc., SAM's creators. SAM itself (himself?) is not on the SAM tutorial disk. Therefore you must have the SAM disk from Don't Ask Software in order to use this tutorial.

WAIT!

If you accidently bought this tutorial because you LOVED the first 11, but don't yet have SAM, you shouldn't return it to us yet. SAM is the best thing since wheat bread, so run out immediately (I know it is the middle of the night) and buy SAM. If you mention Nerdwell sent you, they will only add 15% to the price.

Since many of the terms used in this tutorial may be new to you, a Glossary of terms is included at the rear of this manual. If you see a term that you do not understand then flip back to the Glossary for a definition of the term. If you still don't find the term, look in your SAM manual or your ATARI Basic manual.

Unlike most speech synthesizers which require special hardware that you must buy, SAM is totally software driven. SAM uses audio register zero (Sound 0,#,#,#) of the computer to produce speech. Thus, everything you need to hear SAM talk is on the SAM disk.

INTRODUCTION

The following programs are included in this tutorial:

PHONEMES - This program will show you the phonemes that SAM uses to produce speech. You can use a joystick to select a phoneme, then press the trigger to hear SAM say the phoneme.

PUNCT - You can affect SAM's speech by using punctuation along with the phonemes. This program will let you listen to the affect that punctuation has on SAM's speech.

STRESS - One of the key features of SAM is the ability to add stress or inflection to the speech. This gives SAM more of a natural sounding voice. This program will let you listen to the affect the different stress values have on SAM's speech.

GRAPHICS - SAM's speech is totally software driven, but the vertical blanking routine built into the Atari operating system causes SAM's speech to become distorted unless the vertical blanking routine (VBI) is disabled during speech. The GRAPHICS program allows you to listen to SAM talk using different graphics modes both with, and without, the VBI disabled. We won't get into what VBI is. Just think of it being off or on.

KNOBS - Knobs is a new feature of SAM and was not included in the older versions. For that reason the KNOBS feature is included on this tutorial disk. Please don't write in complaining that you already have it. It is for those who don't. Please DO write in if you find other problems with the TUTORIAL. The KNOBS tutorial program will show you how to use the KNOBS feature.

SINGING - This program explains the fundamentals of making SAM sing by showing you how to expand the diphthongs.

DAISY - In this program you can hear SAM sing the ever-popular song, DAISY DAISY.

SONGEDIT - This program will let you create a song for SAM to sing. With it you can create, edit and hear files containing the words and music for the song.

SINGIT - With this program you can make SAM sing the songs created with the SONGEDIT program.

SONG.DAT - This is not a program. This is the file containing the words and music for the song DAISY DAISY. You can use the SONGEDIT program to edit this file if you like. Also, you can use the SINGIT program to make SAM sing the song.

DEFAULTS.LST - This is a routine that you can ENTER into your own programs for SAM. The routine performs two functions - verifying that the required binary load files have been loaded, and setting all of the SAM registers to the default value.

Also included on the tutorial disk is a program called MENU that lists the programs on the disk. You can use a joystick to pick the program you want. Each of the tutorial programs returns to the menu when you press the OPTION key.

Most of the SAM tutorial programs introduce you to the features and options available with SAM and do not include technical information on how to integrate these features into your own programs. Then what good is all of this. The idea of the lesson is to allow you to actually make changes that you can only read about in the manual that comes with SAM. Things like Phonemes are pretty hard to understand when reading about them, but make sense when you can hear them.

Appendix D of this tutorial gives you all of the technical information on how to use the features in your own programs. A complete list of pokes and peeks to be used with SAM is provided as well as some sample routines.

INTRODUCTION

GETTING STARTED

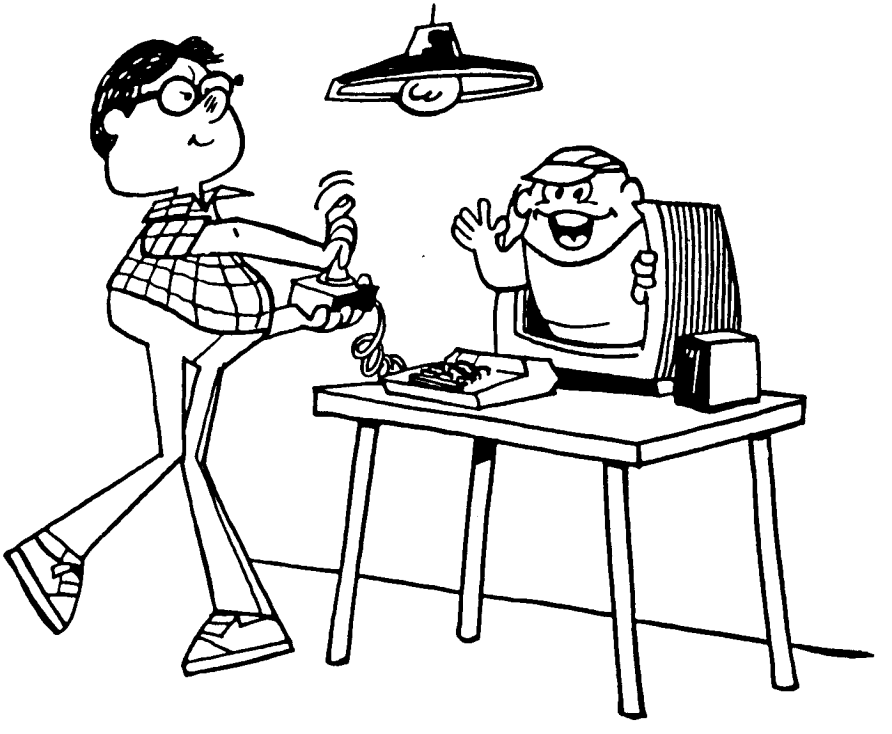
To use this tutorial you must first boot in the SAM program by following these instructions:

1) If the computer is not off then turn it off.

2) Turn the disk drive on and insert the SAM disk from Don't Ask Software Inc.

3) Turn the computer on.

This will load in the SAM program. After you see the READY prompt, remove the SAM disk and insert the SAM tutorial disk from Educational Software Inc. Then run the MENU program by typing in RUN "D:MENU". You can then use a joystick to select the desired tutorial program.



USING SAM'S PHONETIC LANGUAGE

The SAM disk from Don't Ask Software contains a program called RECITER that is an English text-to-speech program. RECITER uses about 450 rules to convert English into SAM's phonetic language. So it is not absolutely necessary for you to know SAM's phonetic language in order to make SAM talk. Although the RECITER program does an excellent job of converting text to speech, it has its limitations. First, it cannot correctly convert ALL text. There are certain conditions in which the translation is not exactly correct. But secondly, and most importantly, the translator has no way of knowing exactly where the stress or inflection should be placed. As you will see in the STRESS tutorial program, inflection placed at different locations within the speech can actually change the meaning of the words. Therefore, where the highest quality speech with full inflection is desired, you will need to learn SAM's phonetic language.

What is a phoneme (pronounced foe'neem)? It is the smallest contrastive unit of sound in the system of language. For example, the 't' in the word 'tip' or the 'th' in the word 'thin'. Using phonemes instead of syllables or whole words allows SAM to use the least amount of computer memory while providing the highest degree of flexibility.

If you haven't already done so, then run the PHONEMES tutorial program now by selecting PHONEMES in the menu. After the introduction screen you will see most of the phonemes that SAM uses to produce speech. Use a joystick to move the flashing arrow to the desired phoneme then press the trigger to hear SAM say the phoneme. You can change the SPEED or PITCH by first positioning the flashing arrow next to the SPEED or PITCH field, then pressing the trigger while you push the joystick either up or down. As the names imply, the SPEED field controls how fast or slow SAM talks and the PITCH field controls how high or low SAM's speech is. By controlling the PITCH field you can actually make SAM sing! More about singing later.

