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| **INTRODUCTION**  **Congratulations!** You have just purchased S.A.M. -- the Software Automatic Mouth -- a versatile, high-quality speech synthesizer created entirely in software. You have added quality speech to your personal computer for a lower cost than ever before possible and, in the bargain, have gained features that other speech synthesizers cannot offer.  S.A.M. is designed to be easy to use. With a couple of simple program statements, you can add speech to your BASIC or assembly-language programs. When you have mastered the easy-to-learn phonetic alphabet, the inflection system, and the use of pitch and speed controls, you will be amazed at what you can make S.A.M. do. **And**, until then it will already match the performance of other speech synthesizers.  We strongly suggest that you read this manual carefully while learning to use S.A.M. There are thorough discussions of S.A.M.'s features with illustrative examples of how to implement them. There is also a dictionary of useful words and their phonetic equivalents to help you learn the phonetic spelling system.  Also remember that as a registered S.A.M. owner, you are entitled to our services in answering your S.A.M.-related questions, providing updates and improvements to the S.A.M. program at nominal cost, and helping you with your applications of S.A.M. Yes, this is a not-too-subtle hint that you should send in your S.A.M. owner registration card today. We look forward to hearing from you.  **THE S.A.M. DISKETTE**  The S.A.M. diskette contains several programs.  **1. The S.A.M. speech synthesis program** This program will boot in automatically and will leave your [computer](https://www.fbo.gov/?s=opportunity&mode=form&tab=core&id=1e39e1c94e9ad60b45c6097218975d65&_cview=0), whether on its [l shaped desk](http://www.beyondtheofficedoor.com/Compact-L-shaped-desk.php) or other workstation, ready to accept speech input through BASIC or machine language programs. The program occupies about 9K bytes.  **2. RECITER --** RECITER is the English text-to-speech program that interfaces the S.A.M. program with ordinary English text input. It is not used for phonetic input and must be loaded in separately (see instructions). It occupies about 6K bytes.  **3. SAYIT --** A short BASIC program that allows you to type in strings of phonemes or text and hear them spoken immediately.  **4. DEMO --** A BASIC program that demonstrates some of S.A.M.'s features by telling a short story.  **5. SPEECHES --** Another BASlC program that features some familiar texts to be spoken aloud by S.A.M.  **6. GUESSNUM --** A vocal version of the old guess-the-number-between-one-and-one-hundred [game](http://gsaauctions.gov/gsaauctions/aucdsclnk?sl=A1QSCI09162745). Great for kids.  We suggest that you do not write additional data on the S.A.M. diskette. Remove it after loading the desired programs.  **USING THE S.A.M. PROGRAMS**  The S.A.M. program itself is a self-contained machine-language program that automatically boots in from the S.A.M. diskette when a system [cartridge](http://atech.edu/?p=392) (e.g. BASIC or ASSEMBLER) is in the left slot. Programs using S.A.M. in the phonetic mode can be run immediately at this point.  In order to allow maximum working space in Atari memory, S.A.M. has been installed in a location that conflicts with some functions of the Atari DOS 2.OS operating system. In particular, when the DOS menu must be accessed, such as to load the RECITER program or the RS232 handler, special care must be taken. We therefore ask you to take the following steps:  **1.** Format a blank diskette using DOS 2.0S (S.A.M. is **incompatible** with other versions of DOS) and write the DOS files to the disk with the "H" option in DOS. **DO NOT** use the DOS from the S.A.M. disk to create the copy disk; use DOS from another disk.  **2.** Copy the programs from the S.A.M. diskette onto this new disk using the "O" (duplicate file) command followed by \*.\* to copy all the files (the "J" command will not work). The S.A.M. program will **not** be transferred to the new disk.  **3.** Make sure there is a MEM.SAV file on your copy disk and always leave it **unwrite-protected**.  **4.** To use S.A.M. in conjunction with DOS, boot the S.A.M. disk. Then remove it and place the copy disk you have created into your drive. Then type "DOS" to enter the DOS menu. You can now load machine language files such as RECITER via the "L" command in DOS. Just remember that in order to use DOS with S.A.M. in the system,there **must** be a MEM.SAV on the disk. To return to BASIC after loading in a file, use the "B" command. (See the DOS 2.0S manual for further information on the use of MEM.SAV.)  We have included a S.A.M.-and-RECITER-compatible bootstrap for the RS232C handler on the S.A.M. diskette. Binary load it from DOS exactly as you do with RECITER if you need to use the RS232 interface along with S.A.M.  **The RS232 handler provided will only function if RECITER is already loaded in. It will not work with S.A.M. alone.**  **RUNNING THE DEMO PROGRAMS**  Once S.A.M. is loaded into memory, you can run all four demo programs on the S.A.M. disk (SAYIT, DEMO, SPEECHES, and GUESSNUM). These are all Atari BASIC programs and run from the usual BASIC "RUN" command. To operate SAYIT with English input, make sure you have binary-loaded RECITER as well.  **USING S.A.M. FROM ATARI BASIC**  S.A.M. patches into Atari BASIC by the use of the reserved string variable named SAM$ (easy to remember).  Two BASIC statments are all that are required to make S.A.M. speak. The following statements inserted anywhere in an Atari BASIC program will cause S.A.M. to speak the phrase "I am a computer".  100 SAM$= "AY4 AEM AH KUMPYUW3TER."  110 A= USR(**8192**) |
| By using Atari BASIC'S string handling capabilities, it is possible to generate the SAM$ string from sentence fragments, data statements, text files, etc. Just make sure the SAM$ string is DlMensioned in your program (it can be DIMensioned no more than 255 characters long). The GUESSNUM program listed in this manual illustrates some of the techniques of using S.A.M. in BASIC.  **SOME ADDITIONAL NOTES:**  **1.** To avoid stepping on S.A.M. with your Atari BASIC program, do not make any changes in the value of LOWMEM.  **2.** S.A.M. makes use of the "zero" sound register in the Atari (location $D201). You may use the other three sound registers undisturbed during vocal output. S.A.M. has no effect on Atari graphics modes other than using up memory that might be needed for large programs requiring high resolution (e.g. GR.8) graphic display.  **3.** S.A.M. disables interrupt requests and shuts down the ANTIC chip during vocal output. Therefore, the screen will blank out and the BREAK key will not operate while S.A.M. is speaking. See the Technical Notes for more details.  **USING RECITER FROM ATARI BASIC**  To use RECITER from Atari BASIC, follow this procedure:    1. Boot S.A.M. in from the S.A.M. diskette.    2. Enter DOS from a disk containing MEM.SAV and RECITER (see page 6).    3. Type "L" for Binary Load.    4. Type "RECITER".    5. When the DOS prompt returns, type "B" to get back into BASIC.    6. You are ready to use RECITER in your programs or in SAYIT.  Using RECITER from Atari BASIC is the same as using S.A.M. in his phonetic mode. However, this time the string SAM$ is in plain English. Also the calling address is different.  100 SAM$= "I AM A COMPUTER."  110 A= USR(8199) |