PHONEME CLASSIFICATIONS

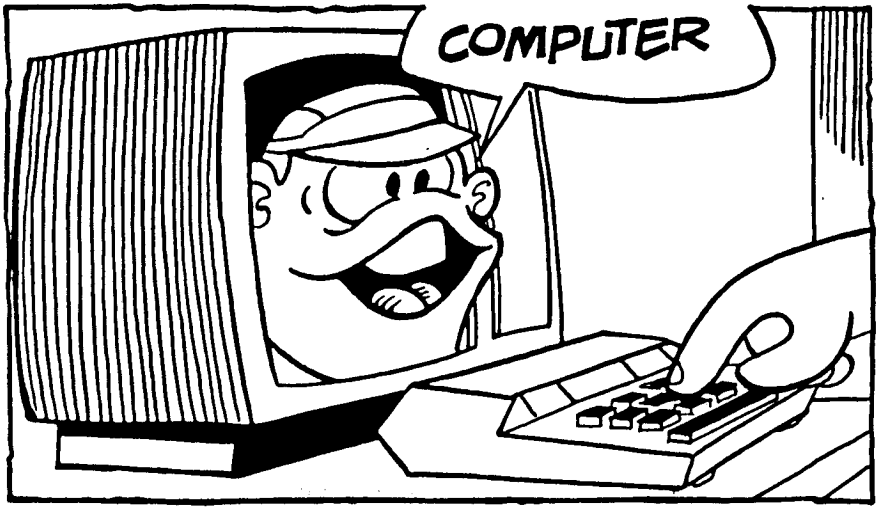
As you can see, there are about 50 phonemes that SAM uses. They are grouped into two categories: vowels and consonants. Among the vowels are the simple vowel sounds such as the 'i' in the word 'pin', the 'o' in 'pot' and the 'a' in 'Sam'. These vowels maintain the same sound throughout their duration. Also included in the vowels is a special class of vowels called diphthongs (pronounced dif'thongs). These vowels do not maintain the same sound throughout their duration. For example, the 'I' in the word 'high', the 'o' in 'slow' and the 'a' in 'made'. Use the joystick to change the SPEED to 255 (the slowest speed) then

listen carefully to each of the diphthongs. You can hear the combination of sounds that make up a diphthong.

The other category of phonemes is the consonants. Like the vowels, there are two groups. They are: voiced consonants and unvoiced consonants. The voiced consonants require you to use your vocal chords to produce the sound, whereas the unvoiced consonants are produced entirely by rushing air. For example, the 'th' in the word 'then' is produced primarily by the vocal chords and is therefore a voiced consonant. On the other hand, the 'th' in the word 'thin' is produced only by air rushing past the tongue as it is pressed against the teeth. Therefore it is an unvoiced consonant.

MAKING WORDS FROM PHONEMES

Ok, so SAM can say phonemes. But how do you make SAM talk? That's the simple part, because you don't even need to know how to spell. You only need to be able to carefully sound out the words. Take the word 'computer' for example. Did you know that the word 'computer' actually has a 'y' sound and a 'w' sound in it? So how would you make SAM say the word 'computer'? First you must sound out the word, then find the correct phoneme to produce each sound.



USING SAM'S PHONETIC LANGUAGE

Although the word 'computer' begins with the letter 'c', the sound is that of the letter 'k'. So our first phoneme will be 'K'. The next sound is the same sound as the 'u' in the word 'up' or 'budget'. By looking at the phoneme list you can see that the phoneme 'AH' will produce the desired sound. Producing the 'm' sound is as simple as using the 'M' phoneme. Now you have the first syllable of the word 'computer' - KAHM. The next syllable gets a little tricky. If you carefully sound out 'computer', you will notice that there is actually a 'y' sound and a 'w' sound in the second syllable. By selecting the phonemes to produce the correct sounds you should get a phoneme combination that looks something like this - PYUW. The third syllable is simple, the 't' sound and the 'er' sound. For these you can use the 'T' phoneme and the 'ER' phoneme. Put it all together and you have KAHMPYUWTER.

By now you may think that you will have to wait until you recieve your degree in computer science to understand all of this.

NOT TRUE

All you really have to do is experiment with the utilities that we enclose, and soon you will find creating words becomes much easier. Try words in your own programs, and if they come out "Funny", just change them a little and try again.

The manual that accompanies the S.A.M. disk from Don't Ask Software includes a dictionary that gives the correct phonetic spelling for many words. Although there is a 'correct' way to phonetically spell words, you will find that you may occasionally want to modify the spelling so that the pronounciation sounds better to you. The word 'computer', for example, could be spelled KUMPYUWTER or KUMPYUWTIXR. It is best to experiment with the phonemes and use what sounds best to you. Personally, I spell "computer" like this:

ATARI 800

But what do I know!To return to the menu press the OPTION key.

PUNCTUATION/STRESS

The PUNCTUATION tutorial program will show you how punctuation affects SAM's speech. The SAM program recognizes only certain punctuation characters. They are: period (.), comma (,), dash (-) and question mark(?). Use of any other punctuation will result in an error. The RECITER program supplied with the SAM disk from Don't Ask Computer Software will allow additional punctuation to be used. It converts punctuation like exclamation mark (!), semi-colon (;) and colon (:) to a period before passing it on to the SAM program.

What affect does punctuation have on SAM's speech? Basically the same affect it would have on any spoken text. A period causes the word prior to the period to end in a lower pitch and the question mark causes the word to end in a higher pitch. The comma causes a pause in the speech and the dash causes a short pause in the speech.

Run the punctuation program now by selecting PUNCT on the menu. After the introduction screen you will see the sentence 'HELLO, MY NAME IS SAM.' on the screen. Under this is the phonetic spelling for the sentence. Use a joystick to move the flashing arrow to the punctuation to be changed then push the joystick up or down to change the punctuation. To hear SAM talk, press the trigger.

Try several different punctuation combinations. To return to the menu, press the OPTION key.

ADDING STRESS TO SAM'S SPEECH

The STRESS program will let you explore one of the aspects that gives SAM the ability to closely reproduce human speech - the ability to add inflection to speech. SAM adds inflection by the use of stress numbers. The stress numbers are placed in the phonetic text right after the phoneme to be stressed. For example - /HEH3LOW8.

The allowable values for the stress numbers are 1 through 8. The number 1 indicates very emotional stress (the pitch will be higher). The number 8 causes the pitch to drop. Normal stress is the number 6 (same as not using a stress number).

If you haven't already done so then run the STRESS program now by selecting STRESS on the menu. After the introduction screen you will see the sentence 'WHY SHOULD I WALK TO THE STORE'. Under this is the same sentence spelled phonetically, including stress numbers. Initially all of the stress numbers are 6, or normal stress. The stress numbers can be changed with a joystick. To change a stress

number first pick the stress number to be changed by pushing the joystick left or right. Then push the joystick up or down to change the stress number. To hear SAM say the sentence, press the joystick trigger.

By changing the stress numbers you can actually change the meaning of the sentence. Try changing the stress numbers to get the following meanings-

You want a reason to do it. (stress the word 'WHY').

You want someone else to do it. (stress the word 'I').

You would rather drive. (stress the word 'WALK').

You may have noticed that the stress numbers are placed only after the vowels, not the consonants. There is a reason for this. SAM will automatically add stress to any consonant that directly proceeds a stressed vowel. For example, the word 'HELP' spelled phonetically as /HEH3LP will be pronounced the same as /H3EH3LP. Since the consonant /H directly proceeds the stressed vowel EH3, then SAM will apply the same stress to the /H.

To return to the menu press the OPTION key.

USING SAM IN DIFFERENT GRAPHICS MODES

With the GRAPHICS program you can hear SAM talk while a specific graphics mode is displayed. This is useful because the quality of SAM's speech is affected by the graphics mode being displayed. will sound just fine until you try and use him with graphics, then he gets a real frog in his throat!

You can use a joystick to change the graphics mode, speed, pitch and lights option. This will let you hear the affect that the different graphics modes have on SAM's speech.

The lights option is used to either leave the display on while SAM talks (lights 'on') or to blank the screen while SAM talks (lights 'off'). Run the GRAPHICS program now by selecting GRAPHICS on the menu. After the introduction screen you will see the current graphics mode, speed, pitch and lights option. Initially the lights option will be 'off' (the screen will blank when SAM talks). Press the trigger to hear SAM talk. Now move the flashing arrow to the lights option and then push the joystick up (lights 'on'). Press the trigger again.

What happened to SAM's voice? A sudden attack of the flu? Nope, the distortion in SAM's voice is caused by the way the Atari displays information on the screen. When any display is on the screen, the Atari interrupts the processing every 60th of a second to redraw the display you see on the TV screen. This is called DMA or Direct Memory Access. Under normal processing the interruption happens so fast that you don't even notice it. However, when the program being interrupted is producing speech, then the interrupt becomes apparent. Can you imagine trying to talk while you are interrupted 60 times every second? When the lights option is 'off' then the SAM program disables the display while speaking. Thus, SAM is able to talk without interruption.

GRAPHICS AND SPEECH IS POSSIBLE

Does this mean you can never have a display on the screen while SAM is talking? The answer is no. Try this - turn the lights option 'on' then change the graphics mode to 19 (graphics mode 3 without a text window). Now press the trigger. Not too bad, eh?

Why the difference between modes 0 and 19? Again, it is the way the Atari handles displays. In any of the text graphics modes (0, 1, 2, 17, 18), the time required to refresh the display is considerably longer than the time required to refresh the non-text modes (such as mode 19). The amount of distortion in SAM's voice is directly related to the time required by the DMA routine.

ADVANCED NOTES

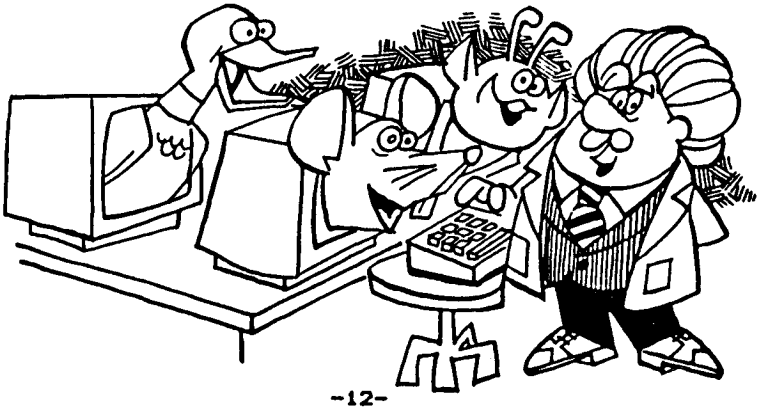
For those of you who intuitively have already purchased our DISPLAY LISTS TUTORIAL, there are some ways to create displays with any Graphics mode, and still have SAM sound good. You merely create a custom display list with most of the screen using modes that require little memory. Next, place a small section of high resolution graphics in the middle of the screen. The memory for the whole screen will be much less than normal for high res screens.

Confused? In simple language, the more complicated your display on the screen, the more work you give the computer to do. When it is working harder, it doesn't have enough reserve to also do SAM's voice properly. By only making a small part of the screen complicated, we only slow SAM down slightly, so he will sound almost like normal.

Try several other graphics modes with various speeds, pitches and lights options. As you will discover, it is possible to have graphics displayed while SAM talks and still have quality speech. In the KNOBS tutorial program you will learn some advanced graphics techiques (including player missile graphics control). To return to the menu, press the OPTION key.

KNOBS AND ADVANCED GRAPHICS

The KNOBS tutorial program is similar to the GRAPHICS tutorial program except that three new features are introduced - knobs, DMA control and waveform control. The knobs feature will allow you to change the quality of SAM's voice. You can actually make SAM talk like a duck, a mouse or an alien.



KNOBS AND ADVANCED GRAPHICS

The DMA control feature gives you control over what graphics (playfields, player missiles) will be displayed while SAM is talking. Waveform control can be accomplished by adjusting the waveform registers. Waveform adjustment can enhance SAM's voice quality when using graphics.

Before running the KNOBS tutorial program, you must first load in the KNOBS.SAM program provided on the tutorial disk. Appendix A of this tutorial gives detailed information on all of the binary load files. If you are confused about binary load files and how to load them then you may want to read appendix A now. You can load the KNOBS.SAM program by following these instructions:

1) Select DOS on the SAM tutorial menu. Do NOT have a protect tab on your disk!

2) Select option 'L' - binary load and enter KNOBS.SAM.

3) After the file is loaded then select option B - return to cartridge.

4) When the READY prompt appears then run the tutorial by entering RUN "D:KNOBS".

After the introduction screen you will see the following options displayed: graphics mode, speed, pitch, lights option, knobs and DMA control. On the second line you will see the waveform register values. Initially all of the options will be set to their default values.

CONTROLLING DMA

Plug in a joystick and press the trigger. Notice how both the playfield (background graphics) and Prototype (a player missile) blanked out while SAM was talking. Now use a joystick to change the DMA option to 12, then press the trigger. This time only the playfield blanked out. The player missile remained on the screen while SAM was talking. Change the DMA option to 34 and press the trigger. This time the playfield did not blank out, but something else strange happened. Prototype turned into a wall of flashing lights while SAM was talking. This is because the computer has been given conflicting information - one thing tells the computer to display a player/missile and one thing tells it not to display a player/missile. A 34 in the DMA option indicated that only playfield graphics (no player missiles) is to be displayed. However, a player missile has been left on the screen. The result is the wall of flashing lights. In some cases (i.e. games) this "special effect" may be desired and actually used as an integral part of the game.

But in most cases the effect is not desired. Two options are available to correct this problem - turn off player missiles or set the player missile position to zero (off the left edge of the screen).

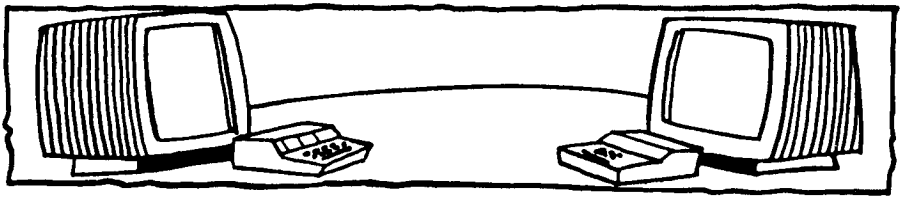
But what if you want the player missiles to be displayed along with the playfield? Then change the DMA option to 46. Use the joystick to do this now, then press the trigger. This time both the playfield and Prototype were displayed correctly while SAM was talking. If you don't understand the degradation in SAM's voice then see the GRAPHICS tutorial program. For a detailed discussion on how to create playfields and player missiles, see our Tricky Tutorial #5 - Player Missile Graphics. Although many more values are available for the DMA option, the following values are the main ones:

0	-	do not display any graphics
12	-	display player/missiles only
34	-	display background graphics only
46	-	display both player/missiles and background graphics.

So why use the DMA control option if it causes SAM's voice to be so distorted? As shown in the GRAPHICS program, the amount of distortion depends on the graphics mode being displayed while SAM is talking. Try this - leave the DMA option at 46 (playfield and player missiles ON), change the graphics mode to 19, then press the trigger. How about that - SAM can talk perfectly normal while graphics and player missiles are displayed.

SIMPLE GRAPHICS?

All of the graphics that we are using consist of straight lines. The reason is not that we aren't artistic. The goal is to show you all of this stuff in the simplest manner. YOU can place as complicated graphics on the screen as each graphics mode will allow and still have SAM sound exactly the same as our examples. The quality of speech depends on what graphics modes the screen is set up to do, not how much you actually use.



KNOBS AND ADVANCED GRAPHICS

USING THE KNOBS FEATURE

Now for one of the more exciting features of SAM - knobs. As you may know, many of the older versions of SAM from Don't Ask Software do not include the KNOBS feature. The KNOBS feature comes in the form of two binary load files. One is to be used with SAM only (SAM without the RECITER program loaded) and one is for use with the RECITER feature. The file names for the binary load files are KNOBS.SAM and KNOBS.REC respectively. Thanks to the folks from Don't Ask Software, both of these binary load files are available on the SAM tutorial disk for those of you who don't have them yet.

The easiest way to understand how the KNOBS feature functions is to try some examples. Try setting the options to the following values and listening carefully to the effect it has on SAM's voice:

GR. MODE	SPEED	PITCH	LIGHTS	KNOBS		DMA
21	72	55	ON	255	255	0
19	65	44	ON	255	1	0
20	88	44	ON	172	1	0
19	50	61	OFF	111	180	46
20	75	42	ON	122	255	0
20	65	96	OFF	1	145	46

ADJUSTING THE WAVEFORM REGISTERS

The waveform registers are displayed on the second line. There are three registers. The registers control the 'shape' of SAM's voice. Normally it is not necessary to change the waveform registers. However, when the DMA option is changed to cause graphics to be displayed while SAM is talking then the registers can be adjusted to enhance SAM's voice quality.

Set all of the registers and options on the first line to their default values - speed 72, pitch 64, lights off, knobs (both) 128. Set the graphics mode to 19 and the DMA option to 46 - playfield and player missiles enabled. Now press the SELECT key to move the flashing arrow to the second line. Press the trigger to hear SAM talk. Now change the waveform registers to 13, 11 and 10 and press the trigger. Did you hear the difference? It is not a great difference but is indeed an improvement.

MAKING SAM SING

As you know from the GRAPHICS program, the amount of distortion in SAM's voice caused by graphics depends on the graphics mode (the DMA delay time). Try other graphics modes and change the waveform registers to make adjustments for the DMA degradation.

You will probably want to save a record of all your favorite combinations. We love to get mystery disks in the mail with messages in strange voices. Hint hint!

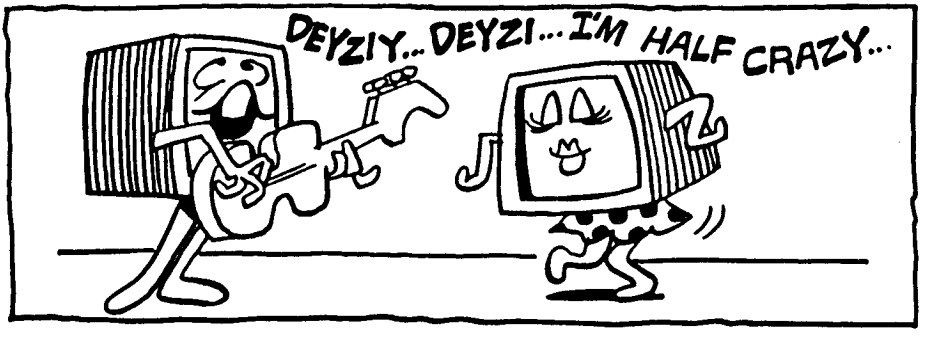
To return to the tutorial menu, press the OPTION key.