| Use of punctuation with RECITER is discussed later, but note that a dash will be treated as a pause-making dash only if there is non-letter (not A-Z) on both sides of it. Examples: the dash in "YOU ARE A RAT-FINK" will not pause, but the dash in "HELLO JIM - THIS IS ANN" will.  **USE OF S.A.M. AND RECITER FROM MACHINE LANGUAGE**  This is very similar to using S.A.M. from Atari BASIC except for one change; you must do your own string handling. A string of ATASCII characters (the same ones you would use in BASIC) is moved into locations $2014-2113. The first character must be in $2014 and the last character, an $9B return character, marks the string's end. Bytes after the $9B are not read by S.A.M. Following the string definition, a JSR $2004 is done and S.A.M. speaks. The use of RECITER is the same except that you do a JSR $200B instead.  **THE RECITER PROGRAM**  RECITER is an English text-to-speech program that converts ordinary text into phonemes that S.A.M. can understand. You simply supply output strings of 256 characters or less to the program. RECITER takes care of the rest.  The program uses about 450 rules to convert English into S.A.M.'s phonetic language. Included among these rules are some stress markers for situations where the stress choice is unambiguous. In addition, S.A.M.'s usual punctuation rules still operate with some additional symbols ("!", ";", and ":") being considered as periods. The net result is that even directly-translated English text has a fair amount of inflection.  RECITER also recognizes a number of special characters. Numbers are read aloud, and several others are pronounced as well. If a character is not understood by RECITER, it simply isn't passed to S.A.M.  We recommend use of RECITER (or any text-to-speech program, for that matter) only for applications where the user has no control of the text. For example, text already in a file, text received over a MODEM, and text supplied by users unfamiliar with the phonetic system. Where the highest quality speech with full inflection is desired, we urge you to use S.A.M.'s phonetic system.  Don't be discouraged. though. You will find that RECITER will do a better job of speaking from English text than other text-translator products.  **THE SAYIT PROGRAM**  SAYIT is a short BASIC program that allows you to test many of S.A.M. and RECITER's features by directly inputting the string SAM$.  If both S.A.M. and RECITER have been loaded in, you may opt for English input when running the program.  Typing "**ctrl-N**" will allow you to input new pitch and speed values to test these features. Once you have done so, the new pitch and speed will remain until you type "**crtl-N**" again.  **PHONETIC INPUT TO S.A.M. I. THE PHONETIC SPELLING SYSTEM**  S.A.M. is equipped with a version of the easy-to-learn, very readable International Phonetic Alphabet. There are about fifty phonemes which will let you spell all the words in English. Some sounds from foreign languages are not available in the system at this time.  Why use the phonetic system? There are two compelling reasons. 1.) In the phonetic system, all the words will be pronounced correctly; and 2.) You can put inflection into the speech however and wherever you want it.  If you have already tried the RECITER text-to-speech program, you know that it does a fair job of pronouncing English words. However, it does make mistakes. Some words sound a little strange and others are difficult to understand. The reasons for this are not hard to understand. English is a language of exceptions rather than rules; words that are spelled alike are pronounced differently ("have" vs. "gave"). A rule system like RECITER cannot pronounce all words correctly unless it stores an enormous dictionary that takes up vast amounts of memory. But the second flaw in text-to-speech conversion is more serious. Such a rule system cannot decide where the stress belongs in what is being said. The phonetic system in S.A.M., on the other hand, allows you to decide where to accent syllables within a word and where to stress words within a sentence.  So it is clear that the preferred way to make S.A.M. speak is with the phonetic alphabet. But how hard is it to use? It's really easier than writing in English because **you don't have to know how to spell!** You only have to know how to say the word in order to spell it phonetically.  Here is the complete list of phonemes, each presented with a sample word containing its sound. Note that there are many vowels, which is why they are all indicated by two letters rather than one.  The phonemes are classified into two categories: vowels and consonants. Among the vowels are the simple vowel sounds such as the "i" in "sit", the "o" in "slot", and the "a" in "hat". These vowels do not change their quality throughout their duration. There are also vowels called diphthongs such as the "i" in "site", the "o" in "slow", and the "a" in "hate", as well as the "oi" in "oil" and the "ow" in "how". These vowels start with one sound and end with another (e.g. "oi" glides from an "oh" sound to an "ee" sound).  The consonants are also divided into two groups: voiced and unvoiced. The voiced consonants require you to use your vocal chords to produce the sound. Such sounds as "b". "I", "n", and "z" sounds fall into this category. The unvoiced consonants, on the other hand, are produced entirely by rushing air and include such sounds as the "p", "t", "h", and "sh" sounds.  **PHONETIC ALPHABET FOR S.A.M.**  The example words have the **sound** of the phoneme, not necessarily the same letters. |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 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m**a**de | |  | **AY** | h**igh** | |  | **OY** | b**oy** | |  | **AW** | h**ow** | |  | **OW** | sl**ow** | |  | **UW** | cr**ew** | |  |  | | --- | |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | |  |  |  |  |  |  | | --- | --- | --- | --- | | The following symbols are used internally by some of S.A.M.'s rules, but they are also available to the user. | | | | |  |  |  |  | |  | **YX** |  | diphthong ending | |  | **WX** |  | diphthong ending | |  | **RX** |  | R after a vowel | |  | **LX** |  | L after a vowel | |  | **/X** |  | H before a non-front vowel or consonant | |  | **DX** |  | "flap" as in pi**t**y | | |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 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a**g**ain | |  | **J** | **j**u**dg**e | |  | **Z** | **z**oo | |  | **ZH** | plea**s**ure | |  | **V** | se**v**en | |  | **DH** | **th**en | | -------------- | | | | **UNVOICED CONSONANTS** | | | |  | **S** | **S**am | |  | **SH** | fi**sh** | |  | **F** | **f**ish | |  | **TH** | **th**in | |  | **P** | **p**oke | |  | **T** | **t**alk | |  | **K** | **c**a**k**e | |  | **CH** | spee**ch** | |  | **/H** | a**h**ead | |  |  | | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | |  |  |  |  |  | | --- | --- | --- | | **SPECIAL PHONEMES** | | | |  | **UL** | sett**le** (= AXL) | |  | **UM** | astron**om**y (= AXM) | |  | **UN** | functi**on** (= ASN) | |  | **Q** | kitt**-**en (glottal stop) | | |  | |
| Note: The symbol for the "H" sound is **/H**. A glottal stop is a forced stoppage of sound. |
| On the phoneme chart, you will notice six phonemes -- YX, WX, RX, LX, /X, and DX -- which are described as being used by S.A.M.'s rule system. However, they have been provided with letter codes so that you may experiment with these special sounds directly. YX and WX are weaker versions of Y and W. RX and LX are smooth gliding versions of R and L. /X is the "h" sound in "who", and DX is the quick flap of the tongue on the upper palate as in the word "pi**t**y".  We are now ready to transcribe ordinary speech into its phonetic representation. Let's use the following sentence as an example:  **I do my calculations on the computer.**  The first step is to say each word aloud and decide how many syllables are in the word. a syllable has one vowel phoneme and its associated consonants (if any). We then identify the proper vowel phoneme by comparing its sound to lhe sounds listed in the table, and do the same for the consonants. The resultant combination of phonemes is the phonetic representation of the syllable. We do this for each syllable in a word.  In our example. the first word -- "I" -- is a single phoneme, the diphthong "AY". The next word -- "do" -- is a single syllable comprised of the diphthong "UW" preceded by the voiced consonant "D". The phonetic spelling is therefore "DUW". Similarly. the third word -- "my" -- again uses the "AY" sound, this time preceded by an "M", resulting in "MAY".  The word "calculations" has four syllables. The first syllable transcribes as "KAEL". The "c" sound is pronounced as "k". unlike the "s" pronunciation in a word like "cell" (notice there is no "C" in the phoneme table). The next syllable -- "cu" -- transcribes as "KYUW". Note here that the "Y" sound prevents this syllable from being pronounced as "coo". The third syllable comes out as "LEY", and the fourth becomes "SHAXNZ". This word ends with a voiced sound "7" and notthe hissy"S" sound as in "list". You will rapidly discover that many words contain the phonetic combinations "AXL". "AXM". and "AXN". To enhance the readability of the phonetic spelling, the special symbols "UL". "UM", and "UN" can be substituted for these combinations. The "tions" syllable is now written as "SHUNZ". So, "calculations" becomes "KAELKYUWLEYSHUNZ".  