MAKING SAM SING

In the SINGING tutorial program you will learn the basics of how to make SAM sing. Two items must be addressed - getting the right pitch and elongating the words. Getting the pitch right is as simple as setting the proper PITCH value. The SONGEDIT program can assist you in setting the pitch properly. The second item - elongating the words - sounds simple, and basically is. However, there are a couple of rules that you should follow. Please note that the rules stated here are really guidelines, not hard rules. You should always experiment and use what sounds best. The rules stated here will hold true in most cases, although there may be times when you should deviate from these rules for best results.

Included in the SAM tutorial is a program called DAISY. This program will let you hear SAM sing the song "Daisy Daisy". Run the program now and listen carefully to the way the words are pronounced.

Let's take the first word of the song as an example. The word Daisy spelled phonetically is DEYZIY. So to make SAM sing the word, just slow the word down by using multiple phonemes - right? Not quite. True, you will use multiply phonemes, but other adjustments must also be made.



MAKING SAM SING

SOME BASIC RULES

In the song, the word Daisy is spelled phonetically DEHEHEHEHEHEHZIYIYIYIY. Notice that multiples of the consonants ('D' and 'Z') were not used. This is rule number one - When elongating words only the vowels are elongated, not the consonants.

When using multiple vowels to elongate a word, you must be aware of the type of vowel being used - simple vowel or diphthong. Elongating the simple vowels is just that - simple. For example, the long 'e' sound in Daisy can be produced by using the IY phoneme multiple times - IYIYIYIY. However if the vowel is a diphthong, then an elongated sound cannot be accomplished simply by using multiple phonemes. Since diphthongs change their sound throughout the duration then using multiple diphthongs will result in multiple changes in sound. For example, using the diphthong EY (which progresses from an 'a' sound to an 'e') multiple times will produce an 'aeaeeaeae' sound. So how do you elongate the diphthongs? This is rule number two - To elongate a diphthong first convert the diphthong to simple vowels then use multiple simple vowels.

Run the SINGING program now. Note that the diphthong EY can be converted to the simple vowels EH and IH. The program shows how the other diphthongs can be converted to simple vowels.

Now that you understand the basics of making SAM sing, you can use the SONGEDIT program to produce your own songs. See the section on using the song editor for details of that program. To return to the menu press the OPTION key.

USING THE SONG EDITOR & SINGIT PROGRAM

As you learned in the SINGING program, it is possible to make SAM actually sing. With the SONGEDIT program you can create and change songs for SAM to sing. The song created by the SONGEDIT program is saved in the form of data statements. Each data statement line contains four things - the word or syllable for SAM to sing, the pitch, the note to play and the face number. The words to the song must be spelled phonetically. The SAM tutorial includes the data statements (D:SONG.DAT) for the song Daisy Daisy.

Run the SONGEDIT program now. The first display is the main menu. The menu options are:

CTRL-I	Input the data statements containing the song
CTRL-E	edit a song
CTRL-S	save the data statements to disk
CTRL-H	hear SAM sing the song
CTRL-L	list the data statements containing the song
ESC	end the program.

The Input command (CTRL-I) will request the name of the file containing the data statements for the song. The tutorial disk contains the file D:SONG.DAT. This file contains the data statements for the song Daisy Daisy. Hold down the CTRL key and press the letter 'I'. You will see the following prompt:

ENTER NAME OF FILE TO INPUT (OMIT D:)

Enter SONG.DAT and press the RETURN key. The program will first reload itself (to get rid of any previously entered data statements), then enter the data statements for the song.

USING THE SONG EDITOR & SINGIT PROGRAM

You can list the data statements with the CTRL-L command. Hold down the CTRL key and press the letter 'L'. You will see the following prompt:

ENTER BEGINNING LINE, ENDING LINE

Enter 10000,10100. This will list the first few lines of the song. Press the RETURN key to return to the menu. If you want to list only one line then enter the line number and press the RETURN key twice. You must press it twice because two values must be entered - the beginning line number and the ending line number. If you enter a null value (just press the RETURN key) for the ending line number then the program will assume you want only the one line number.

The CTRL-H command will let you hear SAM sing the song. Enter the CTRL-H command now and you will see the following prompt:

SPEED (20 TO 255)?

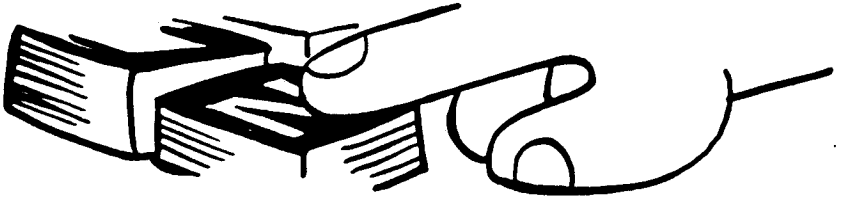
Enter 60 and press RETURN. You will then see:

PLAY NOTES TOO(Y OR N)?

Press the letter 'Y' and you will hear SAM sing Daisy Daisy. After the song you will see the following prompt:

WOULD YOU LIKE TO HEAR IT AGAIN?

Press the letter 'N'.



USING THE SONG EDITOR & SINGIT PROGRAM

USING THE EDIT MODE

The CTRL-E command will allow you to change a line of the song. Enter the CTRL-E command now and you will see the following prompt:

```
ENTER LINE NUMBER TO EDIT
```

Enter 10000 and press RETURN. Since line number 10000 is an existing line you will now be in edit mode. If the line number entered is not an existing line then the following prompt will be displayed:

```
LINE NUMBER DOES NOT EXIST
HIT 'A' TO ADD OR 'R' TO RETRY
```

The edit mode menu contains the following options:

```
RETURN   hear SAM say the current word
CTRL-N   change the current note
CTRL-P   change the current pitch
CTRL-S   change the current speed
CTRL-F   change the current face number.
CTRL-D   delete the current line
CTRL-M   return to the main menu.
```

There is no option to end the program from the edit mode. You must return to the main menu (CTRL-M) before you can end the program. It is at this time that the data statement is actually updated.

Below the menu options you will see the current value for the NOTE, PITCH, SPEED, FACE and LINE NUMBER. Below that you will see the current word or syllable being edited. In our example this is the first syllable of the word 'Daisy'. Press the RETURN key and you will hear SAM say the syllable. You can type in a new word or change the existing word. The word must be spelled phonetically. If an invalid phoneme is entered, the computer will beep twice and the invalid phoneme will be displayed in reverse video.

The CTRL-N (change note) command will give you the following prompt:

```
ENTER NEW NOTE - HIT RETURN FOR OFF
```

If you just press RETURN, the note will be turned off and SAM will repeat the word. Enter the CTRL-N command again. This time enter 81 (our original note of G). You can find the values for the notes in Appendix C of this tutorial or in your Basic Reference Manual.

With the change pitch command (CTRL-P) you can change the pitch of SAM's voice to match the desired note. This is how you can make SAM sing 'on key'. Enter the CTRL-P command now. You should see the following prompt:

USE JOYSTICK - PRESS TRIGGER TO TALK

Plug in a joystick and press up on the stick. Notice how the pitch changes. Change the pitch to 40 and press the trigger. Notice how SAM's voice is sharp. Continue changing the pitch and pressing the trigger until SAM sings on key. At first this may be a little difficult, but with practice you can get SAM to sing on key quickly. After you have gotten SAM to sing on key, you should be on pitch 45 (our original pitch). If not, then change the pitch to 45 before continuing.

You can change the speed with which SAM talks with the CTRL-S command. When you enter edit mode the speed is automatically set to 255 - the slowest speed. This so you can carefully listen to the words that SAM is singing. Changing the speed here will have no affect on how fast or slow SAM will sing the entire song. You can verify this by going to the CTRL-H option on the main menu and listening to SAM sing the entire song. Changing the speed in the edit mode only allows you to listen to SAM say the current word slowly. To make SAM sing a word slower or faster use multiple phonemes. See the SINGING program for details if needed.

Enter the CTRL-S command now and you will see the following prompt:

ENTER NEW SPEED - HIT RETURN FOR 72

You can set the speed to the default value of 72 just by pressing RETURN, or you can enter a value between 20 (the fastest) and 255 (the slowest).

The CTRL-F command will allow you to select the face (open mouth or closed mouth) that is associated with the word or phrase currently displayed.

The CTRL-D command will delete the entire current line and return to the main menu. Don't do it now unless you are feeling brave and want to experiment. If you are, then remember the note is 81, the pitch is 45, the face is 2 and the current word is DEHEHEHEHEHEHEHEHEY.

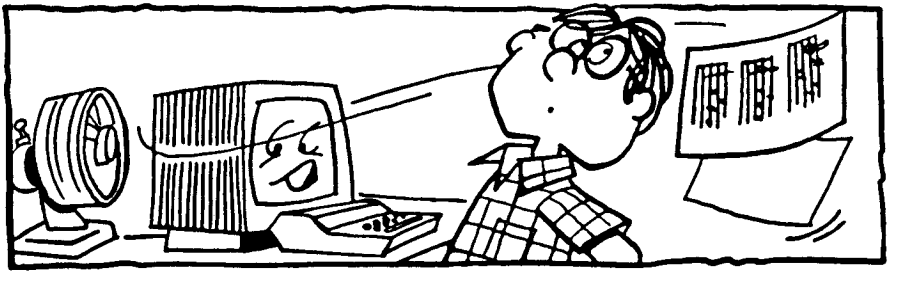
After you have finished editing the line you can return to the main menu with the CTRL-M command. Do this now then press the ESC key (to end the program). You should get the following message:

```
SONG NOT SAVED!
PRESS CTRL-S TO SAVE SONG
OR ESC TO END PROGRAM
```

This is a safeguard to keep you from inadvertently ending the program without saving the current song. Press CTRL and the letter 'S' and you will get the following prompt:

```
ENTER NAME OF OUTPUT FILE (OMIT D:)
```

If you want to save the song you can type in a file name and press RETURN. The data statements containing the song will then be listed to the file specified. NOTE: the SONG.DAT file on the tutorial is locked. You will get an error if you use this file name. If you don't want to save the song under another name then just press RETURN without entering a file name. To end the program without saving the song, just press the ESC key twice.



USING THE SINGIT PROGRAM

After you have created a song with the SONGEDIT program you can use the SINGIT program to hear the song. The SINGIT program is the same as the CTRL-H (hear a song) option of the SONGEDIT program with some differences. Run the SINGIT program now. You should see the following prompt:

```
NO SONG IS LOADED....
ENTER THE NAME OF THE FILE THAT
CONTAINS THE MUSIC (OMIT THE 'D:')
```

Enter SONG.DAT and press return. The program will enter the data statements and start over again. The following prompt will be displayed:

```
SPEED (20 TO 255)?
```

Enter 60 and press RETURN. The following prompt will then be displayed:

```
PLAY NOTES TOO (Y OR N)?
```

Press either the letter 'Y' (to play the music as SAM sings) or 'N' (to hear SAM sing without the music).

After SAM has finished singing the song, you will get the following prompt:

```
WOULD YOU LIKE TO HEAR IT AGAIN?
```

Press either the letter 'Y' or the letter 'N'. If you press the letter 'N' then the program will return to the SAM Tutorial Menu. Pressing the letter 'Y' will allow you to hear the song again. If you want to save the program (along with the data statements), then press the BREAK key to stop the program, then save it under the desired name. This is how the DAISY program was created.

APPENDIX A-LOADING BINARY FILES

A binary load file is a file that contains machine language code - i.e. a program written in machine language. Each binary load file contains a two-byte header having the value 255,255 (hex $FF,$FF). The computer looks for this header as the identifier for a binary load file. After the header is the memory address to which the binary file should be loaded. The file can also contain the address of an initialization address or a run address or both.

You can load a binary load file (machine language program) into memory with the BINARY LOAD option of the Disk Operating System (DOS). To do this from BASIC or the assembler cartridge you first type in 'DOS' to go to the Disk Operating System. Note: If you do not have a MEM.SAV file on disk then the current program in memory will be lost. Once in DOS, select option 'L'. After the file name prompt appears, enter the name of the binary file to be loaded. DOS will open the file and read the first two bytes to verify that the file contains a binary load file header. Assuming a valid header is found it will then read the beginning and ending memory addresses to which the file is to be loaded and read the file into the specified memory addresses.

There are several binary load files that can be used with SAM. They are listed below along with the beginning and ending memory addressess and the size.

FILE NAME	START (HEX)	END (HEX)	Size
(SAM)	8192 ($2000)	17798 ($4586)	9607
KNOBS.SAM	17800 ($4588)	18153 ($46E9)	356
RECITER	17808 ($4590)	23741 ($5CBD)	5834
RS232	17824 ($45A0)	17938 ($4612)	115
KNOBS.REC	23789 ($5CED)	24144 ($5E50)	356

The SAM file from Don't Ask Software is not really a file on disk, it is an integral part of the boot process. It gets loaded when you turn on the power to the computer with the SAM disk in the disk drive. The other binary load files listed above must be loaded with the BINARY LOAD option of DOS.

APPENDIX A-LOADING BINARY FILES

Note that there are conflicts in the load addresses of the files listed above. This means that some combinations of files cannot be loaded. For example, you cannot load the KNOBS.SAM program and the RECITER program since they would overlap each other in memory. Whichever is loaded second will overwrite the first. That is why there is a KNOBS.REC program - it loads at a higher address and will not overlap the RECITER program.

The following is a list of the prerequisites and restrictions associated with each binary load file. Each program must be loaded after SAM (the AUTORUN.SYS) is booted in.

KNOBS.SAM

The KNOBS.SAM program cannot be used with any of the other programs except SAM itself. If you want to use the knobs option with the RECITER program then use the KNOBS.REC program.

RECITER

The RECITER program can be used with all of the other programs except the KNOBS.SAM program. If you use the RECITER program with any of the other programs (RS232 or KNOBS.REC) then you must load the RECITER program FIRST.

RS232

This program will turn on the Atari 850 interface. You must load this program before using any of the RS232 ports. The RS232 program can be used with all of the other programs except the KNOBS.SAM program. You MUST load the RECITER program BEFORE loading the RS232 program.

KNOBS.REC

Use this program when you want to use the KNOBS option with the RECITER program. You can use this program with all of the other programs except the KNOBS.SAM program. You MUST load the RECITER program BEFORE loading the KNOBS.REC program.

APPENDIX B-

USING THE DEFAULTS ROUTINE

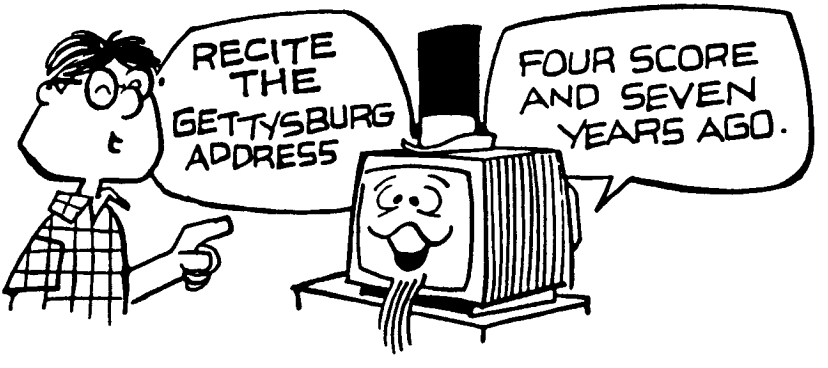
On the next page is a listing of the defaults routine. The purpose of this routine is to set all of the SAM registers to their default value and to verify that required programs (binary load files) have been loaded. The routine is on the SAM Tutorial disk with a name of D:DEFAULTS.LST. To use the routine you must first enter the routine into your program. This can be done by entering the following: ENTER "D:DEFAULTS.LST". Note that your program must not use lines 30000 through 30240 since the defaults routine uses these lines.

At the beginning of your program you must also include the following:

```
10 RECITER=0:KNOBSAM=0:KNOBREC=0:RS232=0
20 GOSUB 30000
```

By setting the variables to either 0 or 1 you can control which programs (binary load files) should be loaded. For example, if you need the RECITER program loaded, then change RECITER=0 to RECITER=1. This will cause the defaults routine to verify that the RECITER program has been loaded. If a required program has not been loaded, then a message will be printed and the program will end.

If you need the registers to be set to a value other than the default then you can change the values on lines 30000 through 30060 of the routine. Also, if you want to perform some special action if a required program is not loaded then you can change the appropriate line in the routine. For example, if you want to perform some special action (i.e. run another program or put out a different message) if the RECITER program is not loaded then replace the PRINT on line 30150 with a GOTO 1000 (assuming line 1000 has the special routine).