The next word "on" becomes "AAN", and "the" becomes "DHAX". By the way. if the word "the" precedes a word beginning with a vowel, it gets pronounced "thee" and is spelled "DHIY". You should also notice that the "th" letter combination has two phonetic representations: unvoiced (TH) as in "thin", or voiced (DH) as in "the".  By now. the steps used in getting from "computer" to "KUMPYUWTER" should already be obvious. Try it.  Once you get used to the phonetic system, it will seem very easy and obvious. Initially, there will be some spellings that seem tricky (did you know that "adventure" has a "CH" in it?). However,the rule is always to write the word the way you say it, not the way you spell it.  To help you learn the system fast, we have provided an English-to-phonetic spelling dictionary of almost 1500 words. Many common words are in the dictionary; some unusual ones are in it as well. If you are really stuck on how to spell a word that isn't in the dictionary, think of another word that sounds like it and that one may be listed.  In any case, don't hesitate to experiment with the phonetic spelling system. Let your ears be your guide. This system is easy to learn, easy to use, easy to read, and you will be amazed at what you can do with it.  **II. ADDING STRESS TO S.A.M.'S SPEECH**  In the phonetic mode, S.A.M. is capable of speaking with a great deal of inflection and emphasis. This gives a much more natural and understandable quality to the speech than is otherwise possible.  The stress system for S.A.M. is particulary easy to use. There are eight stress markers that can be used simply by inserting a number (1-8) **after** the vowel to be stressed. For example. the monotonic pronunciation of the word "hello" produced by the phonetic spelling "/HEHLOW" becomes a much friendlier sounding greeting when spelled "/HEH3LOW".  Why do **you** have to put in the stress markers? Simply because they can go **anywhere** and S.A.M. has no way of knowing where you **want** them to go. The following simple example will demonstrate this point to you. Use the SAYIT program on your S.A.M. disk to hear the following sample phrases.  We will have S.A.M. say  **"Why should I walk to the store?"**  in a number of different ways.  **1.** WAY2 SHUH7D AY WAO5K TUX DHAH STOH5R. (You want a reason to do it.)  **2.** WAY7 SHUH2D AY WAO7K TUX DHAH STOH5R. (You are reluctant to go.)  **3.** WAY5 SHUH7D AY2 WAO7K TUX DHAH STOHR. (You want someone else to do it.)  **4.** WAY5 SHUHD AY7 WAO2K TUX7 DHAH STOHR. (You'd rather drive.)  **5.** WAY5 SHUHD AY WAO5K TUX DHAH STOH2OH7R. (You want to walk somewhere else.)  Each of these stress examples has a slightly different meaning, even though the words are all the same. Stress markers give you the ability to let S.A.M. be expressive.  What do the stress markers do? The number you type tells S.A.M.to raise (or lower) his pitch and elongate the associated vowel sound.  The number system works like this:    1 = very emotional stress    2 = very emphatic stress    3 = rather strong stress    4 = ordinary stress    5 = light stress    6 = neutral (no pitch change) stress    7 = pitch-dropping stress    8 = extreme pitch-dropping stress  When should you use each of these? It all depends on how you want S.A.M. to sound. Say the words to yourself as expressively as you can and see where your voice rises and falls. Remember, the smaller the number, the more extreme the emphasis will be. Also, the stress markers will help get difficult words pronounced correctly. If some syllable is not enunciated sufficiently, put in a neutral stress marker.  A general rule is that the most important word or words in a sentence get the most stress and the rest of the words get little or no stress. However, words of more than one syllable should have stress marked on their accented syllables (most dictionaries show which these are if you are uncertain).  We will now assign stresses to our first example sentence about doing calculations on the computer. The first word "AY" is usually an important word (can you think of anyone more important?). We will write it as "AY4", assigning ordinary stress. "DUW", the only verb, is also important. We'll try "DUW4". "MAY" isn't very strong (unless you want to draw attention to it) and it is a single syllable. so we will leave it alone. "KAELKYUWLEYSHUNZ" is polysyllabic so we must identify the accented syllables. It is also the most important word in the sentence so it will have the strongest stress. "LEY" has the primary stress and "KAEL" receives the secondary stress. so we will write "KAE4LKYUWLEY3SHUNZ". "AAN" and "DHAX" are short, unstressed words. "KUMPYUWTER" has a single accent on "PYUW" and gets written "KUMPYUW4TER". So. our original sentence gets written  **AY4 DUW4 MAY KAE4LKYUWLEY3SHUNZ AAN DHAH KUMPYUW4TER.**  Try typing it into the SAYIT program compared to the unstressed version.  How about really unusual stress? When you place extraordinary emphasis on a word, you do so by elongating its vowel sounds. S.A.M. can do the same thing. For example, a call for help can become "/HEH5EH4EH3EH2EH2EH3EH4EH5EHLP." You can always do this with the ordinary vowel sounds, but be careful with the diphthongs. They are complex sounds and if you repeat them, they will not do what you want (e.g. "OYOYOYOYOYOY" sounds just like it reads in English). To extend the diphthong sounds, you need to break them into component parts. So "OY" can be extended with "OHOHIYIYIY", and "AY" can be extended with "AAAAIYIYIY". You should experiment to find out just what you can do.  Unlike many other speech synthesis systems, S.A.M. allows you to control consonant stresses directly. This is usually done to produce a special tonal pattern in a word. Sometimes you might want a pitch rise on the final phoneme occurring just before a comma. For example, try typing: "AY4 YUWZ SAE5M3, AE4ND RIYSAY4TER." Notice how the pitch rises on the "M". It is never necessary to specify stress for a consonant occurring immediately before a stressed vowel. This is handled automatically.  Try to become familiar with the stress marker system. It makes all the difference between an ordinary speech synthesizer and the very expressive S.A.M.  **III. THE EFFECTS OF PUNCTUATION**  S.A.M. understands four punctuation marks. They are the hyphen, comma, period, and question mark.  The hyphen (-) serves to mark clause boundaries by inserting a short pause in the speech. It also has other uses to be discussed later. The comma marks phrase boundaries and inserts a pause approximately double that of the hyphen. The question-mark and period mark the end of sentences, The period inserts a pause and also causes the pitch to fall. The question-mark also inserts a pause, but it causes the pitch to rise. Notice that not all questions should end with a question mark (rising pitch), only those that require a yes-or-no answer. ("Are we hiking today?" rises; "Why are we going to the woods?" falls at the end and should be marked with a period).  **IV. FINAL NOTES ON PHONETIC INPUT**  S.A.M. is capable of speaking only 2.5 seconds of speech without a break (this is the size of his "breath"). If the string to be spoken exceeds this, S.A.M. will insert short breaks every 2.5 seconds. S.A.M. **always** breaks at punctuation marks in anticipation of the following phrase. So, if you don't like where S.A.M. broke up a phrase, you can specify your own breaks with hypens. An example of this is: "I use the telephone - to call out of town".  S.A.M. uses the spaces between words to makes his sentence-breaking decisions. If a single word requires more than 2.5 seconds to say, S.A.M. will not be able to insert his own breaks and will therefore be unable to say the word.  In summary, the procedures outlined above may seem complex, but this is because they were presented in fine detail. In reality, the steps become automatic and you will soon be able to type in phonetics almost as fast as you can type English text.  **THE USE OF PITCH AND SPEED CONTROLS**  S.A.M. is capable of speaking in a wide range of tones and at many different rates. Both pitch and speed controls are accessed bysingle POKES to memory locations.  The following chart shows the effects of different values in the pitch and speed registers.\*   |  | | --- | | **PITCH** | | POKE PITCH,N | | N= | | 00-20 | impractical | | 20-30 | very high | | 30-40 | high | | 40-50 | high normal | | 50-70 | normal | | 70-80 | low normal | | 80-90 | low | | 90-255 | very low | | default = 64 |  |  |  | | --- | | **SPEED** | | POKE SPEED,M | | M= | | 0-20 | impractical | | 20-40 | very fast | | 40-60 | fast | | 60-70 | fast conversational | | 70-75 | normal conversational | | 75-90 | narrative | | 90-100 | slow | | 100-225 | very slow | | default = 72 |  |   \*see the memory reference chart for these locations |
| **WHAT AM I HEARING?**  In recent years, many new speech synthesizers have appeared in the marketplace. The techniques they use vary widely depending on the intended application. Most synthesizers found in consumer products, such as talking televisions or microwave ovens, use a "speech compression" technique of one sort or another. These techniques require a person to speak the needed words or entire sentences. The speech waveform is then "compressed" using a mathematical algorithm and, as a result, can then be stored in a memory chip without taking up a lot of room. The synthesizer's job is to then take this compressed speech information and expand it back into the original waveform. Some of these systems work quite well, retaining the speaker's intonation and sometimes even his or her identity. The processes used in such synthesizers differ greatly from those used in unlimited vocabulary synthesizers like S.A.M.  Let's follow the evolution of an unlimited vocabulary speech synthesizer. First, we must define the task. Simply, we want to create a system that will synthesize any English utterance. One way to begin would be to record every possible utterance on tape and just play back the right one whenever we need it. This would take up more tape or computer memory than could ever exist, so this method is obviously not too practical.  The next method might be to record all the English words and play them back in a specific order to create sentences. This is certainly practical. It would take up a large amount of memory, but it would work. However, we have lost something in this process. The words now sound disjointed because we have "spliced" the sentence together. Also, the stress or inflection pattern of the sentence is either wrong or non-existent. If we wanted an accurate stress pattern, we would need to record every word in a number of different styles, at different pitches, etc.  Such a system needs too much memory. So, let's break things down even further and try to store as little as possible in memory. Instead of storing sentences or words or even syllables, we could store phonemes. Phonemes are the atoms of spoken language, the individual speech sounds. It turns out that English has a little over forty of them. Wow -- this takes up practically no memory at all! We could specify the phonemes in the order we need to create words and sentences and really have ourselves a system. So, we go and record the phonemes and play them back to say the sentence, "I am a computer." Why can we barely understand it? It seems we have broken things down a bit too far. When we chop the words down to this level and then try to reassemble them, everything that blends one sound into another is lost and the results are nothing less than horrible.  But all is not lost, Our efforts are not wasted because we have the acoustic phonetician to come to our rescue. These people deal in the study of speech sounds and they can tell us just how to repair our phoneme-based system. First, instead of recording the actual speech waveform, we only store the frequency spectrums. By doing this, we save memory and pick up other advantages. Second, we learn that we need to store some data about timing. These are numbers pertaining to the duration of each phoneme under different circumstances, and also some data on transition times so we can know how to blend a phoneme into its neighbors. Third, we devise a system of rules to deal with all this data and, much to our amazement, our computer is babbling in no time.  The advantages in synthesizing speech in this way are tremendous. We use very little memory for all the data and the rules to use that data, and we also gain the ability to specify inflection, timing, and intonation. This is because we have not stored actual speech sounds, only their spectrums. (You can think of this as a printer needing only four colors of ink to reproduce all the colors in a picture.)  Now, in actuality, we do not store all the spectrums, but only those that are targets. Each phoneme has associated with it a target spectrum which can be specified with very little data. The target may be thought of as a "frozen" speech sound, the sound you would be making if your mouth was frozen exactly in the middle of pronouncing the phoneme. The timing rules tell the synthesizer how to move from target to target in a manner that imitates the timing of a human talker.  S.A.M. is this type of synthesizer implemented entirely in software. It has the tables of phoneme spectra and timing, together with the rules for using this data to blend the sounds together into any English utterance we may have in mind. We have traded some quality from the method using all the recorded words, but what we have gained is versatility, practicality, and the ability to do it all in real time, with very little memory usage, on an inexpensive microcomputer.  **ENGLISH-TO-PHONETIC SPELLING DICTIONARY**  [A](http://www.retrobits.net/atari/sam.shtml#dictA)   [B](http://www.retrobits.net/atari/sam.shtml#dictB)   [C](http://www.retrobits.net/atari/sam.shtml#dictC)   [D](http://www.retrobits.net/atari/sam.shtml#dictD)   [E](http://www.retrobits.net/atari/sam.shtml#dictE)   [F](http://www.retrobits.net/atari/sam.shtml#dictF)   [G](http://www.retrobits.net/atari/sam.shtml#dictG)   [H](http://www.retrobits.net/atari/sam.shtml#dictH)   [I](http://www.retrobits.net/atari/sam.shtml#dictI)   [J](http://www.retrobits.net/atari/sam.shtml#dictJ)   [K](http://www.retrobits.net/atari/sam.shtml#dictK)   [L](http://www.retrobits.net/atari/sam.shtml#dictL)   [M](http://www.retrobits.net/atari/sam.shtml#dictM)   [N](http://www.retrobits.net/atari/sam.shtml#dictN)   [O](http://www.retrobits.net/atari/sam.shtml#dictO)   [P](http://www.retrobits.net/atari/sam.shtml#dictP)   [Q](http://www.retrobits.net/atari/sam.shtml#dictQ)   [R](http://www.retrobits.net/atari/sam.shtml#dictR)   [S](http://www.retrobits.net/atari/sam.shtml#dictS)   [T](http://www.retrobits.net/atari/sam.shtml#dictT)   [U](http://www.retrobits.net/atari/sam.shtml#dictU)   [V](http://www.retrobits.net/atari/sam.shtml#dictV)   [W](http://www.retrobits.net/atari/sam.shtml#dictW)   [X](http://www.retrobits.net/atari/sam.shtml#dictX)   [Y](http://www.retrobits.net/atari/sam.shtml#dictY)   [Z](http://www.retrobits.net/atari/sam.shtml#dictZ) [DAYS OF THE WEEK](http://www.retrobits.net/atari/sam.shtml#dictDays) [MONTHS OF THE YEAR](http://www.retrobits.net/atari/sam.shtml#dictMonths) [NUMBERS](http://www.retrobits.net/atari/sam.shtml#dictNums) [STATES AND PROVINCES](http://www.retrobits.net/atari/sam.shtml#dictStates) [UNITS](http://www.retrobits.net/atari/sam.shtml#dictUnits)  - A -  abandon = AHBAE4NDUN  ability = AHBIH4LIXTIY  able = EY4BUL  abort = AHBOH4RT  about = AHBAW4T  above = AHBAH4V  absolute = AE5BSOHLUW4T  abuse = AHBYUW4S  accelerate = EHKSEH4LEREYT  accent = AE4KSEHNT  accept = AEKSEH4PT  access = AE4KSEHS  accident = AE4KSIXDEHNT  account = AHKAW4NT  acknowledge = EHKNA4LIHJ  action = AE4KSHUN  active = AE4KTIHV  address = AE4DREHS  adjust = AHJAH4ST  adult = AHDAH4LT  advance = EHDVAE4NS  adventure = AEDVEH4NCHER  affair = AHFEY4R  afford = AHFOH4RD  after = AE4FTER  age = EY4J  agree = AHGRIY4  air = EH4R  airplane = EH4RPLEYN  alarm = AHLAA4RM  algebra = AE4LJAXBRAH  alien = EY4LIYIXN  allow = AHLAW4  alone = AHLOW4N  along = AHLAO4NX  alphabet = AE4LFAXBEHT  alternate = AO4LTERNIXT  America = AHMEH4RIXKAH  among = AHMAH4NX  analysis = AHNAE4LIXSIXS  and = AE4ND  anger = AE4NXGER  announce = AHNAW4NS  answer = AE4NSER  antenna = AENTEH4NAH  anticipate = AENTIH4SIXPEYT  apology = AHPAA4LAXJIY  appear = AHPIY4R  apple = AE4PUL  appropriate = AHPROH4PRIYIXT  approve = AHPRUW4V  area = EH4RIYAH  arm = AA4RM  arrive = AHRAY4V  ask = AE4SK  assumption = AHSAH4MPSHUN  astronomy = AHSTRAA4NUMIY  Atari = AHTAA4RIY  atom = AE4TUM  attack = AHTAE4K  audio = AO4DIYOW  authority = AHTHOH4RIXTIY  automatic = AO5TUMAE4TIXK  auxiliary = AOKZIH4LYERIY  available = AHVEH4LAXBUL  - B -  baby = BEY4BIY  back = BAE4K  bad = BAE4D  balance = BAE4LIXNS  bank = BAE4NXK  bargain = BAA4RGUN  base = BEY4S  basic = BEY4SIHK  battle = BAE4TUL  beam = BIY4M  beautiful = BYUW4TIXFUHL  behave = BIY/HEY4V  belief = BIXLIY4F  beneficial = BEH4NAXFIH4SHUL  betray = BIYTREY4  better = BEH4TER  bible = BAY4BUL  bibliography = BIH5BLIYAA4GRAXFIY  bicycle = BAY4SIXKUL  billion = BIH4LYUN  binary = BAY4NEHRIY  bite = BAY4T  black = BAE4K  blast = BLAE4ST  block = BLAA4K  blood = BLAH4D  board = BOH4RD  bomb = BAA4M  book = BUH4K  boot = BUW4T  boss = BAO4S  bottle = BAA4TUL  bottom = BAA4TUM  box = BAA4KS  boy = BOY4  brain = BREY4N  branch = BRAE4NCH  break = BREY4K  brief = BRIY4F  bring = BRIH4NX  broken = BROW4KIXN  brother = BRAH4DHER  budget = BAH4JIXT  buffer = BAH4FER  bug = BAH4G  bureau = BYER4OW  burglar = BER4GULER  bus = BAH4S  business = BIH4ZNIXS  busy = BIH4ZIY  by = BAY4  byfe = BAY4T  - C -  cabinet = KAE4BUNIXT  cable KEY4BUL  calculate = KAE4LKYAXLEYT  calendar = KAE4LUNDER  call = KAO4L  calorie = KAE4LERIY  cancel = KAE4NSUL  candy = KAE4NDIY  cant = KAE4NT  capacity = KAXPAE4SIXTIY  captain = KAE4PTIXN  capture = KAE4PCHER  card = KAA4RD  careful = KEH4RFUHL  carry = KEH4RIY  cartridge = KAA4RTRIXJ  case = KEY4S  cashier = KAE4SHIY4R  cassette = KAXSEH4T  catalog = KAE4TULAOG  celebrate = SEH4LAXBREYT  celestial = SULEH4SCHIYUL  Celsius = SEH4LSIYAXS  center = SEH4NTER  certain = SER4TQN  challenge = CHAE4LIXNJ  change = CHEY4NJ  channel = CHAE4NUL  chapter = CHAE4PTER  charge = CHAA4RJ  chauvenism = SHOH4VIXNIHZUM  Cheese = CHIY4Z  child = CHAY4LD  children = CHIH4LDRIXN  chocolate = CHAO4KLIXT  choreography = KOH5RIYAA4GRAXFIY  Christmas = KRIH4SMAXS  church = CHER4CH  cinema = SIH4NUMAH  circle = SER4KUL  circuit = SER4KIXT  circumstance = SER4KUMSTAENS  citizen = SIH4TIXSUN  city = SIH4TIY  classify = KLAE4SIXFAY  clear = KLIY4R  close = KLOW4Z  coaxial = KOHAE4KSIYUL  coffee = KAO4FIY  coherent = KOW/HEH4RIXNT  cold = KOW4LD  college = KAA4LIXJ  color = KAH4LER  comfortable = KAH4MFTERBUL  command = KUMAE4ND  common = KAA4MUN  company = KAHM4PUNIY  complain = KUMPLEY4N  complex = KUMPLEH4KS  component = KAHMPOH4NUNT  computer = KUMPYUW4TER  condition = KUNDIH4SHUN  conscience = KAA4NSHUNTS  console = KAA4NSOHL  control = KUNTROH4L  conversation = KAA5NVERSEY4SHUN  coordinate = KOHWOH4DUNIXT  corporation = KOH5RPEREY4SHUN  correction = KOHREH4KSHUN  count = KAW4NT  country = KAH4NTRIY  cousin = KAH4ZIXN  create = KRIYEY4T  critical = KRIH4TIXKUL  culture = KAH4LCHER  curious = KYUH4RIYAXS  - D -  danger = DEY4NJER  data = DEY4TAH  decay = DIXKEY4  decibel = DEH4SIXBUL  decrease = DIYKRIY4S  definition = DEH5FUNIH4SHUN  degree = DIXGRIY4  delay = DIXLEY4  demonstrate = DEH4MUNSTREYT  department = DIYPAA4RTMIXNT  desire = DIXZAY4ER  develop = DIXVEH4LAHP  dictionary = DIH4KSHUNEHRIY  different = DIH4FRIXNT  discount = DIH4SKAWNT  distance = DIH4STIXNS  distribution = DIH5STRAXBYUW4SHUN  division = DIXVIH4ZHUN  doctor = DAA4KTER  double = DAH4BUL  down = DAW4N  drive = DRAY4V  dungeon = DAH4NJUN  - E -  earth = ER4TH  easy = IY4ZIY  economics = IY5KUNAA4MIXKS  education = EH5JUWKEY4SHUN  either = IY4DHER  eject = IXJEH4KT  electricity = ULEHKTRIH4SIXTIY  electronic = ULEHKTRAA4NIXK  elementary = EH4LUMEH4NTRIY  emphasis = EH4MFAXSIHS  encyclopedia=EHNSAY5KLAXPIY4DIYAH  energy = EH4NERJIY  engineering = EH5NJUNIY4RIHNX  enter = EH4NTER  enunciate = IYNAH4NSIYEYT  equal = IY4KWUL  erase = IXREY4S  error = EH4ROHR  escape = EHSKEY4P  estimate = EH4STUMIXT  Europe = YUH4RAXP  evil = IY4VUL  exciting = EHKSAY4TIHNX  explain = EHKSPLEY4N  expression EHKSPREH4SHUN  extra = EH4KSTRAH  - F -  face = FEY4S  fail = FEY4L  Fahrenheit = FEH4RIXN/HAYT  false = FAO4LS  family = FAE4MULIY  fast = FAE4ST  fatal = FEY4TUL  father= FAA4DHER  fault = FAO4LT  female = FIY4MEYL  fight = FAY4T  figure = FIH4GYER  file = FAY4L  filter= FIH4LTER6  finance = FAY4NAENS  find = FAY4ND  finger = FIH4NXGER  finish = FIH4NIXSH  fire = FAY4ER  first = FER4ST  flavor = FLEY4VER  flight = FLAY4T  flow chart = FLOW4CHAART  flower = FLAW4ER  fluorescent = FLUHREH4SIXNT  focus = FOW4KAXS  follow = FAA4LOW  foot = FUH5T  force = FOH4RS  formula = FOH4RMYUXLAH  forward = FOH4RWERD  fraction = FRAE4KSHUN  fragile = FRAE4JUL  freedom = FRIY4DUM  frequency = FRIY4KWUNSIY  from = FRAH4M  fuel = FYUW4L  full = FUH4L  function = FAH4NXKSHUN  fundamental = FAH5NDUMEH4NTUL  fuse = FYUW4Z  fusion = FYUWSZHUN  future = FYUW4CHER  - G -  gain = GEY4N  galaxy = GAE4LAXKSIY  game = GEY4M  garbage = GAA4RBIXJ  gasoline = GAE4SULIYN  gate = GEY4T  general = JEH4NERUL  generate = JEH4NEREYT  genius = JIY4NYAXS  gentle = JEH4NTUL  genuine = JEH4NUYXIXN  geometry = JIYAA4MIXTRIY  get = GEH4T  giant = JAY4IXNT  gift = GIH4FT  glass = GLAE4S  gnome = NOW4M  go = GOW4  gold = GOH4LD  good = GUH4D  gourmet = GUHRMEY4  government = GAH4VERNMEHNT  grand = GRAE4ND  graphic = GRAE4FIXK  gravity = GRAE4VIXTIY  ground = GRAW4ND  guarantee = GAE4RIXNTIY4  guide = GAY4D  gun = GAH4N  gyroscope = JAY4RAXSKOWP  - H -  habit = /HAE4BIXT  hacker = /HAE4KER  hair = /HEH4R  half = /HAE4F  hallucination = /HULUW4SIXNEY5SHUN  hand = /HAE4ND  happy = /HAE4PIY  hardware = /HAA4RDWEHR  harmony = /HAA4RMUNIY  have = /HAE4V  head = /HEH4D  heart = /HAA4RT  helicopter = /HEH4LIXKAAPTER  hello = /HEH4LOW  here = /HIY4R  hero = /HIY4ROW  herta = /HER4TS  hesitate = /HEH4ZIXTEY6T  hexadecimal = !HEH5KSIXDEH4SUMUL  high = /HAY4  history = /HIH4STERIY  hobby = /HAA4BIY  hold = /HOW4LD  home = /HOW4M  honest = AA4NIXST  horoscope = /HOH4RAXSKOWP  hospital = /HAA4SPIXTUL  hour = AW4ER  house = /HAW4S  however = /HAWEH4VER  huge /HYUW4J  human = /HYUW4MUN  humor = /HUYW4MER  husband = /HAH4ZBUND  hyper = /HAY4PER  hypothesis = /HAYPAA4THAXSIHS  - I -  I = AY4  ice = AY4S  idea = AYDIY4AX  identical = AYDEH4NTIXKUL  identity = AYDEH4N11XTIY  illusion = IHLUX4ZHUN  image = IH4MIXJ  imagination = IHMAE4JIXNEY5SHUN  immobilize = IXMOH4BULAYZ  important = IHMPOH4RTUNT  in = IH4N  inch = IHN4CH  included = IHNKLUX4DIXD  income = IH4NKUM  inconvenient = IHN5KUNVIY4NYUNT  increase = IHNKRIY4S  indeed = IHNDIY4D  index = IH4NDEHKS  indicate = IH4NDIXKEYT  indirect = IH5NDEREH4KT  individual = IH5NDIXVIH4JUWUL  industry = IH4NDAHSTRIY  inferior = IHNFIH4RIYER  inflation = IHNFLEY4SHUN  influence = IH4NFLUWIXNS  information = IH5NFERMEY4SHUN  -ing = IHNX  inject = IHNJEH4KT  injure = IH4NJER  initial = IXNIH4SHUL  inside = IHNSAY4D  inspect = IHNSPEH4KT  insulator = IH4NSULEYTER  integer = IH4NTIXJER  intelligent = IHNTEH4LIXJIXNT  interest = IH4NTREHST  interference = IH4NTERFIY4RIXNS  intermittent = IH4NTERMIH4TNNT  invader = IHNVEY4DER  invent = IHNVEH4NT  inverse = IH4NVERS  involve = IHNVAA4LV  iron = AY4ERN  irrational = IHRAE4SHUNUL  isolate = AY4SULEYT  issue = IH4SHUW  item = AY4TUM  - J -  jacket = JAE4KIXT  jam = JAE4M  jargon = JAA4RGUN  jazz = JAE4Z  jiffy = JIH4FIY  job = JAA4B  join = JOY4N  joke = JOW4K  judge = JAH4J  jump = JAH4MP  junction = JAH4NXKSHUN  junior = JUW4NYER  just = JAH4ST  jail = JEY4L  jewelry = JUW4LRIY  journey = JER4NIY  jungle JAH4NXGUL  junk = JAH4NXK  - K -  keep = KIY4P  key = KIY4  keyboard = KIY4BOHRD  kilobyte = KIH4LAXBAYT  kind = KAY4ND  kingdom = KIH4NXGDUM  knight = NAY4T  knowledge = NAA4LIXJ  - L -  label = LEY4BUL  lady = LEY4DIY  language = LAE4NXGWIXJ  large = LAA4RJ  laser = LEY4ZER  last = LAE4ST  late = LEY4T  laugh = LAE4F  launch = LAO4NCH  law = LAO4  layer = LEY4ER  lead = LIY4D  lease = LIY4S  lecture = LEH4KCHER  left = LEH4FT  legal = LIY4GUL  legend = LEH4JIXND  leisure = LIY4ZHER  length = LEH4NTH  letter = LEH4TER  level = LEH4VUL  liberal = LIH4BERUL  life = LAY4F  lift = LIH4FT  light = LAY4T  like = LAY4K  limit = LIH4MIXT  linear = LIH4NIYER  liquid = LIH4KWIXD  list = LIH4ST  listen = LIH4SIXN  literature = LIH4TERIXCHER  little = LIH4TU  load = LOW4D  local = LOW4KUL  location = LOWKEY4SHUN  lock = LAA4K  logarithm = LAO4GERIH5DHUM  logical = LAA4JIHKUL  long = LAO4NX  look = LUH4K  loop = LUW4P  lose = LOW4Z  love = LAH4V  low = LOW4  loyal = LOY4UL  luminescence = LUW4MIXNEH5SIXNS  lunatic = LUW4NAXTIH6K  luxury = LAH4GZHERIY  - M -  machine = MAXSHIY4N  madam = MAE4DUM  made = MEY4D  magazine = MAEGAXZIY4N  magic = MAE4JIHK  magnet = MAE4GNIXT  magnitude = MAE4GNIHTUX5D  mail = MEY4L  main = MEY4N  major = MEY4JER  make = MEY4K  malfunction = MAE5LFAH4NXKSHUN  man = MAE4N  manager = MAE4NIXJER  maneuver = MUNUW4VER  manipulate = MUNIH4PYUHLEYT  manual = MAE4NYUWUL  manufacture = MAE5NUYXFAE4KCHER  many = MEH4NIY  marginal = MAA4RJIXNUL  market = MM4RKIXT  marriage = MEH4RIXJ  mass = MAE4S  master = MAE4STER  mate = MEY4T  material = MAXTIH4RIYUL  mathematics = MAE4THUMAE5TIXKS  mature = MAXCHUX4R  maximum = MAE4KSIXMUM  may = MEY4  meaning = MUY4NIHNX  measure = MEH4ZHER  mechanical = MIXKAE4NIHKUL  mechanism = MEH4KUNIHZUM  media = MIY4DIYAH  medical = MEH4DIXKUL  medium = MIY4DIYUM  member = MEH4MBER  memory = MEH4MERIY  mental = MEH4NTUL  menu = MEH4NYUW  merchandise = MER4CHUNDAY5S  merge = MER4J  metal = MEH4TUL  meter = MIY4TER  method = MEH4THIXD  micro = MAY4KROW6  middle = MIH4DUL  might = MAY4T  mile = MAY4L  military = MIH4LIXTEH6RIY  million = MIH4LYUN  mind = MAY4ND  mineral = MIH4NERUL  miniature = MIH4NIYAXCHER  minimum = MIH4NIXMUM  minus = MAY4NIXS  miracle = MIH4RIXKUL  miscellaneous = MIH5SULEY4NIYAXS  missile = MIH4SUL  mister = MIH4STER  mixture = MIH4KSCHER  mnemonic = NIXMAA4NIXK  model = MAA4DUL  modulation = MAA4JULEY5SHUN  molecule = MAA4LIXKYUWL  moment = MOH4MIXNT  money = MAH4NIY  monitor = MAA4NIXTER  monolithic = MAANULIH4THIXK  monotone = MAA4NAXTOW6N  month = MAH4NTH  moon = MUW4N  morning = MOH4RNIHNX  most = MOW4ST  mother = MAH4DHER  motion = MOW4SHUN  motor = MOW4TER  mouth = MAW4TH  move = MUW4V  much = MAH4CH  multiply = MAH4LTIX6PLAY  murder = MER4DER  muscle = MAH4SUL  music = MYUW4ZIXK  must = MAH4ST  my = MAY4  myself = MAYSEH4LF  mystery = MIH4STERIY  - N -  naive = NAY5IY4V  name = NEY4M  narrate = NAE4REYT  narrow = NAE4ROW  natural = NAE4CHERUL  nature = NEY4CHER  navigate = NAE4VIXGEYT  near= NIY4R  need = NIY4D  negative = NEH5GAXTIH6V  negotiate NIXGOW4SHIYEYT  neighborhood = NEY4BER/HUH6D  nerve = NER4V  neutral = NUX4TRUL  news = NUW4Z  nice = NAY4S  night = NAY4T  noise = NOY4Z  nomenclature = NOH4MIXNKLEY6CHER  none = NAH4N  normal = NOH4RMUL  north = NOH4RTH  nose = NOW4Z  notation = NOHTEY4SHUN  notice = NOW4TIXS  nothing = NAH4THIHNX  now = NAW4  nuclear = NUX4KLIYER  number= NAH4MBER  - O -  object = AA4BJEHKT  obligation = AA5BLIXGEY4SHUN  observe = AXBZER4V  obvious = AA4BVIYAXS  occational = AHKEY4ZHUNUL  occupation = AA5KYUXPEY4SHUN  ocean = OW4SHUN  odd = AA4D  of = AH4V  off = AO4F  offer = AO4FER  office = AO4FIXS  official = AHFIH4SHUL  ogre = OW4GER  ohm = OW4M  oil = OY4L  O.K. = OW4KEY  old = OW4LD  omen = OW4MUN  on = AA4N  open = OW4PUN  operate = AA4PEREYT  opinion = AHPIH4NYUN  oppose = AHPOW4Z  opposite = AA4PAXSIHT  option = AA4PSHUN  orbit = OH4RBIHT  orchestra = OH4RKEHSTRAH  order = OH4RDER  ordinary = OH4RDIXNEHRIY  organize = OH4GUNAYZ  origin = OH4RIXJIXN  oscillation = AA5SULEY4SHUN  other = AH4DHER  ought = AO4T  out = AW4T  outlet = AW4TLEHT  output = AW4TPUHT  outside = AWTSAY4D  over = OW4VER  own = OW4N  oxygen = AA4KSAXJIXN  - p -  pack = PAEPAE4K  package = PAE4KIXJ  page = PEY4J  paint = PEY4NT  pair = PEH4R  palace = PAE4LIXS  panel = PAE4NUL  paper = PEY4PER  parabola = PERAE4BULAH  paradox = PAE4RAXDAA6KS  parallel = PAE4RULEH6L  paragraph = PAE4RAXGRAEF  pardon = PAA4RDUN  parent = PEH4RUNT  parity = PAE4RIXTIY  park = PAA4RK  part = PAA4RT  particle = PAA4RTIXKUL  particular = PAARTIH4KYUHLER  pass = PAE4S  patch = PAE4TCH  pathetic = PAHTHEH4TIXK  pattern = PAE4TERN  pause = PAO4Z  pay = PEY4  payroll = PEY4ROW6L  peculiar = PIXKYUW4LYER  penalty = PEH4NULTIY4  penetrate = PEH4NAXTREY6T  perception = PERSEH4PSHUN  perfect = PER4FIXKT  period = PIH4RIYIXD  permanent = PER4MUNIXNT  permission = PERMIH4SHUN  person = PER4SUN  personality = PER4SUNAE5LIX1  perspective = PERSPEH4KTIXV  pet = PEH4T  phantom = FAE4NTUM  phase = FEY4Z  phenomenon = FUNAA4MIXNU  philosophy = FULAA4SAHFIY  phoneme = FOW4NIYM  photo = FOW4TOW  physical = FIH4ZIXKUL  physics = FIH4ZIXKS  piano = PYAE4NOW  pick = PIH4K  picture = PIH4KCHER  pilot = PAY4LIXT  pin = PIH4N  pirate = PAY4RIXT  pistol = PIH4STUL  pitch = PIH4TCH  pity = PIH4TIY  place = PLEY4S  plan = PLAE4N  planet = PLAE4NIXT  plastic = PLAE4STIxK  plausible = PLAO4ZAXBUL  play = PLEY4  please = PLIY4Z  pleasure = PLEH4ZHER  plectrum = PLEH4KTRUM  plenty = PLEH4NTIY  plot = PLAA4T  plug = PLAH4G  plus = PLAH4S  poetry = POW4IXTRIY  point = POY4NT  poke = POW4K  police = PULIY4S  policy = PAA4LIXSIY  polynomial = PAA5LIXNOH4MIYUL  pop = PAA4P  popular = PAA4PYULER  population = PAA4PYULEY4SHUN  port = POH4RT  portable = POH4RTAXBUL  positive = PAA4ZIXTIX6V  position = PAXZIH4SHUN  power= PAW4ER  practice = PRAE4KTIHS  precise = PRIXSAY4S  prefer = PRIXFER4  preliminary = PREIXLIH4MIXNEHRIY  prepare = PRIXPEH4R  present = PREH4ZIXNT  press = PREH4S  pressure = PREH4SHER  prevent = PRIXVEH4NT  primary = PRAY4MEHRIY  primitive = PRIH4MIXTIX6V  prince = PRIH4NS  princess = PRIH4NSEHS  print = PRIH4NT  private = PRAY4VIXT  probably = PRAA4BAXBLIY  problem = PRAA4BLUM  proceed = PROHSIY4D  process = PRAA4SEHS  produce = PRAXDUW4S  professional = PRAXFEH4SHUNUL  professor = PRAHFEH4SER  profit = PRAA4FIXT  program = PROW4GRAEM  project = PRAA4JEHKT  promise = PRAA4MIHS  pronounce = PRUNAW4NS  proper = PRAA4PER  proportional = PRAXPOH4RSHUNUL  protect = PRAXTEH4KT  proud = PRAW4D  psychiatrist = SAYKAY4AXTRIX6ST  public = PAH4BLIXK  publish = PAH4BLIHSH  pull = PUH4L  pulse = PAH4LS  pure = PYUW4R  push = PUH4SH  put = PUH4T  - Q -  quality = KWAA4LIXTIY  quantity = KWAA4NTIXTIY  question = KWEH4SCHUN  quick= KWIH4K  quiet = KWAY4IXT  quit = KWIH4T  quiz = KWIH4Z  quote = KWOW4T  quotient = KWOW4SHUNT  - R -  race = REY4S  radar = REY4DAAR  radiation = REY5DIYEY4SHUN  radio = REY4DIYOW  radius = REY4DIYAHS  rain = REY4N  random = RAE4NDUM  range = REY4NJ  rare = REH4R  rate = REY4T  rather = RAE4DHER  ratio = REY4SHIYOW  reach = RIY4CH  reaction = RIYAE4KSHUN  read = RIY4D  realistic = RIY5LIH4STIXK  reason = RIY4ZUN  receive = RIXSIY4V  reciter = RIXSAY4TER  recognize = REH4KAXGNAYZ  recommend = REH5KUMEH4ND  record = REH4KERD  recover = RIYKAH4VER  rectangle = REH4KTAENXGUL  reduce = RIXDUW4S  refer = RIYFER4  reference = REH4FERIXNS  reflection = RIXFLEH4KSHUN  refrigerator = RIXFRIH4JEREYTER  region = RIY4JUN  register = REH4JIXSTER  regular = REH4GYUXLER  reject = RIXJEH4KT  relativity = REH5LAXTIH4VIXTIY  relax = RIXLAE4KS  relay= RIY4LEY  release = RIXLIY4S  relief = RIYLIY4F  religion = RIXLUH4JUN  remain = RIYMEY4N  remember = RIXMEH4MBER  remove = RIYMUX4V  rent = REH4NT  repeat = RIXPIY4T  replace = RIXPLEY4S  reply = RIXPLAY4  report = RIXPOH4RT  represent = REHPRIXZEH4NT  reproduction = RIY5PRAXDAH4KSHUN  republic = RIXPAH4BLIXK  rescue = REH4SKYUW  research = RIY4SERCH  reserve = RIXZER4V  resistance = RIXZIH4STUNS  respect = RIXSPEH4KT  response = RIXSPAA4NS  rest = REH4ST  restore = RIXSTOH4R  retail = RIY4TEY6L  return = RIXTER4N  reverse = RIXVER4S  review = RIXVYUW4  revolution = REH5VULUXWSHUN  rhapsody = RAE4PSAXDIY  rhythm = RIH4DHUM  rich = RIH4CH  ride = RAY4D  ridiculous = RIXDIH4KYULAXS  right = RAY4T  rigid = RIH4JIXD  ring = RIH4NX  rise = RAY4Z  river = RIH4VER  road = ROW4D  rocket = RAA4KIXT  roll = ROH4L  room = RUW4M  rough = RAH4F  round = RAW4ND  rubber= RAH4BER  rule = RUW4L  run = RAH4N  rush = RAH4SH  - S -  sabotage = SAE5BAXTAA6ZH  sacrifice = SAE4KRIXFAYS  sad = SAE4D  safe = SEY4F  safety = SEY4FTIY  saint = SEY4NT  sale = SEY4L  S.A.M. = SAE4M  same = SEY4M  sample = SAE4MPUL  sanctuary = SAE4NXKCHUWEH6RIY  sandwich = SAE4NWIXCH  sarcasm = SAA4IRKAEZUM  satisfaction = SAE4TIXSFAE4KSHUN  savage = SAE4VIXJ  save = SEY4V  say = SEY4  scale = SKEY4L  scandal = SKAE4NDUL  scarce = SKEY4RS  scatter = SKAE4TER  scenic = SIY4NIXK  schedule = SKEH4JYUWL  scheme = SKIY4M  scholar = SKAA4LER  school = SKUW4L  science = SAY4IHNS  scientific = SAY4UNTIH5FIXK  scientific = SAY4AXNTIH5FIXK  scissors = SIH4ZERZ  score = SKOH4R  scramble = SKRAE4MBUL  scratch = SKRAE4CH  scream = SKRIY4M  screw = SKRUW4  script = SKRIH4PT  scroll = SKROW4L  seal = SIY4L  search = SER4CH  season = SIY4ZUN  second = SEH4KUND  secret = SIY4KRIXT  secretary = SEH4KRIXTEH5RIY  section = SEH4KSHUN  security = SIXKYUH4RIXTIY  see = SIY4  seek = SIY4K  segment = SEH4GMIXNT  self = SEH4LF  sell = SEH4L  semi- = SEH4MIY  send = SEH4ND  sensation = SEHNSEY4SHUN  senior = SIY4NYER  sense = SEH4NS  sensible = SEH4NSIXBUL  