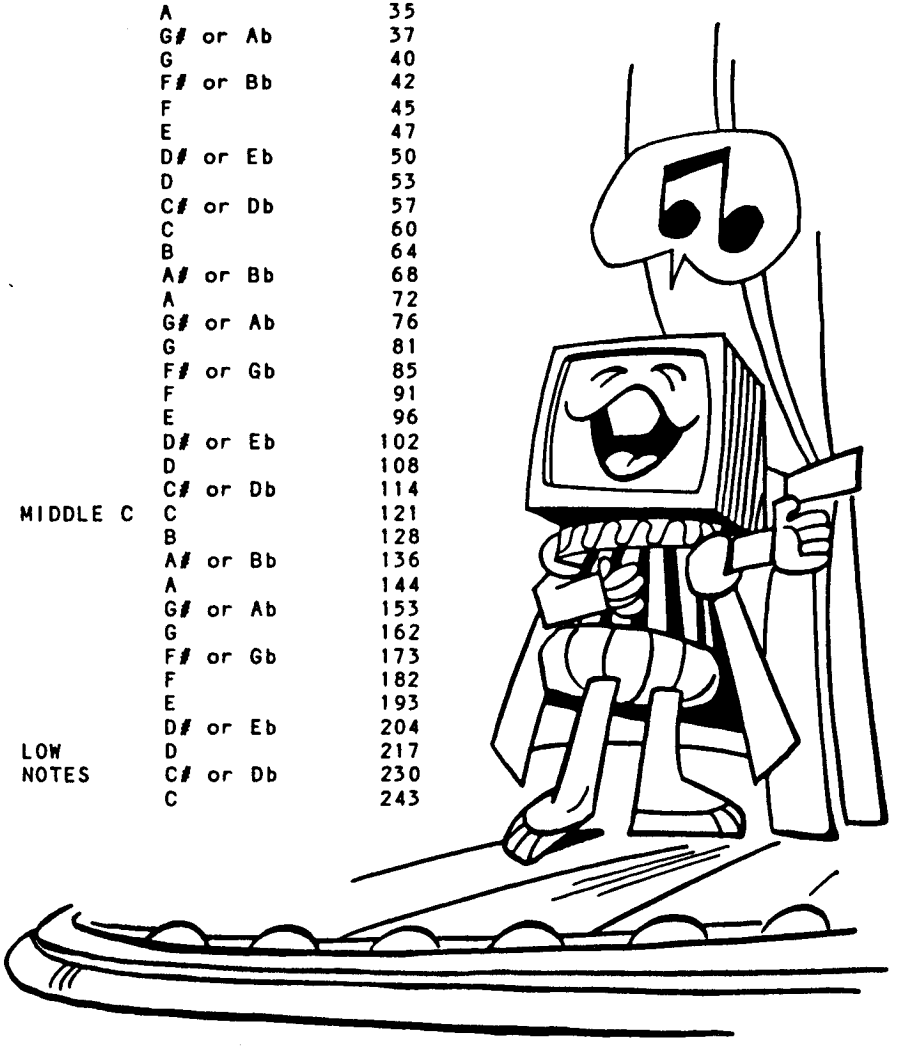
LISTING OF D:DEFAULTS.LST FILE

```
30000 REM SET ALL SAM DEFAULTS
30010 PITCH=64
30020 SPEED=72
30030 LIGHTS=0
30040 DMA=0
30050 KNOB1=128:KNOB2=128
30060 R1=16:R2=13:R3=12
30070 REM VERIFY SAM IS LOADED
30080 IF PEEK(8192)<>104 OR PEEK(8193)<>76 THEN ? "SAM NOT
LOADED":END
30090 POKE 8209,PITCH
30100 POKE 8208,SPEED
30110 IF LIGHTS=0 THEN POKE 8550,141:POKE 8551,0:POKE
8552,212
30115 IF LIGHTS=1 THEN POKE 8550,234:POKE 8551,234:POKE
8552,234
30120 POKE 8549,DMA
30130 POKE 8554,R1:POKE 8559,R2:POKE 8564,R3
30140 REM VERIFY RECITER IS LOADED
30150 IF RECITER THEN IF PEEK(18184)<>32 OR PEEK(18185)<>183
THEN PRINT "RECITER NOT LOADED":END
30160 REM VERIFY KNOBS.SAM IS LOADED
30170 IF KNOBSAM THEN IF PEEK(17829)<>189 OR PEEK(17831)<>54
THEN PRINT "KNOBS.SAM NOT LOADED":END
30180 IF KNOBSAM THEN POKE 18050,KNOB1:POKE
18051,KNOB2:W=USR(17800)
30190 REM VERIFY KNOBS.REC IS LOADED
30200 IF KNOBREC THEN IF PEEK(23789)<>104 OR
PEEK(23790)<>173 THEN PRINT "KNOBS.REC NOT LOADED":END
30210 IF KNOBREC THEN POKE 24039,KNOB1:POKE
24040,KNOB2:W=USR(23789)
30220 REM VERIFY RS232 IS LOADED
30230 IF RS232 THEN IF PEEK(17829)<>169 OR PEEK(17831)<>141
THEN PRINT "RS232 NOT LOADED":END
30240 RETURN
```

APPENDIX C-NOTE VALUE TABLE

The SONGEDIT program will allow you to create songs for SAM to sing. Along with the words for SAM to sing, you can also specify the musical notes to play. Use the following table to select the correct note value.

HIGH NOTES	C	29
	B	31
	A# or Bb	33
	A	35
	G# or Ab	37
	G	40
	F# or Bb	42
	F	45
	E	47
	D# or Eb	50
	D	53
	C# or Db	57
	C	60
	B	64
	A# or Bb	68
	A	72
	G# or Ab	76
	G	81
	F# or Gb	85
	F	91
	E	96
	D# or Eb	102
	D	108
	C# or Db	114
MIDDLE C	C	121
	B	128
	A# or Bb	136
	A	144
	G# or Ab	153
	G	162
	F# or Gb	173
	F	182
	E	193
	D# or Eb	204
LOW NOTES	D	217
	C# or Db	230
	C	243



APPENDIX D-S.A.M. MEMORY MAP

On the following pages is a complete map of all the signifigant memory locations used by SAM. Most of the locations listed have a sample program that you can enter. In these programs you will see lines that look like the following:

```
20 RECITER=0:KNOBSAM=0:KNOBREC=0:RS232=0
30 GOSUB 30000
```

These lines establish which binary load files are required and call the defaults routine to set all of the SAM registers to their default values. Before entering the program example you should first enter the following:

```
ENTER "D:DEFAULTS.LST"
```

This will enter the defaults subroutine starting at line 30000. Since you will be changing several of the registers associated with SAM, it is important that you call the defaults routine before running the example program. For details of how the defaults routine works see Appendix B.

8192 ($2000)

This is the address you use to call SAM from BASIC. You must have previously DIMensioned a string named SAM$. The string cannot exceed 255 characters and must contain phonetically spelled words.
Example:

```
 10 DIM SAM$(128)
 20 RECITER=0:KNOBSAM=0:KNOBREC=0:RS232=0
 30 GOSUB 30000
 40 SAM$="/HEH4LOW, MAY NEYM IHS SAEM."
 50 W=USR(8192)
 60 END
```

8192,8193 ($2000,$2001)

Use these addresses to determine if SAM is loaded. If SAM is loaded then location 8192 will contain the value 104 and location 8193 will contain the value 76. Any other values indicate SAM is not loaded.
Example:

```
 10 IF PEEK(8192)<>104 OR PEEK(8193)<>76
    THEN PRINT "SAM NOT LOADED":END
 20 PRINT "SAM IS LOADED":END
```

APPENDIX D-S.A.M. MEMORY MAP

8196 ($2004)

If you are using SAM from machine language then call SAM at this address by doing a JSR $2004. There must be a string of phonetically spelled words starting at location 8212. See location 8212 for more details.

8199 ($2007)

Use this address to call SAM when using the RECITER program from BASIC. The RECITER program will convert regular English text to phonemes and then call SAM. You must have previously loaded the RECITER program. See Appendix A for information on loading binary files.
Example:

```
 10 DIM SAM$(128)
 20 RECITER=1:KNOBSAM=0:KNOBREC=0:RS232=0
 30 GOSUB 30000
 40 SAM$="HELLO, MY NAME IS SAM."
 50 W=USR(8199)
 60 END
```

8203 ($200B)

Use this address to call SAM when using the RECITER program from machine language. You must have previously loaded the RECITER program. The RECITER program will convert the English text in location 8212 ($2014) through location 8467 ($2113) into a phoneme string and pass the phonemes on to SAM. Thus you must first store a string containing English text starting at location 8212 ($2014) then do a JSR $200B. See location 8212 for more details.

8208 ($2010)

This is the SPEED register. Place a number between 20 and 255 at this location before calling SAM or the RECITER program. The lower the number the faster SAM will talk. The default value is 72. Speeds lower than 20 generally cause SAM to talk too fast to be intelligible.
Example:

```
 10 DIM SAM$(128)
 20 RECITER=0:KNOBSAM=0:KNOBREC=0:RS232=0
 30 GOSUB 30000
 40 SAM$="/HEH4LOW, MAY NEYM IHS SAEM."
 50 FOR X=15 TO 255 STEP 20
 60 POKE 8208,X
 70 W=USR(8192)
 80 NEXT X
 90 END
```

APPENDIX D-S.A.M. MEMORY MAP

8209 ($2011)

This is the PITCH register. Place a number between 20 and 255 at this location before calling SAM or the RECITER program. The lower the number the higher SAM's voice will be. The default value is 64. Values below 20 generally cause SAM's voice to be too high to be intelligible.
Example:

```
 10 DIM SAM$(128)
 20 RECITER=0:KNOBSAM=0:KNOBREC=0:RS232=0
 30 GOSUB 30000
 40 SAM$="/HEH4LOW, MAY NEYM IHS SAEM."
 50 FOR X=15 TO 255 STEP 20
 60 POKE 8209,X
 70 W=USR(8192)
 80 NEXT X
 90 END
```

8211 ($2013)

If you are using phonetically spelled words (SAM without the RECITER program), then you should check this address after calling SAM to determine if any invalid phonemes were in the SAM$ string. If after calling SAM this location contains the value 255 then no invalid phonemes were found. Any other value indicates an error was found. The value will point to the position within the SAM$ string where the error occured. The following example program will check for phoneme errors and print the beginning of the invalid phoneme in reverse video.
Example:

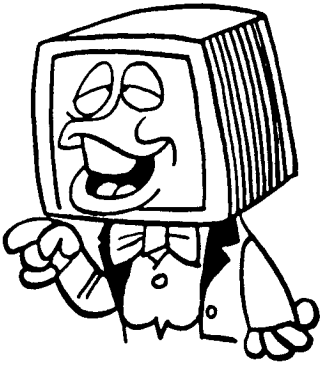
```
 10 DIM SAM$(128)
 20 RECITER=0:KNOBSAM=0:KNOBREC=0:RS232=0
 30 GOSUB 30000
 40 SAM$="/HEHLOW, MAY NEYM IS SAEM."
 50 W=USR(8192)
 60 IF PEEK(8211)<255 THEN GOTO 80
 70 PRINT "NO ERRORS":END
 80 SAM$(W,W)=CHR$(ASC(SAM$(W,W))+128)
 90 PRINT SAM$
100 END
```

8549 ($2165)

This is the DMA control register. The value in this location is stored in DMACTL ($D400) while SAM is speaking. You can use this location to control what graphics are enabled while SAM speaks. Explaining all possible values for the DMACTL field is beyond the scope of this tutorial. Our Tricky Tutorial #5 - Player Missile Graphics - contains a comprehensive explanation of how DMA functions. See the LIGHTS option (location 8550) for comparison. Some of the more common DMACTL values are:

 0 - no playfield or players (blank screen)
12 - enable player missiles only (no playfield)
34 - enable playfield only (no player missiles)
46 - enable playfield and player missiles.

8550,8551,8552 ($2166,$2167,$2168)



These locations make up the lights option. Use them to tell SAM if the screen is to be left on (lights 'on') during speech or if the screen is to be blanked out (lights 'off') during speech. For lights on, use the values 234,234,234. For lights off, use the values 141,0,212. See the DMA control register (location 8549) for comparison.
Example:

```
 10 DIM SAM$(128)
 20 RECITER=0:KNOBSAM=0:KNOBREC=0:RS232=0
 30 GOSUB 30000
 40 SAM$="/HEH4LOW, MAY NEYM IHS SAEM."
 50 REM TURN LIGHTS ON
 60 POKE 8550,234:POKE 8551,234:POKE 8552,234
 70 X=USR(8192)
 80 REM TURN LIGHTS OFF
 90 POKE 8550,141:POKE 8551,0:POKE 8552,212
100 X=USR(8192)
110 END
```

APPENDIX D-S.A.M. MEMORY MAP

8554,8559,8564 ($216A,$216F,$2174)

These are the waveform registers and can be used to "fine tune" SAM's speech. Generally it will not be necessary to adjust these registers since SAM is normally correctly tuned at the default values of 16, 13 and 12. However, when graphics are enabled while SAM talks, you can adjust the waveform registers to compensate for the distortion caused by DMA. To get a feel for how these registers affect SAM's speech, try different values in lines 50, 60 and 70 of the following example program:

```
 10 DIM SAM$(128)
 20 RECITER=0:KNOBSAM=0:KNOBREC=0:RS232=0
 30 GOSUB 30000
 40 SAM$="/HEH4LOW, MAY NEYM IHS SAEM."
 50 POKE 8554,16
 60 POKE 8559,13
 70 POKE 8564,12
 80 W=USR(8192)
 90 END
```

17800 ($4588)

This is the KNOBS set routine for the KNOBS.SAM program. See location 18050,18051 for details.

17829,17831 ($45A5,$45A7)

Use these addresses to determine if the KNOBS.SAM program or the RS232 program is loaded. If the KNOBS.SAM program is loaded then location 17829 will contain the value 189 and location 17831 will contain the value 54. If the RS232 program is loaded then location 17829 will contain the value 169 and location 17831 will contain the value 141.

Example:

```
 10 IF PEEK(17829)=189 AND PEEK(17831)=54
    THEN PRINT "KNOBS.SAM LOADED":END
 20 IF PEEK(17829)=169 AND PEEK(17831)=141
    THEN PRINT "RS232 LOADED":END
 30 PRINT "NEITHER PROGRAM IS LOADED":END
```

18050,18051 ($4682,$4683)

These are the KNOBS registers for use by SAM only (SAM without the RECITER program). Changing the values in these registers can change the quality of SAM's voice. You can make SAM sound like a mouse, a duck or a strange alien. The default values for both registers is 128. You must have previously loaded the KNOBS.SAM program before using the KNOBS option with SAM. See Appendix A for details on

loading the KNOBS.SAM program. To use the KNOBS with SAM you must first poke the desired values into the KNOBS registers, then you must call the KNOBS set routine at location 17800. To use the KNOBS with the RECITER program see locations 24039,24040. To get a feel for how the KNOBS option affects SAM's speech, try different values on lines 50 and 60 of the following program:

```
 10 DIM SAM$(128)
 20 RECITER=0:KNOBSAM=1:KNOBREC=0:RS232=0
 30 GOSUB 30000
 40 SAM$="/HEH4LOW, MAY NEYM IHS SAEM."
 50 POKE 18050,128:REM KNOB1
 60 POKE 18051,128:REM KNOB2
 70 W=USR(17800):REM CALL THE KNOB SET ROUTINE
 80 W=USR(8192)
 90 END
```

18184,18185 ($4708,$4709)

Check these addresses to determine if the RECITER program is loaded. If the RECITER program is loaded then location 18184 will contain the value 32 and location 18185 will contain the value 183. Any other values indicate that the RECITER program is not loaded.
Example:

```
 10 IF PEEK(18184)<>32 OR PEEK(18185)<>183
    THEN PRINT "RECITER NOT LOADED":END
 20 PRINT "RECITER IS LOADED":END
```

23789 ($5CED)

This is the KNOBS set routine for using the KNOBS option with the RECITER program. See locations 24039,24040 for details.

23789,23790 ($5CED,$5CEE)

Use these addresses to determine if the KNOBS.REC program is loaded. If the KNOBS option for use with the RECITER program is loaded then location 23789 will contain the value 104 and location 23790 will contain the value 173. Any other values indicate that the KNOBS.REC program is not loaded.
Example:

```
 10 IF PEEK(23789)<>104 OR PEEK(23790)<>173
    THEN PRINT "KNOBS.REC NOT LOADED":END
 20 PRINT "KNOBS.REC LOADED":END
```

APPENDIX D-S.A.M. MEMORY MAP

24039,24040 ($5DE7,$5DE8)

These are the KNOBS registers for use with the RECITER program. Changing the values in these registers can change the quality of SAM's voice. Before using the KNOBS.REC option you must have previously loaded the RECITER program and the KNOBS.REC program (in that order!). See Appendix A for details on loading binary files. To use the KNOBS option with the RECITER program you must first poke the desired values into the registers, then call KNOBS set routine at location 23789. To use the KNOBS option without the RECITER program see locations 18050,10851. To get a feel for how the KNOBS option affects SAM's speech, try changing the values on lines 50 and 60 of the following program:

```
10 DIM SAM$(128)
20 RECITER=1:KNOBSAM=0:KNOBREC=1:RS232=0
30 GOSUB 30000
40 SAM$="HELLO, MY NAME IS SAM."
50 POKE 18050,128:REM KNOB1
60 POKE 18051,128:REM KNOB2
70 W=USR(23789):REM CALL THE KNOB SET ROUTINE
80 W=USR(8199)
90 END
```

GLOSSARY

The following is a list of terms that may be new to you or that have special meaning in the SAM tutorial.