sensitive = SEH4NSIXTIX6V  sentence = SEH4NTIXNS  separate = SEH4PERIXT  sequence = SIY4KWEHNS  serial = SIH4RIYUL  serious = SIH4RIYAHS  serve = SER4V  service = SER4VIXS  session = SEH4SHUN  set = SEH4T  settle = SEH4TUL  several = SEH4VERUL  sex = SEH4KS  shadow = SHAE4DOW  shake = SHEY4K  shame = SHEY4M  shape = SHEY4P  share = SHEY4R  sharp = SHAA4RP  she = SHIY4  sheet = SHIY4T  shield = SHIY4LD  shift = SHIH4FT  shock = SHAA4K  shoot = SHUW4T  shop = SHAA4P  short = SHOH4RT  should = SHUH4D  show = SHOW4  shy = SHAY4  sick = SIH4K  side = SAY4D  sight = SAY4T  sign = SAY4N  signal = SIH4GNUL  silent = SAY4LIXNT  silver = SIH4LVER  similar = SIH4MULER  simple = SIH4MPUL  simplicity = SIHMPLIH4SIXTIY  simulator = SIH4MYULEYTER  sin = SIH4N  single = SIH4NXGUL  sinister = SIH4NIXSTER  sir = SER4  siren = SAY4RIXN  sit = SIH4T  situation = SIH5CHUWEY4SHUN  skeptical = SKEH4PTIXKUL  sketch = SKEH4TCH  skill = SKIH4L  skip = SKIH4P  slang = SLAE4NX  sleep = SLIY4P  sleeve = SLIY4V  slip = SLIH4P  slot = SLAA4T  slow = SLOW4  small = SMAO4L  smart = SMAA4RT  smell = SMEH4L  smooth = SMUW4DH  snap = SNAE4P  so = SOW4  social = SOW4SHUL  society = SAXSAY4IXTIY  soft = SAO4FT  solar = SOW4LER  soldier = SOH4LJER  solemn = SAA4LUM  solid = SAA4LIXD  solitude = SAA4LIXTUW6D  solution = SULUW4SHUN  some = SAH4M  somebody = SAH4MBAADIY  song = SAO4NX  soon = SUW4N  sophisticated = SAXFIH4STIXKEYTIXD  sorry = SAA4RIY  sort = SOH4RT  sound = SAW4ND  south = SAW4TH  space = SPEY4S  spare = SPEY4R  spatial = SPEY4SHUL  speak = SPIY4K  special = SPEH4SHUL  specific = SPAXSIH4FIXK  speculate = SPEH4KYULEYT  speech = SPIY4CH  speed = SPIY4D  spell = SPEH4L  spend = SPEH4ND  sphere = SFIY4R  spin = SPIH4N  spiral = SPAY4RUL  spirit = SPIH4RIXT  splendid = SPLEH4NDIXD  split = SPLIH4T  spoil = SPOY4L  spontaneous = SPAANTEY4NIYAHS  sports = SPOH4RTS  spot = SPAA4T  spread = SPREH4D  spring = SPRIH4NX  spy = SPAY4  square = SKWEH4R  squeeze = SKWIY4Z  stability = STAXBIH4LIXTIY  staff = STAE4F  stand = STAE4ND  standard = STAE4NDERD  star = STAA4R  start = STAA4RT  state = STEY4T  static = STAE4TIXK  station = STEY4SHUN  stay = STEY4  steady = STEH4DIY  steer = STIY4R  step = STEH4P  stereo = STEH4RIYOW  stick = STIH4K  stimualte = STIH4MYULEYT  stock = STAA4K  stone = STOW4N  stop = STAA4P  store = STOH4R  story = STOH4RIY  straight = STREY4T  strange = STREY4NJ  strategy = STRAE4TIXJIY  street = STRIY4T  strength = STREY4NTH  strike = STRAY4K  strong = STRAO4NX  structure = STRAH4KCHER  stubborn = STAH4BERN  student = STUW4DIXNT  study = STAH4DIY  stuff = STAH4F  stupid = STUX4PIXD  style = STAY4L  subject = SAH4BJEHKT  substance = SAH4BSTIXNS  subtle = SAH4TUL  succession = SAHKSEH4SHUN  succeed = SAHKSIY4D  such = SAH4CH  sudden = SAH4DIXN  suggest = SAHGJEH4ST  sum = SAH4M  summer = SAH4MER  sun = SAH4N  super = SUX4PER  superb = SUXPER4B  superior = SUXPIH4RIYER  supply = SAXPLAY4  support = SAXPOH4RT  sure = SHUX4R  surprise = SERPRAY4Z  surroundings = SERAW4NDIHNXGZ  suspend = SAHSPEH4ND  swear = SWEH4R  sweep = SWIY4P  swell = SWEH4L  swing = SWIH4NX  syllable = SIH4LAXBUL  symbol = SIH4MBUL  symbolic = SIHMBAA4LIXK  symmetric = SIHMEH4TRIXK  sympathy = SIH4MPAXTHIY  synchronize = SIH4NXKRAX5NAYZ  synonym = SIH4NUNIXM  system = SIH4STUM  synthesizer = SIH4NTHAXSAYZER  - T -  tab = TAE4B  table = TEY4BUL  tactical = TAE4KTIXKUL  tail = TEY4L  take = TEY4K  talent = TAE4LIX6NT  tall = TAO4L  talk = TAO4K  tap = TAE4P  tape = TEY4P  target = TAA4RGIXT  task = TEY4ST  tax = TAE4KS  teach = TIY4CH  team = TIY4M  technical = TEH4KNIXKUL  technology = TEHKNAA4LAXJIY  telephone = TEH4LAX6FOWN  television = TEH4LAX6VIXZHUN  temper = TEH4MPER  tender = TEH4NDER  tense = TEH4NS  tension = TEH4NSHUN  term = TER4M  terminal = TER4MIXNUL  terrestrial = TER6EH4STRIY6UL  terrible = TEH4RAXBUL  territory = TEH4RAXTOH6RIY  terror = TEH4RER6  test = TEH4ST  testimony = TEH4STUMOHNIY  text = TEH4KST  than = DHAE4N  than = DHAE4N  thank = THAE4NXK  that = DHAE4T  the = DHAH4  theater = THIY4AHTER  then = DHEH4N  theorem = THIY4RUM  theory = THIY4RIY  thermometer = THERMAA4MIXTER  thesis = THIY4SIXS  they = DHEY4  thin = THIH4N  thing = THIH4NX  think = THIH4NXK  this = DHIH4S  thought = THAO4T  threshold = THREH4SH/HOWLD  through = THRUW4  ticket = TIH4KIXT  tight = TAY4T  time = TAY4M  tiny = TAY4NIY  tired = TAY4ERD  title = TAY4TUL  together = TUXGEH4DHER  tolerance = TAA4LERIXNS  tone = TOW4N  tool = TUW4L  top = TAA4P  toss = TAO4S  touch = TAH4CH  tough = TAH4F  tournament = TER4NUMIXNT  toward = TOH4RD  toward = TOW4RD  town = TAW4N  toy = TOY4  trace = TREY4S  track = TRAE4K  trade = TREY4D  tradition = TRAXDIH4SHUN  traffic = TRAE4FIXK  trail = TREY4L  trajectory = TRAXJEH4KTERY  transaction = TRAENZAE4KSHUN  transfer = TRAE4NSFER  transform = TRAENSFOH4RM  transistor = TRAENZIH4STER  translate = TRAE4NZLEYT  transmit = TRAE4NZMIXT  transparent = TRAE5NSPEH4RIXNT  transportation = TRAE5NZPOHRTEY4SHUN  trap = TRAE4P  treasury = TREH4ZHERIY  tree = TRIY4  trek = TREH4K  tremendous = TRIXMEH4NDAXS  trespass = TREH4SPAES  trial = TRAY4UL  trangle = TRAY4AENXGUL  trick = TRIH4K  trgger = TRIH4GER  trim = TRIH4M  trip = TRIH4P  triple = TRIH4PUL  triumph = TRAY4AHMF  troll = TROW4L  trophy = TROW4FIY  trouble = TRAH4BUL  truck = TRAH4K  true = TRUW4  truth = TRUW4TH  trj = TRAY4  tune = TUW4N  tunnel = TAH4NUL  turn = TER4N  tutor = TUW4TER  twist = TWIH4ST  type = TAY4P  typewriter = TAY4PRAYTER  - U -  ugly = AH4GLIY  ultimate = AH4LTAX6MIXT  uncle = AH4NKUL  under = AH4NDER  understand = AH5NDERSTAE4ND  uniform = YUW4NIXFOHRM  union = YUW4NYUN  unit = YUW4NIXT  universal = YUW5NIXVER4SUL  unless = AHNLEH4S  up = AH4P  upset = AHPSEH4T  urge = EH4RJ  use = YUW4S  utility = YUWTIH4LIXTIY  - V -  vacation = VEYKEY4SHUN  vacuum = VAE4KYUWM  vague = VEY4G  valid = VAE4LIXD  value = VAE4LYUW  valve = VAE4LV  vanadium = VUNEY4DIYUM  vapor = VEY4PER  variation = VEH5RIYEY4SHUN  various = VEH4RIYAHS  vary = VEH4RIY  veal = VIY4L  vector = VEH4KTER  vegetable = VEH4JTAXBUL  vehicle = VIY4IX6KUL  ventilate = VEH4NTULEYT  verb = VER4B  versatile = VER4SAXTUL  verse = VER4S  version = VER4ZHUN  vertical = VER4TIXKUL  very = VEH4RIY  veto = VIY4TOW  vibration = VAYBREY4SHUN  vicinity = VAXSIH4NIXTIY  victory = VIH4KTERIY  video = VIH4DIYOW  village = VIH4LIXJ  vinyl = VAY4NUL  violation = VAY4AXLEY5SHUN  virtue = VER4CHUW  visible = VIH4ZIXBUL  visit = VIH4ZIXT  vital = VAY4TUL  vocabulary = VOHKAE4BYULEHRIY  vocal = VOW4KUL  voice = VOY4S  volt = VOW4LT  volume = VAA4LYUWM  voluntary = VAA4LUNTEH5RIY  vote = VOW4T  vowel = VAW4UL  voyage = VOY4IXJ  video = VIH4DIYOW  - W -  wafer = WEY4FER  wage = WEY4J  wait = WEY4T  wake = WEY4K  walk = WAO4K  wall = WAO4L  war = WOH4R  warm = WOH4RM  warp = WOH4RP  warranty = WOH5RIXNTIY4  wash = WAA4SH  waste = WEY4ST  watch = WAA4CH  water = WAO4TER  watt = WAA4T  wave = WEY4V  way = WEY4  weak = WIY4K  wealth = WEH4LTH  wear = WEH4R  wedding = WEH4DIHNX  week = WIY4K  weight = WEY4  welcome = WEH4LKUM  well = WEH4L  were = WER4  what = WHAH4T  wheel = WHIY4L  when = WHEH4N  which = WHIH4CH  while = WHAY4L  whisper = WHIH4SPER  white = WHAY4T  who = /HUW4  whole = /HOW4L  wide = WAY4D  wild = WAY4LD  will = WIH4L  win = WIH4N  window = WIH4NDOW  wing = WIH4NX  winter = WIH4NTER  wise = WAY4Z  wish = WIH4SH  with = WIH4TH  wizard = WIH4ZERD  woman = WUH4MUN  women = WIH4MIXN  wonder = WAH4NDER  word = WER4D  Wordrace = WER2DREYS  work = WER4K  world = WUH4RLD  worry = WER4IY  would = WUH4D  wrap = RAE4P  write = RAY4T  wrong = RAO4NX  - X -  Zerox = ZIH4RAAKS  X-ray = EH4KSREY  xylophone = ZAY4LAXFOWN  - Y -  yacht = YAA4T  yard = YAA4RD  yawn = YAO4N  year = YIH4R  yellow = YEH4LOW  yes = YEH4S  you = YUW4  your = YOH4R  youth = YUX4TH  - Z -  zany = ZEY4NIY  zero = ZIY4ROW  zig-zag = ZIH3GZAEG  zip = ZIH4P  zodiac = ZOW4DIY6AEK  zone = ZOW4N  - DAYS OF THE WEEK -  Monday = MAH4NDEY  Tuesday = TUW4ZDEY  Wednesday = WEH4NZDEY  Thursday = THER4ZDEY  Friday = FRAY4DEY  Saturday = SAE4TERDEY  Sunday = SAH4NDEY  - MONTHS OF THE YEAR -  January = JAE4NYUXEHRIY  February = FEH4BRUXEH6RIY  March = MAA4RCH  April = EY4PRIXL  May= MEY4  June = JUW4N  July = JUHLAY4  August = AO4GAXST  September = SEHPTEH4MBER  October = AAKTOW4BER  November = NOHVEH4MBER  December = DIHSEH4MBER  - NUMBERS -  one = WAH4N  two = TUW4  three = THRIY4  four = FOH4R  five = FAY4V  six = SIH4KS  seven = SEH4VIXN  eight = EY4T  nine = NAY4N  ten = TEH4N  eleven = IXLEH4VIXN  twelve = TWEH4LV  thirteen = THER4TIY6N  twenty = TWEH4NTIY  thirty = THER4TIY  hundred = /HAH4NDRIXD  thousand = THAW4ZUND  million = MIH4LYUN  - STATES AND PROVINCES -  United States = YUWNAY4TIXD STEY4TS  Alabama = AE4LAXBAE6MAX  Alaska = AHLAE4SKAH  Arizona = EH4RAXZOW5NAH  Arkansas = AA4RKUNSAO  California = KAE5LAXFOH4RNYAH  Colorado = KAA5LAXRAA4DOW  Connecticut = KAHNEH4TIXKAHT  Delaware = DEH4LAXWEH6R  Florida = FLOH4RIXDAH  Georgia = JOH4RJAH  Hawaii = /HAHWAY4IY  Idaho = AY4DAH/HOW  Illinois = IHLUNOY4  Indiana = IH5NDIYAE4NAH  Iowa = AY4AHWAH  Kansas = KAE4NZIXS  Kentucky = KEHNTAH4KIY  Louisiana = LUXIY4ZIYAE5NAH  Maine = MEY4N  Maryland = MEH4RULIXND  Massachusetts = MAE5SAXCHUW4SIXTS  Michigan = MIH4SAXGUN  Minnesota = MIH5NAXSOW4TAH  Mississippi = MIH5SIXSIH4PIY  Missouri = MIHZUH4RIY  Montana = MAANTAE4NAH  Nebraska = NAXBRAE4SKAH  Nevada = NAXVAE4DAH  New Hampshire= NUW6/HAE4MPSHER  New Jersey = NUWJER4ZIY  New Mexico = NUWMEH4KSIXKOW  New York = NUWYOH4RK  North Carolina = NOH4RTH KEH5RULAY4NAH  North Dakota= NOH4RTH DAHKOW4TAH  Ohio = OW/HAY4OW  Oklahoma = OWKLAX6/HOW4MAH  Oregon = OH4RIXGUN  Pennsylvania = PEH5NSULVEY4NYAH  Rhode Island = ROW5D AY4LUND  South Carolina = SAW4TH KEH5RULAY4NAH  South Dakota = SAW4TH DAXKOW4TAH  Tennessee = TEH5NAXSIY4  Texas = TEH4KSAXS  Utah = YUW4TAO6  Vermont = VERMAA4NT  Virginia = VERJIH4NYAH  Washington = WAA4SHIHNXTAHN  West Virginia = WEH5ST VERJIH4NYAH  Wisconsin = WIHSKAA4NSUN  Wyoming = WAYOW4MIHNX  Provinces of Canada =  PRAA4VIXNSIXZ AHV KAE4NAXDAH  Alberta = AELBER4TAH  British Columbia =  BRIH4TIXSH KAHLAH4MBIYAH  Manitoba = MAE5NIXTOW4BAH  New Brunswich = NUWBRAH4NZWIXK  Newfoundland = NUW4FIXNLIXND  Nova Scotia = NOH4VAX5KOW4SHAH  Ontario = AANTEH4RIYOW  Prince Edward Island =  PRIH5NS EH4DWERD AY4LUND  Quebec = KUHBEH4K  Saskatchewan = SAESKAE4CHAXWAAN  - UNITS -  units = YUW4NIXTS  inches = IH4NCHIXZ  feet = FIY4T  yards = YAA4RDZ  miles = MAY4LZ  centimeters = SEH4NTIXMIY6TERZ  kilometers = KIXLAA4MIXTERZ  acres = EY4KERZ  ounces = AW4NSIXZ  pounds = PAW4NDZ  tons = TAH4NZ  grams = GRAE4MZ  teaspoons = TIY4SPUWNZ  cups = KAH4PS  pints = PAY4NTS  quarts = KWOH4RTS  gallons = GAE4LUNZ  liters = LIY4TERZ  degrees = DAXGRIY4Z |
| **FINDING PHONEME SPELLING ERRORS**  If you have made a phonetic spelling mistake that causes S.A.M. to be unable to break your string down into phonemes, he will beep twice at you and come back to BASIC without speaking. The location of the bad letter in the string is stored for you to examine. Also, you may PEEK at this location in a program to see if there were any errors in spelling and then make the required changes.  Here is a sample error-checking and display program:  .  .  .  100 SAM$="MAY VOY4C IHZ BIHZAA5R."  110 A=USR(**8192**)  120 IF PEEK(**8211**)<255 THEN GOSUB 1000  :REM ERROR CHECK  .  .  .  1000 REM ERROR DISPLAY -- ERROR APPEARS IN INVERSE  1010 N=PEEK(**8211**):REM N IS POSITION OF ERROR  1020 SAM$(N,N) = CHR$(ASC(SAM$(N,N))+128)  1030 PRINT SAM$  1040 RETURN  The inverse character marks the spot where S.A.M. could no longer continue reading the string.  **TECHNICAL NOTES USE IN BASIC**  S.A.M. from BASIC performs all stack housekeeping that is required.  When S.A.M. completes vocal output,the NMIEN (Non-maskable Interrupt Enable) ($D40E) returns to the following conditions:     BIT 6 -- Vertical Blank Interrupt Enable = "on"    BIT 7 -- Display List Instruction Interrupt Enable = "on"  All other registers are returned to OS shadow values within 1/60 second after vocal output.  Note that during speech, the VBI is shut down so that the real-time clock registers (18, 19, 20) do not advance.  **SCREEN BLANK**  The screen blanks during vocal output because Direct Memory Access (DMA) causes gaps to be inserted into the speech waveform each time the 6502 processor waits for the ANTIC chip to access memory. The audible result is extremely distorted speech when the screen is on.  If this speech quality is desirable for some application (or the screen must remain on during speech), S.A.M. may be operated in the DMA-enabled mode by POKE-ing a "1" into the "lights" register: **8210**. There are different speed and pitch addresses to be used in this case. To return to DMA-disabled speech, POKE a "0" into this register.  **IMPORTANT ADDRESSES**   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  |  |  | | --- | --- | --- | |  | Decimal | Hex | | S.A.M. from Atari BASIC | **8192** | **$2000** | | S.A.M. from machine language | **8196** | **$2004** | | RECITER from Atari BASIC | **8199** | **$2007** | | RECITER from machine language | **8203** | **$200B** | | SPEED (LIGHTS OFF) | **8208** | **$2010** | | SPEED (LIGHTS ON) | **8206** | **$200E** | | PITCH (LIGHTS OFF) | **8209** | **$2011** | | PITCH (LIGHTS ON) | **8207** | **$200F** | | DMA-enable | **8210** | **$2012** | | ERROR | **8211** | **$2013** | | ATASCII STRING | **8212** | **$2014** | | | |
| **LISTING OF GUESSNUM** [**Download GUESSNUM.BAS (Atari BASIC)**](http://www.retrobits.net/atari/downloads/GUESSNUM.BAS)  10 REM ---- GUESSNUM ----  20 DIM SAM$(255),B$(50),C$(50)  30 SAM=8192:REM SAM'S ADDRE5S  40 GRAPHICS 2:? #6;"GUESS THE NUMBER":? #6;"BETWEEN  1 AND 100"  50 SETCOLOR 2,0,0  60 N=INT(99\*RND(0))+1  70 SAM$="GEH3S DHAX NAH4MBER BIXTWIY5N WAH4N Q AEND  WAHH6 /HAN4NDRIHD.":A=USR(SAM)  80 TRAP 80:INPUT G  90 IF G>99 THEN SAM$="DHAETS MON4R DHAEN WAHN  /HAH4NDRIXD.":A=USR(SAM):GOTO 80  100 IF G<1 THEN SAM$="DHAE5TS LEH3S DHAEN WAH5N."  :A=USR(SAM):GOTO 80  110 SAM$=""  120 IF G<10 THEN B$="":GOTO 340  130 DN G-9 GOTO 150,160,170,180,190,200,210,220,230,240  140 GOTO 250  150 B$="TEH4N":GOTO 460  160 B$="IHLEH4VIXN":GOTO 460  170 B$="TWEH4LV":GOTO 460  180 B$="THER4TIY6N":GOTO 460  190 B$="FOH4RTIY6N":GOTO 460  200 B$="FIH4FTIY6N":GOTO 460  210 B$="SIH4KSTIY6N":GOTO 460  220 B$="SEH4VUNTIY6N":GOTO 460  230 B$="EY4TIY6N":GOTO 460  240 B$="NAY4NTIY6N":GOTO 460  250 ON INT(G/10)-1 GOTO 260,270,280,290,300,310,320,330  260 B$="TWEH4NTIY6":GOTO 340  270 B$="THER4TIY6":GOTO 340  280 B$="FOH4RTIY6":GOTO 340  290 B$="FIH4FTIY6":GOTO 340  300 B$="SIH4KSTIY6":GOTO 340  310 B$="SEH4VUNTIY6":GOTO 340  320 B$="EY4T1Y6":GOTO 340  330 B$="NAY4NTIY6"  340 R=G-10\*INT(G/10)  350 IF R=0 THEN GOTO 460  360 ON R GOTO 370,380,390.400,410,420,430,440,450  370 B$(LEN(B$)+1)="WAH5N":GOTO 460  380 B$(LEN(B$)+1)="TUW5":GOTO 460  390 B$(LEN(B$)+1)="THRIY5":GOTO 460  400 B$(LEN(B$)+1)="FOHR5":GOTO 460  410 B$(LEN(B$)+1)="FAY5V":GOTO 460  420 B$(LEN(B$)+1)="SIH5KS":GOTO 460  430 B$(LEN(B$)+1)="SEH5VUN":GOTO 460  440 B$(LEN(B$)+1)="EY5T":GOTO 460  450 B$(LEN(B$)+1)="NAY5N"  460 IF G>N+25 THEN C$=" IHZ MAH3CH TUW5 /HAY6."  :GOTO 530  470 IF G>N+5 THEN C$=" IHZ TUW3 /HAY6."  :GOTO 530  480 IF G>N THEN C$=" IHZ AN LIH3TUL TUW4 /HAY6, "  :GOTO 530  490 IF C<N-25 THEN C$=" IHZ MAH3CH TUW4 LAXOW, "  :GOTO 530  300 IF G<N-5 THEN C$=" IHZ TUW3 LAXOW. "  :GOTO 530  310 IF C<="">N THEN GOTO 80  350 ? :? :? :? :? :GOTO 60  **SELDOM-USED PHONEME COMBINATIONS**   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  |  |  |  |  | | --- | --- | --- | --- | --- | | Phoneme Combination |  | You probably want: |  | Unless it splits syllables like: | | GS |  | GZ e.g. ba**gs** | bu**gs**pray |  | | BS |  | BZ e.g. slo**bs** | o**bs**cene |  | | DS |  | DZ e.g. su**ds** | Hu**ds**on |  | | PZ |  | PS e.g. sla**ps** | -- |  | | TZ |  | TS e.g. cur**ts**y | -- |  | | KZ |  | KS e.g. fi**x** | -- |  | | NC |  | NXG e.g. s**inging** | **ing**rate |  | | NK |  | NXK e.g. ba**nk** | Su**nk**ist |  | | |     **FUTURE IMPROVEMENTS**  Improvements upon and modifications to the S.A.M. system may occur in the future. Such new versions of S.A.M. will be made available at nominal cost to **registered S.A.M. owners**.  We are also planning to release a new program called "SUPERECITER". RECITER presently has a pronunciation accuracy of about 90%. SUPERECITER will show a major improvement in this area. But, we need your help.  It you hear a word mispronounced by RECITER that you feel is important, jot it down. Send us your list of these words (or proper names) so that we may incorporate them into the expanded rule set of SUPERECITER. Your contributions will be greatly appreciated.  S.A.M. is an ongoing project at DON'T ASK Computer Software. We welcome your comments and suggestions on our software speech synthesis products.  **NOTES** |