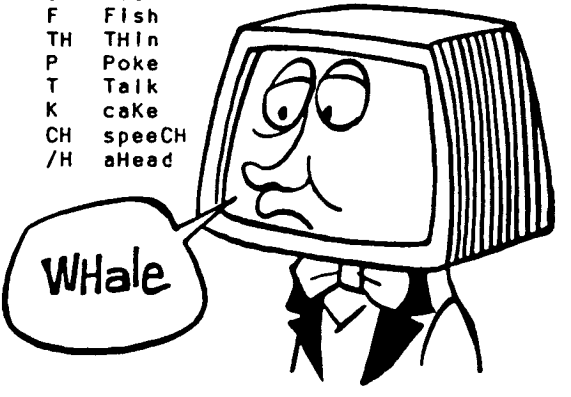
BINARY LOAD FILE

A file containing machine language code that has a header to define the location at which the code is to be loaded into memory. The RECITER program and the KNOBS.SAM and KNOBS.REC programs are binary load files.

CONSONANTS

There are two classes of consonants - voiced and unvoiced. The voiced consonants require you to use your vocal chords to produce the sound. For example, the 'b' in the word 'boy' or the 'z' in the word 'zoo' are voiced consonants. In the unvoiced consonants, the sound is made entirely by rushing air in the mouth. These include sounds such as the 'p' in the word 'pit' or the 'sh' in the word 'ship'. The following is a list of the consonant phonemes that SAM uses to produce speech:

VOICED CONSONANTS		UNVOICED CONSONANTS	
R	Red	S	Sam
L	aLLow	SH	fISH
W	aWay	F	Fish
WH	WHale	TH	THIn
Y	You	P	Poke
M	saM	T	Talk
N	maN	K	caKe
NX	soNG	CH	speeCH
B	Bad	/H	aHead
D	Dog		
G	aGain		
J	JuDGe		
Z	Zoo		
ZH	pleaSure		
V	seVen		
DH	THen		



DIPHTHONGS

A special class of vowels in which the sound changes during pronounciation. For example, the 'I' in the word 'high' is a diphthong because its sound goes from an 'I' sound to an 'ee' sound. See VOWELS for a list of the diphthongs that SAM uses.

GLOSSARY

DMA

Direct Memory Access. The Atari uses DMA to redraw the display you see on the television screen 60 times a second. The DMA control register (location 8549) is used to tell SAM what is to be drawn (background graphics, player/missiles, etc.).

INFLECTION

See STRESS.

KNOBS

A new feature of SAM that allows you to change the quality of SAM's voice. With the KNOBS feature you can make SAM sound like a mouse, a duck or a strange alien. The KNOBS registers are at locations 18050,18051 or 24039,24040 if using the RECITER program. Before using the KNOBS feature you must first load the KNOBS program. There are two KNOBS programs on the tutorial disk - KNOBS.SAM (for use with SAM only) and KNOBS.REC (for use with SAM and the RECITER program). To load either KNOBS program, use the binary load option (option L) of DOS.

LIGHTS OPTION

The lights option will determine whether SAM will talk with the screen display still on (lights 'on') or whether the screen will go blank (lights 'off') when SAM talks. The lights registers are at locations 8550,8551 and 8552.

MACHINE LANGUAGE

The language native to the computer. Binary load files are in machine language.

PHONEME

The smallest contrastive unit of sound in the system of language. For example, the 't' in the word 'tip' or the 'th' in the word 'thin' are phonemes. SAM uses two types of phonemes - consonants and vowels. See CONSONANTS and VOWELS for lists of the phonemes used by SAM.

GLOSSARY

PITCH REGISTER

How high or low SAM talks is determined by the pitch register at location 8209. The lower the number poked into the pitch register, the higher SAM's voice will be. The maximum number you can use is 255 and will cause SAM's voice to be very low.

PLAYER/MISSILES

A special type of graphics used on the Atari. Graphics characters (space ships, laser beams, etc.) defined as player/missiles can be moved across the screen independently of the background graphics.

RECITER

A machine language program (binary load file) that you can use to automatically convert regular spoken English to phonemes. To load the RECITER program use the binary load option (option L) of DOS.

SAM

Software Automated Mouth. A speech synthesis program from Don't Ask Software.

SPEECH SYNTHESIS

The generation of spoken words by assembling individual sounds into words. SAM is a speech synthesis program that produces speech by assembling phonemes into words.

SPEED REGISTER

How quickly or slowly SAM talks is determined by the value in the speed register at location 8208. The lower the number poked into the speed register, the faster SAM will talk. The highest value available is 255 and will cause SAM to talk at the slowest speed.

STRESS

Emphasizing specific words in a sentence by raising the pitch of the word is called stressing the word. Also called inflection.

UNVOICED CONSONANTS

See CONSONANTS.

VERTICAL BLANKING

The brief period of time in which the beam in the television must travel from the bottom of the screen to the top of the screen to begin the next display frame. The screen is redrawn 60 times a second, thus the vertical blanking occurs 60 times a second also. The Atari makes use of this 'blank' time to perform certain functions. This causes a program that is running to be interrupted 60 times a second. The vertical blanking interrupt can be turned off by setting the DMA register at location 8549 to zero.

VOICED CONSONANTS

See CONSONANTS.

VOWELS

The phonemes that SAM uses consists of two types of vowels - simple and diphthongs. Simple vowels maintain a constant sound throughout their duration while diphthongs do not. For example, the 'I' in the word 'pin' is a simple vowel while the 'I' in the word 'site' is a diphthong since it goes from an 'eye' sound to an 'ee' sound. The following is a list of the vowel phonemes that SAM uses:

SIMPLE VOWELS		DIPHTHONG VOWELS	
IY	fEEt	EY	mAde
IH	pIn	AY	hIGH
EH	bEg	OY	bOY
AE	sAm	AW	hOW
AA	pOt	OW	sIOW
AH	bUdget	UW	crEW
AO	tAlk		
OH	cOne		
UH	bOOk		
UX	lOOt		
ER	bIRd		
AX	gallOn		
IX	dIgIt		

WAVEFORM REGISTERS

There are three registers that can be used to actually shape SAM's voice. They are at locations 8554,8559 and 8564. By poking different values into these registers you can change the texture of SAM's speech.

S.A.M. MEMORY MAP REFERENCE CHART			
ADDRESS	DESCRIPTION	DEFAULT	*NOTES*
8192	Call SAM from BASIC.		
8192 8193	Verify SAM is loaded by checking these addresses.	104 76	
8196	Call SAM from machine lang.		
8199	Call RECITER from BASIC.		REC
8203	Call RECITER from mach. lang.		REC
8208	SPEED register (20 to 255).	72	
8209	PITCH register (20 to 255).	64	
8211	Invalid phoneme pointer.	255	
8549	DMA control register.	0	
8550 8551 8552	LIGHTS option registers lights on = 234, 234, 234 lights off = 141, 0, 212	141 0 212	
8554 8559 8564	Waveform registers. Use these registers to 'fine tune' SAM's voice.	16 13 12	
17800	KNOBS set routine (SAM).		KS
17829 17831	Verify KNOBS.SAM is loaded by checking these addresses.	189 54	KS, ++
18050 18051	KNOBS registers one and two for use with KNOBS.SAM prog.	128	KS
18184 18185	Verify RECITER is loaded by checking these addresses.	32 183	REC
23789	KNOBS set routine (RECITER)		REC, KR
23789 23790	Verify KNOBS.REC is loaded by checking these addresses.	104 173	REC, KR
24039 24040	KNOBS registers one and two for use with KNOBS.REC prog.	128 128	REC, KR

NOTES REC - RECITER MUST BE LOADED
KS - KNOBS.SAM MUST BE LOADED
KR - KNOBS.REC MUST BE LOADED.
++ - VALUES 169,141 = RS232 LOADED.

NOTES

NOTES

S.A.M. TUTORIAL

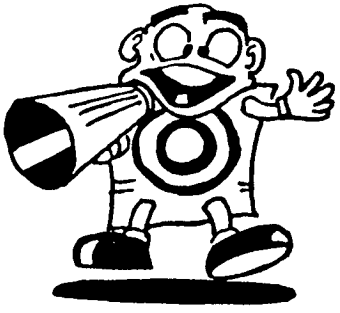
by Charlie Parker

Has your computer been having problems speaking to you lately? All you really need is the Software Automated Mouth from Don't Ask Software, and this Tricky Tutorial!

Professor von Chip has put together a very special set of examples and utilities to make using SAM easy for anyone with a little Basic programming knowledge:

SINGING

We combine music with SAM's singing voice to bring you that old favorite, DAISY! Also included are editors to help you write your own songs and music.



GRAPHICS

Deep in the Professors lab he discovered a way to make SAM talk while still keeping graphics on the screen.

PHONEMES and STRESS

An easy to use set of examples that you will use to sound out words and sentences. These almost make PHONEMES as much fun as they are to pronounce.

VOICE

If you bought SAM before he came with KNOBS, you will be happy to know that we include it in this Tutorial. KNOBS allows you to change the way SAM's voice sounds. Now you can create little alien SAM's, monster SAM's, and any other voice your imagination can dream up.

REQUIRES:
BASIC Cartridge
32K Memory
Disk Drive
S.A.M.

51) = Y THEN POKE